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ENVIRONMENTAL RADIATION DATA

REPORT 128

October - December 2006

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
October 2006

Location	Number of Samples	5-hour Field Estimate (pCi/m³) Max	Min	Avg	NAREL Lab Measurement (pCi/m³) Max	Min	Avg
AL: Montgomery/408	9	0.2	0.0	0.1	0.020	0.008	0.013
AR: Little Rock	5	0.0	0.0	0.0	0.020	0.011	0.017
AZ: Phoenix	5	0.6	0.4	0.5	0.015	0.011	0.013
CA: Los Angeles	8	0.4	0.0	0.2	0.022	0.008	0.015
CA: Richmond	5	0.1	0.0	0.1	0.012	0.007	0.010
CA: San Diego	8	0.3	0.0	0.1	0.017	0.004	0.010
CA: San Francisco	2	0.0	0.0	0.0	0.014	0.010	0.012
CO: Denver	9	0.7	0.1	0.3	0.010	0.004	0.007
CT: Hartford	9	0.1	0.0	0.1	0.009	0.003	0.006
DC: Washington	9	0.6	0.0	0.3	0.015	0.007	0.010
DE: Wilmington	8	0.1	0.0	0.1	0.013	0.006	0.009
FL: Jacksonville	9	0.1	0.0	0.1	0.011	0.006	0.008
FL: Miami	9	0.1	0.0	0.1	0.014	0.005	0.008
GA: Atlanta	4	0.1	0.0	0.0	0.017	0.008	0.013
IA: Iowa City	9	1.1	0.5	0.8	0.017	0.007	0.011
ID: Idaho Falls	9				0.017	0.006	0.011
IL: Chicago	3	0.2	0.0	0.1	0.008	0.005	0.006
IN: Indianapolis	9	0.5	0.0	0.2	0.016	0.004	0.008
KS: Kansas City	7	2.8	0.5	1.2	0.023	0.007	0.015
KS: Topeka	9	2.1	0.3	0.8	0.021	0.011	0.015
MA: Boston	9	0.1	0.0	0.0	0.011	0.003	0.006
MD: Baltimore	3	0.0	0.0	0.0	0.009	0.006	0.007
MI: Detroit	9	0.3	0.0	0.1	0.013	0.005	0.008
MI: Lansing	9	0.2	0.0	0.1	0.011	0.006	0.008
MN: St. Paul	5	0.9	0.1	0.3	0.012	0.008	0.010
MS: Jackson	9	1.1	0.0	0.2	0.027	0.007	0.016
NC: Charlotte	9	0.1	0.0	0.0	0.023	0.007	0.013
NC: Wilmington	4				0.012	0.009	0.010
ND: Bismarck	7	1.7	0.4	0.7	0.027	0.007	0.014
NH: Concord	9	0.6	0.1	0.3	0.010	0.003	0.006
NJ: Trenton	9	0.9	0.1	0.3	0.011	0.005	0.008
NM: Santa Fe	1	3.8	3.8	3.8	0.020	0.020	0.020
NV: Las Vegas/913	4				0.010	0.008	0.009
NY: Albany	4	0.1	0.0	0.0	0.008	0.006	0.007
NY: New York City	7	0.0	0.0	0.0	0.019	0.006	0.014
NY: Yaphank	8	0.1	0.0	0.1	0.008	0.003	0.005
OH: Painesville	8	0.4	0.0	0.1	0.009	0.005	0.008
OH: Ross	9				0.016	0.008	0.012

Table 2 (continued)
Gross Beta in Airborne Particulates
October 2006

Location	Number of Samples	5-hour Field Estimate (pCi/m³) Max	Min	Avg	NAREL Lab Measurement (pCi/m³) Max	Min	Avg
OR: Portland	7	0.1	0.0	0.0	0.010	0.004	0.006
PA: Harrisburg	9	1.0	0.1	0.3	0.015	0.006	0.010
PA: Philadelphia	1				0.007	0.007	0.007
PA: Pittsburgh	9	0.3	0.1	0.2	0.016	0.008	0.011
SC: Barnwell	2	0.0	0.0	0.0	0.016	0.013	0.015
SC: Columbia	4	0.4	0.0	0.2	0.026	0.012	0.018
SD: Pierre	9	0.8	0.2	0.4	0.024	0.006	0.015
TN: Knoxville	7	0.1	0.0	0.1	0.035	0.007	0.018
TN: Memphis	9	0.3	0.0	0.1	0.019	0.007	0.011
TN: Nashville	9	0.2	0.1	0.1	0.018	0.007	0.012
TN: Oak Ridge/Bethel	9	1.4	0.3	0.5	0.021	0.010	0.014
TN: Oak Ridge/K25	8	1.4	0.1	0.7	0.022	0.009	0.014
TN: Oak Ridge/Melton	9	1.8	0.2	0.6	0.022	0.009	0.013
TN: Oak Ridge/Y12 E	9	1.5	0.2	0.5	0.027	0.011	0.015
TN: Oak Ridge/Y12 W	9	0.7	0.1	0.3	0.022	0.008	0.012
TX: Austin	9	0.2	0.1	0.2	0.021	0.008	0.012
TX: Dallas	9	0.6	0.1	0.3	0.015	0.006	0.009
TX: El Paso	9	1.3	0.4	0.8	0.025	0.010	0.017
UT: Salt Lake City	8	0.3	0.0	0.2	0.013	0.005	0.010
VA: Lynchburg	9	1.2	0.2	0.4	0.017	0.005	0.010
WA: Olympia	9	0.2	0.0	0.1	0.010	0.002	0.006
WA: Spokane	9	1.0	0.3	0.6	0.023	0.005	0.014
WI: Milwaukee	2	0.3	0.0	0.2	0.013	0.007	0.010

Table 3
Gross Beta in Airborne Particulates
November 2006

Location	Number of Samples	5-hour Field Estimate (pCi/m³) Max	Min	Avg	NAREL Lab Measurement (pCi/m³) Max	Min	Avg
AL: Montgomery/408	9	0.1	0.0	0.1	0.022	0.007	0.011
AR: Little Rock	7	0.1	0.0	0.0	0.020	0.008	0.015
AZ: Phoenix	4	0.9	0.5	0.7	0.026	0.015	0.021
CA: Los Angeles	6	0.5	0.1	0.3	0.023	0.010	0.015
CA: Richmond	4	0.1	0.0	0.1	0.005	0.003	0.004
CA: San Diego	5	0.4	0.0	0.1	0.018	0.005	0.010
CA: San Francisco	3	0.1	0.0	0.0	0.004	0.002	0.003
CA: San Jose	5	0.0	0.0	0.0	0.008	0.004	0.005
CO: Denver	8	0.8	0.1	0.4	0.015	0.004	0.009
CT: Hartford	8	0.2	0.0	0.1	0.020	0.007	0.013
DC: Washington	10	0.3	0.0	0.1	0.020	0.005	0.010
DE: Wilmington	8	0.1	0.1	0.1	0.018	0.007	0.010
FL: Jacksonville	8	0.1	0.0	0.1	0.013	0.005	0.007
FL: Miami	6	0.1	0.0	0.0	0.015	0.004	0.009
GA: Atlanta	5	0.0	0.0	0.0	0.011	0.007	0.009
IA: Iowa City	8	1.8	0.3	1.2	0.027	0.012	0.019
ID: Idaho Falls	9				0.014	0.006	0.009
IN: Indianapolis	7	0.1	0.1	0.1	0.014	0.006	0.010
KS: Kansas City	8	4.2	1.5	2.5	0.031	0.016	0.024
KS: Topeka	9	1.8	0.6	1.1	0.032	0.014	0.023
MA: Boston	8	0.0	0.0	0.0	0.013	0.003	0.006
MD: Baltimore	4	0.0	0.0	0.0	0.011	0.006	0.008
MI: Detroit	7	0.3	0.0	0.1	0.037	0.008	0.015
MI: Lansing	8	0.2	0.1	0.1	0.016	0.008	0.013
MN: St. Paul	4	0.5	0.1	0.3	0.026	0.016	0.021
MS: Jackson	5	0.4	0.0	0.1	0.013	0.008	0.010
NC: Charlotte	7	0.1	0.0	0.0	0.014	0.004	0.010
NC: Wilmington	3				0.011	0.006	0.009
ND: Bismarck	4	1.4	0.9	1.1	0.023	0.013	0.017
NH: Concord	7	0.5	0.1	0.3	0.018	0.004	0.009
NJ: Trenton	9	0.2	0.1	0.1	0.020	0.001	0.009
NM: Santa Fe	1	0.0	0.0	0.0	0.002	0.002	0.002
NV: Las Vegas/913	2	0.0	0.0	0.0	0.011	0.007	0.009
NY: Albany	5	0.1	0.0	0.0	0.016	0.004	0.009
NY: New York City	5	0.0	0.0	0.0	0.040	0.014	0.022
NY: Yaphank	9	0.1	0.0	0.0	0.014	0.002	0.006
OH: Painesville	7	0.2	0.1	0.1	0.016	0.008	0.012
OH: Ross	8				0.061	0.010	0.020

Table 3 (continued)
Gross Beta in Airborne Particulates
November 2006

Location	Number of Samples	5-hour Field Estimate (pCi/m³) Max	Min	Avg	NAREL Lab Measurement (pCi/m³) Max	Min	Avg
OR: Portland	7	0.1	0.0	0.0	0.010	0.002	0.004
PA: Harrisburg	9	0.3	0.0	0.1	0.022	0.005	0.012
PA: Pittsburgh	8	0.2	0.0	0.1	0.020	0.009	0.015
SC: Barnwell	1	0.0	0.0	0.0	0.011	0.011	0.011
SC: Columbia	1	0.0	0.0	0.0	0.009	0.009	0.009
SD: Pierre	5	0.4	0.2	0.3	0.018	0.009	0.012
TN: Knoxville	8	0.2	0.0	0.1	0.026	0.008	0.017
TN: Memphis	8	0.2	0.0	0.1	0.023	0.009	0.014
TN: Nashville	8	0.2	0.0	0.1	0.022	0.006	0.014
TN: Oak Ridge/Bethel	8	0.6	0.2	0.3	0.015	0.010	0.013
TN: Oak Ridge/K25	8	0.6	0.3	0.4	0.015	0.011	0.013
TN: Oak Ridge/Melton	8	0.3	0.2	0.2	0.015	0.010	0.012
TN: Oak Ridge/Y12 E	8	0.7	0.1	0.3	0.018	0.010	0.014
TN: Oak Ridge/Y12 W	8	0.2	0.1	0.2	0.015	0.010	0.012
TX: Austin	8	0.2	0.1	0.2	0.016	0.007	0.012
TX: Dallas	6	0.6	0.1	0.3	0.019	0.009	0.013
TX: El Paso	6	1.7	0.3	0.8	0.040	0.013	0.021
UT: Salt Lake City	8	0.4	0.0	0.2	0.016	0.006	0.011
VA: Lynchburg	6	1.0	0.1	0.4	0.019	0.009	0.013
WA: Olympia	7	0.0	0.0	0.0	0.006	0.002	0.003
WA: Spokane	8	0.6	0.0	0.2	0.018	0.003	0.008
WI: Milwaukee	7	0.4	0.0	0.1	0.027	0.010	0.018

Table 4
Gross Beta in Airborne Particulates
December 2006

Location	Number of Samples	5-hour Field Estimate (pCi/m³) Max	Min	Avg	NAREL Lab Measurement (pCi/m³) Max	Min	Avg
AL: Montgomery/408	8	0.1	0.0	0.1	0.022	0.008	0.015
AR: Little Rock	3	0.1	0.0	0.0	0.020	0.018	0.019
AZ: Phoenix	4	0.5	0.2	0.4	0.026	0.014	0.019
CA: Los Angeles	9	0.6	0.2	0.4	0.019	0.007	0.011
CA: Richmond	4	0.2	0.1	0.1	0.018	0.006	0.013
CA: San Diego	6	0.1	0.0	0.0	0.011	0.005	0.007
CA: San Jose	7	0.0	0.0	0.0	0.034	0.003	0.014
CO: Denver	8	0.3	0.0	0.1	0.008	0.003	0.006
CT: Hartford	7	0.2	0.1	0.1	0.028	0.009	0.020
DC: Washington	8	0.6	0.0	0.3	0.018	0.009	0.013
DE: Wilmington	7	0.7	0.0	0.2	0.021	0.010	0.014
FL: Jacksonville	9	0.8	0.0	0.1	0.019	0.003	0.010
FL: Miami	5	0.0	0.0	0.0	0.007	0.004	0.005
GA: Atlanta	3	0.0	0.0	0.0	0.015	0.012	0.013
IA: Iowa City	7	1.5	0.4	0.9	0.028	0.011	0.018
ID: Idaho Falls	8				0.025	0.004	0.013
IN: Indianapolis	9	0.1	0.0	0.1	0.015	0.005	0.010
KS: Kansas City	8	2.6	0.5	1.0	0.028	0.013	0.017
KS: Topeka	8	1.6	0.2	0.5	0.026	0.008	0.017
MA: Boston	9	0.0	0.0	0.0	0.014	0.003	0.008
MD: Baltimore	3	0.0	0.0	0.0	0.012	0.009	0.010
MI: Detroit	5	0.2	0.0	0.1	0.015	0.011	0.013
MI: Lansing	7	0.2	0.0	0.1	0.021	0.011	0.015
MN: St. Paul	4	0.2	0.1	0.1	0.020	0.014	0.016
MS: Jackson	5	0.1	0.0	0.0	0.021	0.004	0.012
NC: Charlotte	7	0.1	0.0	0.0	0.021	0.009	0.016
NC: Wilmington	3				0.013	0.011	0.011
ND: Bismarck	8	1.7	0.3	1.1	0.023	0.006	0.014
NH: Concord	9	0.5	0.1	0.2	0.017	0.005	0.011
NJ: Trenton	8	0.3	0.1	0.2	0.017	0.007	0.012
NV: Las Vegas/913	5	0.0	0.0	0.0	0.014	0.008	0.011
NY: Albany	4	0.0	0.0	0.0	0.017	0.010	0.014
NY: New York City	6	0.1	0.0	0.0	0.030	0.013	0.023
NY: Yaphank	7	0.1	0.0	0.0	0.009	0.003	0.006
OH: Cleveland	2	0.1	0.0	0.0	0.027	0.015	0.021
OH: Painesville	7	0.2	0.0	0.1	0.019	0.007	0.012
OH: Ross	9				0.030	0.008	0.017
OR: Portland	8	0.1	0.0	0.0	0.025	0.002	0.009

Table 4 (continued)
Gross Beta in Airborne Particulates
December 2006

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)
PA: Harrisburg	8	0.2	0.1	0.1	0.016	0.008	0.011
PA: Pittsburgh	5	0.6	0.0	0.2	0.021	0.006	0.014
RI: Providence	6	0.1	0.0	0.1	0.009	0.003	0.007
SC: Barnwell	1	0.0	0.0	0.0	0.013	0.013	0.013
SC: Columbia	2	0.1	0.0	0.1	0.015	0.012	0.014
SD: Pierre	8	1.1	0.2	0.4	0.024	0.008	0.013
TN: Knoxville	5	0.3	0.0	0.1	0.035	0.016	0.024
TN: Memphis	9	0.4	0.0	0.1	0.015	0.005	0.011
TN: Nashville	6	0.2	0.0	0.1	0.020	0.014	0.017
TN: Oak Ridge/Bethel	7	0.6	0.2	0.4	0.019	0.013	0.015
TN: Oak Ridge/K25	7	0.8	0.2	0.5	0.020	0.012	0.016
TN: Oak Ridge/Melton	7	0.5	0.1	0.3	0.022	0.009	0.015
TN: Oak Ridge/Y12 E	7	0.6	0.1	0.4	0.022	0.012	0.016
TN: Oak Ridge/Y12 W	7	0.3	0.1	0.2	0.020	0.010	0.015
TX: Austin	7	0.3	0.1	0.2	0.019	0.006	0.013
TX: Dallas	7	0.3	0.1	0.1	0.015	0.009	0.012
TX: El Paso	7	1.8	0.1	0.6	0.038	0.012	0.021
UT: Salt Lake City	7	0.3	0.0	0.1	0.031	0.007	0.016
VA: Lynchburg	5	0.6	0.2	0.4	0.017	0.009	0.013
WA: Olympia	8	0.1	0.0	0.0	0.015	0.002	0.006
WA: Spokane	8	0.2	0.1	0.1	0.026	0.002	0.014
WI: Milwaukee	9	0.3	0.0	0.1	0.037	0.014	0.020

Table 5
Gross Beta and Specific Gamma in Precipitation
October 2006

Location	Gross Beta Activity pCi/L	± 2*u*	Gamma-Emitting Radionuclides Nuclide	pCi/L	± 2*u*
AL: Montgomery/408	0.31	0.27		ND	
AR: Little Rock	0.62	0.32	K40	20	34
CA: Richmond	2.36	0.62		ND	
CO: Denver	1.06	0.37	Be7	23	23
			Pb212	3.5	5.7
CT: Hartford	0.56	0.30	Be7	27	29
			K40	29	33
DE: Wilmington	0.19	0.26		ND	
FL: Jacksonville	0.13	0.26	K40	61	22
			Pb212	3.7	2.6
			Tl208	2.2	2.5
FL: Miami	0.99	0.35		ND	
GA: Atlanta	0.70	0.34	Be7	43	25
IA: Iowa City	1.28	0.40	K40	88	31
			Pb212	5.6	8.3
ID: Idaho Falls	1.75	0.44		ND	
KS: Kansas City	0.38	0.28		ND	
MA: Boston	1.68	0.40	Be7	62	31
MI: Lansing	0.64	0.33		ND	
MN: St. Paul	2.97	0.56	K40	62	35
NC: Charlotte	0.44	0.28	Be7	55	27
NC: Wilmington	0.51	0.30		ND	
NH: Concord	0.62	0.30	Be7	43	28
NM: Santa Fe	1.36	0.40	Be7	43	31
NY: Albany	0.61	0.30		ND	
NY: Yaphank	11.7	1.4		ND	
OH: Painesville	0.83	0.34	K40	47	35
			Ra228	14.6	9.6
OR: Portland	0.54	0.31	K40	46	19
			Ra228	9.2	5.5
			Tl208	2.5	1.6
TN: Knoxville	13.4	1.6	Pb212	5.6	8.2
TN: Nashville	0.44	0.29		ND	
TN: Oak Ridge/Melton	2.80	0.52	Pb212	9.0	8.3
TX: Austin	0.33	0.30	K40	46	34
TX: Dallas	0.22	0.28	K40	24	41
TX: El Paso	0.78	0.34	K40	40	65

Note: ND = Not Detected

Table 5 (continued)
Gross Beta and Specific Gamma in Precipitation
October 2006

Location	Gross Beta Activity pCi/L	± 2*u*	Gamma-Emitting Radionuclides Nuclide	pCi/L	± 2*u*
UT: Salt Lake City	3.24	0.59	Be7	37	24
VA: Lynchburg	2.61	0.50		ND	
WA: Olympia	0.85	0.35	Be7	17.1	8.8

Note: ND = Not Detected

Table 6
Gross Beta and Specific Gamma in Precipitation
November 2006

Location	Gross Beta Activity pCi/L	± 2*u*	Gamma-Emitting Radionuclides Nuclide	pCi/L	± 2*u*
AL: Montgomery/408	0.66	0.31		ND	
AR: Little Rock	1.97	0.46		ND	
CA: Richmond	0.63	0.31	Bi212	27	44
CO: Denver	0.78	0.33		ND	
CT: Hartford	0.62	0.31	Be7	16	15
DE: Wilmington	0.70	0.31	Be7	66	36
FL: Jacksonville	1.93	0.50	Be7	52	30
FL: Miami	0.06	0.25		ND	
GA: Atlanta	0.35	0.28	Bi212	35	32
IA: Iowa City	2.35	0.50		ND	
ID: Idaho Falls	0.81	0.33		ND	
MA: Boston	1.06	0.35	Be7	37	28
MI: Lansing	0.88	0.33		ND	
MN: St. Paul	13.3	1.6	Be7	40	27
NC: Charlotte	0.44	0.29	Pb212	6.9	8.1
			Tl208	1.9	4.7
NC: Wilmington	0.57	0.31	Be7	31	31
			Pb212	6.6	9.0
NH: Concord	0.97	0.34	Be7	40	27
			Pb212	5.6	8.1
			Tl208	2.5	5.0
NY: Albany	0.95	0.35	Pb212	5.0	9.1
NY: Yaphank	1.95	0.44	Be7	13	15
OH: Painesville	1.60	0.40	Be7	36	23
OR: Portland	0.48	0.29	Be7	60	25
PA: Harrisburg	0.59	0.31	Pb212	8.9	8.2
TN: Knoxville	53.7	5.7	K40	51	71
	41.3	4.4	K40	51	71
TN: Nashville	0.41	0.29	Bi212	34	28
TN: Oak Ridge/Melton	1.68	0.40	Be7	41	18
UT: Salt Lake City	3.85	0.67		ND	
VA: Lynchburg	2.89	0.53	Bi212	31	26
			Pb212	6.3	8.6
WA: Olympia	0.41	0.28		ND	

Note: ND = Not Detected

Table 7
Gross Beta and Specific Gamma in Precipitation
December 2006

Location	Gross Beta Activity pCi/L	± 2*u*	Gamma-Emitting Radionuclides Nuclide	pCi/L	± 2*u*
AL: Montgomery/408	4.98	0.76	Be7	60	31
CA: Richmond	0.32	0.29	Pb212	7.9	8.6
CO: Denver	1.31	0.39	Be7	31	30
			Pb212	4.4	5.7
			Ra224	48	49
CT: Hartford	2.77	0.53		ND	
DE: Wilmington	1.12	0.38		ND	
FL: Jacksonville	2.03	0.49	Be7	48	22
GA: Atlanta	0.85	0.35	Be7	24	20
IA: Iowa City	0.40	0.30		ND	
ID: Idaho Falls	1.12	0.38		ND	
KS: Kansas City	0.53	0.32	Be7	18	20
MA: Boston	6.96	0.95	Be7	74	19
MN: St. Paul	2.89	0.56		ND	
NC: Charlotte	0.51	0.31		ND	
NC: Wilmington	0.67	0.33		ND	
NH: Concord	0.70	0.32	Ra228	9	14
NY: Albany	1.38	0.41	Be7	57	35
NY: Yaphank	2.13	0.47	Be7	15	12
OH: Painesville	1.20	0.38	Be7	27	25
OR: Portland	0.53	0.31	Be7	74	31
PA: Harrisburg	0.84	0.35	Be7	25	23
TN: Knoxville	12.0	1.5		ND	
TN: Nashville	0.83	0.34	Be7	39	15
			Tl208	1.4	1.5
TN: Oak Ridge/Melton	1.58	0.41	Be7	54	26
			K40	22	35
TX: Austin	0.79	0.34		ND	
UT: Salt Lake City	1.64	0.44	Be7	47	31
			Pb212	7.1	8.5
VA: Lynchburg	4.08	0.67		ND	
WA: Olympia	0.43	0.30	Be7	34	16

Note: ND = Not Detected

Table 8
Tritium in Precipitation
October - December 2006

Location	October 2006 pCi/L	± 2*u*	November 2006 pCi/L	± 2*u*	December 2006 pCi/L	± 2*u*
AL: Montgomery/408	0	76	43	80	-2	80
AR: Little Rock	-22	83	-12	78	NS	
CA: Richmond	-44	83	43	81	-38	83
CO: Denver	9	84	2	79	16	78
CT: Hartford	10	77	-63	83	29	77
DE: Wilmington	57	79	-2	85	-4	78
FL: Jacksonville	14	77	6	79	-61	77
FL: Miami	4	76	-2	78	NS	
GA: Atlanta	51	79	61	81	-38	78
IA: Iowa City	41	78	30	80	-20	79
ID: Idaho Falls	-18	84	25	79	-43	80
KS: Kansas City	-73	81	NS		-45	78
MA: Boston	33	78	-71	82	27	77
MI: Lansing	23	77	67	82	NS	
MN: St. Paul	51	79	39	81	0	79
NC: Charlotte	47	78	-43	84	-24	76
NC: Wilmington	22	77	-94	81	-3	77
NH: Concord	-18	75	-24	85	-38	73
NM: Santa Fe	-16	84	NS		NS	
NY: Albany	29	77	-52	84	21	77
NY: Yaphank	59	79	-65	82	0	78
OH: Painesville	39	78	45	81	31	81
OR: Portland	-49	82	-4	79	-7	79
PA: Harrisburg	NS		-65	83	-2	78
TN: Knoxville	18	77	-49	76	56	83
TN: Nashville	49	79	47	80	-50	78
TN: Oak Ridge/Melton	45	78	61	82	155	86
TX: Austin	-33	83	NS		56	82
TX: Dallas	-5	84	NS		NS	
TX: El Paso	-90	81	NS		NS	
UT: Salt Lake City	35	86	-6	78	4	80
VA: Lynchburg	33	78	4	79	-60	76
WA: Olympia	9	85	73	82	-42	81

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.

Table 9
Plutonium and Uranium in Airborne Particulates
January - December 2006 Composites

Location	^{238}Pu		$^{239-240}$Pu		^{234}U		^{235}U		^{238}U	
	aCi/m³	± 2*u*	aCi/m³	± 2*u*	aCi/m³	± 2*u*	aCi/m³	± 2*u*	aCi/m³	± 2*u*
AL: Montgomery/408	0.4	1.4	0.19	0.56	19.8	4.5	1.2	1.1	21.3	4.7
AR: Little Rock	3.4	6.7	-0.3	2.3	221	44	11.7	9.4	192	40
AZ: Phoenix	4.0	4.6	0.9	2.7	135	30	4.3	6.0	128	28
CA: Los Angeles	2.9	3.0	0.2	1.7	77	16	3.9	3.5	58	13
CA: Richmond	1.4	1.4	0.00	0.50	15.9	4.0	1.6	1.3	15.6	3.9
CA: Richmond	0.27	0.88	0.11	0.49	15.9	4.0	1.6	1.3	15.6	3.9
CA: San Diego	1.1	4.8	-0.2	2.1	58	16	4.1	4.8	56	15
CA: San Francisco	0.6	1.1	0.17	0.76	14.5	4.2	0.5	1.1	10.4	3.5
CA: San Jose	-0.5	1.6	0.1	1.1	13.7	4.4	1.4	1.6	12.5	4.2
CO: Denver	0.9	1.9	0.7	1.3	55	11	3.3	2.5	43.5	9.4
CT: Hartford	-1.0	2.8	-0.4	1.1	23.1	6.9	1.8	2.3	18.2	6.0
DC: Washington	2.6	3.9	-0.5	1.1	24.0	6.5	2.5	2.5	24.2	6.6
DC: Washington	1.3	1.4	0.00	0.42	24.0	6.5	2.5	2.5	24.2	6.6
DE: Wilmington	2.8	4.7	-0.6	1.6	41	12	6.4	5.1	39	12
FL: Jacksonville	0.8	2.8	0.3	1.2	28.8	7.7	3.2	3.0	27.6	7.6
FL: Miami	1.2	1.7	0.70	0.95	34.3	7.5	4.1	2.5	34.7	7.5
GA: Atlanta	0.4	2.0	-0.31	0.75	32.1	7.8	3.3	2.7	34.6	8.2
IA: Iowa City	-1.2	1.7	-0.33	0.80	27.3	6.7	2.8	2.2	28.6	6.9
ID: Idaho Falls	0.2	4.7	-1.2	1.9	43	13	4.2	4.9	42	13
IL: Chicago	4.0	3.0	0.2	1.1	36.6	8.8	5.5	3.6	46	10
IN: Indianapolis	-1.1	2.0	0.4	1.1	39.7	8.9	2.3	2.2	40.2	9.0
KS: Kansas City	0.9	2.2	0.0	1.1	37.0	7.9	2.8	2.2	29.8	6.9
KS: Topeka	0.2	1.4	0.5	1.4	56	12	4.3	3.5	60	13
MA: Boston	0.6	2.0	0.1	1.0	13.4	4.5	1.1	1.5	11.0	4.1
MD: Baltimore	0.5	1.1	0.12	0.54	10.4	3.1	0.8	1.2	10.0	3.1
ME: Augusta	0.5	2.5	0.3	1.4	21.5	6.0	1.9	1.9	16.5	5.2
MI: Detroit	0.10	0.88	0.29	0.84	24.1	6.3	1.5	1.7	28.3	6.9
MI: Lansing	0.0	1.5	0.53	0.93	27.5	6.2	3.2	2.2	26.6	6.1
MN: St. Paul	-0.1	2.6	0.4	1.0	38.0	8.8	4.9	3.2	41.7	9.4
MS: Jackson	1.0	2.1	0.09	0.82	18.9	5.1	1.4	1.7	17.4	4.9
NC: Charlotte	-1.7	4.6	0.2	2.2	44	11	4.3	3.7	37	10
NC: Wilmington	-0.8	2.3	0.0	1.1	20.6	5.9	2.0	2.0	25.7	6.7
ND: Bismarck	-0.2	1.6	1.0	1.7	56	12	1.6	2.2	43	10
NH: Concord	0.6	2.4	0.1	1.1	26.8	6.9	2.8	2.3	26.5	6.8
NJ: Trenton	0.9	3.9	-0.5	1.3	31.2	9.0	3.2	3.3	26.1	8.1
NM: Santa Fe	0.46	0.53	0.08	0.35	9.7	2.5	0.75	0.82	10.0	2.6
NV: Las Vegas/913	0.7	1.4	0.33	0.96	74	14	2.6	2.5	52	11
NY: Albany	-0.2	5.0	-0.5	1.7	37	11	5.2	4.3	42	11
NY: New York City	0.5	3.9	0.2	2.2	33	11	0.8	2.4	38	11
NY: Yaphank	-0.1	1.9	0.1	1.0	14.9	4.2	0.18	0.81	10.2	3.3

Note: NA = No Analysis

Table 9 (continued)
Plutonium and Uranium in Airborne Particulates
January - December 2006 Composites

Location	^{238}Pu		$^{239–240}$Pu		^{234}U		^{235}U		^{238}U	
	aCi/m³	± 2*u*	aCi/m³	± 2*u*	aCi/m³	± 2*u*	aCi/m³	± 2*u*	aCi/m³	± 2*u*
OH: Cleveland	0.3	1.2	0.17	0.62	17.0	4.5	1.6	1.5	14.0	4.0
OH: Painesville	0.9	1.5	0.06	0.59	19.4	4.6	1.8	1.6	22.2	5.1
OH: Ross	0.32	0.93	-0.11	0.71	43.6	9.7	4.2	3.0	47	10
OR: Portland	0.1	1.2	0.0	1.2	12.2	4.1	3.2	2.3	13.0	4.2
PA: Harrisburg	-1.0	2.8	-0.4	1.4	18.8	5.2	2.9	2.2	16.7	4.8
PA: Philadelphia	0.3	3.4	-0.2	1.5	30.8	8.5	0.5	1.6	32.1	8.7
PA: Pittsburgh	0.5	3.1	-0.3	1.1	37.5	9.3	2.3	2.5	33.0	8.5
RI: Providence	-0.4	1.0	0.21	0.58	6.1	1.9	0.23	0.60	4.5	1.6
SC: Barnwell	0.8	1.0	0.41	0.68	21.1	4.3	1.6	1.1	21.5	4.3
SC: Columbia	-0.4	1.2	0.18	0.52	51.3	9.2	5.0	2.5	40.8	7.8
SD: Pierre	0.00	0.77	0.6	1.3	34.9	8.2	3.5	2.6	34.9	8.1
TN: Knoxville	0.8	2.2	0.5	1.3	36.7	8.5	2.9	2.4	33.1	7.9
TN: Memphis	-0.31	0.83	-0.09	0.30	14.4	3.4	1.5	1.1	12.5	3.1
TN: Nashville	0.5	1.9	-0.28	0.67	26.8	6.6	2.7	2.3	21.9	5.8
TN: Oak Ridge/Bethel	0.1	1.1	0.18	0.65	16.6	3.8	1.4	1.1	17.3	3.9
TN: Oak Ridge/K25	-0.22	0.69	1.13	0.78	66.2	9.4	4.6	1.6	89	12
TN: Oak Ridge/Melton	0.18	0.98	0.00	0.29	16.4	3.7	1.20	0.99	13.0	3.2
TN: Oak Ridge/Y12 E	0.4	2.4	0.2	1.1	82	14	6.0	3.2	45.6	9.3
TN: Oak Ridge/Y12 W	3.3	1.8	0.37	0.77	134	19	5.9	2.3	30.7	5.8
TX: Austin	3.0	2.6	0.21	0.96	26.3	7.4	1.7	2.2	19.9	6.3
TX: Austin	0.7	1.2	0.50	0.78	26.3	7.4	1.7	2.2	19.9	6.3
TX: Dallas	0.2	2.1	0.7	2.0	61	15	2.3	3.5	58	15
TX: El Paso	1.8	5.5	0.0	2.4	113	27	1.8	4.8	95	24
UT: Salt Lake City	2.7	3.1	0.0	1.1	49	14	1.2	3.2	55	15
UT: Salt Lake City	0.8	1.8	-0.31	0.75	49	14	1.2	3.2	55	15
VA: Lynchburg	2.6	4.0	-0.5	1.5	87	15	7.2	3.5	17.4	5.1
WA: Olympia	-2.1	2.5	0.1	1.6	10.8	4.0	0.1	1.1	10.3	3.9
WA: Spokane	1.1	2.0	0.8	1.7	45	12	1.8	2.7	37	10
WI: Milwaukee	0.50	0.71	0.14	0.40	20.1	4.1	0.92	0.88	17.6	3.8

Note: NA = No Analysis

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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. 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 10
Tritium in Drinking Water
October - December 2006

Location	Date Collected	^{3}H pCi/L	± 2*u*
AK: Fairbanks	10/06/06	27	78
AL: Dothan	10/13/06	-10	81
AL: Montgomery	10/05/06	69	81
AL: Muscle Shoals	10/05/06	284	94
AL: Scottsboro	10/05/06	180	89
AR: Little Rock	10/12/06	14	80
CA: Los Angeles	10/05/06	16	80
CA: Richmond	10/03/06	18	78
CO: Denver	10/10/06	37	81
CT: Hartford	10/03/06	51	80
DE: Dover	10/06/06	0	80
FL: Tampa	11/07/06	11	85
GA: Baxley	11/20/06	-37	83
GA: Savannah	12/29/06	29	78
HI: Honolulu	10/04/06	-8	76
IA: Cedar Rapids	10/11/06	25	81
ID: Boise	12/06/06	-4	75
ID: Idaho Falls	10/13/06	-57	81
IL: Morris	12/29/06	-28	72
IL: W. Chicago	10/17/06	-8	81
KS: Topeka	10/17/06	17	82
MA: Lawrence	11/21/06	-8	85
MD: Conowingo	11/28/06	-43	83
MI: Detroit	10/02/06	125	83
MI: Grand Rapids	10/16/06	29	82
MN: Red Wing	10/10/06	66	82
MN: St. Paul	10/31/06	31	86
MO: Jefferson City	10/05/06	60	80
MS: Jackson	10/03/06	25	78
MS: Port Gibson	10/03/06	31	78
MT: Helena	10/18/06	16	82
NC: Charlotte	10/12/06	1370	130
NC: Raleigh	11/15/06	2	86
ND: Bismarck	10/05/06	107	82
NE: Lincoln	10/04/06	4	77
NH: Concord	10/13/06	47	83
NJ: Trenton	10/04/06	72	80
NJ: Waretown	10/10/06	-17	80
NM: Santa Fe	10/30/06	-2	84
NV: Las Vegas	12/20/06	46	77

Table 10 (continued)
Tritium in Drinking Water
October - December 2006

Location	Date Collected	^{3}H pCi/L	± 2*u*
NY: Albany	10/05/06	76	80
NY: New York City	10/16/06	4	81
NY: Syracuse	12/04/06	2	85
OH: Cincinnati	11/16/06	-38	82
OH: Columbus	10/04/06	54	79
OH: E. Liverpool	11/21/06	6	86
OH: Painesville	11/01/06	25	85
OH: Toledo	10/03/06	127	83
OR: Portland	12/11/06	-6	75
PA: Columbia	11/29/06	700	110
PA: Harrisburg	11/29/06	-59	83
PA: Philadelphia/Baxter	10/30/06	-49	81
PA: Philadelphia/Belmont	10/30/06	18	84
PA: Philadelphia/Queen	10/30/06	-25	82
PA: Pittsburgh	11/21/06	-37	84
RI: Providence	11/27/06	4	86
SC: Barnwell	10/19/06	-15	84
SC: Columbia	10/04/06	147	84
SC: Jenkinsville	10/12/06	26	86
SC: Seneca	10/09/06	14	80
TN: Chattanooga	10/03/06	246	91
TN: Knoxville	10/03/06	-8	77
TN: Oak Ridge/#360	10/10/06	8	80
TN: Oak Ridge/#371	10/10/06	8	80
TN: Oak Ridge/#4442	10/10/06	110	85
TN: Oak Ridge/#768	10/10/06	2	79
TN: Oak Ridge/#772	10/10/06	35	81
TX: Austin	10/16/06	4	81
VA: Ashland	11/15/06	89	88
VA: Lynchburg	10/03/06	16	78
WA: Richland	10/09/06	45	81
WA: Seattle	11/28/06	-37	83

Table 11
Plutonium and Uranium Analyses
Selected Drinking Water Composite Samples
January - December 2006

Location	^{238}Pu pCi/L ± 2*u*	$^{239–240}$Pu pCi/L ± 2*u*	^{234}U pCi/L ± 2*u*	^{235}U pCi/L ± 2*u*	^{238}U pCi/L ± 2*u*
CA: Los Angeles	0.003 0.021	0.000 0.012	1.48 0.20	0.071 0.044	1.14 0.17
FL: Tampa	-0.002 0.029	0.002 0.014	0.174 0.061	0.009 0.024	0.134 0.052
GA: Baxley	0.009 0.026	0.000 0.012	0.086 0.045	0.027 0.032	0.018 0.025
IL: Morris	-0.001 0.019	-0.0028 0.0096	0.58 0.11	0.009 0.024	0.078 0.041
IL: W. Chicago	0.002 0.035	-0.002 0.010	0.114 0.051	0.002 0.018	0.024 0.027
LA: New Orleans	0.003 0.025	0.000 0.012	1.05 0.16	0.052 0.041	0.69 0.13
ME: Augusta	0.001 0.034	0.003 0.013	1.11 0.16	0.035 0.033	0.93 0.14
MS: Port Gibson	0.004 0.022	0.003 0.012	0.131 0.049	0.010 0.018	0.044 0.032
NE: Lincoln	-0.004 0.019	-0.0013 0.0090	2.96 0.32	0.097 0.050	1.98 0.24
NM: Santa Fe	-0.011 0.021	0.000 0.012	6.52 0.57	0.123 0.053	2.64 0.28
NV: Las Vegas	-0.005 0.019	0.008 0.014	3.12 0.32	0.089 0.045	1.69 0.21

Note: NA = No Analysis

Table 12
Iodine-131 in Drinking Water
January - December 2006

Location	Date Collected	^{131}I pCi/L	± 2*u*
AK: Fairbanks	03/02/06	0.07	0.17
AL: Dothan	07/12/06	0.01	0.13
AL: Montgomery	01/05/06	0.06	0.15
AL: Muscle Shoals	01/10/06	0.06	0.15
AL: Muscle Shoals	10/05/06	0.11	0.47
AL: Scottsboro	01/10/06	0.01	0.16
AR: Little Rock	01/05/06	0.15	0.25
CA: Los Angeles	01/04/06	-0.03	0.13
CA: Richmond	10/03/06	-0.03	0.33
CO: Denver	07/20/06	-0.05	0.17
CT: Hartford	10/03/06	-0.03	0.18
DE: Dover	10/06/06	0.06	0.25
FL: Tampa	09/26/06	0.03	0.19
GA: Baxley	11/20/06	-0.16	0.34
GA: Savannah	12/29/06	0.12	0.26
HI: Honolulu	07/14/06	0.07	0.15
IA: Cedar Rapids	01/10/06	0.08	0.15
ID: Boise	08/21/06	-0.08	0.23
ID: Idaho Falls	01/17/06	0.06	0.18
IL: Morris	07/25/06	0.04	0.14
IL: W. Chicago	01/10/06	0.04	0.16
KS: Topeka	07/10/06	0.10	0.15
MA: Lawrence	11/21/06	0.07	0.19
MD: Baltimore	01/05/06	-0.08	0.28
MD: Conowingo	11/28/06	0.11	0.18
MI: Detroit	10/02/06	0.09	0.21
MI: Grand Rapids	07/21/06	0.04	0.14
MN: Red Wing	01/17/06	-0.02	0.16
MN: St. Paul	10/31/06	0.02	0.32
MO: Jefferson City	01/05/06	0.28	0.25
MS: Jackson	07/11/06	-0.06	0.13
MS: Port Gibson	07/11/06	0.03	0.12
MT: Helena	10/18/06	0.06	0.16
NC: Charlotte	10/12/06	-0.01	0.28
NC: Raleigh	01/25/06	0.09	0.14
NC: Raleigh	07/13/06	0.06	0.16
ND: Bismarck	01/10/06	-0.02	0.15
NE: Lincoln	07/07/06	0.03	0.19
NH: Concord	01/04/06	0.01	0.13
NJ: Trenton	01/04/06	0.32	0.22
NJ: Waretown	10/10/06	-0.03	0.27

Table 12 (continued)
Iodine-131 in Drinking Water
January - December 2006

Location	Date Collected	^{131}I pCi/L	± 2*u*
NM: Santa Fe	10/30/06	0.16	0.33
NV: Las Vegas	12/20/06	0.11	0.21
NY: Albany	10/05/06	-0.10	0.28
NY: New York City	10/16/06	0.06	0.20
NY: Niagara Falls	02/28/06	0.08	0.14
NY: Syracuse	12/04/06	-0.08	0.15
OH: Cincinnati	02/08/06	0.04	0.16
OH: Columbus	10/04/06	-0.16	0.31
OH: E. Liverpool	01/10/06	0.46	0.18
OH: Painesville	11/01/06	0.02	0.37
OH: Toledo	01/04/06	0.04	0.13
OR: Portland	12/11/06	0.21	0.38
PA: Columbia	11/29/06	0.19	0.16
PA: Harrisburg	11/29/06	0.07	0.19
PA: Philadelphia/Baxter	10/30/06	0.23	0.21
PA: Philadelphia/Baxter	10/30/06	0.11	0.12
PA: Philadelphia/Belmont	10/30/06	0.14	0.46
PA: Philadelphia/Belmont	10/30/06	0.25	0.21
PA: Philadelphia/Belmont	10/30/06	0.16	0.12
PA: Philadelphia/Queen	10/30/06	1.09	0.41
PA: Philadelphia/Queen	10/30/06	0.83	0.21
PA: Philadelphia/Queen	10/30/06	0.88	0.12
PA: Pittsburgh	01/10/06	-0.01	0.16
RI: Providence	11/27/06	0.11	0.25
SC: Barnwell	10/19/06	0.25	0.99
SC: Columbia	10/04/06	-0.05	0.31
SC: Jenkinsville	10/12/06	-0.1	1.9
SC: Seneca	10/09/06	0.06	0.20
TN: Chattanooga	01/05/06	-0.02	0.24
TN: Knoxville	10/03/06	-0.27	0.35
TN: Oak Ridge/#360	07/14/06	-0.22	0.26
TN: Oak Ridge/#360	10/10/06	0.05	0.30
TN: Oak Ridge/#371	07/14/06	0.09	0.23
TN: Oak Ridge/#371	10/10/06	0.03	0.28
TN: Oak Ridge/#4442	07/14/06	0.03	0.22
TN: Oak Ridge/#4442	10/10/06	0.11	0.18
TN: Oak Ridge/#768	07/14/06	0.09	0.23
TN: Oak Ridge/#768	10/10/06	0.00	0.17
TN: Oak Ridge/#772	07/14/06	-0.09	0.26
TN: Oak Ridge/#772	10/10/06	0.01	0.31
TX: Austin	01/04/06	-0.01	0.13

Table 12 (continued)
Iodine-131 in Drinking Water
January - December 2006

Location	Date Collected	^{131}I pCi/L	± 2*u*
VA: Ashland	01/04/06	0.06	0.14
VA: Lynchburg	07/07/06	0.06	0.14
WA: Richland	01/18/06	0.04	0.16
WA: Seattle	02/21/06	0.13	0.23
WA: Seattle	09/13/06	0.07	0.29

Table 13
Drinking Water
Alpha, Beta, and Sr-90 Concentrations
Composites
January - December 2006

Location	Total Solids (mg/L)	Gross Beta pCi/L ± 2*u*	Gross Alpha pCi/L ± 2*u*	^{90}Sr pCi/L ± 2*u*
AK: Fairbanks	29.6	0.9 1.9	0.0 3.3	
AL: Dothan	48.7	1.1 1.9	-0.6 4.2	-0.03 0.21
AL: Montgomery	45.8	1.70 0.71	-0.1 1.3	0.00 0.22
AL: Muscle Shoals	88.6	2.51 0.84	-0.1 2.1	0.18 0.24
AL: Scottsboro	71.9	1.88 0.88	-0.6 2.1	0.20 0.23
AR: Little Rock	22.2	1.58 0.78	0.07 0.85	
CA: Los Angeles	52.5	3.8 2.2	2.6 5.1	
CA: Richmond	41.0	0.94 0.76	0.0 1.5	
CO: Denver	86.1	2.9 1.0	1.2 2.8	
CT: Hartford	32.2	0.36 0.61	0.5 1.1	
DE: Dover	90.8	8.6 2.8	0.1 6.8	
FL: Miami	59.6	3.6 1.5	1.3 3.2	0.20 0.31
FL: Tampa	106.9	3.9 1.9	4.0 6.7	0.20 0.23
GA: Baxley	59.7	2.9 1.7	2.5 4.4	-0.16 0.23
GA: Savannah	58.8	1.6 1.3	-0.2 3.0	-0.03 0.23
HI: Honolulu	49.5	1.3 1.9	0.9 4.7	
IA: Cedar Rapids	59.6	3.5 1.7	-0.3 3.2	
ID: Boise	27.0	1.1 1.2	0.2 1.8	
ID: Idaho Falls	44.6	4.4 3.1	0.0 6.3	
IL: Morris	145.0	15.3 3.4	14 10	
IL: W. Chicago	39.3	9.7 4.5	2.8 6.7	
KS: Topeka	59.0	6.9 3.0	1.9 5.9	
LA: New Orleans	77.8	6.3 2.5	2.2 5.4	
MA: Lawrence	74.9	1.38 0.71	-0.1 1.8	
MD: Baltimore	72.8	2.4 1.2	0.5 3.1	
MD: Conowingo	57.3	2.2 1.3	-0.1 2.9	
ME: Augusta	83.8	5.7 1.7	3.1 4.4	
MI: Detroit	90.3	1.40 0.92	0.6 2.3	
MI: Grand Rapids	65.5	2.0 1.1	0.8 2.3	
MN: Red Wing	134.3	13.8 5.0	-1 14	
MN: St. Paul	20.7	1.8 3.6	0.0 4.0	
MO: Jefferson City	68.6	7.0 2.3	0.4 4.6	
MS: Jackson	64.4	2.73 0.82	-0.1 1.6	0.11 0.24
MS: Port Gibson	56.4	6.5 3.5	9.2 9.0	-0.06 0.22
MT: Helena	24.6	2.2 1.3	0.6 1.7	
NC: Charlotte	35.4	1.64 0.71	-0.1 1.1	0.18 0.22
NC: Raleigh	79.9	3.66 0.92	-0.3 1.8	0.48 0.31

Table 13 (continued)
Drinking Water
Alpha, Beta, and Sr-90 Concentrations
Composites
January - December 2006

Location	Total Solids (mg/L)	Gross Beta pCi/L ± 2*u*	Gross Alpha pCi/L ± 2*u*	^{90}Sr pCi/L ± 2*u*
NC: Raleigh	79.9	3.66 0.92	-0.3 1.8	0.35 0.28
ND: Bismarck	56.8	5.7 2.4	0.9 5.2	
NE: Lincoln	47.6	11.4 3.5	5.1 5.6	
NH: Concord	67.5	0.89 0.66	0.0 1.7	
NJ: Trenton	51.7	1.6 1.1	0.4 2.3	
NJ: Waretown	57.0	2.77 0.83	1.2 1.7	
NM: Santa Fe	125.1	5.7 1.8	15.0 7.3	
NV: Las Vegas	81.5	7.8 3.6	4 10	
NY: Albany	46.3	1.2 1.0	-0.5 2.0	
NY: New York City	36.5	1.71 0.71	0.3 1.1	
NY: Niagara Falls	57.7	2.3 1.3	0.7 3.1	
NY: Syracuse	53.2	1.4 1.3	0.2 3.0	
OH: Cincinnati	70.8	2.5 1.5	1.9 3.5	
OH: Columbus	118.1	4.2 1.1	0.9 2.8	
OH: E. Liverpool	69.4	3.6 1.6	0.8 3.2	
OH: Painesville	81.2	1.4 1.3	0.0 3.4	
OH: Toledo	111.4	2.6 1.0	-0.5 2.5	
OK: Oklahoma City	136.5	8.6 1.7	-0.9 3.5	
OR: Portland	21.3	0.84 0.60	0.07 0.74	
PA: Columbia	57.7	1.3 1.3	0.3 3.0	
PA: Harrisburg	49.5	1.7 1.3	-0.3 2.7	-0.18 0.28
PA: Philadelphia/Baxter	68.2	1.6 1.1	-0.5 2.7	0.26 0.29
PA: Philadelphia/Belmont	60.8	3.5 1.7	1.3 4.1	0.11 0.25
PA: Philadelphia/Queen	98.8	5.0 2.0	-0.2 5.4	0.01 0.25
PA: Pittsburgh	72.9	2.3 1.2	0.2 3.1	0.14 0.25
RI: Providence	60.5	1.81 0.76	0.0 1.6	
SC: Barnwell	48.3	1.66 0.72	1.5 1.6	0.31 0.30
				0.01 0.30
SC: Columbia	49.2	2.53 0.81	0.6 1.5	
SC: Jenkinsville	46.3	3.32 0.87	1.2 1.5	
SC: Seneca	86.9	1.63 0.74	0.0 2.1	
TN: Chattanooga	92.2	2.20 0.82	0.3 2.2	
TN: Knoxville	70.0	1.86 0.90	1.7 2.4	
TN: Oak Ridge/#360 - Roane Co.	43.4	1.7 1.2	1.1 2.6	0.17 0.22
TN: Oak Ridge/#371 - Knox Co.	69.9	2.1 1.3	0.0 3.5	0.05 0.22
TN: Oak Ridge/#4442 - Roane Co.	64.5	3.2 1.4	0.3 3.4	0.57 0.27
				0.27 0.31

Table 13 (continued)
Drinking Water
Alpha, Beta, and Sr-90 Concentrations
Composites
January - December 2006

Location	Total Solids (mg/L)	Gross Beta pCi/L ± 2*u*	Gross Alpha pCi/L ± 2*u*	^{90}Sr pCi/L ± 2*u*
TN: Oak Ridge/#768 - Anderson Co	67.3	2.6 1.4	0.0 3.4	0.17 0.24
TN: Oak Ridge/#772 - Anderson Co.	62.6	1.7 1.3	0.3 3.2	0.03 0.24
TX: Austin	69.6	3.1 1.2	0.8 2.4	
VA: Ashland	58.8	3.40 0.88	0.7 1.6	0.08 0.23
VA: Lynchburg	33.2	0.64 0.62	0.1 1.1	-0.06 0.23
WA: Richland	40.1	0.43 0.72	0.3 1.5	
WA: Seattle	0.7	0.23 0.54	-0.04 0.43	

Table 14
Drinking Water
Radium and Gamma-Emitting Radionuclides
Composites
January - December 2006

Location	^{226}Ra pCi/L	± 2*u*	^{228}Ra pCi/L	± 2*u*	Gamma-Emitting Radionuclides Nuclide	pCi/L	± 2*u*
AK: Fairbanks	NA		NA			ND	
AL: Dothan	NA		NA		Tl208	1.1	1.5
AL: Montgomery	NA		NA			ND	
AL: Muscle Shoals	NA		NA			ND	
AL: Scottsboro	NA		NA			ND	
AR: Little Rock	NA		NA		K40	14	14
CA: Los Angeles	0.101	0.020	NA			ND	
CA: Richmond	NA		NA		Pb212	2.1	2.3
CO: Denver	NA		NA			ND	
CT: Hartford	NA		NA			ND	
DE: Dover	NA		NA		K40	18	14
FL: Miami	NA		NA			ND	
FL: Tampa	0.363	0.052	NA			ND	
GA: Baxley	1.51	0.19	NA			ND	
GA: Savannah	NA		NA		Pb212	1.7	2.4
HI: Honolulu	NA		NA			ND	
IA: Cedar Rapids	NA		NA		Tl208	1.6	1.7
ID: Boise	NA		NA			ND	
ID: Idaho Falls	NA		NA			ND	
IL: Morris	3.93	0.46	4.22	0.81	K40	10	14
IL: W. Chicago	0.403	0.056	NA			ND	
KS: Topeka	NA		NA		K40	10.0	7.7
					Pb212	1.5	2.4
LA: New Orleans	0.112	0.023	NA			ND	
MA: Lawrence	NA		NA			ND	
MD: Baltimore	NA		NA			ND	
MD: Conowingo	NA		NA			ND	
ME: Augusta	0.105	0.021	NA		K40	10	14
MI: Detroit	NA		NA		K40	12	14
MI: Grand Rapids	NA		NA			ND	
MN: Red Wing	NA		NA			ND	
MN: St. Paul	NA		NA			ND	
MO: Jefferson City	NA		NA		Tl208	0.82	0.78
MS: Jackson	NA		NA			ND	
MS: Port Gibson	0.634	0.082	NA		K40	17	14

Note: ND = Not Detected
NA = No Analysis

Table 14 (continued)
Drinking Water
Radium and Gamma-Emitting Radionuclides
Composites
January - December 2006

Location	^{226}Ra pCi/L ± 2*u*	^{228}Ra pCi/L ± 2*u*	Gamma-Emitting Radionuclides Nuclide	pCi/L ± 2*u*
MT: Helena	NA	NA		ND
NC: Charlotte	NA	NA	Pb212	2.9 2.8
NC: Raleigh	NA	NA		ND
ND: Bismarck	NA	NA		ND
NE: Lincoln	0.166 0.028	NA		ND
NH: Concord	NA	NA		ND
NJ: Trenton	NA	NA		ND
NJ: Waretown	NA	NA		ND
NM: Santa Fe	0.201 0.032	NA		ND
NV: Las Vegas	0.182 0.030	NA		ND
NY: Albany	NA	NA	K40	9 14
NY: New York City	NA	NA		ND
NY: Niagara Falls	NA	NA		ND
NY: Syracuse	NA	NA		ND
OH: Cincinnati	NA	NA		ND
OH: Columbus	NA	NA		ND
OH: E. Liverpool	NA	NA		ND
OH: Painesville	NA	NA	Pb212	2.2 2.4
			Tl208	1.2 1.6
OH: Toledo	NA	NA		ND
OK: Oklahoma City	NA	NA		ND
OR: Portland	NA	NA		ND
PA: Columbia	NA	NA		ND
PA: Harrisburg	NA	NA		ND
PA: Philadelphia/Baxter	NA	NA	Tl208	1.4 1.6
PA: Philadelphia/Belmont	NA	NA		ND
PA: Philadelphia/Queen	NA	NA		ND
PA: Pittsburgh	NA	NA		ND
RI: Providence	NA	NA		ND
SC: Barnwell	NA	NA		ND
SC: Columbia	NA	NA		ND
SC: Jenkinsville	NA	NA		ND
SC: Seneca	NA	NA		ND
TN: Chattanooga	NA	NA		ND
TN: Knoxville	NA	NA		ND

Note: ND = Not Detected
NA = No Analysis

Table 14 (continued)
Drinking Water
Radium and Gamma-Emitting Radionuclides
Composites
January - December 2006

Location	^{226}Ra pCi/L ± 2*u*	^{228}Ra pCi/L ± 2*u*	Gamma-Emitting Radionuclides Nuclide	pCi/L ± 2*u*
TN: Oak Ridge-Roane Co. # 360	NA	NA		ND
TN: Oak Ridge-Knox Co. # 371	NA	NA		ND
TN: Oak Ridge-Roane Co. #4442	NA	NA		ND
TN: Oak Ridge-Anderson Co # 768	NA	NA		ND
TN: Oak Ridge-Anderson Co. # 772	NA	NA		ND
TX: Austin	NA	NA		ND
VA: Ashland	NA	NA		ND
VA: Lynchburg	NA	NA		ND
WA: Richland	NA	NA		ND
WA: Seattle	NA	NA		ND

Note: ND = Not Detected
NA = No Analysis

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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 15

Radionuclides in Pasteurized Milk

October - December 2006

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	11/27/06	1.61 0.21	ND	ND	ND
AZ: Phoenix	11/03/06	1.67 0.24	ND	ND	ND
CA: Los Angeles	10/06/06	1.62 0.21	ND	ND	ND
CA: Sacramento	10/26/06	1.67 0.20	ND	ND	ND
CA: San Francisco	10/10/06	1.49 0.19	ND	ND	ND
CT: Hartford	10/12/06	1.63 0.20	ND	ND	ND
DE: Wilmington	11/28/06	1.53 0.23	ND	ND	ND
FL: Tampa	10/09/06	1.56 0.20	ND	ND	ND
HI: Honolulu	11/15/06	1.51 0.19	ND	ND	ND
IA: Des Moines	10/03/06	1.54 0.19	ND	ND	ND
IN: Indianapolis	12/11/06	1.58 0.20	ND	ND	ND
KS: Wichita	10/10/06	1.56 0.20	ND	ND	ND
KY: Louisville	10/04/06	1.69 0.22	ND	ND	ND
MA: Boston	12/18/06	1.62 0.21	ND	ND	ND
MD: Baltimore	10/06/06	1.60 0.20	ND	ND	ND
MI: Detroit	12/13/06	1.63 0.21	ND	ND	ND
MO: Jefferson City	11/16/06	1.68 0.21	ND	ND	ND
NJ: Trenton	10/31/06	1.60 0.20	ND	ND	ND
NM: Albuquerque	10/03/06	1.54 0.20	ND	ND	ND
NV: Las Vegas	10/04/06	1.57 0.20	ND	ND	ND
NY: Buffalo	10/06/06	1.64 0.20	ND	ND	ND
NY: Syracuse	10/05/06	1.60 0.20	ND	ND	ND
OH: Cincinnati	10/16/06	1.57 0.20	ND	ND	ND
OH: Cleveland	10/26/06	1.66 0.21	ND	ND	ND
OR: Portland	11/06/06	1.62 0.20	ND	ND	ND
PA: Pittsburgh	10/03/06	1.55 0.19	ND	ND	ND
TN: Chattanooga	10/10/06	1.55 0.23	ND	ND	ND
TN: Knoxville	10/02/06	1.50 0.19	ND	ND	ND
TN: Memphis	10/09/06	1.53 0.20	ND	ND	ND
TX: Ft. Worth	11/08/06	1.54 0.20	ND	ND	ND
TX: San Antonio	10/10/06	1.38 0.18	ND	ND	ND
VA: Norfolk	12/14/06	1.63 0.20	ND	ND	ND
VT: Montpelier	12/26/06	1.66 0.21	ND	ND	ND
WA: Spokane	10/06/06	1.64 0.24	ND	ND	ND
WA: Tacoma	12/29/06	1.62 0.21	ND	ND	ND
WV: Charleston	10/02/06	1.68 0.20	ND	ND	ND

Note: ND = Not Detected

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:

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