

ENVIRONMENTAL

RADIATION

DATA

REPORT 120

October - December 2004

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 Environmental Radiation Ambient Monitoring System (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 ERAMS in 1973 with an emphasis on identifying trends in the accumulation of long-lived radionuclides in the environment. ERAMS 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 ERAMS 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 Environmental Radiation Ambient Monitoring System (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 ERAMS. 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 blank sample.

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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
	Milk	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. 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/m³. 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 2004

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min	Avg	Max	Min	Avg
		(pCi/m ³)			(pCi/m ³)		
AL: Montgomery	4	0.2	0.0	0.1	0.013	0.007	0.011
AR: Little Rock	6	0.0	0.0	0.0	0.024	0.009	0.016
AZ: Phoenix	4	0.7	0.3	0.5	0.019	0.011	0.014
CA: Los Angeles	9	0.3	0.1	0.2	0.028	0.005	0.014
CA: Richmond	4	0.1	0.0	0.1	0.008	0.003	0.006
CO: Denver	8	2.2	0.5	1.0	0.023	0.007	0.012
CT: Hartford	9	0.3	0.1	0.1	0.012	0.002	0.008
DC: Washington	9	0.1	0.0	0.1	0.013	0.004	0.008
DE: Wilmington	8	0.2	0.0	0.1	0.013	0.004	0.009
FL: Jacksonville	9	0.1	0.1	0.1	0.026	0.006	0.014
GA: Atlanta	4	0.1	0.0	0.0	0.024	0.010	0.015
HI: Honolulu	7	0.2	0.0	0.1	0.003	0.001	0.002
IA: Iowa City	8	0.3	0.1	0.2	0.024	0.005	0.010
ID: Idaho Falls	8				0.014	0.003	0.009
IN: Indianapolis	9	1.2	0.1	0.4	0.013	0.007	0.009
KS: Kansas City	6	1.7	0.1	0.7	0.015	0.010	0.013
KS: Topeka	5	0.9	0.3	0.6	0.016	0.012	0.014
MA: Boston	6	0.4	0.0	0.2	0.014	0.002	0.007
ME: Augusta	4	0.1	0.1	0.1	0.008	0.004	0.006
MI: Detroit	8	2.5	0.7	1.2	0.020	0.006	0.011
MI: Lansing	8	0.7	0.1	0.3	0.018	0.005	0.010
MN: Minneapolis	4	0.1	0.1	0.1	0.012	0.006	0.009
MS: Jackson	9	1.2	0.0	0.2	0.027	0.009	0.017
NC: Charlotte	9	0.1	0.0	0.1	0.024	0.009	0.016
NC: Wilmington	2				0.013	0.010	0.012
NH: Concord	6	0.6	0.2	0.4	0.009	0.003	0.006
NJ: Trenton	8	0.6	0.1	0.2	0.013	0.004	0.008
NV: Las Vegas	6	0.2	0.0	0.1	0.022	0.007	0.012
NV: Las Vegas/913	6	0.1	0.0	0.1	0.018	0.004	0.008
NY: Albany	4	0.1	0.0	0.0	0.009	0.007	0.008
NY: New York City	8	0.2	0.0	0.1	0.018	0.004	0.010
NY: Yaphank	7	0.2	0.0	0.1	0.010	0.002	0.007
OH: Painesville	7	0.5	0.1	0.3	0.015	0.006	0.010
OH: Ross	9				0.021	0.010	0.015
OR: Portland	9	0.2	0.0	0.1	0.021	0.003	0.008
PA: Harrisburg	7	0.4	0.1	0.2	0.017	0.007	0.011
PA: Philadelphia	9	2.5	0.0	0.4	0.014	0.003	0.010
PA: Pittsburgh	8	0.3	0.1	0.2	0.017	0.006	0.011

Table 2 (continued)
Gross Beta in Airborne Particulates
October 2004

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min	Avg	Max	Min	Avg
		(pCi/m ³)			(pCi/m ³)		
SC: Barnwell	1	0.0	0.0	0.0	0.009	0.009	0.009
SC: Columbia	3	0.2	0.1	0.2	0.032	0.013	0.021
SD: Pierre	6	0.5	0.2	0.4	0.019	0.007	0.011
TN: Knoxville	5	0.0	0.0	0.0	0.027	0.012	0.020
TN: Nashville	8	0.4	0.0	0.1	0.017	0.009	0.014
TN: Oak Ridge/Bethel	8	1.2	0.2	0.5	0.027	0.009	0.015
TN: Oak Ridge/K25	7	2.1	0.3	0.8	0.025	0.008	0.016
TN: Oak Ridge/Melton	8	1.6	0.3	0.7	0.021	0.009	0.015
TN: Oak Ridge/Y12 E	8	1.5	0.2	0.6	0.030	0.010	0.017
TN: Oak Ridge/Y12 W	8	1.0	0.2	0.4	0.025	0.010	0.015
TX: Austin	8	0.2	0.0	0.1	0.030	0.005	0.012
TX: Dallas	9	1.1	0.1	0.3	0.030	0.004	0.015
TX: El Paso	9	1.1	0.3	0.7	0.019	0.006	0.013
UT: Salt Lake City	9	0.5	0.0	0.1	0.021	0.004	0.013
VA: Lynchburg	7	1.0	0.3	0.5	0.015	0.007	0.010
WA: Olympia	9	0.2	0.0	0.1	0.009	0.002	0.005
WA: Spokane	8	1.0	0.1	0.5	0.018	0.004	0.010

Table 3
Gross Beta in Airborne Particulates
November 2004

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min	Avg	Max	Min	Avg
		(pCi/m ³)			(pCi/m ³)		
AL: Montgomery	8	0.2	0.0	0.1	0.015	0.005	0.010
AR: Little Rock	6	0.0	0.0	0.0	0.016	0.004	0.010
AZ: Phoenix	5	0.5	0.2	0.3	0.018	0.008	0.012
CA: Los Angeles	8	0.4	0.1	0.3	0.025	0.009	0.016
CA: Richmond	3	0.2	0.0	0.1	0.012	0.006	0.009
CO: Denver	8	1.3	0.1	0.8	0.020	0.005	0.011
CT: Hartford	9	0.1	0.0	0.1	0.012	0.006	0.008
DC: Washington	9	0.1	0.0	0.0	0.017	0.005	0.009
DE: Wilmington	9	0.2	0.0	0.1	0.018	0.006	0.011
FL: Jacksonville	8	0.1	0.0	0.1	0.014	0.006	0.009
GA: Atlanta	4	0.0	0.0	0.0	0.019	0.009	0.014
HI: Honolulu	5	0.1	0.0	0.0	0.003	0.002	0.002
IA: Iowa City	8	0.5	0.1	0.2	0.017	0.009	0.012
ID: Idaho Falls	9				0.031	0.006	0.014
IN: Indianapolis	8	0.2	0.1	0.2	0.011	0.007	0.009
KS: Kansas City	7	1.6	0.3	0.9	0.021	0.010	0.014
KS: Topeka	5	0.9	0.4	0.6	0.020	0.011	0.015
MA: Boston	9	0.3	0.0	0.1	0.013	0.004	0.009
ME: Augusta	2	0.1	0.1	0.1	0.012	0.006	0.009
MI: Detroit	8	1.7	0.3	0.7	0.020	0.006	0.013
MI: Lansing	9	0.4	0.1	0.2	0.016	0.007	0.011
MN: Minneapolis	5	0.3	0.1	0.2	0.019	0.010	0.015
MS: Jackson	8	0.1	0.0	0.1	0.017	0.005	0.011
NC: Charlotte	8	0.1	0.0	0.1	0.016	0.007	0.012
NC: Wilmington	5				0.014	0.008	0.011
ND: Bismarck	7	2.8	0.3	1.6	0.033	0.011	0.019
NH: Concord	8	0.4	0.1	0.2	0.010	0.004	0.008
NJ: Trenton	7	0.3	0.0	0.1	0.015	0.006	0.010
NV: Las Vegas	5	0.1	0.0	0.0	0.017	0.010	0.013
NV: Las Vegas/913	5	0.0	0.0	0.0	0.017	0.004	0.010
NY: Albany	4	0.1	0.0	0.0	0.017	0.007	0.011
NY: New York City	7	0.1	0.0	0.0	0.020	0.009	0.014
NY: Yaphank	7	0.3	0.0	0.1	0.013	0.005	0.009
OH: Painesville	8	0.4	0.1	0.2	0.017	0.009	0.012
OH: Ross	8				0.023	0.007	0.013
OR: Portland	8	0.1	0.0	0.1	0.019	0.003	0.010
PA: Harrisburg	9	0.4	0.1	0.2	0.022	0.006	0.013
PA: Philadelphia	8	0.7	0.0	0.1	0.018	0.007	0.011

Table 3 (continued)
Gross Beta in Airborne Particulates
November 2004

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min	Avg	Max	Min	Avg
		(pCi/m ³)			(pCi/m ³)		
PA: Pittsburgh	9	0.2	0.0	0.1	0.017	0.007	0.011
SC: Columbia	6	0.2	0.1	0.1	0.025	0.008	0.012
SD: Pierre	6	0.6	0.1	0.3	0.021	0.006	0.013
TN: Knoxville	4	0.0	0.0	0.0	0.017	0.011	0.014
TN: Nashville	8	0.2	0.0	0.1	0.017	0.007	0.011
TN: Oak Ridge/Bethel	7	0.5	0.1	0.3	0.014	0.008	0.011
TN: Oak Ridge/K25	7	0.7	0.1	0.4	0.013	0.008	0.010
TN: Oak Ridge/Melton	7	0.5	0.1	0.3	0.013	0.007	0.010
TN: Oak Ridge/Y12 E	7	0.6	0.1	0.3	0.017	0.008	0.011
TN: Oak Ridge/Y12 W	7	0.3	0.1	0.2	0.015	0.009	0.011
TX: Austin	6	0.1	0.0	0.1	0.012	0.005	0.008
TX: Dallas	4	0.1	0.0	0.1	0.017	0.008	0.014
TX: El Paso	5	0.8	0.1	0.5	0.021	0.007	0.013
UT: Salt Lake City	7	0.5	0.0	0.2	0.041	0.008	0.016
VA: Lynchburg	8	0.7	0.1	0.4	0.014	0.006	0.010
WA: Olympia	7	0.1	0.0	0.0	0.014	0.002	0.006
WA: Spokane	9	0.7	0.1	0.4	0.038	0.006	0.015

Table 4
Gross Beta in Airborne Particulates
December 2004

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min	Avg	Max	Min	Avg
		(pCi/m ³)			(pCi/m ³)		
AL: Montgomery	9	0.1	0.0	0.0	0.014	0.007	0.011
AR: Little Rock	2	0.1	0.0	0.0	0.018	0.015	0.016
AZ: Phoenix	4	0.9	0.2	0.5	0.019	0.013	0.016
CA: Los Angeles	8	0.5	0.2	0.3	0.018	0.005	0.012
CA: Richmond	5	0.2	0.0	0.1	0.017	0.006	0.010
CO: Denver	9	0.7	0.1	0.3	0.012	0.004	0.008
CT: Hartford	9	0.1	0.0	0.1	0.012	0.003	0.008
DC: Washington	9	0.2	0.0	0.0	0.016	0.003	0.008
DE: Wilmington	9	0.1	0.0	0.0	0.015	0.005	0.010
FL: Jacksonville	9	0.2	0.1	0.1	0.013	0.006	0.010
GA: Atlanta	3	0.0	0.0	0.0	0.016	0.014	0.015
HI: Honolulu	5	0.1	0.0	0.1	0.003	0.002	0.003
IA: Iowa City	8	1.6	0.0	0.4	0.033	0.013	0.019
ID: Idaho Falls	8				0.022	0.007	0.013
IN: Indianapolis	8	0.2	0.0	0.1	0.016	0.009	0.012
KS: Kansas City	9	4.2	0.6	1.9	0.045	0.013	0.021
KS: Topeka	3	0.9	0.4	0.6	0.030	0.017	0.022
MA: Boston	8	0.2	0.0	0.1	0.013	0.005	0.010
ME: Augusta	2	0.0	0.0	0.0	0.010	0.009	0.010
MI: Detroit	7	0.7	0.1	0.4	0.017	0.009	0.013
MI: Lansing	9	0.2	0.0	0.1	0.018	0.009	0.013
MN: Minneapolis	4	0.2	0.1	0.1	0.021	0.018	0.019
MS: Jackson	5	0.1	0.0	0.1	0.015	0.007	0.012
NC: Charlotte	7	0.1	0.0	0.0	0.024	0.009	0.014
NC: Wilmington	3				0.012	0.009	0.010
ND: Bismarck	6	4.6	0.3	1.5	0.050	0.022	0.029
NH: Concord	9	0.2	0.0	0.1	0.012	0.004	0.008
NJ: Trenton	7	0.2	0.1	0.1	0.014	0.006	0.010
NM: Santa Fe	1	2.6	2.6	2.6	0.012	0.012	0.012
NV: Las Vegas	5	0.3	0.0	0.1	0.016	0.008	0.012
NV: Las Vegas/913	5	0.3	0.0	0.2	0.015	0.007	0.011
NY: Albany	5	0.0	0.0	0.0	0.013	0.007	0.010
NY: New York City	9	0.1	0.0	0.0	0.025	0.007	0.016
NY: Yaphank	9	0.7	0.0	0.1	0.012	0.004	0.009
OH: Painesville	6	0.2	0.0	0.1	0.014	0.007	0.010
OH: Ross	9				0.016	0.010	0.013
OR: Portland	7	0.1	0.0	0.1	0.007	0.002	0.005
PA: Harrisburg	9	0.3	0.1	0.2	0.016	0.007	0.012

Table 4 (continued)
Gross Beta in Airborne Particulates
December 2004

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min	Avg	Max	Min	Avg
		(pCi/m ³)			(pCi/m ³)		
PA: Philadelphia	9	0.6	0.0	0.1	0.023	0.006	0.012
PA: Pittsburgh	9	0.1	0.0	0.1	0.016	0.008	0.011
SC: Columbia	5	0.4	0.1	0.2	0.013	0.008	0.010
SD: Pierre	9	0.5	0.1	0.3	0.063	0.006	0.022
TN: Knoxville	5	0.0	0.0	0.0	0.021	0.016	0.019
TN: Nashville	8	1.0	0.0	0.2	0.022	0.009	0.014
TN: Oak Ridge/Bethel	8	0.3	0.1	0.2	0.016	0.008	0.012
TN: Oak Ridge/K25	8	0.5	0.1	0.3	0.017	0.008	0.013
TN: Oak Ridge/Melton	8	0.3	0.1	0.2	0.016	0.008	0.012
TN: Oak Ridge/Y12 E	8	0.4	0.1	0.2	0.020	0.010	0.014
TN: Oak Ridge/Y12 W	8	0.2	0.1	0.1	0.019	0.010	0.014
TX: Austin	6	0.2	0.0	0.1	0.014	0.006	0.010
TX: Dallas	4	0.2	0.0	0.1	0.026	0.013	0.018
TX: El Paso	6	1.4	0.5	1.0	0.025	0.006	0.016
UT: Salt Lake City	8	0.3	0.0	0.1	0.023	0.012	0.015
VA: Lynchburg	6	0.6	0.1	0.2	0.014	0.007	0.010
WA: Olympia	5	0.1	0.0	0.0	0.007	0.002	0.004
WA: Spokane	9	0.3	0.1	0.2	0.026	0.003	0.013

Table 5
Gross Beta and Specific Gamma in Precipitation
October 2004

Location	Gross Beta Activity		Gamma-Emitting Radionuclides	
	pCi/L $\pm 2u$		Nuclide	pCi/L $\pm 2u$
AL: Montgomery	0.39	0.28		ND
AR: Little Rock	0.67	0.29		ND
CA: Richmond	0.66	0.31		ND
CO: Denver	0.76	0.29		ND
CT: Hartford	0.04	0.26	Be7	22 16
DE: Wilmington	1.11	0.34	Be7	54 11
FL: Jacksonville	0.58	0.29	Be7	36 19
GA: Atlanta	0.86	0.30	Be7	42 25
HI: Honolulu	0.43	0.29		ND
IA: Iowa City	1.22	0.35	K40	8 11
ID: Idaho Falls	1.03	0.33	Tl208	3.3 4.3
KS: Kansas City	0.16	0.27		ND
MA: Boston	1.90	0.38	Be7	41 18
MI: Lansing	0.83	0.33		ND
MN: Minneapolis	1.66	0.37	Be7	36 16
NC: Charlotte	0.41	0.27	Be7	36 27
NC: Wilmington	1.51	0.36		ND
NH: Concord	3.44	0.45	Be7	55 16
NY: Albany	0.92	0.31	Be7	43 20
NY: Yaphank	4.96	0.53	K40	5.3 9.8
OH: Painesville	0.89	0.31	Be7	50 27
OR: Portland	0.27	0.28	Be7	62 32
TN: Knoxville	5.68	0.57	K40	11.3 8.2
TN: Nashville	0.34	0.28	Be7	34 17
TX: Austin	0.04	0.25		ND
TX: Dallas	0.17	0.26		ND
UT: Salt Lake City	0.82	0.32		ND
VA: Lynchburg	4.13	0.51		ND
WA: Olympia	0.05	0.24	Be7	9.3 7.8

Note: ND = Not Detected

Table 6
Gross Beta and Specific Gamma in Precipitation
November 2004

Location	Gross Beta Activity		Gamma-Emitting Radionuclides	
	pCi/L $\pm 2u$		Nuclide	pCi/L $\pm 2u$
AL: Montgomery	0.55	0.28	Tl208	1.1 1.3
AR: Little Rock	0.88	0.31		ND
AZ: Phoenix	1.12	0.34		ND
CA: Richmond	0.48	0.29		ND
CO: Denver	4.70	0.53	Be7	64 24
CT: Hartford	2.68	0.43	Be7	64 21
DE: Wilmington	0.44	0.28		ND
FL: Jacksonville	0.26	0.28		ND
GA: Atlanta	1.24	0.34	Tl208	1.5 1.6
HI: Honolulu	1.46	0.36	Tl208	1.0 1.3
IA: Iowa City	0.63	0.29		ND
ID: Idaho Falls	0.36	0.28	K40	21 33
			Pb212	3.3 4.7
KS: Kansas City	0.79	0.31	Pb212	3.2 2.6
MA: Boston	2.21	0.39	Be7	60 21
MI: Lansing	0.85	0.32	Be7	27 21
MN: Minneapolis	1.00	0.32	Be7	26 21
NC: Charlotte	0.71	0.29	K40	12 12
NC: Wilmington	1.10	0.34	Be7	39 20
ND: Bismarck	0.97	0.35	Be7	36 30
			K40	25 40
NH: Concord	3.79	0.47	Be7	70 22
NY: Albany	1.60	0.38	Be7	47 20
NY: Yaphank	2.18	0.40		ND
OH: Painesville	3.98	0.48	Be7	67 24
OR: Portland	1.69	0.36		ND
PA: Harrisburg	1.12	0.33	Be7	49 23
TN: Knoxville	10.38	0.75	K40	16 12
TN: Nashville	0.77	0.31		ND
TX: Austin	0.23	0.26		ND
TX: Dallas	0.90	0.32		ND
TX: El Paso	0.98	0.32	K40	24 31
UT: Salt Lake City	0.56	0.30		ND
VA: Lynchburg	3.92	0.49		ND
WA: Olympia	0.24	0.26		ND

Note: ND = Not Detected

Table 7
Gross Beta and Specific Gamma in Precipitation
December 2004

Location	Gross Beta Activity		Gamma-Emitting Radionuclides	
	pCi/L $\pm 2u$		Nuclide	pCi/L $\pm 2u$
AL: Montgomery	0.45	0.28		ND
AR: Little Rock	0.55	0.35		ND
AZ: Phoenix	0.99	0.39		ND
CA: Richmond	-0.15	0.32		ND
CO: Denver	1.00	0.39		ND
CT: Hartford	2.49	0.41	Be7	31 15
DE: Wilmington	1.38	0.35	Be7	56 18
FL: Jacksonville	0.39	0.28		ND
GA: Atlanta	0.91	0.32	Be7	43 20
HI: Honolulu	0.48	0.35	K40	9 13
IA: Iowa City	0.44	0.35		ND
KS: Kansas City	0.23	0.35		ND
MA: Boston	0.72	0.30	Be7	42 18
			K40	15 12
MN: Minneapolis	5.34	0.62	Be7	44 39
NC: Charlotte	1.28	0.34	Be7	48 20
NC: Wilmington	1.6	1.1	Be7	40 27
ND: Bismarck	1.71	0.49	Be7	186 77
NY: Albany	0.86	0.32	Be7	35 18
NY: Yaphank	2.07	0.40	Be7	26 12
			Pb212	1.6 1.9
OH: Painesville	4.52	0.55	Be7	37 17
OR: Portland	1.85	0.42	Be7	81 37
PA: Harrisburg	1.49	0.35		ND
TN: Knoxville	7.75	0.65		ND
TN: Nashville	0.43	0.28		ND
TN: Oak Ridge/Melton	0.89	0.31	Pb212	4.3 5.9
			Tl208	3.5 3.9
TX: Dallas	0.58	0.36	Be7	46 20
TX: El Paso	0.25	0.36	Bi212	34 42
UT: Salt Lake City	1.28	0.45	K40	9 13
VA: Lynchburg	2.28	0.41		ND
WA: Olympia	0.17	0.33		ND

Note: ND = Not Detected

Table 8
Tritium in Precipitation
October - December 2004

Location	October 2004		November 2004		December 2004	
	pCi/L $\pm 2u$		pCi/L $\pm 2u$		pCi/L $\pm 2u$	
AL: Montgomery	-80	79	-4	77	54	78
AR: Little Rock	28	84	-28	78	-55	82
AZ: Phoenix	NS		30	81	-33	83
CA: Richmond	30	84	10	80	-10	84
CO: Denver	-26	82	36	82	16	85
CT: Hartford	41	79	61	81	163	84
DE: Wilmington	103	83	97	84	145	83
FL: Jacksonville	-32	76	-87	73	70	79
GA: Atlanta	-55	75	-83	74	98	81
HI: Honolulu	-22	82	60	81	-26	83
IA: Iowa City	4	83	67	83	146	83
ID: Idaho Falls	-28	82	10	80	NS	
KS: Kansas City	-18	82	0	79	11	85
MA: Boston	127	84	65	81	40	78
MI: Lansing	40	85	-38	78	NS	
MN: Minneapolis	-89	78	10	80	88	80
NC: Charlotte	42	80	61	81	50	78
NC: Wilmington	-20	76	-8	75	205	86
ND: Bismarck	NS		-26	79	127	82
NH: Concord	6	78	94	83	NS	
NY: Albany	34	79	149	85	226	87
NY: Yaphank	97	82	98	84	38	78
OH: Painesville	-20	82	55	83	44	78
OR: Portland	-81	79	-20	79	7	84
PA: Harrisburg	NS		59	81	83	80
TN: Knoxville	56	86	47	80	92	80
TN: Nashville	20	84	98	82	99	81
TN: Oak Ridge/Melton	NS		NS		164	84
TX: Austin	-40	81	-30	78	NS	
TX: Dallas	32	84	-42	78	-7	84
TX: El Paso	NS		95	85	83	77
UT: Salt Lake City	-48	81	-67	76	18	86
VA: Lynchburg	38	80	22	79	44	78
WA: Olympia	-67	79	18	80	-30	83

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 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 the 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 nuclides.

2. Drinking Water Program

The ERAMS 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
October - December 2004

Location	Date Collected	³ H pCi/L ± 2 <i>u</i>	
AK: Fairbanks	10/06/04	12	82
AL: Dothan	10/06/04	-53	69
AL: Montgomery	10/07/04	-69	74
AL: Muscle Shoals	10/13/04	93	75
AL: Scottsboro	10/14/04	176	79
AR: Little Rock	10/07/04	43	80
CA: Los Angeles	10/05/04	94	76
CA: Richmond	10/27/04	-59	76
CO: Denver	10/28/04	-16	78
CT: Hartford	10/08/04	159	85
DE: Dover	10/12/04	50	73
FL: Tampa	11/29/04	30	79
GA: Baxley	10/07/04	-61	74
GA: Savannah	12/08/04	-62	75
HI: Honolulu	10/06/04	4	78
IA: Cedar Rapids	10/04/04	117	78
ID: Boise	11/04/04	-32	77
ID: Idaho Falls	11/05/04	-36	77
IL: Morris	10/19/04	5	72
IL: W. Chicago	10/04/04	80	77
KS: Topeka	10/04/04	73	76
LA: New Orleans	11/03/04	159	86
MA: Lawrence	12/03/04	107	83
MD: Baltimore	10/04/04	-10	78
MD: Conowingo	11/16/04	-83	75
ME: Augusta	10/04/04	77	76
MI: Detroit	10/04/04	-24	77
MI: Grand Rapids	10/12/04	125	77
MN: Minneapolis	10/18/04	78	75
MN: Red Wing	10/11/04	92	75
MO: Jefferson City	10/04/04	21	74
MS: Jackson	10/05/04	40	78
MS: Port Gibson	10/05/04	-33	76
MT: Helena	10/05/04	42	80
NC: Charlotte	10/27/04	231	93
NC: Raleigh	10/20/04	-77	75
ND: Bismarck	10/04/04	74	76
NE: Lincoln	10/08/04	16	78
NH: Concord	10/05/04	104	83
NJ: Trenton	10/12/04	83	75

Table 9 (continued)
Tritium in Drinking Water
October - December 2004

Location	Date Collected	³ H pCi/L ± 2 <i>u</i>	
NJ: Waretown	10/14/04	10	72
NM: Santa Fe	10/25/04	-32	77
NV: Las Vegas	12/21/04	-48	85
NY: Albany	10/04/04	-63	74
NY: New York City	10/05/04	-18	77
NY: Niagara Falls	12/27/04	-20	83
NY: Syracuse	10/14/04	161	79
OH: Cincinnati	10/25/04	95	84
OH: E. Liverpool	11/17/04	-32	78
OH: Painesville	11/03/04	-12	78
OH: Toledo	10/07/04	4	77
OK: Oklahoma City	10/06/04	-7	73
OR: Portland	10/12/04	99	76
PA: Columbia	11/17/04	-14	78
PA: Harrisburg	11/18/04	-38	81
PA: Philadelphia - Belmont Lab	12/15/04	18	86
PA: Philadelphia - Queen Lane Lab	12/15/04	0	84
PA: Philadelphia -Baxter	12/15/04	20	85
PA: Pittsburgh	11/17/04	-6	78
RI: Providence	10/12/04	119	77
SC: Barnwell	10/18/04	-65	76
SC: Columbia	10/08/04	16	79
SC: Jenkinsville	10/14/04	152	78
SC: Seneca	10/05/04	95	82
TN: Chattanooga	10/08/04	-52	73
TN: Knoxville	10/21/04	-41	77
TN: Oak Ridge - Roane Co. #4442	10/20/04	276	92
TN: Oak Ridge - Anderson Co. #768	10/22/04	-40	78
TN: Oak Ridge - Roane Co. #360	10/22/04	8	79
TN: Oak Ridge - Knox Co. #371	10/22/04	-39	77
TN: Oak Ridge - Anderson Co. #772	10/22/04	-18	78
TX: Austin	10/19/04	-18	78
VA: Lynchburg	10/05/04	88	76
WA: Richland	10/08/04	129	77
WA: Seattle	11/23/04	14	79

Table 10
Iodine-131 in Drinking Water
January - December 2004

Location	Date Collected	¹³¹ I pCi/L ± 2 <i>u</i>	
AK: Fairbanks	10/06/04	0.00	0.31
AL: Dothan	10/06/04	0.03	0.29
AL: Montgomery	04/09/04	0.01	0.14
AL: Muscle Shoals	07/20/04	0.02	0.17
AL: Scottsboro	07/21/04	0.01	0.18
AR: Little Rock	07/09/04	0.07	0.13
CA: Los Angeles	10/05/04	-0.18	0.35
CA: Richmond	05/10/04	0.01	0.12
CO: Denver	07/21/04	0.03	0.17
CT: Hartford	04/15/04	0.01	0.15
DE: Dover	07/08/04	0.11	0.15
FL: Tampa	02/26/04	0.18	0.18
FL: Tampa	11/29/04	0.02	0.20
GA: Baxley	05/20/04	0.05	0.19
GA: Savannah	12/08/04	0.02	0.16
HI: Honolulu	10/06/04	0.13	0.31
IA: Cedar Rapids	04/20/04	0.05	0.14
ID: Boise	03/01/04	0.07	0.12
ID: Idaho Falls	11/05/04	-0.01	0.38
IL: Morris	07/12/04	0.11	0.15
IL: W. Chicago	01/28/04	-0.05	0.29
KS: Topeka	04/09/04	0.06	0.14
LA: New Orleans	03/17/04	0.02	0.22
MA: Lawrence	12/03/04	0.26	0.22
MD: Baltimore	04/09/04	0.15	0.14
MD: Conowingo	11/16/04	-0.02	0.32
ME: Augusta	04/09/04	0.10	0.14
MI: Detroit	04/15/04	0.05	0.14
MI: Grand Rapids	04/21/04	-0.01	0.14
MN: Minneapolis	04/13/04	0.04	0.13
MN: Red Wing	10/11/04	0.04	0.18
MO: Jefferson City	10/04/04	0.40	0.18
MS: Jackson	10/05/04	0.13	0.18
MS: Port Gibson	10/05/04	0.02	0.17
MT: Helena	07/08/04	0.15	0.19
NC: Charlotte	05/05/04	0.09	0.16
NC: Raleigh	07/21/04	0.02	0.16
ND: Bismarck	10/04/04	-0.01	0.19
NE: Lincoln	04/16/04	-0.06	0.19
NH: Concord	10/05/04	0.01	0.17
NJ: Trenton	04/22/04	0.11	0.14

Table 10 (continued)
Iodine-131 in Drinking Water
January - December 2004

Location	Date Collected	¹³¹ I pCi/L ± 2 <i>u</i>	
NJ: Waretown	04/28/04	0.03	0.14
NM: Santa Fe	10/25/04	-0.01	0.21
NV: Las Vegas	06/25/04	0.12	0.14
NY: New York City	04/30/04	0.05	0.16
NY: Niagara Falls	04/29/04	0.11	0.13
NY: Syracuse	10/14/04	0.01	0.14
OH: Cincinnati	10/25/04	0.12	0.25
OH: E. Liverpool	07/14/04	0.73	0.16
OH: Painesville	08/12/04	0.04	0.13
OH: Toledo	04/12/04	0.00	0.11
OK: Oklahoma City	10/06/04	-0.10	0.30
OR: Portland	10/12/04	-0.02	0.19
PA: Columbia	02/19/04	0.15	0.16
PA: Harrisburg	02/18/04	0.19	0.15
PA: Philadelphia - Belmont	02/18/04	1.79	0.16
PA: Philadelphia - Baxter	02/18/04	0.44	0.16
PA: Philadelphia - Queen Lane Lab	06/18/04	0.21	0.14
PA: Pittsburgh	06/22/04	0.12	0.20
RI: Providence	10/12/04	-0.05	0.23
SC: Barnwell	01/28/04	0.00	0.14
SC: Columbia	07/21/04	0.10	0.15
SC: Jenkinsville	04/28/04	0.05	0.15
SC: Jenkinsville	07/20/04	0.06	0.17
SC: Seneca	04/28/04	0.00	0.14
SC: Seneca	07/20/04	0.14	0.18
TN: Chattanooga	10/08/04	0.05	0.45
TN: Knoxville	10/21/04	-0.01	0.15
TN: Oak Ridge - Roane Co. #4442	10/20/04	0.05	0.20
TN: Oak Ridge - Roane Co. #360	10/22/04	0.02	0.27
TN: Oak Ridge - Anderson Co. #772	10/22/04	-0.05	0.16
TN: Oak Ridge - Knox Co. #371	10/22/04	0.04	0.16
TN: Oak Ridge - Anderson Co. #768	10/22/04	0.10	0.14
TX: Austin	10/19/04	0.02	0.19
VA: Ashland	04/13/04	0.06	0.13
VA: Lynchburg	10/05/04	0.09	0.31
WA: Richland	04/22/04	0.03	0.14
WA: Seattle	09/20/04	0.11	0.18

Table 11

**Alpha, Beta, and Sr-90 Concentrations in Drinking Water
January - December 2004**

Alpha, beta, and strontium-90 in drinking water results will be published when they become available.

Table 12

Radium-226, -228, and Gamma-Emitting Radionuclides in Drinking Water January - December 2004

Radium-226, -228, and gamma-emitting radionuclides in drinking water results will be published when they become available.

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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 13
Radionuclides in Pasteurized Milk
October - December 2004

Location	Date Collected	K g/L $\pm 2u$		^{137}Cs pCi/L $\pm 2u$	^{140}Ba pCi/L $\pm 2u$	^{131}I pCi/L $\pm 2u$
AL: Montgomery	10/08/04	1.58	0.13	ND	ND	ND
AR: Little Rock	12/06/04	1.63	0.13	ND	ND	ND
AZ: Phoenix	12/27/04	1.62	0.13	ND	ND	ND
CA: Los Angeles	10/15/04	1.64	0.17	ND	ND	ND
CA: Sacramento	12/21/04	1.55	0.12	ND	ND	ND
CA: San Francisco	10/12/04	1.67	0.13	ND	ND	ND
CT: Hartford	10/29/04	1.72	0.13	ND	ND	ND
DE: Dover	10/27/04	1.56	0.12	ND	ND	ND
FL: Tampa	10/06/04	1.63	0.18	ND	ND	ND
HI: Honolulu	10/28/04	1.63	0.11	ND	ND	ND
IA: Des Moines	10/11/04	1.64	0.13	ND	ND	ND
IN: Indianapolis	10/15/04	1.60	0.12	ND	ND	ND
KS: Wichita	10/05/04	1.64	0.12	ND	ND	ND
KY: Louisville	10/11/04	1.64	0.12	ND	ND	ND
MA: Boston	12/15/04	1.67	0.13	ND	ND	ND
MD: Baltimore	10/01/04	1.48	0.12	ND	ND	ND
ME: Portland	11/04/04	1.50	0.11	ND	ND	ND
MI: Detroit	12/15/04	1.69	0.12	ND	ND	ND
MO: Jefferson City	10/26/04	1.55	0.13	ND	ND	ND
NJ: Trenton	10/27/04	1.60	0.12	ND	ND	ND
NM: Albuquerque	10/26/04	1.50	0.12	ND	ND	ND
NV: Las Vegas	10/12/04	1.55	0.13	ND	ND	ND
NY: Buffalo	10/08/04	1.68	0.13	ND	ND	ND
NY: Syracuse	10/08/04	1.62	0.13	ND	ND	ND
OH: Cincinnati	11/30/04	1.73	0.18	ND	ND	ND
OH: Cleveland	11/09/04	1.67	0.13	ND	ND	ND
OR: Portland	10/18/04	1.51	0.13	ND	ND	ND
PA: Philadelphia	10/05/04	1.66	0.13	ND	ND	ND
PA: Pittsburgh	10/05/04	1.58	0.12	ND	ND	ND
TN: Chattanooga	10/25/04	1.53	0.12	ND	ND	ND
TN: Knoxville	10/26/04	1.64	0.12	ND	ND	ND
TN: Memphis	10/25/04	1.48	0.13	ND	ND	ND
TX: Ft. Worth	10/28/04	1.53	0.12	ND	ND	ND
TX: San Antonio	10/12/04	1.42	0.11	ND	ND	ND
VA: Norfolk	12/22/04	1.61	0.11	ND	ND	ND
VT: Montpelier	12/30/04	1.62	0.12	ND	ND	ND
WA: Spokane	11/29/04	1.56	0.12	ND	ND	ND
WA: Tacoma	12/28/04	1.57	0.13	ND	ND	ND
WV: Charleston	10/05/04	1.54	0.13	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 ERAMS and the data that are generated should be directed as follows:

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