

ENVIRONMENTAL

RADIATION

DATA

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United States Environmental Protection Agency

Office of Radiation and Indoor Air

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Preface

Environmental Radiation Data (ERD) 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, precipitation, drinking water, and milk samples.

Sampling locations are selected to provide optimal population coverage while functioning to monitor fallout from nuclear devices and other forms of radioactive contamination of the environment. The radiation analyses performed on these samples include gross alpha and gross beta analyses, 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 *Eastern Environmental Radiation Facility Radiochemistry Procedures Manual* (EPA 520/5-84-006). 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 the 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, including present and potential sources of environmental radioactivity. Sampling sites are located 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 at 5 hours after collection to allow for decay of natural radon isotopes and their progeny. 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 analyses in a low background beta counter. Gamma scans are performed on all filters showing gross beta counts greater than 1 pCi/m³. The laboratory obtained values are usually lower than the field estimates due to the decay of naturally occurring radionuclides between the times of the two measurements.

Precipitation samples are collected at most field stations collecting 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
April 2000

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg	Max	Min (pCi/m ³)	Avg
AL: Montgomery	16	0.1	0.0	0.0	0.022	0.006	0.012
AR: Little Rock	6	0.1	0.0	0.0	0.011	0.008	0.010
AZ: Phoenix	4	0.6	0.3	0.4	0.012	0.007	0.010
CA: Berkeley	8	0.1	0.0	0.0	0.009	0.002	0.005
CA: Los Angeles	8	0.2	0.0	0.1	0.014	0.003	0.009
CO: Denver	7	1.0	0.5	0.7	0.013	0.007	0.009
CT: Hartford	8	0.1	0.0	0.1	0.007	0.002	0.006
DE: Wilmington	8	0.1	0.0	0.1	0.010	0.001	0.007
FL: Jacksonville	8	0.1	0.0	0.1	0.009	0.004	0.008
FL: Miami	4	0.0	0.0	0.0	0.010	0.004	0.007
HI: Honolulu	6	0.1	0.1	0.1	0.005	0.002	0.004
IA: Iowa City	8	0.7	0.1	0.4	0.013	0.008	0.010
ID: Boise	7	0.4	0.3	0.4	0.009	0.006	0.007
ID: Idaho Falls	8				0.012	0.005	0.008
IL: Chicago	7	0.3	0.0	0.2	0.015	0.010	0.012
IN: Indianapolis	8	0.4	0.0	0.3	0.013	0.007	0.010
KS: Topeka	8	1.0	0.3	0.5	0.013	0.008	0.010
ME: Augusta	8	0.2	0.0	0.1	0.011	0.003	0.008
MI: Lansing	8	0.2	0.1	0.2	0.012	0.007	0.009
MN: Minneapolis	4	0.3	0.1	0.2	0.012	0.008	0.011
MN: Welch/510	1				0.010	0.010	0.010
MS: Jackson	8	0.2	0.0	0.1	0.011	0.007	0.009
NC: Charlotte	4	0.1	0.0	0.0	0.011	0.006	0.009
ND: Bismarck	5	0.6	0.0	0.4	0.011	0.006	0.009
NH: Concord	8	0.2	0.0	0.1	0.008	0.002	0.006
NV: Las Vegas	5	0.2	0.1	0.1	0.010	0.004	0.008
NY: Albany	4	0.0	0.0	0.0	0.011	0.006	0.008
NY: New York City	8	0.1	0.0	0.0	0.009	0.002	0.007
NY: Syracuse	3				0.007	0.006	0.007
NY: Yaphank	7	0.1	0.0	0.0	0.008	0.003	0.006
OH: Painesville	7	0.3	0.1	0.1	0.013	0.006	0.009
OH: Ross	8				0.012	0.007	0.009
OR: Portland	7	0.1	0.0	0.1	0.009	0.003	0.005
PA: Harrisburg	8	0.3	0.0	0.1	0.011	0.002	0.008
PA: Pittsburgh	8				0.011	0.004	0.008
SC: Barnwell	2	0.0	0.0	0.0	0.009	0.006	0.008
SC: Columbia	7	0.1	0.1	0.1	0.011	0.006	0.009
TN: Knoxville	7	0.6	0.0	0.3	0.014	0.007	0.011

Table 2 (continued)
Gross Beta in Airborne Particulates
April 2000

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg	Max	Min (pCi/m ³)	Avg
TN: Nashville	8	0.2	0.0	0.1	0.011	0.007	0.009
TN: Oak Ridge/Bethel	8	0.4	0.1	0.2	0.009	0.006	0.008
TN: Oak Ridge/K25	8	0.4	0.1	0.2	0.008	0.005	0.007
TN: Oak Ridge/Melton	8	0.3	0.1	0.2	0.009	0.006	0.007
TN: Oak Ridge/Y12 E	8	0.5	0.1	0.2	0.010	0.006	0.007
TN: Oak Ridge/Y12 W	8	0.2	0.0	0.1	0.010	0.006	0.008
TX: Austin	6	0.1	0.0	0.1	0.012	0.007	0.010
TX: El Paso	8	1.1	0.3	0.6	0.018	0.010	0.013
UT: Salt Lake City	2	0.1	0.1	0.1	0.010	0.008	0.009
VA: Lynchburg	7	0.2	0.1	0.1	0.009	0.002	0.007
WA: Olympia	7	0.1	0.0	0.1	0.008	0.003	0.005
WA: Spokane	8	0.3	0.1	0.2	0.014	0.004	0.008

Table 3
Gross Beta in Airborne Particulates
May 2000

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg	Max	Min (pCi/m ³)	Avg
AK: Fairbanks	1	0.0	0.0	0.0	0.008	0.008	0.008
AL: Montgomery	16	0.2	0.0	0.1	0.027	0.007	0.015
AR: Little Rock	8	0.1	0.0	0.0	0.014	0.009	0.011
AZ: Phoenix	4	0.5	0.3	0.4	0.014	0.009	0.012
CA: Berkeley	9	0.1	0.0	0.0	0.008	0.002	0.004
CA: Los Angeles	9	0.2	0.1	0.1	0.013	0.004	0.008
CO: Denver	9	0.7	0.3	0.5	0.011	0.007	0.009
CT: Hartford	9	0.1	0.1	0.1	0.010	0.002	0.007
DE: Wilmington	9	0.3	0.1	0.1	0.020	0.003	0.010
FL: Jacksonville	9	0.2	0.0	0.1	0.012	0.008	0.010
FL: Miami	4	0.1	0.0	0.0	0.013	0.007	0.009
HI: Honolulu	9	0.2	0.1	0.1	0.007	0.002	0.004
IA: Iowa City	9	0.7	0.1	0.3	0.018	0.008	0.011
ID: Boise	8	0.6	0.1	0.3	0.010	0.005	0.008
ID: Idaho Falls	9				0.011	0.005	0.008
IL: Chicago	8	0.7	0.0	0.3	0.019	0.007	0.012
IN: Indianapolis	9	0.6	0.1	0.3	0.012	0.005	0.009
KS: Topeka	9	1.6	0.2	0.7	0.016	0.008	0.011
ME: Augusta	9	0.1	0.0	0.1	0.009	0.001	0.005
MI: Lansing	9	0.2	0.1	0.1	0.012	0.004	0.008
MN: Minneapolis	5	0.3	0.2	0.2	0.012	0.007	0.010
MS: Jackson	9	0.3	0.0	0.2	0.016	0.011	0.013
NC: Charlotte	6	0.1	0.0	0.0	0.013	0.010	0.012
NC: Wilmington	4				0.012	0.010	0.010
ND: Bismarck	6	1.0	0.3	0.5	0.008	0.007	0.008
NH: Concord	9	0.1	0.0	0.1	0.011	0.001	0.006
NM: Espanola	2				0.014	0.010	0.013
NM: Santa Fe	9				0.034	0.005	0.012
NV: Las Vegas	9	0.2	0.0	0.1	0.012	0.005	0.009
NY: Albany	4	0.3	0.0	0.1	0.016	0.003	0.009
NY: New York City	9	0.1	0.0	0.0	0.014	0.003	0.008
NY: Syracuse	2				0.011	0.006	0.009
NY: Yaphank	9	0.1	0.0	0.0	0.013	0.003	0.008
OH: Painesville	8	0.2	0.1	0.1	0.016	0.005	0.009
OH: Ross	9				0.017	0.006	0.012
OR: Portland	6	0.1	0.0	0.0	0.006	0.003	0.004
PA: Harrisburg	9	0.7	0.1	0.2	0.017	0.005	0.010
PA: Pittsburgh	9				0.015	0.005	0.010

Table 3 (continued)
Gross Beta in Airborne Particulates
May 2000

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg	Max	Min (pCi/m ³)	Avg
SC: Barnwell	2	0.1	0.0	0.1	0.013	0.010	0.011
SC: Columbia	9	0.3	0.0	0.1	0.016	0.010	0.012
TN: Knoxville	5	0.9	0.1	0.3	0.020	0.012	0.015
TN: Nashville	9	0.2	0.0	0.1	0.016	0.008	0.013
TN: Oak Ridge/Bethel	9	1.0	0.2	0.4	0.016	0.008	0.012
TN: Oak Ridge/K25	9	1.1	0.2	0.4	0.014	0.009	0.011
TN: Oak Ridge/Melton	9	0.9	0.2	0.4	0.014	0.008	0.011
TN: Oak Ridge/Y12 E	9	1.0	0.2	0.4	0.015	0.009	0.012
TN: Oak Ridge/Y12 W	9	0.4	0.1	0.2	0.016	0.009	0.012
TX: Austin	8	0.1	0.0	0.1	0.010	0.007	0.009
TX: El Paso	8	0.7	0.4	0.5	0.016	0.009	0.012
UT: Salt Lake City	4	0.1	0.1	0.1	0.011	0.008	0.009
VA: Lynchburg	9	0.7	0.1	0.3	0.012	0.007	0.009
WA: Olympia	8	0.1	0.0	0.0	0.009	0.002	0.004
WA: Spokane	9	0.2	0.1	0.1	0.012	0.004	0.007

Table 4
Gross Beta in Airborne Particulates
June 2000

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg	Max	Min (pCi/m ³)	Avg
AK: Fairbanks	3	0.2	0.0	0.1	0.009	0.006	0.007
AL: Montgomery	17	0.1	0.0	0.0	0.018	0.004	0.009
AR: Little Rock	6	0.1	0.0	0.0	0.020	0.006	0.011
CA: Berkeley	9	0.1	0.0	0.0	0.007	0.002	0.004
CA: Los Angeles	9	0.2	0.0	0.1	0.013	0.006	0.009
CO: Denver	9	1.2	0.3	0.6	0.015	0.006	0.009
CT: Hartford	9	0.2	0.0	0.1	0.009	0.004	0.006
DE: Wilmington	9	0.3	0.1	0.2	0.016	0.005	0.008
FL: Jacksonville	9	0.1	0.0	0.1	0.008	0.003	0.006
FL: Miami	5	0.0	0.0	0.0	0.007	0.005	0.006
HI: Honolulu	9	0.2	0.1	0.1	0.003	0.002	0.003
IA: Iowa City	8	0.4	0.1	0.2	0.012	0.005	0.008
ID: Boise	8	0.6	0.0	0.3	0.017	0.004	0.007
ID: Idaho Falls	10				0.096	0.004	0.016
IL: Chicago	6	0.2	0.1	0.1	0.010	0.006	0.008
IN: Indianapolis	9	0.3	0.1	0.2	0.012	0.005	0.008
KS: Topeka	9	0.7	0.1	0.4	0.012	0.005	0.008
ME: Augusta	9	0.3	0.1	0.1	0.010	0.004	0.006
MI: Lansing	9	0.3	0.1	0.2	0.008	0.004	0.006
MN: Minneapolis	4	0.2	0.1	0.1	0.010	0.004	0.007
MS: Jackson	9	0.4	0.0	0.2	0.021	0.006	0.012
NC: Charlotte	4	0.1	0.0	0.0	0.011	0.005	0.009
NC: Wilmington	2				0.007	0.007	0.007
ND: Bismarck	5	0.3	0.1	0.2	0.008	0.005	0.006
NH: Concord	9	0.2	0.1	0.1	0.008	0.004	0.006
NV: Las Vegas	9	0.1	0.1	0.1	0.010	0.006	0.008
NY: Albany	4	0.1	0.0	0.0	0.010	0.007	0.008
NY: New York City	8	0.1	0.0	0.1	0.014	0.005	0.007
NY: Syracuse	3				0.011	0.005	0.008
NY: Yaphank	9	0.2	0.0	0.1	0.010	0.002	0.006
OH: Painesville	9	0.3	0.0	0.1	0.011	0.006	0.008
OH: Ross	9				0.017	0.006	0.009
OR: Portland	7	0.1	0.0	0.1	0.006	0.001	0.003
PA: Harrisburg	9	0.4	0.1	0.2	0.017	0.005	0.008
PA: Pittsburgh	9				0.013	0.005	0.008
SC: Barnwell	1	0.0	0.0	0.0	0.007	0.007	0.007
SC: Columbia	8	0.2	0.0	0.1	0.021	0.004	0.009
TN: Knoxville	7	1.0	0.0	0.3	0.027	0.006	0.015

Table 4 (continued)
Gross Beta in Airborne Particulates
June 2000

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg	Max	Min (pCi/m ³)	Avg
TN: Nashville	9	0.3	0.1	0.2	0.033	0.007	0.013
TN: Oak Ridge/Bethel	9	0.8	0.2	0.4	0.014	0.005	0.010
TN: Oak Ridge/K25	9	0.9	0.2	0.4	0.014	0.006	0.010
TN: Oak Ridge/Melton	9	1.0	0.2	0.4	0.014	0.004	0.010
TN: Oak Ridge/Y12 E	9	0.9	0.1	0.4	0.015	0.005	0.011
TN: Oak Ridge/Y12 W	9	0.4	0.1	0.2	0.016	0.005	0.011
TX: Austin	8	0.1	0.0	0.1	0.013	0.007	0.010
TX: El Paso	9	0.5	0.3	0.4	0.015	0.006	0.010
UT: Salt Lake City	4	0.2	0.0	0.1	0.011	0.006	0.009
VA: Lynchburg	9	0.8	0.1	0.4	0.012	0.004	0.008
WA: Olympia	9	0.1	0.0	0.0	0.015	0.001	0.005
WA: Spokane	10	0.6	0.1	0.2	0.034	0.002	0.008

Table 5
Gross Beta and Specific Gamma in Precipitation
April 2000

Location	Gross Beta Activity		Specific Gamma Activity	
	pCi/L $\pm 2\sigma$		Nuclide	pCi/L $\pm 2\sigma$
AL: Montgomery	1.61	0.44		ND
AR: Little Rock	1.97	0.35	Pb212	4.3 6.9
AZ: Phoenix	0.5	2.8	Be7	48 29
			Tl208	2.6 3.0
CA: Berkeley	0.8	2.7		ND
CO: Denver	1.02	0.29		ND
CT: Hartford	2.40	0.38	Be7	49 33
DE: Wilmington	2.42	0.37	Be7	40 36
FL: Jacksonville	0.97	0.29	Pb212	7.6 6.6
FL: Miami	0.53	0.37		ND
HI: Honolulu	1.0	2.8		ND
IA: Iowa City	0.69	0.40		ND
ID: Boise	3.9	3.0		ND
ID: Idaho Falls	-0.4	2.7	Be7	37 39
KS: Topeka	3.87	0.46		ND
MI: Lansing	1.17	0.41		ND
MN: Minneapolis	1.92	0.36		ND
MN: Welch	0.85	0.39	Pb212	5.2 5.4
NC: Charlotte	3.31	0.43	Be7	97 55
NC: Wilmington	1.20	0.30	Be7	42 44
ND: Bismarck	1.94	0.35		ND
NH: Concord	1.11	0.29	Tl208	2.3 4.2
NM: Santa Fe	3.35	0.44		ND
NY: Albany	1.69	0.34	Be7	58 41
NY: Yaphank	2.19	0.37	Pb212	4.0 6.2
OH: Painesville	6.46	0.66	Be7	58 58
OR: Portland	0.9	2.8	Pb212	4.7 7.3
PA: Harrisburg	2.68	0.40	Be7	40 34
			Pb212	3.1 4.9
SC: Barnwell	3.50	0.54		ND
TN: Knoxville	6.58	0.65		ND
TN: Nashville	1.53	0.45		ND
TX: Austin	0.65	0.27	Pb212	4.1 5.7
UT: Salt Lake City	2.80	0.42	Be7	36 30
VA: Lynchburg	2.55	0.40		ND
WA: Olympia	1.2	2.7		ND

Note: ND = Not Detected

Table 6
Gross Beta and Specific Gamma in Precipitation
May 2000

Location	Gross Beta Activity		Specific Gamma Activity	
	pCi/L $\pm 2\sigma$		Nuclide	pCi/L $\pm 2\sigma$
AL: Montgomery	1.08	0.36		ND
AR: Little Rock	0.81	0.33		ND
CA: Berkeley	1.03	0.35		ND
CO: Denver	2.92	0.46		ND
CT: Hartford	3.73	0.51	Be7	90 29
DE: Wilmington	2.54	0.45	Be7	129 29
			K40	13 15
FL: Jacksonville	1.33	0.37	K40	42 62
			Pb212	4.4 6.7
FL: Miami	0.78	0.34		ND
HI: Honolulu	4.22	0.53	Pb212	7.6 5.0
IA: Iowa City	0.90	0.33		ND
ID: Boise	1.38	0.37	Pb212	5.6 5.3
ID: Idaho Falls	0.90	0.34		ND
KS: Topeka	2.04	0.42		ND
ME: Augusta	3.19	0.48	Be7	54 28
			Tl208	1.6 1.9
MI: Lansing	1.23	0.37	Be7	35 29
MN: Minneapolis	1.58	0.39	Bi212	55 26
MN: Welch	-3.1	5.2		ND
NC: Wilmington	1.17	0.35		ND
ND: Bismarck	1.23	0.37		ND
NH: Concord	4.19	0.51	Be7	93 30
			Pb212	3.1 3.3
NY: Albany	1.88	0.41	Be7	50 28
NY: Syracuse	1.79	0.39	Be7	34 27
NY: Yaphank	1.99	0.41	Be7	33 23
			Pb212	3.8 3.7
OH: Painesville	1.26	0.36	Be7	63 27
			Pb212	5.4 3.6
			Tl208	1.8 1.9
OR: Portland	0.94	0.35	Be7	37 31
PA: Harrisburg	2.21	0.42	Be7	41 41
			Bi212	45 40
			Pb212	4.8 6.2
TN: Knoxville	1.14	0.35	K40	20 28
TN: Nashville	1.16	0.36		ND

Note: ND = Not Detected

Table 6 (continued)
Gross Beta and Specific Gamma in Precipitation
May 2000

Location	Gross Beta Activity		Specific Gamma Activity	
	pCi/L $\pm 2\sigma$		Nuclide	pCi/L $\pm 2\sigma$
TX: Austin	0.51	0.31	K40	51 49
			Pb212	4.6 6.4
UT: Salt Lake City	1.71	0.41	K40	22 41
VA: Lynchburg	8.27	0.70	K40	59 59
WA: Olympia	0.33	0.30	Pb212	7.8 6.5
			Tl208	2.4 3.6

Note: ND = Not Detected

Table 7
Gross Beta and Specific Gamma in Precipitation
June 2000

Location	Gross Beta Activity		Specific Gamma Activity	
	pCi/L $\pm 2\sigma$		Nuclide	pCi/L $\pm 2\sigma$
AL: Montgomery	0.75	0.32	Be7	44 26
AR: Little Rock	1.22	0.35		ND
AZ: Phoenix	1.05	0.35		ND
CA: Berkeley	1.26	0.37		ND
CO: Denver	3.97	0.52	Be7	104 47
			Pb212	4.4 5.9
CT: Hartford	2.98	0.46	Be7	49 26
DE: Wilmington	2.85	0.45	Be7	57 25
FL: Jacksonville	1.11	0.35	Be7	45 24
			Pb212	3.1 3.5
			Tl208	3.3 1.7
FL: Miami	0.59	0.32		ND
IA: Iowa City	0.46	0.30		ND
ID: Idaho Falls	0.29	0.29	Pb212	4.4 6.8
KS: Topeka	0.94	0.33		ND
ME: Augusta	5.36	0.58	Be7	59 27
MI: Lansing	1.02	0.35		ND
MN: Minneapolis	0.85	0.34	Pb212	5.9 4.0
			Tl208	2.4 2.0
MN: Welch	1.85	0.42		ND
NC: Charlotte	1.68	0.40	Be7	40 39
NC: Wilmington	1.46	0.38	Be7	47 21
			Tl208	1.6 1.8
ND: Bismarck	0.46	0.31	Tl208	1.9 1.8
NH: Concord	1.89	0.39	Be7	46 23
NM: Santa Fe	2.50	0.44		ND
NY: Albany	0.83	0.33		ND
NY: Syracuse	0.79	0.34		ND
NY: Yaphank	0.87	0.32	Tl208	2.8 3.3
OH: Painesville	2.40	0.42	Be7	79 49
OR: Portland	2.40	0.42		ND
PA: Harrisburg	2.53	0.44	Be7	62 37
SC: Barnwell	2.94	0.45		ND
SC: Columbia	1.09	0.35	Be7	22 23
TN: Knoxville	2.22	0.42		ND
TN: Nashville	1.94	0.40	Be7	38 32
TX: Austin	0.61	0.31	Tl208	1.5 1.7

Note: ND = Not Detected

Table 7 (continued)
Gross Beta and Specific Gamma in Precipitation
June 2000

Location	Gross Beta Activity		Specific Gamma Activity	
	pCi/L $\pm 2\sigma$		Nuclide	pCi/L $\pm 2\sigma$
TX: El Paso	0.72	0.33		ND
VA: Lynchburg	16.23	0.95	K40	40 48
WA: Olympia	0.23	0.28	Tl208	3.1 3.5

Note: ND = Not Detected

Table 8
Tritium in Precipitation
April - June 2000

Location	April 2000		May 2000		June 2000	
	pCi/L $\pm 2u$		pCi/L $\pm 2u$		pCi/L $\pm 2u$	
AL: Montgomery	-43	78	17	79	-54	82
AR: Little Rock	-12	77	7	74	-87	71
AZ: Phoenix	48	81	NS		-16	75
CA: Berkeley	-15	76	-16	72	9	76
CO: Denver	0	77	-2	73	22	78
CT: Hartford	-59	77	75	81	-5	84
DE: Wilmington	8	80	60	81	-41	81
FL: Jacksonville	-3	80	85	81	-87	80
FL: Miami	-21	79	12	79	-75	80
HI: Honolulu	-3	78	2	74	NS	
IA: Iowa City	-34	77	61	80	-16	74
ID: Boise	28	79	-2	73	NS	
ID: Idaho Falls	43	80	54	77	-53	73
KS: Topeka	58	80	-5	73	-53	73
ME: Augusta	NS		32	79	-57	81
MI: Lansing	-13	78	84	82	-3	84
MN: Minneapolis	41	80	-7	77	5	75
MN: Welch	-5	80	38	79	21	76
NC: Charlotte	-26	79	NS		-50	82
NC: Wilmington	-2	77	77	82	-65	80
ND: Bismarck	27	79	33	76	-19	74
NH: Concord	-45	78	86	81	-25	83
NM: Santa Fe	13	78	NS		-50	73
NY: Albany	-33	78	54	80	15	83
NY: Syracuse	NS		61	79	-20	82
NY: Yaphank	-43	78	36	81	-2	83
OH: Painesville	-55	79	43	79	-17	82
OR: Portland	8	78	-45	72	-47	74
PA: Harrisburg	-18	80	87	82	-47	81
SC: Barnwell	97	85	NS		95	87
SC: Columbia	NS		NS		87	87
TN: Knoxville	-23	78	20	79	-69	80
TN: Nashville	-27	80	37	79	-69	81
TX: Austin	-23	77	-21	72	-20	75
TX: El Paso	NS		NS		-39	73
UT: Salt Lake City	40	80	4	74	NS	
VA: Lynchburg	-20	79	54	80	-26	81
WA: Olympia	28	79	-2	74	-48	73

Note: NS = No Sample

Plutonium and Uranium in Airborne Particulates and Precipitation

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 ranges from 120,000 to 500,000 cubic meters.

Plutonium and uranium results are published when they become available.

2. Drinking Water Program

The ERAMS drinking water program provides data on radionuclide concentrations in the nation's drinking water supplies.

The program monitors ambient radiation levels in drinking water in as many as 78 sites. These data serve 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.

Grab samples are taken at the 78 sites which are either major population centers or selected nuclear facility environs.

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
April - June 2000

Location	Date Collected	³ H pCi/L ± 2 <i>u</i>	
AK: Fairbanks	05/24/00	81	79
AL: Dothan	04/04/00	-16	77
AL: Montgomery	04/03/00	2	79
AL: Muscle Shoals	04/13/00	160	81
AL: Scottsboro	04/10/00	82	76
AR: Little Rock	04/05/00	65	76
CA: Berkeley	04/13/00	33	77
CA: Los Angeles	04/04/00	33	75
CO: Denver	04/07/00	68	76
CO: Platteville	04/05/00	0	73
CT: Hartford	04/05/00	-7	73
DC: Washington	04/05/00	-17	71
DE: Dover	04/17/00	47	75
FL: Miami	04/04/00	10	80
GA: Baxley	04/18/00	42	77
GA: Savannah	04/12/00	-47	78
HI: Honolulu	04/05/00	13	74
IA: Cedar Rapids	04/03/00	-2	78
ID: Idaho Falls	05/15/00	-30	76
IL: Morris	04/03/00	-20	68
KS: Topeka	04/03/00	-23	77
LA: New Orleans	04/28/00	109	79
MD: Baltimore	04/11/00	19	78
MD: Conowingo	04/25/00	21	75
ME: Augusta	04/19/00	49	76
MI: Detroit	04/03/00	118	79
MI: Grand Rapids	04/06/00	49	75
MN: Minneapolis	04/24/00	112	78
MN: Red Wing	04/17/00	8	73
MO: Jefferson City	04/04/00	61	77
MS: Jackson	04/19/00	45	76
MS: Port Gibson	04/18/00	68	76
NC: Charlotte	04/17/00	458	94
NC: Wilmington	04/10/00	158	83
ND: Bismarck	04/04/00	77	76
NE: Lincoln	04/04/00	35	75
NH: Concord	04/03/00	-45	70
NJ: Trenton	05/01/00	43	79
NJ: Waretown	04/26/00	-18	72
NM: Santa Fe	04/17/00	3	75

Table 9 (continued)
Tritium in Drinking Water
April - June 2000

Location	Date Collected	³ H pCi/L ± 2 <i>u</i>	
NV: Las Vegas	04/05/00	-5	72
NY: Albany	04/12/00	-10	78
NY: Niagara Falls	05/15/00	41	79
NY: Syracuse	05/05/00	11	78
OH: Cincinnati	06/06/00	122	80
OH: E. Liverpool	04/27/00	75	78
OH: Painesville	04/04/00	164	88
OK: Oklahoma City	04/06/00	-35	70
OR: Portland	04/04/00	-28	77
PA: Columbia	04/27/00	20	75
PA: Harrisburg	04/28/00	105	78
PA: Philadelphia - Baxter	04/13/00	-21	73
PA: Philadelphia - Queen	04/13/00	14	75
PA: Pittsburgh	04/27/00	63	76
RI: Providence	04/03/00	31	78
SC: Barnwell	04/13/00	-48	72
SC: Columbia	04/04/00	141	84
SC: Jenkinsville	04/14/00	78	78
SC: Seneca	04/17/00	70	75
TN: Chattanooga	04/07/00	121	79
TN: Knoxville	04/03/00	3	78
TN: Oak Ridge - Anderson Co #768	06/27/00	15	74
TN: Oak Ridge - Anderson Co #772	06/27/00	72	79
TN: Oak Ridge - Knox Co #371	06/27/00	48	77
TN: Oak Ridge - Roane Co #360	06/27/00	225	84
TN: Oak Ridge - Roane Co #4442	06/27/00	389	91
TX: Austin	04/14/00	-12	73
VA: Ashland	05/30/00	73	78
VA: Lynchburg	04/03/00	12	79
WA: Richland	04/06/00	-5	72
WA: Seattle	05/24/00	25	80
WI: Genoa	04/12/00	-8	78

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3. Milk Program

Pasteurized Milk

Milk is a reliable indicator of the general population's intake of 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. All samples collected in July are analyzed for strontium-90.

Iodine-131, barium-140, cesium-137, and potassium-40 are determined by gamma spectral analysis. Strontium-90 is determined by beta counting a total strontium precipitate that has been chemically separated by ion exchange.

Table 10
Radionuclides in Pasteurized Milk
April - June 2000

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	04/05/00	1.680	0.052	ND		ND	ND
AZ: Phoenix	04/17/00	1.740	0.052	ND		ND	ND
CA: Los Angeles	04/06/00	1.740	0.054	ND		ND	ND
CA: Sacramento	05/15/00	1.68	0.11	ND		ND	ND
CA: San Francisco	04/04/00	1.752	0.052	ND		ND	ND
CT: Hartford	04/05/00	1.740	0.053	ND		ND	ND
DE: Wilmington	04/04/00	1.632	0.054	ND		ND	ND
FL: Tampa	04/11/00	1.740	0.053	3.9	1.8	ND	ND
HI: Honolulu	04/10/00	1.752	0.053	ND		ND	ND
IA: Des Moines	04/24/00	1.73	0.11	ND		ND	ND
IN: Indianapolis	04/05/00	1.692	0.052	ND		ND	ND
KS: Wichita	04/10/00	1.621	0.052	ND		ND	ND
KY: Louisville	04/10/00	1.764	0.052	ND		ND	ND
MA: Boston	04/18/00	1.716	0.052	ND		ND	ND
MD: Baltimore	04/07/00	1.609	0.052	ND		ND	ND
ME: Portland	04/10/00	1.66	0.13	ND		ND	ND
MI: Detroit	04/11/00	1.728	0.052	ND		ND	ND
MI: Grand Rapids	04/04/00	1.692	0.054	ND		ND	ND
MO: Jefferson City	05/02/00	1.72	0.11	ND		ND	ND
MS: Jackson	04/07/00	1.704	0.052	ND		ND	ND
NJ: Trenton	04/06/00	1.716	0.054	ND		ND	ND
NM: Albuquerque	06/23/00	1.61	0.13	ND		ND	ND
NV: Las Vegas	04/17/00	1.692	0.052	ND		ND	ND
NY: Buffalo	04/07/00	1.775	0.052	ND		ND	ND
NY: Syracuse	04/04/00	1.692	0.053	ND		ND	ND
OH: Cincinnati	05/15/00	1.66	0.11	ND		ND	ND
OH: Cleveland	04/27/00	1.70	0.11	ND		ND	ND
OR: Portland	04/06/00	1.740	0.053	ND		ND	ND
PA: Philadelphia	04/04/00	1.704	0.052	ND		ND	ND
PA: Pittsburgh	04/05/00	1.692	0.052	ND		ND	ND
PR: San Juan	04/11/00	1.78	0.11	ND		ND	ND
SD: Rapid City	04/14/00	1.728	0.052	ND		ND	ND
TN: Chattanooga	04/17/00	1.692	0.052	ND		ND	ND
TN: Knoxville	04/25/00	1.68	0.11	ND		ND	ND
TN: Memphis	06/27/00	1.69	0.11	ND		ND	ND
TX: Ft. Worth	06/23/00	1.60	0.13	ND		ND	ND
TX: San Antonio	04/27/00	1.56	0.10	ND		ND	ND
VT: Montpelier	06/02/00	1.73	0.13	ND		ND	ND
WA: Spokane	04/05/00	1.752	0.053	ND		ND	ND

Note: ND = Not Detected

Table 10 (continued)
Radionuclides in Pasteurized Milk
April - June 2000

Location	Date Collected	K g/L $\pm 2u$	¹³⁷ Cs pCi/L $\pm 2u$	¹⁴⁰ Ba pCi/L $\pm 2u$	¹³¹ I pCi/L $\pm 2u$
WV: Charleston	04/06/00	1.704 0.052	ND	ND	ND

Note: ND = Not Detected

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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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Contents

	Page
List of Tables	v
Preface	vii
Acknowledgments	ix
Data Reporting Conventions	xi
1. Air Program	1
Airborne Particulates and Precipitation	1
Plutonium and Uranium in Airborne Particulates and Precipitation	14
2. Drinking Water Program	15
3. Milk Program	19
Pasteurized Milk	19

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List of Tables

Table	Page
1 Reporting Units and Minimum Detectable Concentrations	xiii
2 Gross Beta in Airborne Particulates: April 2000	2
3 Gross Beta in Airborne Particulates: May 2000	4
4 Gross Beta in Airborne Particulates: June 2000	6
5 Gross Beta and Specific Gamma in Precipitation: April 2000	8
6 Gross Beta and Specific Gamma in Precipitation: May 2000	9
7 Gross Beta and Specific Gamma in Precipitation: June 2000	11
8 Tritium in Precipitation: April - June 2000	13
9 Tritium in Drinking Water: April - June 2000	16
10 Radionuclides in Pasteurized Milk: April - June 2000	20

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