

ENVIRONMENTAL

RADIATION

DATA

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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](http://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 <sup>3</sup>	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 <sup>3</sup>	0.75
	Water	pCi/L	0.1
† Uranium-234,235,238	Air	aCi/m <sup>3</sup>	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 m<sup>3</sup>. Measurement by alpha spectrometry includes combined activities of <sup>239</sup>Pu and <sup>240</sup>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<sup>3</sup>.

‡ 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<sup>3</sup>. 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 2001**

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min (pCi/m <sup>3</sup> )	Avg	Max	Min (pCi/m <sup>3</sup> )	Avg
AL: Montgomery/408	9	0.1	0.0	0.0	0.014	0.005	0.008
AL: Montgomery/411	9	0.2	0.0	0.1	0.019	0.004	0.009
AR: Little Rock	7	0.1	0.0	0.0	0.016	0.006	0.010
AZ: Phoenix	5	0.9	0.2	0.6	0.028	0.014	0.023
CA: Berkeley	9	0.2	0.0	0.1	0.014	0.007	0.010
CA: Los Angeles	9	0.3	0.0	0.2	0.024	0.013	0.018
CO: Denver	9	1.2	0.2	0.7	0.020	0.006	0.012
CT: Hartford	9	0.2	0.0	0.1	0.015	0.004	0.007
DE: Wilmington	9	0.3	0.1	0.2	0.020	0.005	0.010
FL: Jacksonville	9	0.2	0.0	0.1	0.012	0.003	0.007
FL: Miami	5	0.0	0.0	0.0	0.006	0.003	0.004
HI: Honolulu	6	0.1	0.1	0.1	0.006	0.002	0.003
IA: Iowa City	9	0.3	0.0	0.2	0.014	0.007	0.010
ID: Boise	3	0.5	0.1	0.3	0.013	0.006	0.010
ID: Idaho Falls	9				0.013	0.004	0.009
IN: Indianapolis	9	0.4	0.0	0.2	0.015	0.005	0.009
KS: Topeka	6				0.015	0.007	0.010
ME: Augusta	8	0.6	0.1	0.2	0.022	0.004	0.008
MI: Lansing	9	0.2	0.0	0.1	0.014	0.004	0.008
MN: Minneapolis	3	0.3	0.1	0.2	0.014	0.008	0.011
MN: Welch/510	9	0.8	0.1	0.4	0.018	0.008	0.012
MS: Jackson	9	0.7	0.0	0.3	0.020	0.006	0.011
NC: Charlotte	7	0.1	0.0	0.1	0.019	0.007	0.010
NC: Wilmington	5				0.009	0.005	0.007
ND: Bismarck	7	1.7	0.2	0.8	0.014	0.004	0.010
NH: Concord	9	0.4	0.1	0.2	0.015	0.003	0.009
NJ: Trenton	1				0.004	0.004	0.004
NV: Las Vegas	9	0.2	0.1	0.2	0.018	0.007	0.013
NY: Albany	4	0.2	0.0	0.1	0.015	0.004	0.010
NY: New York City	9	0.3	0.0	0.1	0.026	0.005	0.011
NY: Yaphank	8	0.2	0.0	0.1	0.017	0.005	0.009
OH: Painesville	8	0.3	0.1	0.2	0.015	0.004	0.009
OH: Ross	9				0.025	0.005	0.011
OR: Portland	8	0.2	0.1	0.1	0.008	0.003	0.005
PA: Harrisburg	9	0.9	0.1	0.4	0.020	0.004	0.010
PA: Pittsburgh	9				0.016	0.005	0.010
SC: Barnwell	1	0.0	0.0	0.0	0.011	0.011	0.011
SC: Columbia	7	0.4	0.1	0.2	0.017	0.006	0.009



**Table 2 (continued)**  
**Gross Beta in Airborne Particulates**  
**October 2001**

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min	Avg	Max	Min	Avg
		(pCi/m <sup>3</sup> )			(pCi/m <sup>3</sup> )		
TN: Knoxville	9	0.9	0.0	0.2	0.028	0.007	0.013
TN: Nashville	5	0.3	0.1	0.2	0.018	0.005	0.009
TN: Oak Ridge/Bethel	9	1.1	0.3	0.6	0.016	0.005	0.011
TN: Oak Ridge/K25	9	1.5	0.4	0.8	0.015	0.006	0.010
TN: Oak Ridge/Melton	9	1.4	0.3	0.7	0.015	0.006	0.010
TN: Oak Ridge/Y12 E	9	1.9	0.0	0.8	0.017	0.006	0.011
TN: Oak Ridge/Y12 W	8	0.9	0.2	0.4	0.018	0.005	0.012
TX: Austin	9	0.3	0.0	0.1	0.011	0.004	0.008
TX: El Paso	9	0.9	0.3	0.6	0.021	0.013	0.017
UT: Salt Lake City	9	0.6	0.1	0.3	0.015	0.006	0.011
VA: Lynchburg	9	1.0	0.4	0.7	0.014	0.005	0.009
WA: Olympia	8	0.1	0.0	0.1	0.006	0.002	0.004
WA: Spokane	8	0.5	0.1	0.2	0.015	0.006	0.008

**Table 3**  
**Gross Beta in Airborne Particulates**  
**November 2001**

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min	Avg	Max	Min	Avg
		(pCi/m <sup>3</sup> )			(pCi/m <sup>3</sup> )		
AK: Fairbanks	1	0.0	0.0	0.0	0.023	0.023	0.023
AL: Montgomery/408	8	0.1	0.0	0.1	0.025	0.006	0.014
AL: Montgomery/411	8	0.2	0.0	0.1	0.026	0.006	0.015
AR: Little Rock	8	0.0	0.0	0.0	0.032	0.007	0.018
AZ: Phoenix	4	1.2	0.2	0.6	0.026	0.014	0.021
CA: Berkeley	8	0.5	0.0	0.1	0.014	0.003	0.007
CA: Los Angeles	8	0.4	0.1	0.2	0.031	0.007	0.015
CO: Denver	8	1.5	0.4	0.8	0.021	0.008	0.013
CT: Hartford	9	0.2	0.0	0.1	0.012	0.006	0.008
DE: Wilmington	9	0.4	0.1	0.2	0.020	0.008	0.013
FL: Jacksonville	9	0.1	0.0	0.1	0.021	0.006	0.011
FL: Miami	4	0.0	0.0	0.0	0.008	0.004	0.006
HI: Honolulu	7	0.2	0.0	0.1	0.004	0.002	0.003
IA: Iowa City	9	0.8	0.0	0.3	0.032	0.009	0.016
ID: Boise	5	0.9	0.0	0.4	0.023	0.004	0.012
ID: Idaho Falls	8				0.021	0.008	0.013
IN: Indianapolis	8	0.5	0.1	0.2	0.026	0.005	0.013
KS: Topeka	7				0.032	0.008	0.016
ME: Augusta	7	0.2	0.0	0.1	0.018	0.004	0.009
MI: Lansing	8	0.6	0.1	0.2	0.036	0.006	0.015
MN: Minneapolis	4	0.5	0.1	0.3	0.034	0.013	0.021
MN: Welch/510	7	3.4	0.0	0.9	0.040	0.004	0.020
MS: Jackson	8	1.1	0.0	0.4	0.030	0.003	0.016
NC: Charlotte	2	0.1	0.0	0.0	0.008	0.008	0.008
NC: Wilmington	2				0.010	0.008	0.009
ND: Bismarck	8	3.0	0.3	1.3	0.024	0.009	0.017
NH: Concord	9				0.023	0.005	0.011
NV: Las Vegas	9	0.2	0.1	0.1	0.022	0.004	0.011
NY: Albany	4	0.2	0.0	0.1	0.020	0.010	0.014
NY: New York City	9	0.3	0.0	0.1	0.021	0.006	0.012
NY: Yaphank	7	0.6	0.0	0.2	0.014	0.005	0.009
OH: Painesville	9	0.5	0.1	0.2	0.028	0.008	0.014
OH: Ross	9				0.036	0.009	0.016
OR: Portland	8	0.2	0.0	0.1	0.026	0.002	0.007
PA: Harrisburg	9	1.4	0.1	0.6	0.026	0.007	0.016
PA: Pittsburgh	9				0.034	0.008	0.015
SC: Barnwell	1	0.0	0.0	0.0	0.014	0.014	0.014
SC: Columbia	5	0.6	0.1	0.3	0.026	0.012	0.016

**Table 3 (continued)**  
**Gross Beta in Airborne Particulates**  
**November 2001**

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min	Avg	Max	Min	Avg
		(pCi/m <sup>3</sup> )			(pCi/m <sup>3</sup> )		
TN: Knoxville	7	1.1	0.0	0.3	0.061	0.010	0.026
TN: Nashville	7	0.2	0.1	0.2	0.033	0.007	0.016
TN: Oak Ridge/Bethel	7	1.7	0.2	0.7	0.031	0.009	0.015
TN: Oak Ridge/K25	7	1.6	0.2	0.7	0.048	0.009	0.019
TN: Oak Ridge/Melton	7	0.9	0.2	0.5	0.030	0.008	0.014
TN: Oak Ridge/Y12 E	7	2.1	0.2	0.9	0.033	0.009	0.016
TN: Oak Ridge/Y12 W	6	0.7	0.1	0.4	0.043	0.010	0.019
TX: Austin	8	0.4	0.0	0.2	0.026	0.006	0.013
TX: El Paso	7	2.2	0.6	1.1	0.025	0.010	0.016
UT: Salt Lake City	8	0.5	0.0	0.2	0.018	0.002	0.013
VA: Lynchburg	7	1.4	0.3	0.9	0.033	0.007	0.015
WA: Olympia	6	0.2	0.0	0.1	0.019	0.003	0.006
WA: Spokane	8	0.2	0.0	0.1	0.039	0.002	0.011

**Table 4**  
**Gross Beta in Airborne Particulates**  
**December 2001**

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min (pCi/m <sup>3</sup> )	Avg	Max	Min (pCi/m <sup>3</sup> )	Avg
AK: Fairbanks	1	0.0	0.0	0.0	0.019	0.019	0.019
AL: Montgomery/408	8	0.1	0.0	0.0	0.015	0.004	0.010
AL: Montgomery/411	3	0.1	0.0	0.1	0.018	0.009	0.014
AR: Little Rock	7	0.0	0.0	0.0	0.025	0.012	0.015
AZ: Phoenix	4	0.9	0.3	0.6	0.028	0.007	0.018
CA: Berkeley	8	0.3	0.0	0.1	0.013	0.002	0.005
CA: Los Angeles	9	0.3	0.0	0.2	0.014	0.004	0.008
CO: Denver	7	1.1	0.3	0.5	0.020	0.007	0.011
CT: Hartford	7	0.1	0.0	0.1	0.014	0.006	0.009
DE: Wilmington	9	0.3	0.1	0.2	0.020	0.011	0.015
FL: Jacksonville	8	0.1	0.1	0.1	0.011	0.004	0.009
FL: Miami	4	0.0	0.0	0.0	0.007	0.002	0.004
HI: Honolulu	6	0.1	0.1	0.1	0.003	0.001	0.002
IA: Iowa City	8	0.7	0.1	0.4	0.026	0.013	0.018
ID: Idaho Falls	9				0.037	0.003	0.018
IN: Indianapolis	9	0.4	0.0	0.2	0.018	0.010	0.013
KS: Topeka	9				0.026	0.009	0.014
ME: Augusta	6	0.2	0.0	0.1	0.019	0.007	0.011
MI: Lansing	7	0.2	0.1	0.1	0.020	0.013	0.017
MN: Minneapolis	5	0.3	0.1	0.2	0.031	0.013	0.020
MN: Welch/510	6	0.5	0.1	0.4	0.026	0.010	0.019
MS: Jackson	8	0.2	0.1	0.1	0.017	0.007	0.013
NC: Charlotte	6	0.3	0.0	0.1	0.017	0.005	0.011
NC: Wilmington	3				0.012	0.007	0.010
ND: Bismarck	4	1.0	0.4	0.7	0.036	0.011	0.027
NH: Concord	9	0.5	0.0	0.2	0.015	0.009	0.012
NV: Las Vegas	7	0.2	0.1	0.1	0.011	0.005	0.008
NY: Albany	4	0.1	0.0	0.1	0.017	0.012	0.015
NY: New York City	5	0.3	0.0	0.1	0.024	0.006	0.012
NY: Yaphank	9	0.1	0.0	0.1	0.019	0.006	0.011
OH: Painesville	7	0.3	0.1	0.1	0.015	0.007	0.012
OH: Ross	9				0.019	0.011	0.014
OR: Portland	7	0.2	0.0	0.1	0.032	0.001	0.007
PA: Harrisburg	8	0.6	0.1	0.3	0.020	0.011	0.015
PA: Pittsburgh	9				0.019	0.009	0.015
SC: Barnwell	1	0.0	0.0	0.0	0.009	0.009	0.009
SC: Columbia	6	0.4	0.1	0.2	0.014	0.005	0.009
TN: Knoxville	5	0.4	0.1	0.2	0.027	0.008	0.015

**Table 4 (continued)**  
**Gross Beta in Airborne Particulates**  
**December 2001**

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min	Avg	Max	Min	Avg
		(pCi/m <sup>3</sup> )			(pCi/m <sup>3</sup> )		
TN: Nashville	5	0.2	0.1	0.1	0.017	0.006	0.014
TN: Oak Ridge/Bethel	8	0.7	0.1	0.3	0.019	0.006	0.011
TN: Oak Ridge/K25	8	0.9	0.1	0.3	0.020	0.006	0.011
TN: Oak Ridge/Melton	8	0.4	0.1	0.2	0.018	0.006	0.010
TN: Oak Ridge/Y12 E	8	0.6	0.1	0.2	0.019	0.006	0.011
TN: Oak Ridge/Y12 W	8	0.3	0.1	0.2	0.023	0.008	0.015
TX: Austin	4	0.1	0.0	0.1	0.014	0.008	0.011
TX: El Paso	6	1.6	0.6	1.1	0.024	0.011	0.015
UT: Salt Lake City	9	0.2	0.0	0.1	0.047	0.004	0.016
VA: Lynchburg	5	1.1	0.2	0.7	0.016	0.007	0.011
WA: Olympia	8	0.2	0.0	0.1	0.015	0.001	0.005
WA: Spokane	9	0.1	0.1	0.1	0.028	0.002	0.009

**Table 5**  
**Gross Beta and Specific Gamma in Precipitation**  
**October 2001**

Location	Gross Beta Activity		Gamma-Emitting Radionuclides	
	pCi/L $\pm 2u$		Nuclide	pCi/L $\pm 2u$
AL: Montgomery	0.38	0.29	Pb212	3.1 5.6
AR: Little Rock	0.33	0.38	K40	46 13
CA: Berkeley	1.52	0.45		ND
CT: Hartford	0.80	0.33		ND
DE: Wilmington	0.82	0.32		ND
FL: Jacksonville	2.07	0.43	Be7	49 30
FL: Miami	0.61	0.31		ND
HI: Honolulu	1.62	0.47	Pb212	5.3 6.5
IA: Iowa City	0.59	0.32		ND
ID: Idaho Falls	1.21	0.43		ND
KS: Topeka	0.80	0.41		ND
ME: Augusta	5.94	0.59	Pb214	12.3 7.5
MI: Lansing	0.67	0.32		ND
MN: Minneapolis	1.37	0.36	Be7	31 18
NC: Charlotte	0.84	0.33		ND
NC: Wilmington	2.40	0.44	Be7	39 35
ND: Bismarck	1.73	0.46		ND
NH: Concord	2.87	0.46		ND
NY: Albany	0.55	0.30	Ra224	52 74
NY: Yaphank	2.05	0.41		ND
OH: Painesville	1.20	0.35	Be7	35 19
			Bi214	6.5 3.0
			K40	11 15
OR: Portland	0.69	0.40		ND
PA: Harrisburg	1.40	0.37	Bi214	28.0 7.8
			Pb212	5.0 7.0
			Ra224	52 74
TN: Knoxville	36.7	1.4	Bi214	7.1 6.5
			Pb214	8.9 6.5
TN: Nashville	0.37	0.28		ND
TX: Austin	0.29	0.38		ND
UT: Salt Lake City	2.79	0.52	Be7	58 21
VA: Lynchburg	11.87	0.81	Bi214	7.8 7.4
WA: Olympia	0.06	0.35	Tl208	1.8 1.3

Note: ND = Not Detected

**Table 6**  
**Gross Beta and Specific Gamma in Precipitation**  
**November 2001**

Location	Gross Beta Activity		Gamma-Emitting Radionuclides	
	pCi/L $\pm 2u$		Nuclide	pCi/L $\pm 2u$
AL: Montgomery	0.53	0.31		ND
AR: Little Rock	1.04	0.41		ND
AZ: Phoenix	4.84	0.64	Be7	65 37
CA: Berkeley	0.33	0.35		ND
CO: Denver	4.10	0.56		ND
CT: Hartford	1.21	0.36		ND
DE: Wilmington	1.38	0.37	Be7	33 36
FL: Jacksonville	1.89	0.43	Pb212	4.9 5.8
FL: Miami	1.60	0.40		ND
HI: Honolulu	0.79	0.41		ND
IA: Iowa City	0.70	0.32		ND
ID: Idaho Falls	0.92	0.41		ND
KS: Topeka	1.05	0.35	Pb212	4.0 6.6
ME: Augusta	5.63	0.58	Be7	42 32
MI: Lansing	1.69	0.39		ND
MN: Minneapolis	4.28	0.52	Be7	42 21
			Pb212	2.4 2.9
MN: Welch	8.06	0.68		ND
NC: Wilmington	0.71	0.32	Pb212	6.2 6.1
			Tl208	2.0 3.5
NH: Concord	7.57	0.66	Be7	50 42
NY: Albany	1.75	0.39	Be7	42 36
OH: Painesville	2.29	0.43	Be7	70 22
OR: Portland	1.76	0.45	Be7	59 42
SC: Barnwell	7.82	0.68		ND
SC: Columbia	9.85	0.74		ND
TN: Knoxville	38.9	1.4	K40	29 39
TN: Nashville	0.35	0.29		ND
TX: Austin	0.43	0.38	Be7	28 20
UT: Salt Lake City	1.10	0.42		ND
VA: Lynchburg	12.83	0.84		ND
WA: Olympia	0.20	0.34	K40	19 29

Note: ND = Not Detected

**Table 7**  
**Gross Beta and Specific Gamma in Precipitation**  
**December 2001**

Location	Gross Beta Activity		Gamma-Emitting Radionuclides	
	pCi/L $\pm 2\sigma$		Nuclide	pCi/L $\pm 2\sigma$
AL: Montgomery	0.74	0.39	Be7	29 21
AR: Little Rock	1.14	0.37		ND
AZ: Phoenix	2.85	0.48		ND
CA: Berkeley	0.32	0.29		ND
CO: Denver	0.74	0.32		ND
CT: Hartford	2.59	0.50	Be7	52 38
DE: Wilmington	1.61	0.46	Be7	61 41
			Pb212	4.5 6.5
FL: Jacksonville	0.88	0.41	Tl208	2.0 3.3
FL: Miami	1.08	0.46		ND
HI: Honolulu	1.12	0.37		ND
IA: Iowa City	0.27	0.38		ND
ID: Idaho Falls	0.82	0.35	Ra224	30 28
			Tl208	2.2 2.8
KS: Topeka	3.98	0.58	Tl208	2.5 3.3
MN: Minneapolis	2.39	0.49	Be7	25 19
NC: Charlotte	1.88	0.45	Be7	62 33
NC: Wilmington	-0.02	0.36		ND
NH: Concord	3.41	0.52		ND
NY: Albany	0.24	0.38		ND
NY: Yaphank	1.96	0.46	K40	20 37
			Pb212	5.3 6.2
OH: Painesville	2.61	0.48	Be7	35 32
OR: Portland	0.59	0.31	Tl208	2.4 3.5
PA: Harrisburg	1.62	0.43		ND
SC: Columbia	3.63	0.55	Bi212	32 48
TN: Knoxville	1.68	0.46		ND
TN: Nashville	0.39	0.35	Pb212	3.6 5.6
TX: Austin	0.37	0.35		ND
UT: Salt Lake City	1.39	0.37		ND
VA: Lynchburg	30.7	1.3		ND
WA: Olympia	0.41	0.29		ND

Note: ND = Not Detected



**Table 8**  
**Tritium in Precipitation**  
**October - December 2001**

Location	October 2001		November 2001		December 2001	
	pCi/L $\pm 2u$		pCi/L $\pm 2u$		pCi/L $\pm 2u$	
AL: Montgomery	-45	81	-43	78	-82	76
AR: Little Rock	-22	77	0	76	32	79
AZ: Phoenix	NS		-54	74	5	78
CA: Berkeley	57	80	-32	75	30	80
CO: Denver	NS		-46	74	37	80
CT: Hartford	52	85	188	89	121	86
DE: Wilmington	2910	160	-69	77	9	80
FL: Jacksonville	-31	81	26	81	122	86
FL: Miami	-23	81	-61	77	7	81
HI: Honolulu	3	78	-24	75	-8	78
IA: Iowa City	-48	80	48	78	45	80
ID: Idaho Falls	8	78	-43	74	30	79
KS: Topeka	-52	80	-24	75	65	81
ME: Augusta	17	84	690	110	NS	
MI: Lansing	-48	80	-11	79	NS	
MN: Minneapolis	28	83	54	78	12	78
MN: Welch	NS		112	85	NS	
NC: Charlotte	41	83	NS		-24	80
NC: Wilmington	43	84	-82	76	4	80
ND: Bismarck	35	79	NS		NS	
NH: Concord	520	100	-9	78	126	86
NY: Albany	-54	81	-6	80	24	81
NY: Yaphank	5	82	NS		13	81
OH: Painesville	-12	82	610	110	-15	79
OR: Portland	280	89	-37	75	30	80
PA: Harrisburg	57	85	NS		50	83
SC: Barnwell	NS		56	83	NS	
SC: Columbia	NS		-4	80	-6	80
TN: Knoxville	-12	82	-20	79	-50	78
TN: Nashville	-17	82	-47	78	17	81
TX: Austin	20	79	-13	75	30	79
UT: Salt Lake City	29	78	-4	76	13	78
VA: Lynchburg	53	84	211	90	-45	78
WA: Olympia	73	80	1950	140	-30	76

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.

**Table 9**  
**Plutonium and Uranium in Airborne Particulates**  
**January - December 2001 Composites**

Location	<sup>238</sup> Pu		<sup>239-240</sup> Pu		<sup>234</sup> U		<sup>235</sup> U		<sup>238</sup> U	
	aCi/m <sup>3</sup> ± 2u		aCi/m <sup>3</sup> ± 2u		aCi/m <sup>3</sup> ± 2u		aCi/m <sup>3</sup> ± 2u		aCi/m <sup>3</sup> ± 2u	
AK: Fairbanks	0.7	1.0	-0.10	0.35	8.5	1.8	0.66	0.51	8.5	1.8
AL: Montgomery/408	1.2	1.4	-0.06	0.37	11.7	3.1	0.8	1.0	8.9	2.6
AL: Montgomery/411	1.0	1.4	0.37	0.66	8.9	2.4	1.24	0.95	8.9	2.4
AR: Little Rock	1.3	2.3	0.15	0.83	25.7	5.6	1.3	1.3	26.6	5.7
AZ: Phoenix	-2.3	4.5	-0.9	1.7	52.4	9.5	2.7	2.0	46.0	8.7
CA: Berkeley	0.9	2.2	-0.26	0.86	10.0	2.2	1.68	0.90	8.4	2.0
CA: Los Angeles	1.3	3.3	-0.81	0.96	32.5	6.8	2.8	1.9	32.2	6.7
CO: Denver	-0.3	2.3	0.6	1.0	28.7	5.2	1.8	1.2	31.5	5.6
CT: Hartford	-0.8	1.3	0.00	0.69	12.0	3.0	0.17	0.63	11.9	3.0
DE: Wilmington	-0.16	0.75	0.00	0.34	18.9	3.7	1.7	1.0	17.2	3.5
FL: Jacksonville	0.11	0.98	-0.11	0.38	22.1	4.1	1.7	1.0	20.7	3.9
FL: Miami	0.32	0.88	0.20	0.51	12.8	2.7	0.68	0.71	8.4	2.0
HI: Honolulu	0.2	2.1	0.07	0.86	8.8	2.4	0.35	0.71	7.9	2.2
IA: Iowa City	0.7	1.4	0.31	0.67	12.4	4.1	0.5	1.3	11.0	3.8
ID: Boise	1.2	2.0	0.3	1.1	30.1	5.4	2.0	1.3	28.7	5.2
ID: Idaho Falls	1.2	1.9	0.26	0.85	51.1	9.6	3.4	2.2	44.8	8.7
IN: Indianapolis	0.6	2.4	-0.20	0.71	16.6	4.7	1.0	1.4	17.7	4.8
KS: Topeka	-0.15	0.53	0.00	0.48	20.2	5.4	2.8	2.1	15.9	4.6
ME: Augusta	0.3	1.4	-0.38	0.59	31.2	6.6	2.1	1.7	32.0	6.7
MI: Lansing	0.2	1.9	-0.09	0.58	9.9	3.6	0.4	1.2	10.7	3.8
MN: Minneapolis	0.6	1.6	0.00	0.57	13.2	3.7	1.2	1.2	9.6	3.1
MN: Welch/510	-0.27	0.95	0.8	1.5	25.7	8.0	0.6	2.2	22.6	7.4
MS: Jackson	1.1	2.0	-0.13	0.87	15.4	3.3	1.01	0.83	14.5	3.1
NC: Charlotte	-0.2	1.1	-0.09	0.41	16.1	3.4	1.10	0.88	16.9	3.5
NC: Wilmington	0.5	1.4	-0.05	0.48	14.6	2.8	1.24	0.79	15.5	2.9
ND: Bismarck	0.3	1.3	0.33	0.71	19.9	5.6	5.3	3.1	17.6	5.3
NH: Concord	-0.20	0.64	0.04	0.47	13.0	2.4	0.78	0.57	10.5	2.1
NJ: Trenton	-0.7	1.9	0.6	1.0	52.2	8.9	2.7	1.7	49.0	8.5
NV: Las Vegas	0.3	3.2	0.7	1.7	62	11	1.3	1.6	44.8	8.9
NY: Albany	0.3	1.1	0.16	0.46	22.7	4.8	1.6	1.3	23.5	4.9
NY: New York City	0.5	1.1	-0.10	0.66	28.4	5.3	4.1	1.8	27.7	5.2
NY: Syracuse	0.6	1.7	0.12	0.77	24.4	4.6	1.5	1.1	23.6	4.5
NY: Yaphank	-0.4	1.4	0.21	0.80	10.7	2.6	1.08	0.88	10.2	2.5
OH: Painesville	1.4	1.5	0.18	0.52	11.3	3.3	0.8	1.1	10.8	3.2
OH: Ross	0.1	2.4	-0.1	1.1	27.4	7.0	1.6	1.8	34.2	8.0
OR: Portland	0.5	1.6	-0.27	0.84	10.4	2.6	2.1	1.2	9.3	2.5
PA: Harrisburg	0.1	1.2	0.28	0.61	17.3	3.7	3.2	1.5	14.4	3.3
PA: Pittsburgh	-0.2	1.7	0.07	0.79	35.9	6.4	1.8	1.3	29.2	5.5
SC: Barnwell	0.21	0.58	-0.10	0.20	11.0	2.2	0.81	0.57	10.2	2.1
SC: Columbia	0.54	0.95	0.17	0.46	30.1	5.0	1.7	1.0	26.5	4.6

Note: NA = No Analysis

**Table 9 (continued)**

**Plutonium and Uranium in Airborne Particulates  
January - December 2001 Composites**

Location	<sup>238</sup> Pu		<sup>239-240</sup> Pu		<sup>234</sup> U		<sup>235</sup> U		<sup>238</sup> U	
	aCi/m <sup>3</sup> ± 2u	aCi/m <sup>3</sup> ± 2u	aCi/m <sup>3</sup> ± 2u	aCi/m <sup>3</sup> ± 2u	aCi/m <sup>3</sup> ± 2u	aCi/m <sup>3</sup> ± 2u	aCi/m <sup>3</sup> ± 2u	aCi/m <sup>3</sup> ± 2u	aCi/m <sup>3</sup> ± 2u	aCi/m <sup>3</sup> ± 2u
TN: Knoxville	1.6	2.9	0.0	1.4	15.1	6.5	-1.0	1.8	22.1	7.9
TN: Nashville	0.2	1.4	0.16	0.60	18.8	3.7	0.83	0.75	15.0	3.1
TN: Oak Ridge/Bethel	0.5	1.5	0.9	1.0	9.9	2.6	0.43	0.67	9.3	2.6
TN: Oak Ridge/K25	-2.0	2.5	-0.14	0.90	90	12	8.4	2.2	308	39
TN: Oak Ridge/Melton	1.2	1.3	0.22	0.47	7.6	2.2	0.10	0.43	5.3	1.8
TN: Oak Ridge/Y12 E	0.1	1.7	0.50	0.89	34.2	6.7	1.7	1.5	15.1	4.0
TN: Oak Ridge/Y12 W	0.11	0.99	0.55	0.77	98	14	6.2	2.3	56.1	9.1
TX: Austin	1.5	2.0	0.35	0.96	18.3	3.6	2.2	1.2	16.7	3.4
TX: El Paso	0.2	3.6	-0.5	1.1	88	17	5.7	4.4	74	16
UT: Salt Lake City	-0.1	1.5	0.17	0.78	36.8	6.5	1.2	1.1	34.0	6.2
VA: Lynchburg	0.38	0.83	0.25	0.53	144	18	8.8	2.2	18.1	3.2
WA: Olympia	0.15	0.70	-0.02	0.16	6.5	1.5	0.29	0.37	5.5	1.4
WA: Spokane	0.7	3.1	0.0	1.2	23.6	5.5	0.7	1.4	25.8	5.8

Note: NA = No Analysis

## **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 10**  
**Tritium in Drinking Water**  
**October - December 2001**

Location	Date Collected	<sup>3</sup> H pCi/L ± 2 <i>u</i>	
AK: Fairbanks	10/17/01	1400	130
AL: Montgomery	10/01/01	-57	78
AR: Little Rock	10/05/01	-61	80
CA: Berkeley	10/26/01	124	84
CT: Hartford	10/03/01	64	77
DE: Dover	10/04/01	-73	79
FL: Miami	10/17/01	-17	81
FL: Tampa	12/19/01	15	80
GA: Baxley	10/10/01	6	77
GA: Savannah	11/15/01	27	80
HI: Honolulu	10/23/01	-24	76
ID: Idaho Falls	10/24/01	76	83
IL: Morris	10/03/01	2	73
IL: W. Chicago	11/15/01	59	82
KS: Topeka	10/02/01	9	74
MA: Lawrence	10/01/01	91	79
MD: Baltimore	10/04/01	102	79
MD: Conowingo	10/31/01	135	85
ME: Augusta	10/02/01	15	75
MI: Detroit	10/16/01	123	84
MI: Grand Rapids	11/20/01	107	83
MN: Minneapolis	10/29/01	177	87
MN: Red Wing	10/15/01	-28	81
MO: Jefferson City	10/04/01	13	74
MS: Jackson	10/02/01	30	75
MS: Port Gibson	10/02/01	6	74
MT: Helena	10/05/01	28	75
NC: Charlotte	12/12/01	630	100
NC: Wilmington	10/22/01	70	80
ND: Bismarck	10/05/01	90	78
NH: Manchester	10/16/01	-48	81
NJ: Waretown	10/15/01	-40	80
NM: Santa Fe	11/20/01	80	82
NV: Las Vegas	11/15/01	23	80
NY: Albany	10/04/01	194	82
NY: Syracuse	10/18/01	41	80
OH: Cincinnati	12/10/01	53	81
OH: Columbus	12/31/01	48	76
OH: E. Liverpool	11/01/01	74	83
OH: Painesville	10/03/01	105	80

**Table 10 (continued)**  
**Tritium in Drinking Water**  
**October - December 2001**

Location	Date Collected	<sup>3</sup> H pCi/L ± 2 <i>u</i>	
OH: Toledo	10/04/01	106	87
OR: Portland	10/05/01	-9	73
PA: Columbia	11/02/01	67	82
PA: Harrisburg	11/01/01	111	85
PA: Philadelphia/Baxter	10/18/01	960	110
PA: Philadelphia/Queen	10/18/01	32	84
PA: Pittsburgh	11/01/01	92	83
RI: Providence	10/01/01	18	75
SC: Barnwell	10/22/01	-48	75
SC: Columbia	10/03/01	111	79
SC: Jenkinsville	10/24/01	17	79
SC: Seneca	10/16/01	13	82
TN: Chattanooga	10/03/01	173	82
TN: Knoxville	10/01/01	153	81
TN: Oak Ridge - Anderson Co. #768	10/17/01	-13	77
TN: Oak Ridge - Roane Co. #4442	10/18/01	96	82
TN: Oak Ridge - Knox Co. #371	10/26/01	2	77
TN: Oak Ridge - Roane Co. #360	10/26/01	29	79
TN: Oak Ridge - Anderson Co. #772	10/30/01	-31	75
TX: Austin	10/15/01	-9	77
VA: Ashland	10/03/01	670	100
VA: Lynchburg	10/03/01	9	74
WA: Seattle	11/19/01	12	80

**Table 11**  
**Plutonium and Uranium Analyses**  
**Selected Drinking Water Composite Samples**  
**January - December 2001**

Location	<sup>238</sup> Pu		<sup>239-240</sup> Pu		<sup>234</sup> U		<sup>235</sup> U		<sup>238</sup> U	
	pCi/L ± 2u		pCi/L ± 2u		pCi/L ± 2u		pCi/L ± 2u		pCi/L ± 2u	
CA: Los Angeles	0.004	0.027	0.007	0.017	1.80	0.18	0.067	0.033	1.14	0.14
GA: Baxley	-0.003	0.042	0.011	0.021	0.037	0.035	0.002	0.019	0.032	0.029
IL: Morris	0.020	0.030	-0.0010	0.0068	0.547	0.087	0.025	0.021	0.057	0.027
IL: W. Chicago	0.013	0.031	0.0011	0.0097	0.408	0.077	0.025	0.022	0.070	0.031
MN: Red Wing	0.018	0.045	-0.002	0.014	0.297	0.071	-0.002	0.015	0.066	0.034
NE: Lincoln	-0.014	0.015	-0.004	0.011	4.10	0.35	0.180	0.056	2.98	0.27
NM: Santa Fe	0.009	0.030	0.0011	0.0097	9.92	0.71	0.499	0.095	6.12	0.47
NV: Las Vegas	-0.013	0.024	0.002	0.011	2.41	0.22	0.097	0.038	1.39	0.15
SC: Jenkinsville	0.007	0.041	0.005	0.021	3.69	0.35	0.162	0.059	1.99	0.22

Note: NA = No Analysis



**Table 12**  
**Iodine-131 in Drinking Water**  
**January - December 2001**

Location	Date Collected	<sup>131</sup> I pCi/L ± 2 <i>u</i>	
AK: Fairbanks	10/17/01	0.00	0.31
AL: Dothan	01/17/01	-0.04	0.18
AL: Montgomery	04/02/01	-0.06	0.22
AL: Montgomery	07/02/01	0.01	0.11
AL: Muscle Shoals	01/11/01	-0.07	0.19
AL: Scottsboro	01/12/01	0.03	0.16
AR: Little Rock	04/10/01	-0.01	0.14
CA: Berkeley	07/10/01	0.12	0.25
CA: Los Angeles	04/10/01	-0.04	0.15
CT: Hartford	04/05/01	0.19	0.22
DE: Dover	07/10/01	-0.07	0.26
FL: Miami	10/17/01	-0.10	0.29
FL: Tampa	05/08/01	-0.03	0.14
GA: Baxley	10/10/01	0.27	0.51
GA: Savannah	11/15/01	0.01	0.24
HI: Honolulu	10/23/01	0.03	0.33
IA: Cedar Rapids	10/09/01	0.04	0.18
ID: Boise	10/10/01	-0.07	0.56
ID: Idaho Falls	07/27/01	0.04	0.11
IL: Morris	10/03/01	-0.04	0.22
IL: W. Chicago	02/09/01	0.27	0.45
KS: Topeka	10/02/01	0.10	0.20
LA: New Orleans	06/29/01	-0.01	0.16
MA: Lawrence	04/04/01	-0.05	0.26
MD: Baltimore	01/10/01	0.09	0.19
MD: Conowingo	02/08/01	-0.24	0.58
ME: Augusta	04/04/01	0.09	0.21
MI: Detroit	01/17/01	-0.02	0.28
MI: Grand Rapids	04/13/01	0.05	0.20
MN: Minneapolis	01/29/01	0.00	0.19
MN: Red Wing	10/15/01	0.14	0.88
MO: Jefferson City	04/06/01	0.17	0.24
MS: Jackson	01/10/01	0.00	0.20
MS: Port Gibson	07/10/01	0.00	0.25
MT: Helena	08/07/01	-0.02	0.17
NC: Charlotte	01/17/01	-0.13	0.17
NC: Wilmington	10/22/01	0.07	0.19
ND: Bismarck	01/10/01	0.02	0.16
NE: Lincoln	01/10/01	-0.12	0.18
NH: Manchester	04/11/01	-0.05	0.31
NJ: Trenton	01/17/01	0.24	0.18

**Table 12 (continued)**

**Iodine-131 in Drinking Water  
January - December 2001**

Location	Date Collected	<sup>131</sup> I pCi/L ± 2 <i>u</i>	
NJ: Waretown	01/17/01	-0.08	0.16
NM: Santa Fe	11/20/01	-0.02	0.29
NV: Las Vegas	07/09/01	0.05	0.15
NY: Albany	01/11/01	0.08	0.15
NY: Niagara Falls	04/19/01	0.12	0.15
NY: Niagara Falls	09/29/01	0.09	0.12
NY: Syracuse	07/19/01	0.07	0.17
OH: Cincinnati	12/10/01	0.13	0.18
OH: E. Liverpool	03/02/01	0.64	0.14
OH: Painesville	01/08/01	0.08	0.11
OH: Toledo	04/05/01	0.10	0.21
OK: Oklahoma City	01/10/01	0.02	0.17
OR: Portland	04/05/01	-0.05	0.24
PA: Columbia	02/08/01	0.46	0.52
PA: Harrisburg	02/08/01	0.12	0.47
PA: Philadelphia/Baxter	10/18/01	0.57	0.19
PA: Philadelphia/Queen	10/18/01	2.00	0.30
PA: Pittsburgh	03/02/01	0.23	0.15
RI: Providence	04/09/01	0.32	0.24
SC: Barnwell	07/09/01	-0.02	0.15
SC: Columbia	04/05/01	-0.10	0.26
SC: Jenkinsville	01/18/01	0.10	0.15
SC: Seneca	07/25/01	0.04	0.15
TN: Chattanooga	04/03/01	0.02	0.14
TN: Chattanooga	10/03/01	0.11	0.18
TN: Knoxville	04/09/01	0.02	0.16
TN: Oak Ridge - Anderson Co. #772	02/22/01	0.01	0.16
TN: Oak Ridge - Knox Co. #371	02/22/01	0.08	0.17
TN: Oak Ridge - Anderson Co. #768	03/08/01	0.01	0.14
TN: Oak Ridge - Roane Co. #4442	10/18/01	-0.10	0.18
TN: Oak Ridge - Roane Co. #360	10/26/01	0.09	0.30
TX: Austin	10/15/01	0.12	0.37
VA: Ashland	07/12/01	-0.06	0.22
VA: Lynchburg	10/03/01	-0.02	0.18
WA: Richland	07/16/01	-0.08	0.16
WA: Seattle	11/19/01	-0.11	0.28

**Table 13**  
**Drinking Water**  
**Alpha, Beta, and Sr-90 Concentrations**  
**January - December 2001 Composites**

Location	Total Solids	Gross Beta		Gross Alpha		<sup>90</sup> Sr	
	(mg/L)	pCi/L ± 2u		pCi/L ± 2u		pCi/L ± 2u	
AK: Fairbanks	68.8	4.45	0.86	0.0	1.4	-0.07	0.23
AL: Dothan	93.0	2.0	1.2	-2.4	2.5		
AL: Montgomery	36.3	1.92	0.79	-0.3	1.1		
AL: Muscle Shoals	40.8	2.89	0.99	-0.7	1.5		
AL: Scottsboro	52.3	1.03	0.81	0.1	1.4		
AR: Little Rock	16.8	1.24	0.66	0.18	0.68		
CA: Berkeley	23.7	0.61	0.54	0.12	0.73	0.05	0.26
CA: Los Angeles	35.3	5.2	2.9	7.3	5.5	-0.18	0.24
CO: Denver	64.2	2.69	0.76	1.5	1.6	0.29	0.58
CO: Platteville	5.3	-0.7	2.1	-0.3	2.5	-0.20	0.45
CT: Hartford	21.5	0.43	0.70	-0.13	0.73	0.16	0.26
DE: Dover	54.8	3.1	1.4	0.6	2.2		
FL: Miami	56.4	2.6	1.1	0.3	2.1		
FL: Tampa	143.4	3.8	1.7	0.7	4.7		
GA: Baxley	81.3	3.64	0.98	3.8	2.4		
GA: Savannah	68.2	2.31	0.92	0.4	1.7		
HI: Honolulu	78.9	2.65	0.90	0.1	1.9	-0.04	0.21
IA: Cedar Rapids	70.3	2.47	0.86	0.1	1.4		
ID: Boise	30.7	0.70	0.54	0.29	0.85	0.24	0.40
ID: Idaho Falls	63.7	4.2	1.2	0.4	2.2	-0.14	0.20
IL: Morris	84.8	14.1	3.4	10.6	7.4		
IL: W. Chicago	114.6	11.4	2.4	11.4	6.1		
KS: Topeka	108.1	7.6	2.1	-0.4	4.3		
LA: New Orleans	86.3	4.0	1.2	0.9	2.2		
MA: Lawrence	86.2	2.83	0.94	0.5	1.8	0.26	0.23
MD: Baltimore	58.4	2.41	0.90	0.1	1.3		
MD: Conowingo	73.3	1.4	1.1	-0.2	1.9		
ME: Augusta	45.3	1.16	0.81	-0.5	1.2	0.17	0.27
MI: Detroit	44.7	2.16	0.82	-0.1	1.2		
MI: Grand Rapids	64.1	1.91	0.82	-0.1	1.4		
MN: Minneapolis	42.0	3.47	0.84	0.4	1.1		
MN: Red Wing	74.6	15.6	2.2	31.6	5.8		
MO: Jefferson City	91.0	7.4	1.7	-0.8	3.0	-0.06	0.26
MS: Jackson	48.5	2.74	0.86	-0.5	1.3		
MS: Port Gibson	88.7	4.2	1.9	0.0	4.5		
MT: Helena	58.7	3.36	0.78	0.3	1.3	0.20	0.22
NC: Charlotte	28.1	1.73	0.73	-0.63	0.89		

**Table 13 (continued)**  
**Drinking Water**  
**Alpha, Beta, and Sr-90 Concentrations**  
**January - December 2001 Composites**

Location	Total Solids	Gross Beta		Gross Alpha		<sup>90</sup> Sr	
	(mg/L)	pCi/L ± 2u		pCi/L ± 2u		pCi/L ± 2u	
NC: Wilmington	78.1	4.3	1.0	-0.1	1.7		
ND: Bismarck	90.2	3.6	1.2	0.3	2.7	0.15	0.24
NE: Lincoln	85.2	15.1	2.3	9.3	4.6	0.29	0.22
NH: Manchester	47.3	0.25	0.76	-0.2	1.1	0.38	0.26
NJ: Trenton	61.6	0.76	0.82	-0.7	1.5		
NJ: Waretown	51.7	1.89	0.81	0.8	1.4		
NM: Santa Fe	102.0	11.4	2.0	12.5	5.1		
NV: Las Vegas	76.6	5.3	2.3	2.3	5.1	0.09	0.25
NY: Albany	54.4	0.40	0.78	0.0	1.2		
NY: Niagara Falls	52.6	1.81	0.86	0.0	1.5		
NY: Syracuse	49.7	1.17	0.80	0.0	1.2		
OH: Cincinnati	83.8	3.9	1.1	0.6	2.1		
OH: E. Liverpool	90.1	3.8	1.2	0.6	2.2		
OH: Painesville	52.6	2.1	1.0	0.1	1.7		
OH: Toledo	55.4	2.57	0.85	0.5	1.4		
OK: Oklahoma City	61.8	3.44	0.91	-0.1	1.4		
OR: Portland	11.5	0.63	0.51	0.03	0.58		
PA: Columbia	90.3	2.44	0.98	-1.5	1.8		
PA: Harrisburg	18.1	0.62	0.82	0.38	0.94		
PA: Philadelphia/Baxter	50.5	1.8	1.3	-0.2	2.0		
PA: Philadelphia/Queen	90.2	3.9	1.6	0.2	2.8		
PA: Pittsburgh	73.8	2.3	1.1	-0.5	1.9		
RI: Providence	47.4	1.46	0.82	0.3	1.2	0.32	0.26
SC: Barnwell	25.9	0.68	0.70	0.47	0.98		
SC: Columbia	45.4	2.76	0.89	-1.2	1.3		
SC: Jenkinsville	56.9	3.7	1.1	7.0	2.8		
SC: Seneca	17.2	0.13	0.68	-0.18	0.71		
TN: Chattanooga	45.3	2.28	0.80	-0.7	1.2		
TN: Knoxville	54.6	1.28	0.79	-0.2	1.4		
TN: Oak Ridge - Anderson Co. #768	62.4	1.95	0.68	0.8	1.4	-0.02	0.28
TN: Oak Ridge - Anderson Co. #772	60.1	1.82	0.69	0.3	1.3	0.15	0.27
TN: Oak Ridge - Roane Co. #4442	54.0	2.66	0.72	0.4	1.2	0.60	0.33
TN: Oak Ridge - Roane Co. #360	49.1	2.22	0.68	0.0	1.1	0.26	0.31
TN: Oak Ridge - Knox Co. #371	59.2	1.60	0.65	0.0	1.2	0.02	0.25
TX: Austin	69.2	4.1	1.1	0.5	1.8		
VA: Ashland	51.2	2.1	1.1	-0.5	1.6		
VA: Lynchburg	29.2	0.00	0.71	0.57	0.89		

**Table 13 (continued)**  
**Drinking Water**  
**Alpha, Beta, and Sr-90 Concentrations**  
**January - December 2001 Composites**

Location	Total Solids (mg/L)	Gross Beta pCi/L $\pm 2u$		Gross Alpha pCi/L $\pm 2u$		<sup>90</sup> Sr pCi/L $\pm 2u$	
WA: Richland	29.0	1.34	0.60	0.21	0.82	-0.01	0.20
WA: Seattle	1.6	-0.03	0.43	0.04	0.50	-0.15	0.30

**Table 14**  
**Drinking Water**  
**Radium and Gamma-Emitting Radionuclides**  
**January - December 2001 Composites**

Location	<sup>226</sup> Ra		<sup>228</sup> Ra		Gamma-Emitting Radionuclides	
	pCi/L ± 2u		pCi/L ± 2u		Nuclide	pCi/L ± 2u
AK: Fairbanks	NA		NA			ND
AL: Dothan	NA		NA		Pb212	5.2 7.1
AL: Montgomery	NA		NA		Tl208	2.3 2.6
AL: Muscle Shoals	NA		NA			ND
AL: Scottsboro	NA		NA			ND
AR: Little Rock	NA		NA		Pb212	5.2 6.5
CA: Berkeley	NA		NA			ND
CA: Los Angeles	0.147	0.024	NA			ND
CO: Denver	NA		NA			ND
CO: Platteville	NA		NA			ND
CT: Hartford	NA		NA			ND
DE: Dover	NA		NA			ND
FL: Miami	NA		NA		Pb212	5.7 7.2
FL: Tampa	NA		NA			ND
GA: Baxley	1.69	0.19	NA			ND
GA: Savannah	NA		NA			ND
HI: Honolulu	NA		NA			ND
IA: Cedar Rapids	NA		NA			ND
ID: Boise	NA		NA			ND
ID: Idaho Falls	NA		NA			ND
IL: Morris	2.61	0.29	2.67	0.78	K40	28 39
IL: W. Chicago	1.99	0.22	1.11	0.65		ND
KS: Topeka	NA		NA			ND
LA: New Orleans	NA		NA			ND
MA: Lawrence	NA		NA			ND
MD: Baltimore	NA		NA		Bi212	39 40
MD: Conowingo	NA		NA			ND
ME: Augusta	NA		NA		Tl208	2.8 4.4
MI: Detroit	NA		NA		K40	8 13
MI: Grand Rapids	NA		NA			ND
MN: Minneapolis	NA		NA			ND
MN: Red Wing	3.72	0.42	4.12	0.86	K40	18 14
MO: Jefferson City	NA		NA		Pb212	5.2 6.9
MS: Jackson	NA		NA			ND
MS: Port Gibson	NA		NA		K40	19 34
MT: Helena	NA		NA			ND

Note: ND = Not Detected  
NA = No Analysis

**Table 14 (continued)**

**Drinking Water  
Radium and Gamma-Emitting Radionuclides  
January - December 2001 Composites**

Location	<sup>226</sup> Ra		<sup>228</sup> Ra		Gamma-Emitting Radionuclides	
	pCi/L ± 2u		pCi/L ± 2u		Nuclide	pCi/L ± 2u
NC: Charlotte						
NC: Wilmington	NA		NA		K40	26 37
ND: Bismarck	NA		NA			ND
NE: Lincoln	NA		NA			ND
NH: Manchester	0.181	0.028	NA			ND
NJ: Trenton	NA		NA		Pb212	5.0 6.0
NJ: Waretown	NA		NA		K40	35 35
NM: Santa Fe	NA		NA			ND
NV: Las Vegas	0.163	0.027	NA			ND
NY: Albany	0.201	0.031	NA		K40	56 64
NY: Niagara Falls	NA		NA			ND
NY: Syracuse	NA		NA			ND
OH: Cincinnati	NA		NA		Pb212	4.1 6.6
OH: E. Liverpool	NA		NA			ND
OH: Painesville	NA		NA			ND
OH: Toledo	NA		NA			ND
OK: Oklahoma City	NA		NA			ND
OR: Portland	NA		NA		Pb212	4.0 6.2
PA: Columbia	NA		NA			ND
PA: Harrisburg	NA		NA			ND
PA: Philadelphia/Baxter	NA		NA			ND
PA: Philadelphia/Queen	NA		NA		Pb212	3.4 5.4
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	0.779	0.094	NA			ND
TN: Chattanooga	NA		NA		Pb212	4.3 6.7
TN: Knoxville	NA		NA			ND
TN: Oak Ridge - Anderson Co. #768	NA		NA			ND
TN: Oak Ridge - Anderson Co. #772	NA		NA		Tl208	3.0 4.8
TN: Oak Ridge - Roane Co. #4442	NA		NA			ND
TN: Oak Ridge - Roane Co. #360	NA		NA		K40	16 28
TN: Oak Ridge - Knox Co. #371	NA		NA		K40	22 36
TX: Austin						

Note: ND = Not Detected  
NA = No Analysis

**Table 14 (continued)**  
**Drinking Water**  
**Radium and Gamma-Emitting Radionuclides**  
**January - December 2001 Composites**

Location	$^{226}\text{Ra}$	$^{228}\text{Ra}$	Gamma-Emitting Radionuclides	
	pCi/L $\pm 2u$	pCi/L $\pm 2u$	Nuclide	pCi/L $\pm 2u$
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



### **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 2001**

Location	Date Collected	K g/L $\pm 2u$		<sup>137</sup> Cs pCi/L $\pm 2u$	<sup>140</sup> Ba pCi/L $\pm 2u$	<sup>131</sup> I pCi/L $\pm 2u$
AL: Montgomery	10/10/01	1.62	0.13	ND	ND	ND
AR: Little Rock	10/15/01	1.48	0.12	ND	ND	ND
AZ: Phoenix	12/19/01	1.44	0.12	ND	ND	ND
CA: Los Angeles	10/11/01	1.60	0.12	ND	ND	ND
CA: Sacramento	10/23/01	1.55	0.12	ND	ND	ND
CA: San Francisco	10/10/01	1.53	0.12	ND	ND	ND
DE: Wilmington	10/09/01	1.69	0.13	ND	ND	ND
FL: Tampa	10/09/01	1.54	0.13	ND	ND	ND
HI: Honolulu	10/15/01	1.62	0.12	ND	ND	ND
IA: Des Moines	10/15/01	1.55	0.13	ND	ND	ND
IL: Chicago	10/22/01	1.56	0.12	ND	ND	ND
IN: Indianapolis	10/12/01	1.54	0.12	ND	ND	ND
KS: Wichita	10/22/01	1.58	0.12	ND	ND	ND
KY: Louisville	10/31/01	1.64	0.12	ND	ND	ND
MA: Boston	12/28/01	1.58	0.13	ND	ND	ND
MD: Baltimore	10/05/01	1.58	0.13	ND	ND	ND
MI: Detroit	10/08/01	1.63	0.13	ND	ND	ND
MI: Grand Rapids	10/08/01	1.50	0.16	ND	ND	ND
MO: Jefferson City	10/09/01	1.43	0.11	ND	ND	ND
MS: Jackson	10/08/01	1.61	0.13	ND	ND	ND
NC: Charlotte	12/26/01	1.57	0.12	ND	ND	ND
NJ: Trenton	10/11/01	1.57	0.12	ND	ND	ND
NM: Albuquerque	10/09/01	1.54	0.12	ND	ND	ND
NV: Las Vegas	10/25/01	1.58	0.12	ND	ND	ND
NY: Buffalo	10/12/01	1.64	0.13	ND	ND	ND
NY: Syracuse	10/09/01	1.53	0.16	ND	ND	ND
OH: Cincinnati	11/05/01	1.57	0.12	ND	ND	ND
OH: Cleveland	10/03/01	1.60	0.13	ND	ND	ND
OR: Portland	10/02/01	1.61	0.13	ND	ND	ND
OR: Portland	11/01/01	1.58	0.12	ND	ND	ND
PA: Philadelphia	10/09/01	1.56	0.13	ND	ND	ND
PA: Pittsburgh	10/11/01	1.57	0.12	ND	ND	ND
TN: Chattanooga	10/08/01	1.57	0.13	ND	ND	ND
TN: Knoxville	10/08/01	1.60	0.12	ND	ND	ND
TN: Memphis	10/15/01	1.47	0.16	ND	ND	ND
TX: Ft. Worth	10/10/01	1.54	0.12	ND	ND	ND
TX: San Antonio	10/22/01	1.43	0.12	ND	ND	ND
VA: Norfolk	12/19/01	1.55	0.12	ND	ND	ND
VT: Montpelier	10/03/01	1.75	0.14	ND	ND	ND

Note: ND = Not Detected

**Table 15 (continued)**  
**Radionuclides in Pasteurized Milk**  
**October - December 2001**

Location	Date Collected	K g/L $\pm 2u$	$^{137}\text{Cs}$ pCi/L $\pm 2u$	$^{140}\text{Ba}$ pCi/L $\pm 2u$	$^{131}\text{I}$ pCi/L $\pm 2u$
WA: Spokane	10/12/01	1.57    0.13	ND	ND	ND
WA: Tacoma	11/13/01	1.78    0.14	ND	ND	ND
WV: Charleston	10/04/01	1.63    0.13	ND	ND	ND

Note:    ND = Not Detected

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