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ENVIRONMENTAL RADIATION DATA

REPORT 135

July - September 2008

United States Environmental Protection Agency

Office of Radiation and Indoor Air

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Preface

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

The United States Environmental Protection Agency established RadNet in 1973 with an emphasis on identifying trends in the accumulation of long-lived radionuclides in the environment. RadNet is comprised of a nationwide network of sampling stations that provide air particulate, precipitation, drinking water, and milk samples.

Sampling locations are selected to provide population and geographic coverage for the United States. The radiation analyses performed on these samples include gross alpha and gross beta analysis, gamma analyses, and radionuclide-specific analyses for uranium, plutonium, strontium, iodine, radium, and tritium. This monitoring effort also provides ancillary information on natural background levels and on routine and accidental releases into the environment from stationary sources.

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

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Acknowledgments

All sampling for the RadNet monitoring system (formerly ERAMS) is performed by volunteer collectors who are frequently members of health departments or related environmental agencies of their respective states. The National Air and Radiation Environmental Laboratory (NAREL), on behalf of the U.S. Environmental Protection Agency, would like to acknowledge the time and effort of these volunteer collectors, who are so essential to the successful operation of RadNet. The efforts of the sample collectors are especially appreciated during times of emergency operation when sampling frequencies are increased and schedules are sometimes demanding.

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Data Reporting Conventions

Every laboratory measurement involves uncertainty. When there is little or no radioactivity in a sample, one consequence of measurement uncertainty is the possibility of obtaining a measured value that is less than zero. Such a negative result occurs when random effects in the measurement process cause the measured value for the sample to be less than that of the blank or background, which is subtracted from it. From April 1991 to December 1995, negative results were reported as "not detected" or "ND," and gamma analysis results that were less than their estimated measurement uncertainties were also reported as "ND." In January 1996, both of these practices were discontinued. Although negative activities are physically impossible, the inclusion of negative results in the report allows better statistical analysis of the data.

Results of gamma analyses are still reported as "ND" when gamma-emitting radionuclides are not detected.

Measurement Uncertainty

Each measured value $y$is reported with an expanded uncertainty $U = k\,u_c(y)$, which is determined from the combined standard uncertainty $u_c(y)$ and the coverage factor $k = 2$. The interval from $y - U$to $y + U$is estimated to have a level of confidence of approximately 95 %.

Significant Figures

Expanded uncertainties are reported to two significant figures. Measurement results are rounded to the corresponding number of decimal places.

Detection Capability

The minimum detectable concentrations (MDCs) for each radionuclide are shown in Table 1. The MDC is defined as the minimum concentration that gives a 95 % probability of detection when the detection criteria are chosen to give only a 5 % probability of false detection in a sample that is analyte-free.

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Table 1

Reporting Units and Minimum Detectable Concentrations for Radionuclide Analyses

Radionuclide	Media	Reporting Unit	Minimum Detectable Concentration
Gross Alpha	Water	pCi/L	2
Gross Beta	Air	pCi/m³	0.0015
	Water	pCi/L	2
	Precipitation	pCi/L	2
Tritium	Water	pCi/L	150
	Milk	pCi/L	150
* Plutonium-238,239/240	Air	aCi/m³	0.75
	Water	pCi/L	0.1
† Uranium-234,235,238	Air	aCi/m³	0.75
	Water	pCi/L	0.1
Radium-226	Water	pCi/L	0.02
Strontium-90	Milk	pCi/L	2
	Water	pCi/L	1
‡ Iodine-131	Milk (gamma)	pCi/L	4
	Water (gamma)	pCi/L	4
	Water	pCi/L	0.3
Cesium-137	Milk	pCi/L	5
	Water	pCi/L	5
‡ Barium-140	Milk	pCi/L	15
	Water	pCi/L	15
Potassium	Milk	g/L	0.06
	Water	g/L	0.06
Potassium-40	Water	pCi/L	50

* The MDC for air is based on an assumed total sample volume of 120,000 m³. Measurement by alpha spectrometry includes combined activities of ^{239}Pu and ^{240}Pu, since the relative contributions of these two isotopes cannot be determined.

† The MDC for air is based on an assumed total sample volume of 120,000 m^3.

‡ Activity as of the day of counting.

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1. Air Program

Airborne Particulates and Precipitation

Gross beta radioactivity measurements and certain specific analyses are performed on air particulates and precipitation samples as indicator measurements in assessing the general (national) impact of all contributing sources on environmental levels of radiation. Airborne particulates are collected continuously at field stations representing wide geographic coverage throughout the United States.

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

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

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

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

Table 2
Gross Beta in Airborne Particulates
July 2008

Location	Number of Samples	5-hour Field Estimate Max (pCi/m³)	5-hour Field Estimate Min (pCi/m³)	5-hour Field Estimate Avg (pCi/m³)	NAREL Lab Measurement Max (pCi/m³)	NAREL Lab Measurement Min (pCi/m³)	NAREL Lab Measurement Avg (pCi/m³)
AK: Anchorage	2				0.002	0.001	0.002
AL: Ashford	1	0.0	0.0	0.0	0.007	0.007	0.007
AL: Montgomery/408	8	0.1	0.0	0.1	0.017	0.004	0.010
AR: Little Rock	4	0.1	0.0	0.0	0.013	0.008	0.010
AZ: Phoenix	5	0.5	0.2	0.4	0.014	0.009	0.012
AZ: Phoenix/956	7	0.4	0.1	0.2	0.015	0.010	0.013
CA: Anaheim	9	0.0	0.0	0.0	0.014	0.004	0.009
CA: Fresno	6	0.5	0.1	0.3	0.018	0.006	0.012
CA: Los Angeles	8	0.1	0.0	0.1	0.011	0.006	0.009
CA: Richmond	5	0.0	0.0	0.0	0.005	0.001	0.003
CA: Riverside	8	0.0	0.0	0.0	0.010	0.005	0.007
CA: San Bernardino Cty.	9	0.1	0.0	0.0	0.018	0.008	0.011
CA: San Diego	4	0.0	0.0	0.0	0.011	0.005	0.009
CA: San Francisco	3	0.0	0.0	0.0	0.004	0.001	0.002
CA: San Jose	9	0.3	0.0	0.1	0.008	0.001	0.004
CO: Denver	1	0.3	0.3	0.3	0.007	0.007	0.007
DE: Wilmington	8	1.1	0.2	0.5	0.015	0.007	0.011
FL: Jacksonville	3	0.0	0.0	0.0	0.012	0.005	0.009
FL: Miami	9	0.0	0.0	0.0	0.014	0.004	0.008
FL: Orlando	8	0.1	0.0	0.0	0.010	0.005	0.007
FL: Tampa	8	0.0	0.0	0.0	0.021	0.004	0.009
GA: Atlanta	4	0.1	0.0	0.0	0.014	0.007	0.009
HI: Honolulu	8	0.1	0.0	0.0	0.004	0.002	0.003
IA: Des Moines	8	0.3	0.0	0.1	0.009	0.004	0.007
IA: Iowa City	9	1.2	0.1	0.6	0.011	0.007	0.009
ID: Idaho Falls	9	1.0	0.2	0.6	0.016	0.007	0.011
IL: Chicago	9	0.3	0.0	0.1	0.014	0.006	0.009
KS: Kansas City	8	0.4	0.1	0.2	0.016	0.006	0.010
KS: Topeka	8	0.5	0.2	0.4	0.013	0.006	0.009
KS: Wichita	9	0.8	0.2	0.4	0.015	0.006	0.010
KY: Lexington	7	0.3	-0.0	0.1	0.010	0.004	0.007
LA: Baton Rouge	8	0.4	0.1	0.2	0.018	0.006	0.010
MA: Boston	3	0.1	0.0	0.0	0.007	0.003	0.005
MD: Baltimore	5	0.2	0.1	0.1	0.017	0.010	0.013
MI: Detroit	9	0.2	0.1	0.1	0.015	0.006	0.008
MI: Lansing	9	0.2	0.1	0.1	0.012	0.006	0.008
MN: St. Paul	5	0.1	0.0	0.1	0.006	0.004	0.005
MN: Welch/510	4	0.1	0.0	0.1	0.011	0.006	0.009

Table 2 (continued)
Gross Beta in Airborne Particulates
July 2008

Location	Number of Samples	5-hour Field Estimate Max (pCi/m³)	5-hour Field Estimate Min (pCi/m³)	5-hour Field Estimate Avg (pCi/m³)	NAREL Lab Measurement Max (pCi/m³)	NAREL Lab Measurement Min (pCi/m³)	NAREL Lab Measurement Avg (pCi/m³)
MO: St. Louis	3	0.0	-0.0	-0.0	0.034	0.007	0.021
MS: Jackson	7	0.2	0.0	0.1	0.026	0.006	0.013
NC: Wilmington	5				0.011	0.006	0.008
ND: Bismarck	5	1.0	0.1	0.6	0.012	0.007	0.010
NE: Lincoln	9	0.8	0.2	0.5	0.011	0.004	0.009
NE: Omaha	7	0.4	0.0	0.2	0.011	0.007	0.008
NH: Concord	2	0.0	0.0	0.0	0.068	0.012	0.040
NJ: Edison	7	0.0	-0.0	0.0	0.008	0.005	0.007
NJ: Trenton	9	0.3	0.1	0.2	0.012	0.004	0.009
NV: Las Vegas/913	3				0.041	0.006	0.019
NY: Albany	5	0.0	0.0	0.0	0.010	0.005	0.008
NY: Hauppauge	8	0.2	0.0	0.1	0.008	0.001	0.006
NY: Lockport	8	0.0	0.0	0.0	0.014	0.005	0.007
NY: Yaphank	7	0.1	0.0	0.0	0.009	0.001	0.006
OH: Cincinnati	9	0.5	0.0	0.2	0.012	0.002	0.007
OH: Cleveland	8	0.1	0.0	0.0	0.025	0.009	0.014
OH: Columbus	3	0.0	0.0	0.0	0.010	0.007	0.008
OH: Painesville	8	0.2	0.0	0.1	0.018	0.005	0.010
OH: Ross	9				0.038	0.006	0.018
OK: Oklahoma City	6	0.0	0.0	0.0	0.009	0.002	0.005
OR: Portland	6	0.1	0.0	0.1	0.007	0.004	0.006
PA: Harrisburg	9	0.6	0.1	0.3	0.020	0.008	0.013
PA: Lancaster	1	0.0	0.0	0.0	0.019	0.019	0.019
PA: Pittsburgh	6	0.2	0.1	0.1	0.027	0.008	0.013
PR: San Juan	4	0.0	0.0	0.0	0.006	0.003	0.005
RI: Providence	5	0.1	0.0	0.1	0.009	0.002	0.007
SC: Barnwell	1	0.0	0.0	0.0	0.006	0.006	0.006
SC: Columbia	3	0.1	0.0	0.0	0.008	0.003	0.007
SD: Pierre	8	2.0	0.3	1.0	0.018	0.011	0.013
TN: Knoxville	8	0.6	0.2	0.4	0.016	0.004	0.008
TN: Oak Ridge/Bethel	10	1.0	0.0	0.5	0.653	0.010	0.122
TN: Oak Ridge/K25	10	1.3	0.0	0.6	0.703	0.009	0.137
TN: Oak Ridge/Melton	8	1.1	0.4	0.7	0.674	0.011	0.156
TN: Oak Ridge/Y12 E	10	0.9	0.0	0.5	0.477	0.010	0.108
TN: Oak Ridge/Y12 W	10	0.5	0.0	0.3	0.289	0.010	0.066
TX: Austin	8	0.5	0.1	0.3	0.015	0.005	0.011
TX: Dallas	9	0.6	0.1	0.4	0.014	0.004	0.008
TX: El Paso	8	0.2	0.0	0.1	0.011	0.004	0.007

Table 2 (continued)
Gross Beta in Airborne Particulates
July 2008

Location	Number of Samples	5-hour Field Estimate (pCi/m³) Max	Min	Avg	NAREL Lab Measurement (pCi/m³) Max	Min	Avg
TX: Ft. Worth	9	0.3	0.1	0.2	0.011	0.004	0.006
TX: Houston	7	0.1	0.0	0.0	0.015	0.005	0.010
VA: Lynchburg	7	0.7	0.3	0.5	0.013	0.005	0.011
VA: Richmond	9	0.1	0.0	0.0	0.013	0.004	0.007
VA: Virginia Beach	9	0.1	0.0	0.1	0.013	0.005	0.008
WA: Olympia	9	0.1	0.0	0.0	0.003	0.001	0.002
WA: Seattle	8	0.0	0.0	0.0	0.008	0.001	0.003
WA: Spokane	8	0.4	0.1	0.2	0.009	0.005	0.007
WI: Milwaukee	7	0.2	0.0	0.1	0.016	0.010	0.013
WV: Charleston	7	0.0	0.0	0.0	0.013	0.007	0.010

Table 3
Gross Beta in Airborne Particulates
August 2008

Location	Number of Samples	5-hour Field Estimate (pCi/m³) Max	Min	Avg	NAREL Lab Measurement (pCi/m³) Max	Min	Avg
AL: Montgomery/408	8	0.1	0.0	0.0	0.014	0.005	0.008
AR: Little Rock	6	0.1	0.0	0.1	0.019	0.005	0.012
AZ: Phoenix	4	0.5	0.2	0.3	0.012	0.011	0.011
AZ: Phoenix/956	8	0.6	0.0	0.2	0.019	0.009	0.014
CA: Anaheim	9	0.0	0.0	0.0	0.010	0.006	0.008
CA: Fresno	5	0.2	0.0	0.1	0.013	0.004	0.008
CA: Los Angeles	9	0.1	0.0	0.1	0.012	0.005	0.008
CA: Richmond	3	0.0	0.0	0.0	0.002	0.001	0.002
CA: Riverside	9	0.0	0.0	0.0	0.010	0.004	0.006
CA: San Bernardino Cty.	9	0.0	0.0	0.0	0.026	0.007	0.012
CA: San Diego	4	0.4	0.0	0.1	0.010	0.007	0.008
CA: San Francisco	4	0.0	0.0	0.0	0.001	0.001	0.001
CA: San Jose	7	0.1	0.0	0.0	0.004	0.001	0.002
CO: Denver	2	0.3	0.2	0.2	0.006	0.006	0.006
DE: Wilmington	8	1.3	0.2	0.7	0.012	0.006	0.009
FL: Jacksonville	5	0.0	0.0	0.0	0.009	0.004	0.006
FL: Miami	9	0.1	0.0	0.0	0.012	0.003	0.008
FL: Orlando	9	0.0	0.0	0.0	0.049	0.003	0.012
FL: Tampa	6	0.0	0.0	0.0	0.010	0.003	0.007
GA: Atlanta	5	0.1	0.0	0.0	0.011	0.005	0.009
HI: Honolulu	9	0.0	0.0	0.0	0.002	0.001	0.002
IA: Des Moines	7	0.5	0.1	0.3	0.017	0.005	0.009
IA: Iowa City	8	2.6	0.4	1.1	0.020	0.006	0.011
ID: Idaho Falls	7	1.0	0.1	0.3	0.013	0.005	0.008
IL: Chicago	8	0.2	0.0	0.1	0.013	0.005	0.008
KS: Kansas City	9	0.6	0.1	0.3	0.020	0.007	0.013
KS: Topeka	8	0.6	0.1	0.4	0.016	0.007	0.013
KS: Wichita	8	0.6	0.1	0.3	0.013	0.007	0.010
KY: Lexington	7	0.1	0.0	0.0	0.014	0.005	0.008
LA: Baton Rouge	9	0.2	0.1	0.1	0.011	0.005	0.008
MA: Boston	8	0.1	0.0	0.0	0.005	0.001	0.003
MD: Baltimore	5	0.2	0.1	0.2	0.015	0.008	0.012
MI: Detroit	7	0.2	0.0	0.1	0.008	0.004	0.006
MI: Grand Rapids	1	0.1	0.1	0.1	0.012	0.012	0.012
MI: Lansing	8	0.3	0.1	0.2	0.009	0.004	0.007
MN: Duluth	3	0.9	0.1	0.4	0.009	0.005	0.007
MN: St. Paul	4	0.1	0.1	0.1	0.006	0.004	0.005
MN: Welch/510	8	0.5	0.0	0.2	0.015	0.005	0.009

Table 3 (continued)
Gross Beta in Airborne Particulates
August 2008

Location	Number of Samples	5-hour Field Estimate Max (pCi/m³)	5-hour Field Estimate Min (pCi/m³)	5-hour Field Estimate Avg (pCi/m³)	NAREL Lab Measurement Max (pCi/m³)	NAREL Lab Measurement Min (pCi/m³)	NAREL Lab Measurement Avg (pCi/m³)
MS: Jackson	8	0.1	0.0	0.1	0.020	0.007	0.011
MS: Jackson/Deq	1	0.0	0.0	0.0	0.017	0.017	0.017
NC: Wilmington	4				0.012	0.007	0.009
ND: Bismarck	5	1.3	0.3	0.7	0.015	0.010	0.012
NE: Lincoln	8	1.0	0.2	0.6	0.013	0.007	0.011
NE: Omaha	7	0.9	0.2	0.5	0.013	0.006	0.010
NJ: Edison	8	0.1	0.0	0.0	0.008	0.003	0.005
NJ: Trenton	8	0.5	0.1	0.3	0.011	0.006	0.008
NY: Albany	4	0.3	0.0	0.1	0.008	0.005	0.006
NY: Hauppauge	9	0.1	0.0	0.1	0.011	0.003	0.006
NY: Lockport	9	0.1	0.0	0.0	0.007	0.002	0.005
NY: Yaphank	8	0.1	0.0	0.1	0.009	0.002	0.004
OH: Cincinnati	7	0.5	0.0	0.1	0.015	0.003	0.007
OH: Cleveland	9	0.4	0.0	0.1	0.019	0.006	0.012
OH: Columbus	5	0.0	0.0	0.0	0.036	0.004	0.012
OH: Painesville	8	0.2	0.1	0.1	0.013	0.004	0.009
OH: Ross	9				0.061	0.008	0.017
OK: Oklahoma City	5	0.0	0.0	0.0	0.007	0.005	0.006
OK: Tulsa	8	0.0	0.0	0.0	0.012	0.009	0.010
OR: Corvallis	1	0.8	0.8	0.8	0.004	0.004	0.004
OR: Portland	7	0.1	0.0	0.0	0.007	0.002	0.005
PA: Harrisburg	8	0.3	0.1	0.2	0.012	0.004	0.009
PA: Pittsburgh	7	0.3	0.0	0.2	0.012	0.005	0.008
PR: San Juan	9	0.0	0.0	0.0	0.010	0.002	0.005
RI: Providence	4	0.1	0.0	0.0	0.006	0.003	0.005
SC: Barnwell	1	0.0	0.0	0.0	0.009	0.009	0.009
SC: Columbia	1	0.0	0.0	0.0	0.010	0.010	0.010
SD: Pierre	8	1.8	0.6	1.3	0.021	0.007	0.014
TN: Knoxville	9	0.6	0.1	0.3	0.016	0.004	0.010
TN: Nashville	2	0.1	0.0	0.1	0.008	0.007	0.007
TN: Oak Ridge/Bethel	8	1.5	0.2	0.8	0.229	0.006	0.076
TN: Oak Ridge/K25	8	1.7	0.2	0.8	0.188	0.004	0.071
TN: Oak Ridge/Melton	8	1.7	0.2	0.9	0.210	0.005	0.081
TN: Oak Ridge/Y12 E	8	1.9	0.2	0.8	0.302	0.006	0.081
TN: Oak Ridge/Y12 W	8	0.8	0.1	0.3	0.096	0.006	0.036
TX: Austin	9	0.7	0.2	0.5	0.012	0.005	0.009
TX: Dallas	7	0.8	0.0	0.4	0.010	0.005	0.008
TX: El Paso	8	0.4	0.0	0.2	0.013	0.009	0.011

Table 3 (continued)
Gross Beta in Airborne Particulates
August 2008

Location	Number of Samples	5-hour Field Estimate (pCi/m³) Max	Min	Avg	NAREL Lab Measurement (pCi/m³) Max	Min	Avg
TX: Ft. Worth	9	0.3	0.0	0.1	0.008	0.003	0.006
TX: Houston	8	0.4	0.0	0.1	0.012	0.006	0.009
VA: Lynchburg	8	1.3	0.1	0.7	0.015	0.008	0.011
VA: Richmond	4	0.0	0.0	0.0	0.011	0.004	0.008
VA: Virginia Beach	8	0.1	0.0	0.1	0.011	0.005	0.008
WA: Olympia	8	0.1	0.0	0.0	0.005	0.001	0.003
WA: Seattle	9	0.0	0.0	0.0	0.004	0.001	0.003
WA: Spokane	9	0.3	0.1	0.2	0.008	0.003	0.005
WI: Milwaukee	7	0.1	0.0	0.0	0.028	0.007	0.014
WV: Charleston	4	0.0	0.0	0.0	0.014	0.007	0.011

Table 4
Gross Beta in Airborne Particulates
September 2008

Location	Number of Samples	5-hour Field Estimate Max (pCi/m³)	5-hour Field Estimate Min (pCi/m³)	5-hour Field Estimate Avg (pCi/m³)	NAREL Lab Measurement Max (pCi/m³)	NAREL Lab Measurement Min (pCi/m³)	NAREL Lab Measurement Avg (pCi/m³)
AK: Anchorage	1	0.3	0.3	0.3	0.011	0.011	0.011
AL: Montgomery/408	9	0.1	0.0	0.1	0.016	0.004	0.011
AR: Little Rock	8	0.1	0.0	0.0	0.019	0.005	0.011
AZ: Phoenix	4	0.4	0.0	0.2	0.014	0.007	0.011
AZ: Phoenix/956	9	0.9	0.0	0.4	0.021	0.006	0.015
CA: Anaheim	9	0.0	0.0	0.0	0.023	0.009	0.014
CA: Fresno	3	0.2	-0.0	0.1	0.013	0.010	0.011
CA: Los Angeles	8	0.2	0.1	0.2	0.018	0.009	0.013
CA: Richmond	5	0.1	0.0	0.1	0.008	0.005	0.007
CA: Riverside	9	0.1	0.0	0.0	0.012	0.006	0.009
CA: San Bernardino Cty.	7	0.0	0.0	0.0	0.019	0.010	0.013
CA: San Diego	4	0.1	0.0	0.1	0.013	0.010	0.012
CA: San Francisco	4	0.0	0.0	0.0	0.005	0.002	0.004
CA: San Jose	9	0.2	-0.0	0.1	0.010	0.004	0.006
CO: Denver	8	0.7	0.2	0.4	0.010	0.005	0.008
DC: Washington	2	0.0	0.0	0.0	0.007	0.005	0.006
DE: Wilmington	8	1.3	0.2	0.5	0.012	0.006	0.009
FL: Jacksonville	8	0.0	0.0	0.0	0.015	0.003	0.006
FL: Orlando	9	0.0	0.0	0.0	0.013	0.004	0.008
FL: Tampa	9	0.0	0.0	0.0	0.010	0.004	0.008
GA: Atlanta	5	0.1	0.0	0.0	0.011	0.006	0.008
GA: Augusta	5	0.3	0.2	0.3	0.013	0.007	0.010
HI: Honolulu	9	0.1	0.0	0.0	0.003	0.001	0.002
IA: Des Moines	8	0.4	0.0	0.2	0.015	0.004	0.009
IA: Iowa City	9	1.6	0.3	0.8	0.027	0.005	0.014
IL: Chicago	8	0.1	0.0	0.1	0.022	0.005	0.012
IN: Indianapolis	4	1.1	0.3	0.6	0.047	0.008	0.025
KS: Kansas City	8	0.3	0.1	0.2	0.018	0.004	0.010
KS: Topeka	9	0.5	0.1	0.3	0.018	0.004	0.010
KS: Wichita	8	0.6	0.1	0.4	0.019	0.005	0.010
KY: Lexington	1	0.0	0.0	0.0	0.007	0.007	0.007
LA: Baton Rouge	5	0.2	0.0	0.1	0.013	0.006	0.009
MA: Boston	9	0.1	0.0	0.0	0.007	0.000	0.003
MD: Baltimore	4	0.2	0.1	0.1	0.015	0.006	0.011
MI: Detroit	9	0.3	0.0	0.1	0.013	0.004	0.008
MI: Lansing	9	0.3	0.0	0.2	0.015	0.005	0.010
MN: Duluth	8	0.3	0.0	0.1	0.008	0.002	0.005
MN: St. Paul	5	0.1	0.0	0.1	0.008	0.004	0.006

Table 4 (continued)
Gross Beta in Airborne Particulates
September 2008

Location	Number of Samples	5-hour Field Estimate Max (pCi/m³)	5-hour Field Estimate Min (pCi/m³)	5-hour Field Estimate Avg (pCi/m³)	NAREL Lab Measurement Max (pCi/m³)	NAREL Lab Measurement Min (pCi/m³)	NAREL Lab Measurement Avg (pCi/m³)
MN: Welch/510	9	0.5	0.0	0.1	0.021	0.004	0.012
MO: Jefferson City	5	0.3	0.0	0.1	0.019	0.004	0.009
MS: Jackson	3	0.1	0.1	0.1	0.025	0.005	0.015
MS: Jackson/Deq	3	0.3	0.0	0.2	0.014	0.010	0.013
NC: Wilmington	4				0.008	0.001	0.006
ND: Bismarck	6	1.4	0.1	1.0	0.017	0.005	0.012
NE: Lincoln	9	0.7	0.1	0.3	0.014	0.003	0.009
NE: Omaha	8	0.5	0.0	0.2	0.053	0.003	0.014
NJ: Edison	6	0.0	0.0	0.0	0.007	0.004	0.005
NJ: Trenton	9	0.3	0.1	0.2	0.011	0.004	0.008
NV: Las Vegas/913	2				0.010	0.008	0.009
NY: Albany	4	0.1	0.0	0.1	0.008	0.005	0.007
NY: Hauppauge	9	0.1	-0.1	0.0	0.009	0.002	0.005
NY: Lockport	9	0.0	0.0	0.0	0.009	0.003	0.006
NY: Yaphank	9	0.1	-0.1	0.0	0.006	0.002	0.004
OH: Cincinnati	9	0.5	0.0	0.1	0.023	0.006	0.013
OH: Cleveland	8	0.3	0.0	0.1	0.025	0.006	0.014
OH: Columbus	4	0.0	0.0	0.0	0.016	0.007	0.011
OH: Painesville	8	0.3	0.1	0.1	0.018	0.006	0.012
OH: Ross	1				0.039	0.039	0.039
OK: Oklahoma City	3	0.0	0.0	0.0	0.007	0.005	0.006
OK: Tulsa	7	0.0	0.0	0.0	0.022	0.006	0.013
OR: Corvallis	4	0.2	0.0	0.1	0.005	0.002	0.003
OR: Portland	8	0.2	0.0	0.1	0.022	0.005	0.011
PA: Harrisburg	9	0.5	0.0	0.2	0.016	0.002	0.009
PA: Pittsburgh	5	0.3	0.1	0.2	0.016	0.005	0.009
PR: San Juan	8	0.0	-0.0	0.0	0.005	0.002	0.003
RI: Providence	4	0.1	0.0	0.1	0.005	0.003	0.004
SC: Barnwell	1	0.0	0.0	0.0	0.009	0.009	0.009
SC: Columbia	3	0.8	0.0	0.3	0.017	0.008	0.011
SD: Pierre	7	4.4	0.8	2.0	0.025	0.007	0.016
TN: Knoxville	8	0.6	0.1	0.4	0.010	0.005	0.008
TN: Nashville	6	0.1	0.0	0.0	0.013	0.006	0.011
TN: Oak Ridge/Bethel	8	1.1	0.1	0.5	0.121	0.006	0.040
TN: Oak Ridge/K25	7	1.3	0.1	0.7	0.130	0.007	0.045
TN: Oak Ridge/Melton	8	1.2	0.1	0.7	0.142	0.006	0.044
TN: Oak Ridge/Y12 E	8	1.0	0.1	0.6	0.115	0.006	0.040
TN: Oak Ridge/Y12 W	8	0.5	0.1	0.2	0.057	0.006	0.021

Table 4 (continued)
Gross Beta in Airborne Particulates
September 2008

Location	Number of Samples	5-hour Field Estimate (pCi/m³) Max	Min	Avg	NAREL Lab Measurement (pCi/m³) Max	Min	Avg
TX: Austin	9	0.9	0.1	0.4	0.028	0.005	0.014
TX: Dallas	9	0.7	0.2	0.4	0.019	0.004	0.010
TX: El Paso	8	0.3	0.0	0.2	0.016	0.004	0.012
TX: Ft. Worth	9	1.0	0.1	0.3	0.015	0.003	0.008
TX: Houston	3	0.2	0.0	0.1	0.007	0.005	0.006
UT: Salt Lake City	1	0.2	0.2	0.2	0.011	0.011	0.011
VA: Lynchburg	5	1.2	0.3	0.8	0.016	0.006	0.011
VA: Richmond	1	0.0	0.0	0.0	0.004	0.004	0.004
VA: Virginia Beach	9	0.2	0.0	0.1	0.008	0.003	0.006
WA: Olympia	9	0.1	0.0	0.0	0.008	0.003	0.005
WA: Seattle	9	0.0	0.0	0.0	0.014	0.003	0.007
WA: Spokane	8	0.9	0.1	0.3	0.019	0.005	0.010
WI: Milwaukee	9	0.3	-0.0	0.1	0.036	0.004	0.018
WV: Charleston	6	0.1	0.0	0.0	0.024	0.007	0.014

Table 5
Gross Beta and Specific Gamma in Precipitation
July 2008

Location	Gross Beta Activity pCi/L	± 2*u*	Gamma-Emitting Radionuclides Nuclide	pCi/L	± 2*u*
AL: Montgomery/408	1.23	0.65	Be7	28	17
			Pb212	2.7	2.6
AR: Little Rock	1.57	0.42	Bi212	53	51
AZ: Phoenix	0.93	0.38		ND	
CT: Hartford	2.72	0.80	Be7	74	20
DE: Wilmington	1.04	0.63	Be7	41	21
			K40	17	13
FL: Jacksonville	0.30	0.72	Be7	26	20
GA: Atlanta	3.79	0.89	Be7	64	20
IA: Iowa City	3.35	0.61		ND	
KS: Kansas City	1.28	0.40		ND	
MA: Boston	4.42	0.95	Be7	64	20
			K40	11	14
MI: Lansing	1.37	0.42		ND	
MN: St. Paul	1.89	0.48		ND	
MN: Welch/510	3.21	0.59	Be7	44	22
			K40	15	14
NC: Charlotte	2.79	0.80	Be7	40	43
			Bi212	37	33
NC: Wilmington	0.63	0.32	Be7	34	20
	1.47	0.67	Be7	34	20
ND: Bismarck	1.64	0.44	Be7	12	11
NH: Concord	3.77	0.90		ND	
NM: Santa Fe	1.79	0.45	Be7	29	29
NY: Albany	0.87	0.63	Be7	32	17
			Pb212	2.2	2.3
			Tl208	1.1	1.2
NY: Yaphank	1.54	0.71	Be7	21	13
OH: Painesville	2.04	0.46	Be7	63	19
			K40	10	13
PA: Harrisburg	1.71	0.69	Be7	76	38
TN: Knoxville	0.1	2.7		ND	
TN: Oak Ridge/K25	2.26	0.48	Be7	49	20
TN: Oak Ridge/Melton	1.55	0.68	Be7	44	12
TN: Oak Ridge/Y12 E	0.68	0.33	Be7	42	21
			Pb212	2.7	3.0
TX: Austin	3.38	0.62		ND	

Note: ND = Not Detected

Table 5 (continued)
Gross Beta and Specific Gamma in Precipitation
July 2008

Location	Gross Beta Activity pCi/L ± 2*u*	Gamma-Emitting Radionuclides Nuclide	pCi/L ± 2*u*
TX: El Paso	1.65 0.45	Be7	22 20
VA: Lynchburg	5.6 1.1		ND

Note: ND = Not Detected

Table 6
Gross Beta and Specific Gamma in Precipitation
August 2008

Location	Gross Beta Activity pCi/L	± 2*u*	Gamma-Emitting Radionuclides Nuclide	pCi/L	± 2*u*
AL: Montgomery/408	0.94	0.36	K40	33	39
AR: Little Rock	0.88	0.35	Be7	22	16
AZ: Phoenix	0.84	0.36		ND	
CT: Hartford	3.23	0.58	Be7	65	19
DE: Wilmington	1.21	0.38	Be7	14	14
FL: Jacksonville	0.71	0.33	Be7	16.4	8.6
GA: Atlanta	3.44	0.60	Be7	52	12
IA: Iowa City	1.28	0.41		ND	
KS: Kansas City	1.07	0.38		ND	
MA: Boston	4.42	0.69	Be7	95	21
MI: Lansing	2.61	0.55	Be7	13	14
MN: St. Paul	1.38	0.41		ND	
MN: Welch/510	3.13	0.62		ND	
NC: Wilmington	1.60	0.43	Be7	40	19
ND: Bismarck	0.67	0.33		ND	
NY: Albany	2.37	0.51	Be7	44	19
NY: Yaphank	1.68	0.44	Be7	32	33
OH: Painesville	2.17	0.48	Be7	51	17
OR: Portland	0.21	0.28		ND	
PA: Harrisburg	3.28	0.60	Be7	58	33
TN: Knoxville	1.14	0.38		ND	
TN: Oak Ridge/K25	1.68	0.44	Be7	34	18
TN: Oak Ridge/Melton	2.45	0.51	Be7	49	17
TN: Oak Ridge/Y12 E	2.90	0.57	Be7	24	20
TX: Austin	2.20	0.51		ND	
TX: El Paso	1.40	0.44		ND	
VA: Lynchburg	3.37	0.60	Pb212	3.0	5.2
WA: Olympia	1.56	0.42	Be7	23	18

Note: ND = Not Detected

Table 7
Gross Beta and Specific Gamma in Precipitation
September 2008

Location	Gross Beta Activity pCi/L	± 2*u*	Gamma-Emitting Radionuclides Nuclide	pCi/L	± 2*u*
AL: Montgomery/408	3.75	0.91		ND	
AR: Little Rock	0.73	0.33		ND	
AZ: Phoenix	1.20	0.38	K40	29	26
CO: Denver	0.75	0.34		ND	
CT: Hartford	0.38	0.56	Be7	18	18
			K40	17	13
			Tl208	1.3	1.2
DE: Wilmington	0.95	0.61		ND	
FL: Jacksonville	1.7	1.5		ND	
IA: Iowa City	0.96	0.36		ND	
KS: Kansas City	1.06	0.37	Be7	27	13
MA: Boston	0.89	0.59	Be7	24	21
MI: Lansing	0.25	0.56	Tl208	1.3	1.4
MN: St. Paul	1.13	0.38	Be7	17	11
			Pb212	1.62	0.97
MN: Welch/510	1.67	0.45	K40	11	12
NC: Charlotte	0.53	0.56	Be7	26	18
NC: Wilmington	0.73	0.60	K40	17	11
ND: Bismarck	0.77	0.35		ND	
NY: Albany	1.12	0.65	Be7	34	19
NY: Yaphank	0.96	0.62		ND	
OH: Painesville	1.06	0.61	Be7	27	20
OR: Portland	0.85	0.35		ND	
PA: Harrisburg	0.76	0.60	Pb212	5.2	6.8
TN: Knoxville	0.71	0.60		ND	
TN: Oak Ridge/K25	1.75	0.43		ND	
TN: Oak Ridge/Melton	0.96	0.62	Be7	23	21
TN: Oak Ridge/Y12 E	0.60	0.33		ND	
TX: El Paso	0.92	0.35		ND	
UT: Salt Lake City	5.48	0.85	Be7	44	36
			Pb212	6.4	6.7
VA: Lynchburg	0.90	0.61	K40	25	35
			Pb212	5.4	7.7
WA: Olympia	5.69	0.84	Be7	181	43

Note: ND = Not Detected

Table 8
Tritium in Precipitation
July - September 2008

Location	July 2008 pCi/L	± 2*u*	August 2008 pCi/L	± 2*u*	September 2008 pCi/L	± 2*u*
AL: Montgomery/408	-43	87	-2	86	23	82
AR: Little Rock	-25	88	16	78	-28	76
AZ: Phoenix	-26	86	-8	77	36	79
CO: Denver	NS		NS		2	78
CT: Hartford	47	91	116	91	14	82
DE: Wilmington	-68	86	70	88	-15	81
FL: Jacksonville	-58	86	62	88	-37	80
GA: Atlanta	-39	86	24	86	NS	
IA: Iowa City	2	89	45	88	31	83
KS: Kansas City	2	88	29	79	-5	77
MA: Boston	54	90	101	89	21	82
MI: Lansing	24	90	62	88	50	84
MN: St. Paul	-28	87	43	87	38	83
MN: Welch/510	-6	88	17	86	25	83
NC: Charlotte	-29	91	NS		6	81
NC: Wilmington	-41	87	62	88	2	81
ND: Bismarck	50	91	49	87	35	83
NH: Concord	6	89	NS		NS	
NM: Santa Fe	-51	86	NS		NS	
NY: Albany	21	89	46	88	-23	80
NY: Yaphank	17	90	66	88	27	83
OH: Painesville	-13	88	96	89	17	82
OR: Portland	NS		-45	75	2	77
PA: Harrisburg	-40	88	73	88	8	81
TN: Knoxville	-95	85	17	87	12	82
TN: Oak Ridge/K25	-8	87	43	80	-2	77
TN: Oak Ridge/Melton	24	89	32	87	87	85
TN: Oak Ridge/Y12 E	70	91	33	79	9	77
TX: Austin	-87	84	27	87	NS	
TX: El Paso	38	89	-25	76	16	82
UT: Salt Lake City	NS		NS		36	79
VA: Lynchburg	-49	86	9	85	-12	81
WA: Olympia	NS		48	80	-6	77

Note: NS = No Sample

Plutonium and Uranium in Airborne Particulates

Environmental radiation levels of plutonium and uranium are determined by the analysis of annually composited samples (air filters) collected from the continuously operating airborne particulate samplers.

Concentrations of plutonium-238, combined plutonium-239 and 240, and uranium-234, 235, and 238 are determined by alpha-particle spectrometry following chemical separation. The volume of air represented by the annual composite typically ranges from 120,000 to 500,000 cubic meters.

Plutonium and uranium results are published when they become available.

Beta Activity in Precipitation

All stations routinely submit precipitation samples as rainfall, snow, or sleet occurs. The precipitation samples are composited at NAREL into single monthly samples for each station. Each month that precipitation occurs, an aliquant of the composited sample is analyzed for gross beta, tritium, and gamma-emitting radionuclides.

2. Drinking Water Program

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

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

The analyses include (a) tritium on a quarterly basis; (b) gross alpha, gross beta, strontium-90, and gamma on annual composites; (c) radium-226 if the gross alpha exceeds 2 pCi/L and radium-228 if the radium-226 falls between 3 and 5 pCi/L; (d) iodine-131 on one quarterly sample per year for each station; and (e) an annual composite for plutonium-238, combined plutonium-239 and 240, and uranium-234, 235, and 238 for stations that demonstrate gross alpha levels greater than 2 pCi/L.

Table 9
Tritium in Drinking Water
July - September 2008

Location	Date Collected	^{3}H pCi/L	± 2*u*
AK: Fairbanks	07/16/08	-4	87
AL: Dothan	07/30/08	-45	75
AL: Montgomery	07/08/08	-25	75
AL: Muscle Shoals	07/24/08	13	88
AL: Scottsboro	07/23/08	59	89
AR: Little Rock	07/15/08	37	88
CA: Los Angeles	07/07/08	59	85
CA: Richmond	07/03/08	-101	72
CO: Denver	07/07/08	-20	75
CT: Hartford	07/07/08	-31	75
DE: Dover	07/07/08	-50	310
FL: Miami	07/10/08	-9	82
FL: Tampa	07/03/08	-102	72
GA: Savannah	09/09/08	-23	82
HI: Honolulu	09/05/08	-37	75
IA: Cedar Rapids	07/07/08	-28	75
ID: Boise	08/19/08	32	85
ID: Idaho Falls	07/09/08	56	89
IL: Chicago	08/04/08	-27	84
IL: Morris	07/24/08	15	87
KS: Topeka	07/08/08	-77	73
LA: New Orleans	09/22/08	29	79
MD: Baltimore	07/03/08	-31	75
MD: Conowingo	08/12/08	41	85
MI: Detroit	07/18/08	65	89
MI: Grand Rapids	07/31/08	-71	74
MN: St. Paul	07/15/08	-52	84
MN: Welch - Red Wing Location Ch	07/15/08	-26	86
MO: Jefferson City	07/03/08	-43	74
MS: Jackson	07/09/08	7	83
MS: Port Gibson	07/09/08	-6	82
MT: Helena	07/08/08	54	85
NC: Raleigh	09/10/08	11	88
ND: Bismarck	07/03/08	-32	73
NE: Lincoln	07/09/08	52	85
NJ: Trenton	07/07/08	-11	76
NJ: Waretown	07/15/08	-19	82
NM: Santa Fe	07/17/08	17	87
NV: Las Vegas	07/11/08	22	84
NV: Las Vegas	09/25/08	48	79

Table 9 (continued)
Tritium in Drinking Water
July - September 2008

Location	Date Collected	^{3}H pCi/L	± 2*u*
NY: Albany	07/09/08	30	83
NY: New York City	07/18/08	-71	74
NY: Niagara Falls	09/02/08	71	90
NY: Syracuse	07/07/08	24	84
OH: Cincinnati	09/04/08	-26	86
OH: E. Liverpool	08/07/08	40	86
OH: Painesville	08/11/08	62	86
OH: Toledo	07/07/08	112	87
OR: Portland	09/29/08	13	77
PA: Columbia	08/13/08	34	86
PA: Harrisburg	08/12/08	0	84
PA: Philadelphia/Baxter	07/08/08	-45	74
PA: Philadelphia/Belmont	07/08/08	17	76
PA: Philadelphia/Queen	07/08/08	9	76
PA: Pittsburgh	08/07/08	45	86
RI: Providence	07/17/08	-8	87
SC: Barnwell	07/14/08	-39	85
SC: Columbia	07/31/08	35	78
SC: Jenkinsville	07/01/08	22	88
SC: Seneca	07/02/08	33	83
TN: Chattanooga	07/02/08	-2	76
TN: Knoxville	08/07/08	32	86
TN: Oak Ridge/#360	07/08/08	79	85
TN: Oak Ridge/#371	07/08/08	110	88
TN: Oak Ridge/#4442	07/08/08	69	86
TN: Oak Ridge/#768	07/08/08	45	85
TN: Oak Ridge/#772	07/08/08	34	85
TX: Austin	07/07/08	-4	82
VA: Ashland	07/25/08	7	87
VA: Lynchburg	07/07/08	-39	74
WA: Richland	07/03/08	-89	71
WA: Seattle	07/16/08	11	83

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3. Milk Program

Pasteurized Milk

Milk is a reliable indicator of the general population's intake of certain radionuclides since it is consumed fresh by a large segment of the population and can contain several of the biologically significant radionuclides that result from environmental releases from nuclear activities. A primary function of this program is to obtain reliable monitoring data relative to current radionuclide concentrations and determine any long-term trends.

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

The samples are analyzed for gamma-emitting nuclides, including iodine-131, barium-140, cesium-137, and potassium-40. Total potassium concentrations in g/L are determined from potassium-40 activities assuming natural isotopic abundances. During the third quarter collection, one-fourth of the samples are also analyzed for strontium-90 on a four year rotating schedule.

Table 10

Radionuclides in Pasteurized Milk

July - September 2008

Location	Date Collected	K g/L ± 2*u*	^{137}Cs pCi/L ± 2*u*	^{140}Ba pCi/L ± 2*u*	^{131}I pCi/L ± 2*u*
AR: Little Rock	09/08/08	1.53 0.19	ND	ND	ND
AZ: Phoenix	09/30/08	1.68 0.21	ND	ND	ND
CA: Los Angeles	07/07/08	1.57 0.23	ND	ND	ND
CA: San Francisco	07/16/08	1.55 0.20	ND	ND	ND
CT: Hartford	07/15/08	1.60 0.20	ND	ND	ND
FL: Tampa	07/09/08	1.50 0.19	ND	ND	ND
IA: Des Moines	07/28/08	1.51 0.19	ND	ND	ND
KS: Wichita	07/08/08	1.51 0.19	ND	ND	ND
KY: Louisville	07/07/08	1.51 0.20	ND	ND	ND
MA: Boston	09/25/08	1.49 0.20	ND	ND	ND
MD: Baltimore	07/03/08	1.53 0.23	ND	ND	ND
MO: Jefferson City	07/22/08	1.54 0.20	ND	ND	ND
NJ: Trenton	07/24/08	1.63 0.21	ND	ND	ND
NM: Albuquerque	08/05/08	1.50 0.19	ND	ND	ND
NY: Buffalo	07/10/08	1.45 0.19	ND	ND	ND
NY: Syracuse	07/18/08	1.61 0.24	ND	ND	ND
OH: Cincinnati	08/04/08	1.55 0.20	ND	ND	ND
OR: Portland	08/11/08	1.61 0.24	ND	ND	ND
PA: Pittsburgh	07/08/08	1.53 0.19	ND	ND	ND
TN: Chattanooga	07/24/08	1.57 0.20	ND	ND	ND
TN: Knoxville	08/25/08	1.48 0.19	ND	ND	ND
TN: Memphis	07/14/08	1.54 0.23	ND	ND	ND
TX: Austin	07/15/08	1.45 0.22	ND	ND	ND
VA: Norfolk	07/14/08	1.49 0.19	ND	ND	ND
VT: Montpelier	09/19/08	1.49 0.19	ND	ND	ND
WA: Olympia	07/07/08	1.47 0.19	ND	ND	ND
WA: Tacoma	09/30/08	1.37 0.18	ND	ND	ND
WV: Charleston	07/08/08	1.48 0.19	ND	ND	ND

Note: ND = Not Detected

Table 11
Strontium-90 in Pasteurized Milk
July - September 2008

Location	Date Collected	^{90}Sr pCi/L	± 2*u*
CA: San Francisco	07/16/08	0.35	0.60
CT: Hartford	07/15/08	0.20	0.63
KS: Wichita	07/08/08	0.15	0.52
NM: Albuquerque	08/05/08	0.33	0.40
NY: Buffalo	07/10/08	0.99	0.64
OH: Cincinnati	08/04/08	0.58	0.44
OR: Portland	08/11/08	0.54	0.44
TN: Chattanooga	07/24/08	0.55	0.46
VA: Norfolk	07/14/08	0.55	0.60

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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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