

ENVIRONMENTAL

RADIATION

DATA

REPORT 152

October–December 2012

United States Environmental Protection Agency

Office of Radiation and Indoor Air

This page intentionally left blank

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.....	17
2. Water Program	19
3. Milk Program.....	25
Pasteurized Milk	25

This page intentionally left blank

List of Tables

Table		Page
1	Reporting Units and Minimum Detectable Concentrations	xiii
2	Gross Beta in Airborne Particulates: October 2012	2
3	Gross Beta in Airborne Particulates: November 2012	6
4	Gross Beta in Airborne Particulates: December 2012	10
5	Specific Gamma in Precipitation: October 2012	14
6	Specific Gamma in Precipitation: November 2012	15
7	Specific Gamma in Precipitation: December 2012	16
8	Tritium in Drinking Water: October–December 2012	20
9	Iodine-131 in Drinking Water: January–December 2012	22
10	Radionuclides in Pasteurized Milk: October–December 2012	26

This page intentionally left blank

Preface

Environmental Radiation Data (ERD) contains data from the RadNet monitoring system (formerly ERAMS), which is operated by the Office of Radiation and Indoor Air's National Analytical Radiation Environmental Laboratory (NAREL) in Montgomery, Alabama. ERD is published in both hard-copy and electronic formats. Electronic reports are available online at <http://www.epa.gov/tcfpgv/tcfpgvf/cvlgtf/qvo>. RadNet data are also available in a searchable database at:

<http://epa.gov/enviro/facts/radnet>

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 RadNet samples may include gross alpha and gross beta analysis, gamma analyses, and radionuclide-specific analyses for isotopes of uranium, plutonium, strontium, iodine, radium, and tritium. This monitoring effort also provides information on natural background levels and possible accidental releases into the environment.

This page intentionally left blank

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 Analytical 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.

This page intentionally left blank

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.

This page intentionally left blank

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
* 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.

This page intentionally left blank

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. Continuous air samplers collect airborne particulates at field stations representing wide geographic coverage throughout the United States.

Filters (10 cm diameter synthetic fiber) from air samplers are changed routinely, and generally field measurements are made with a dual-phosphor scintillation counter at least 5 hours after collection to allow ^{222}Rn progeny to decay. Field estimates are reported to appropriate EPA officials by telephone or mail depending on the activity levels found; however, as of the first quarter of 2012, NAREL no longer reports field estimates in *Environmental Radiation Data*.

The filters are sent to NAREL for more sensitive analysis in a gas proportional counter. Gamma scans are performed on all filters showing gross beta activity greater than 1 pCi/m³.

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 gamma-emitting radionuclides. NAREL discontinued gross beta analysis of precipitation in January 2010 and discontinued tritium analysis of precipitation in January 2012.

Table 2
Gross Beta in Airborne Particulates
October 2012

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
AK: Anchorage	8	0.008	0.001	0.004
AK: Fairbanks	8	0.012	0.002	0.005
AK: Juneau	6	0.004	0.001	0.002
AL: Birmingham	8	0.018	0.007	0.013
AL: Montgomery/408	9	0.026	0.012	0.019
AR: Fort Smith	4	0.018	0.011	0.014
AR: Little Rock	6	0.014	0.006	0.011
AZ: Phoenix	7	0.023	0.007	0.015
AZ: Phoenix/956	8	0.021	0.009	0.014
AZ: Tucson	9	0.018	0.005	0.011
CA: Anaheim	9	0.018	0.005	0.011
CA: Bakersfield	4	0.028	0.005	0.016
CA: Eureka	3	0.006	0.003	0.004
CA: Fresno	4	0.019	0.007	0.013
CA: Los Angeles	5	0.015	0.007	0.011
CA: Richmond	5	0.008	0.004	0.006
CA: Riverside	8	0.014	0.005	0.009
CA: Sacramento	2	0.012	0.011	0.011
CA: San Diego	3	0.009	0.008	0.008
CA: San Francisco	7	0.007	0.001	0.004
CA: San Jose	9	0.013	0.004	0.007
CO: Colorado Springs	4	0.016	0.011	0.013
CO: Denver	9	0.020	0.008	0.011
CO: Grand Junction	6	0.024	0.008	0.014
CT: Hartford	9	0.008	0.002	0.005
DC: Washington	8	0.015	0.005	0.009
DE: Dover	6	0.009	0.002	0.007
FL: Jacksonville	9	0.014	0.003	0.007
FL: Miami	4	0.004	0.002	0.003
FL: Orlando	9	0.010	0.002	0.006
FL: Tallahassee	4	0.017	0.009	0.012
FL: Tampa	6	0.012	0.007	0.009
GA: Atlanta	4	0.012	0.008	0.010
GA: Augusta	8	0.018	0.007	0.011
HI: Hilo	9	0.004	0.002	0.003
HI: Honolulu	9	0.005	0.002	0.003
IA: Des Moines	5	0.016	0.009	0.013
IA: Mason City	6	0.014	0.007	0.011

Table 2 (continued)
Gross Beta in Airborne Particulates
October 2012

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
ID: Idaho Falls	5	0.011	0.004	0.009
IL: Aurora	8	0.014	0.008	0.011
IL: Champaign	8	0.016	0.007	0.012
IL: Chicago	8	0.013	0.005	0.009
IN: Fort Wayne	4	0.019	0.009	0.013
IN: Indianapolis	9	0.016	0.007	0.011
KS: Kansas City	3	0.016	0.013	0.014
KS: Topeka	9	0.020	0.008	0.013
KS: Wichita	6	0.014	0.008	0.011
KY: Lexington	9	0.020	0.005	0.013
KY: Louisville	6	0.015	0.007	0.011
LA: Baton Rouge	9	0.021	0.004	0.013
LA: Shreveport	8	0.015	0.006	0.010
MA: Boston	9	0.009	0.002	0.005
MA: Worcester	9	0.011	0.004	0.007
MD: Baltimore	8	0.020	0.008	0.011
ME: Orono	2	0.008	0.004	0.006
ME: Portland	7	0.010	0.001	0.006
MI: Bay City 48708	9	0.015	0.005	0.008
MI: Detroit	9	0.016	0.006	0.009
MI: Grand Rapids	4	0.011	0.006	0.009
MI: Lansing	9	0.032	0.011	0.020
MN: Duluth	9	0.011	0.005	0.007
MN: St. Paul	5	0.013	0.008	0.010
MO: Jefferson City	9	0.024	0.010	0.015
MO: Springfield	8	0.023	0.009	0.014
MO: St. Louis	5	0.012	0.007	0.009
NC: Charlotte	9	0.013	0.008	0.011
NC: Wilmington	4	0.013	0.009	0.012
ND: Bismarck	5	0.015	0.006	0.010
NE: Kearney	8	0.021	0.007	0.012
NE: Lincoln	9	0.020	0.007	0.012
NE: Omaha	3	0.020	0.012	0.017
NH: Concord	3	0.014	0.002	0.007
NJ: Edison	7	0.012	0.004	0.007
NM: Albuquerque	4	0.015	0.007	0.011
NM: Carlsbad	5	0.024	0.017	0.019
NM: Navajo Lake St Park	5	0.012	0.010	0.011

Table 2 (continued)
Gross Beta in Airborne Particulates
October 2012

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
NV: Las Vegas/913	9	0.016	0.005	0.009
NV: Reno	8	0.034	0.005	0.017
NY: Albany	8	0.012	0.004	0.008
NY: Lockport	9	0.016	0.004	0.008
NY: New York City	4	0.009	0.005	0.008
NY: Rochester	7	0.019	0.006	0.009
NY: Syracuse	4	0.013	0.007	0.009
NY: Yaphank	6	0.009	0.003	0.005
OH: Cincinnati	7	0.014	0.007	0.009
OH: Cleveland	9	0.016	0.008	0.010
OH: Painesville	6	0.012	0.007	0.009
OH: Toledo	8	0.010	0.004	0.007
OK: Oklahoma City	9	0.022	0.009	0.015
OK: Tulsa	9	0.019	0.008	0.014
OR: Corvallis	8	0.008	0.001	0.004
OR: Portland	8	0.014	0.002	0.005
PA: Bloomsburg	5	0.024	0.007	0.013
PA: Philadelphia	4	0.015	0.006	0.010
PA: Pittsburgh	6	0.015	0.005	0.010
PR: San Juan	9	0.004	0.002	0.003
RI: Providence	4	0.007	0.003	0.005
SC: Columbia	4	0.019	0.011	0.014
SD: Pierre	9	0.021	0.007	0.013
SD: Rapid City	9	0.022	0.006	0.012
TN: Knoxville	5	0.019	0.009	0.016
TN: Memphis	5	0.016	0.006	0.011
TN: Nashville	5	0.017	0.006	0.011
TN: Oak Ridge/Bethel	9	0.019	0.007	0.014
TN: Oak Ridge/K25	9	0.021	0.009	0.016
TN: Oak Ridge/Melton	9	0.020	0.008	0.014
TN: Oak Ridge/Y12 E	9	0.019	0.008	0.015
TN: Oak Ridge/Y12 W	9	0.017	0.008	0.013
TX: Austin	4	0.027	0.013	0.021
TX: Dallas	9	0.026	0.009	0.016
TX: El Paso	8	0.038	0.015	0.022
TX: Ft. Worth	7	0.023	0.008	0.014
TX: Harlingen	4	0.012	0.006	0.010
TX: Houston	9	0.028	0.011	0.016

Table 2 (continued)
Gross Beta in Airborne Particulates
October 2012

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
TX: Laredo	7	0.018	0.005	0.010
TX: Lubbock	5	0.019	0.011	0.015
TX: San Angelo	6	0.021	0.007	0.014
TX: San Antonio	8	0.020	0.007	0.011
UT: Salt Lake City	7	0.029	0.006	0.016
UT: St. George	4	0.017	0.007	0.012
VA: Harrisonburg	9	0.019	0.009	0.014
VA: Lynchburg	8	0.019	0.009	0.015
VA: Richmond	5	0.015	0.009	0.012
VA: Virginia Beach	9	0.014	0.002	0.008
VT: Burlington	9	0.015	0.003	0.007
WA: Olympia	9	0.014	0.001	0.004
WA: Richland	8	0.020	0.004	0.010
WA: Seattle	4	0.014	0.001	0.005
WA: Spokane	9	0.015	0.003	0.007
WI: Madison	7	0.016	0.005	0.010
WI: Milwaukee	5	0.009	0.005	0.007
WI: Shawano	9	0.015	0.004	0.008
WV: Charleston	6	0.023	0.008	0.015

Table 3
Gross Beta in Airborne Particulates
November 2012

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
AK: Anchorage	4	0.010	0.007	0.009
AK: Fairbanks	8	0.012	0.004	0.008
AK: Juneau	5	0.006	0.004	0.005
AL: Birmingham	9	0.025	0.010	0.015
AL: Montgomery/408	9	0.026	0.011	0.020
AR: Fort Smith	3	0.020	0.009	0.015
AR: Little Rock	7	0.020	0.008	0.014
AZ: Phoenix	7	0.026	0.014	0.021
AZ: Phoenix/956	5	0.029	0.018	0.023
AZ: Tucson	8	0.021	0.006	0.012
AZ: Yuma	1	0.010	0.010	0.010
CA: Anaheim	7	0.016	0.005	0.010
CA: Bakersfield	7	0.050	0.007	0.026
CA: Fresno	4	0.018	0.015	0.016
CA: Los Angeles	3	0.019	0.016	0.017
CA: Richmond	4	0.011	0.005	0.008
CA: Riverside	8	0.024	0.007	0.015
CA: Sacramento	7	0.023	0.006	0.013
CA: San Bernardino Cty.	6	0.022	0.008	0.015
CA: San Diego	3	0.015	0.003	0.008
CA: San Francisco	9	0.007	0.001	0.004
CA: San Jose	6	0.008	0.002	0.005
CO: Colorado Springs	2	0.012	0.012	0.012
CO: Denver	9	0.016	0.005	0.011
CO: Grand Junction	5	0.020	0.009	0.013
CT: Hartford	7	0.011	0.001	0.006
DC: Washington	9	0.016	0.002	0.010
DE: Dover	4	0.012	0.009	0.010
FL: Jacksonville	8	0.014	0.007	0.010
FL: Miami	4	0.008	0.003	0.005
FL: Orlando	6	0.012	0.006	0.009
FL: Tallahassee	4	0.014	0.008	0.011
FL: Tampa	6	0.015	0.006	0.010
GA: Atlanta	4	0.014	0.011	0.012
GA: Augusta	5	0.016	0.013	0.014
HI: Hilo	9	0.004	0.001	0.002
HI: Honolulu	9	0.003	0.002	0.003
IA: Des Moines	8	0.041	0.012	0.019

Table 3 (continued)
Gross Beta in Airborne Particulates
November 2012

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
IA: Mason City	6	0.020	0.010	0.013
ID: Boise	2	0.011	0.004	0.008
ID: Idaho Falls	9	0.021	0.006	0.013
IL: Aurora	8	0.037	0.009	0.021
IL: Champaign	7	0.027	0.009	0.018
IL: Chicago	7	0.027	0.008	0.015
IN: Fort Wayne	3	0.031	0.006	0.017
IN: Indianapolis	8	0.031	0.006	0.018
KS: Kansas City	7	0.030	0.012	0.021
KS: Topeka	8	0.027	0.009	0.018
KS: Wichita	5	0.028	0.013	0.020
KY: Lexington	7	0.020	0.007	0.015
KY: Louisville	7	0.025	0.007	0.015
LA: Baton Rouge	8	0.016	0.007	0.013
LA: Shreveport	8	0.018	0.006	0.012
MA: Boston	9	0.028	0.001	0.013
MA: Worcester	9	0.021	0.002	0.011
MD: Baltimore	8	0.021	0.005	0.012
ME: Portland	6	0.025	0.006	0.014
MI: Bay City 48708	8	0.024	0.002	0.013
MI: Detroit	7	0.022	0.004	0.015
MI: Grand Rapids	4	0.024	0.005	0.012
MI: Lansing	9	0.073	0.007	0.037
MN: Duluth	7	0.034	0.005	0.017
MN: St. Paul	4	0.022	0.011	0.016
MO: Jefferson City	8	0.040	0.012	0.022
MO: Springfield	6	0.028	0.009	0.020
MO: St. Louis	4	0.021	0.009	0.014
NC: Charlotte	8	0.016	0.004	0.012
NC: Wilmington	5	0.013	0.008	0.011
ND: Bismarck	4	0.023	0.007	0.017
NE: Kearney	9	0.027	0.008	0.017
NE: Lincoln	9	0.025	0.010	0.018
NE: Omaha	3	0.022	0.014	0.018
NH: Concord	5	0.025	0.004	0.017
NJ: Edison	6	0.017	0.007	0.011
NM: Albuquerque	3	0.019	0.010	0.014
NM: Carlsbad	5	0.022	0.018	0.019

Table 3 (continued)
Gross Beta in Airborne Particulates
November 2012

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
NM: Navajo Lake St Park	4	0.017	0.009	0.012
NV: Las Vegas/913	9	0.015	0.007	0.011
NV: Reno	7	0.023	0.006	0.014
NY: Albany	6	0.032	0.001	0.012
NY: Lockport	9	0.022	0.001	0.011
NY: New York City	2	0.013	0.010	0.012
NY: Rochester	5	0.016	0.001	0.008
NY: Syracuse	4	0.019	0.004	0.012
OH: Cincinnati	9	0.017	0.004	0.012
OH: Cleveland	9	0.030	0.001	0.015
OH: Painesville	7	0.021	0.002	0.014
OH: Toledo	9	0.018	0.001	0.010
OK: Oklahoma City	8	0.027	0.008	0.019
OK: Tulsa	9	0.030	0.010	0.020
OR: Corvallis	8	0.007	0.001	0.003
OR: Portland	8	0.008	0.002	0.003
PA: Bloomsburg	8	0.021	0.003	0.015
PA: Philadelphia	5	0.016	0.003	0.010
PA: Pittsburgh	5	0.016	0.003	0.011
PR: San Juan	9	0.003	0.001	0.002
RI: Providence	4	0.009	0.002	0.006
SC: Columbia	5	0.016	0.006	0.013
SD: Pierre	8	0.036	0.008	0.021
SD: Rapid City	6	0.020	0.013	0.015
TN: Knoxville	7	0.023	0.012	0.018
TN: Memphis	3	0.020	0.015	0.018
TN: Nashville	7	0.020	0.008	0.013
TN: Oak Ridge/Bethel	7	0.017	0.008	0.014
TN: Oak Ridge/K25	7	0.017	0.009	0.014
TN: Oak Ridge/Melton	7	0.027	0.004	0.014
TN: Oak Ridge/Y12 E	7	0.018	0.009	0.014
TN: Oak Ridge/Y12 W	7	0.018	0.009	0.014
TX: Austin	4	0.026	0.015	0.018
TX: Dallas	7	0.026	0.010	0.019
TX: El Paso	1	0.035	0.035	0.035
TX: Ft. Worth	4	0.026	0.012	0.018
TX: Harlingen	5	0.016	0.007	0.011
TX: Houston	9	0.023	0.009	0.016

Table 3 (continued)
Gross Beta in Airborne Particulates
November 2012

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
TX: Laredo	5	0.012	0.008	0.010
TX: Lubbock	8	0.025	0.012	0.018
TX: San Angelo	6	0.021	0.012	0.016
TX: San Antonio	9	0.021	0.008	0.014
UT: Salt Lake City	7	0.019	0.007	0.013
UT: St. George	3	0.017	0.010	0.014
VA: Harrisonburg	8	0.017	0.004	0.012
VA: Lynchburg	8	0.020	0.001	0.012
VA: Richmond	2	0.014	0.011	0.012
VA: Virginia Beach	7	0.011	0.004	0.008
VT: Burlington	8	0.024	0.002	0.008
WA: Olympia	8	0.005	0.001	0.003
WA: Richland	8	0.017	0.002	0.008
WA: Seattle	5	0.003	0.001	0.002
WA: Spokane	8	0.010	0.002	0.005
WI: Madison	7	0.026	0.012	0.017
WI: Milwaukee	8	0.027	0.005	0.014
WI: Shawano	9	0.040	0.006	0.016
WV: Charleston	6	0.020	0.007	0.014

Table 4
Gross Beta in Airborne Particulates
December 2012

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
AK: Anchorage	9	0.008	0.001	0.005
AK: Fairbanks	9	0.017	0.005	0.011
AK: Juneau	4	0.007	0.000	0.004
AL: Birmingham	8	0.017	0.007	0.012
AL: Montgomery/408	8	0.022	0.008	0.015
AR: Fort Smith	1	0.012	0.012	0.012
AR: Little Rock	2	0.015	0.012	0.013
AZ: Phoenix	9	0.025	0.006	0.017
AZ: Phoenix/956	6	0.021	0.006	0.012
AZ: Tucson	5	0.016	0.007	0.011
AZ: Yuma	1	0.007	0.007	0.007
CA: Anaheim	1	0.005	0.005	0.005
CA: Bakersfield	8	0.028	0.004	0.010
CA: Eureka	2	0.009	0.001	0.005
CA: Fresno	5	0.023	0.004	0.012
CA: Los Angeles	3	0.018	0.008	0.015
CA: Richmond	4	0.005	0.003	0.004
CA: Riverside	8	0.016	0.003	0.008
CA: Sacramento	9	0.015	0.004	0.007
CA: San Bernardino Cty.	8	0.013	0.003	0.007
CA: San Diego	3	0.014	0.004	0.008
CA: San Francisco	9	0.004	0.001	0.002
CA: San Jose	7	0.005	0.002	0.003
CO: Colorado Springs	4	0.022	0.004	0.012
CO: Denver	9	0.040	0.005	0.012
CO: Grand Junction	5	0.030	0.012	0.021
CT: Hartford	4	0.006	0.003	0.004
DC: Washington	9	0.018	0.003	0.010
DE: Dover	4	0.024	0.010	0.014
FL: Jacksonville	8	0.007	0.004	0.005
FL: Miami	1	0.004	0.004	0.004
FL: Orlando	5	0.005	0.003	0.004
FL: Tallahassee	4	0.010	0.006	0.008
FL: Tampa	7	0.008	0.003	0.006
GA: Atlanta	3	0.011	0.007	0.009
GA: Augusta	7	0.015	0.007	0.011
HI: Hilo	9	0.004	0.001	0.002
HI: Honolulu	9	0.004	0.001	0.002

Table 4 (continued)
Gross Beta in Airborne Particulates
December 2012

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
IA: Des Moines	6	0.041	0.009	0.024
IA: Mason City	4	0.028	0.012	0.022
ID: Boise	5	0.005	0.003	0.004
ID: Idaho Falls	9	0.014	0.004	0.008
IL: Aurora	7	0.038	0.011	0.022
IL: Champaign	3	0.025	0.002	0.016
IL: Chicago	7	0.039	0.005	0.017
IN: Fort Wayne	2	0.024	0.006	0.015
IN: Indianapolis	9	0.035	0.007	0.017
KS: Kansas City	6	0.043	0.004	0.029
KS: Topeka	7	0.044	0.005	0.026
KS: Wichita	5	0.040	0.009	0.024
KY: Lexington	5	0.020	0.012	0.016
KY: Louisville	8	0.024	0.007	0.015
LA: Baton Rouge	7	0.015	0.004	0.010
LA: Shreveport	8	0.015	0.006	0.009
MA: Boston	9	0.020	0.002	0.011
MA: Worcester	8	0.015	0.003	0.009
MD: Baltimore	7	0.024	0.011	0.016
ME: Portland	8	0.015	0.007	0.010
MI: Bay City 48708	7	0.025	0.008	0.015
MI: Detroit	6	0.026	0.009	0.014
MI: Grand Rapids	3	0.020	0.014	0.017
MI: Lansing	8	0.067	0.022	0.036
MN: Duluth	6	0.028	0.010	0.018
MN: St. Paul	4	0.036	0.012	0.021
MO: Jefferson City	9	0.039	0.013	0.022
MO: Springfield	6	0.030	0.007	0.020
MO: St. Louis	3	0.017	0.011	0.014
NC: Charlotte	7	0.013	0.007	0.011
NC: Wilmington	4	0.014	0.006	0.009
ND: Bismarck	7	0.036	0.011	0.022
NE: Kearney	5	0.022	0.006	0.014
NE: Lincoln	8	0.034	0.007	0.018
NE: Omaha	5	0.046	0.014	0.025
NH: Concord	4	0.017	0.009	0.013
NJ: Edison	6	0.016	0.005	0.007
NM: Albuquerque	3	0.012	0.007	0.009

Table 4 (continued)
Gross Beta in Airborne Particulates
December 2012

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
NM: Carlsbad	4	0.020	0.003	0.009
NM: Navajo Lake St Park	3	0.013	0.001	0.009
NV: Las Vegas/913	6	0.011	0.003	0.006
NV: Reno	9	0.014	0.003	0.006
NY: Albany	6	0.016	0.005	0.011
NY: Lockport	9	0.022	0.007	0.011
NY: New York City	2	0.009	0.005	0.007
NY: Rochester	9	0.018	0.005	0.009
NY: Syracuse	3	0.017	0.008	0.012
NY: Yaphank	7	0.010	0.002	0.006
OH: Cincinnati	9	0.027	0.006	0.013
OH: Cleveland	9	0.029	0.010	0.016
OH: Painesville	7	0.023	0.008	0.014
OH: Toledo	8	0.019	0.005	0.011
OK: Oklahoma City	7	0.039	0.010	0.022
OK: Tulsa	9	0.031	0.010	0.021
OR: Corvallis	5	0.005	0.001	0.002
OR: Portland	9	0.004	0.001	0.002
PA: Bloomsburg	6	0.023	0.010	0.016
PA: Philadelphia	4	0.015	0.008	0.011
PA: Pittsburgh	2	0.018	0.008	0.013
PR: San Juan	8	0.002	0.001	0.002
RI: Providence	4	0.009	0.004	0.005
SC: Columbia	5	0.013	0.010	0.012
SD: Pierre	9	0.047	0.010	0.025
SD: Rapid City	5	0.056	0.006	0.018
TN: Knoxville	6	0.023	0.010	0.018
TN: Memphis	5	0.019	0.009	0.013
TN: Nashville	6	0.014	0.005	0.010
TN: Oak Ridge/Bethel	7	0.018	0.006	0.013
TN: Oak Ridge/K25	7	0.020	0.006	0.014
TN: Oak Ridge/Melton	7	0.025	0.006	0.016
TN: Oak Ridge/Y12 E	7	0.018	0.007	0.014
TN: Oak Ridge/Y12 W	6	0.019	0.006	0.013
TX: Austin	5	0.023	0.010	0.016
TX: Dallas	8	0.033	0.010	0.018
TX: El Paso	1	0.017	0.017	0.017
TX: Ft. Worth	7	0.021	0.008	0.014

Table 4 (continued)
Gross Beta in Airborne Particulates
December 2012

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
TX: Harlingen	5	0.017	0.001	0.010
TX: Houston	6	0.015	0.011	0.012
TX: Lubbock	4	0.014	0.007	0.011
TX: San Angelo	2	0.021	0.017	0.019
TX: San Antonio	9	0.025	0.006	0.015
UT: Salt Lake City	7	0.011	0.005	0.008
UT: St. George	3	0.017	0.007	0.012
VA: Harrisonburg	7	0.022	0.008	0.014
VA: Lynchburg	6	0.044	0.014	0.021
VA: Richmond	5	0.021	0.004	0.013
VA: Virginia Beach	7	0.032	0.005	0.011
VT: Burlington	9	0.012	0.002	0.007
WA: Olympia	8	0.036	0.001	0.006
WA: Richland	7	0.008	0.002	0.005
WA: Seattle	4	0.002	0.001	0.001
WA: Spokane	8	0.024	0.001	0.006
WI: Madison	8	0.035	0.006	0.016
WI: Milwaukee	4	0.027	0.004	0.017
WI: Shawano	8	0.034	0.008	0.017
WV: Charleston	6	0.021	0.010	0.015

Table 5
Specific Gamma in Precipitation
October 2012

Location	Nuclide	pCi/L \pm 2u	
AL: Montgomery/408	Be-7	9.9	8.9
AR: Little Rock		ND	
CA: Richmond	K-40	16	11
CO: Denver	Be-7	38	12
CT: Hartford		ND	
FL: Jacksonville	Be-7	46	18
GA: Atlanta	Be-7	30	17
HI: Honolulu		ND	
KS: Kansas City		ND	
MA: Boston	Be-7	107	26
MI: Lansing		ND	
MN: St. Paul		ND	
NC: Charlotte	Be-7	29	15
NC: Wilmington		ND	
NH: Concord		ND	
NY: Albany		ND	
NY: Yaphank		ND	
OH: Painesville		ND	
OR: Portland		ND	
PA: Harrisburg	Be-7	18.7	9.1
TN: Knoxville		ND	
TN: Nashville	Be-7	25	12
TN: Oak Ridge/K25	Be-7	42	12
TN: Oak Ridge/Melton		ND	
TN: Oak Ridge/Y12 E	Be-7	32	11
UT: Salt Lake City		ND	
VA: Lynchburg		ND	
WA: Olympia		ND	

Table 6
Specific Gamma in Precipitation
November 2012

Location	Nuclide	pCi/L \pm 2 <i>u</i>	
AL: Montgomery/408	Be-7	28	18
AR: Little Rock		ND	
CA: Richmond		ND	
CO: Denver	Be-7	38	17
CT: Hartford	Be-7	33	19
FL: Jacksonville		ND	
GA: Atlanta		ND	
HI: Honolulu	Be-7	45	23
ID: Idaho Falls		ND	
KS: Kansas City		ND	
MA: Boston	Be-7	81	23
MI: Lansing		ND	
MN: St. Paul	Be-7	29	17
MN: Welch/510		ND	
NC: Charlotte		ND	
NC: Wilmington		ND	
NY: Albany		ND	
NY: Yaphank		ND	
OH: Painesville	Be-7	58	25
OR: Portland		ND	
PA: Harrisburg	Be-7	27	17
TN: Knoxville		ND	
TN: Nashville		ND	
TN: Oak Ridge/K25	Be-7	45	19
TN: Oak Ridge/Melton	Be-7	41	12
TN: Oak Ridge/Y12 E	Be-7	20	18
UT: Salt Lake City		ND	
VA: Lynchburg	K-40	21	13
WA: Olympia		ND	

Table 7
Specific Gamma in Precipitation
December 2012

Location	Nuclide	pCi/L \pm 2u	
AL: Montgomery/408	Be-7	21	14
AZ: Phoenix		ND	
CA: Richmond		ND	
CO: Denver		ND	
CT: Hartford	Be-7	62	20
FL: Jacksonville		ND	
HI: Honolulu		ND	
ID: Idaho Falls		ND	
KS: Kansas City		ND	
MA: Boston	Be-7	70	22
	K-40	9.2	8.8
MI: Lansing	Be-7	23	19
MN: St. Paul		ND	
MN: Welch/510		ND	
NC: Charlotte		ND	
NC: Wilmington	Be-7	35	17
NY: Albany	K-40	12	11
NY: Yaphank		ND	
OR: Portland		ND	
PA: Harrisburg		ND	
TN: Knoxville		ND	
TN: Nashville	Be-7	39	17
TN: Oak Ridge/K25	Be-7	25	18
TN: Oak Ridge/Melton	Be-7	34	18
TN: Oak Ridge/Y12 E	Be-7	33	12
UT: Salt Lake City		ND	
VA: Lynchburg		ND	
WA: Olympia		ND	

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 airborne particulate samplers. Plutonium and uranium results are published in the ERD for the third quarter of the following year.

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.

This page intentionally left blank

2. Drinking Water Program

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

Drinking water data are used to assess trends and anomalies in concentrations. The analysis scheme for RadNet samples is similar to that of EPA's "National Interim Primary Drinking Water Regulations." The analyses include (a) tritium on a quarterly basis; (b) gross alpha, gross beta, 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 on annual composites; (d) iodine-131 on one quarterly sample per year for each station; (e) 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 on annual composites; and (f) strontium-90 on one-fourth of the annual composites on a four year rotating schedule. Composite results are published in the ERD for the third quarter of the following year.

RadNet drinking water data should not be used to monitor compliance with drinking water regulations or for comparisons to those data since different procedures for collection and analysis may be used.

Table 8
Tritium in Drinking Water
October–December 2012

Location	Date Collected	³ H pCi/L ± 2 <i>u</i>
AK: Fairbanks	10/22/12	149 94
AL: Dothan	10/02/12	-49 77
AL: Muscle Shoals	10/11/12	570 110
AL: Scottsboro	10/10/12	295 99
AR: Little Rock	10/03/12	58 82
CA: Richmond	10/02/12	-46 81
CO: Denver	10/09/12	21 88
CT: Hartford	10/01/12	-56 81
FL: Tampa	10/02/12	-103 84
GA: Baxley	10/09/12	-78 81
GA: Savannah	10/15/12	37 89
HI: Honolulu	12/07/12	14 80
IA: Cedar Rapids	11/01/12	-50 77
ID: Boise	10/05/12	-76 77
ID: Idaho Falls	10/04/12	-50 81
IL: Morris	12/03/12	-43 78
IL: W. Chicago	10/15/12	47 81
LA: New Orleans	10/04/12	9 84
MD: Baltimore	10/01/12	-67 81
MD: Conowingo	10/02/12	-25 87
MI: Detroit	11/07/12	82 91
MI: Detroit	11/26/12	50 86
MN: St. Paul	10/02/12	-86 79
MN: Welch	10/02/12	-106 80
MO: Jefferson City	10/04/12	-46 86
MS: Jackson	10/23/12	-52 77
MS: Port Gibson	10/23/12	-56 85
MT: Helena	10/10/12	-44 84
ND: Bismarck	10/02/12	-83 79
NE: Lincoln	10/03/12	-107 80
NJ: Trenton	11/28/12	-32 82
NJ: Waretown	11/27/12	-53 77
NY: Albany	12/17/12	-27 85
NY: New York City	10/10/12	-54 85
NY: Niagara Falls	10/30/12	6 88
OH: Cincinnati	10/02/12	-116 79
OH: Columbus	10/30/12	2 80
OH: E. Liverpool	12/05/12	4 79
OH: Painesville	11/15/12	61 86
OR: Portland	12/28/12	-53 76

Table 8 (continued)
Tritium in Drinking Water
October–December 2012

Location	Date Collected	³ H pCi/L ± 2 <i>u</i>
PA: Columbia	10/05/12	15 89
PA: Harrisburg	10/04/12	-80 80
PA: Philadelphia/Baxter	10/17/12	12 88
PA: Philadelphia/Belmont	10/17/12	-8 87
PA: Philadelphia/Queen	10/17/12	-66 84
PA: Pittsburgh	12/05/12	-23 78
RI: Providence	10/02/12	-47 82
SC: Barnwell	10/10/12	-21 87
SC: Columbia	10/17/12	21 88
SC: Jenkinsville	10/11/12	21 88
SC: Seneca	10/08/12	25 88
TN: Knoxville	10/04/12	-29 87
TN: Oak Ridge/#360	10/02/12	-65 77
TN: Oak Ridge/#371	10/02/12	9 84
TN: Oak Ridge/#4442	10/02/12	-81 80
TN: Oak Ridge/#768	10/02/12	-91 80
TN: Oak Ridge/#772	10/02/12	-48 86
VA: Ashland	11/13/12	1900 170
VA: Lynchburg	10/03/12	-21 87
WA: Richland	10/16/12	70 90
WI: Madison	10/03/12	-40 85

Table 9
Iodine-131 in Drinking Water
January–December 2012

Location	Date Collected	¹³¹ I	
		pCi/L	± 2u
AK: Fairbanks	04/03/12	0.12	0.20
AL: Dothan	04/10/12	0.12	0.15
AL: Montgomery	01/30/12	-0.04	0.12
AL: Muscle Shoals	01/12/12	0.07	0.16
AL: Scottsboro	01/11/12	0.07	0.15
AR: Little Rock	01/06/12	0.14	0.15
CA: Los Angeles	08/14/12	0.28	0.40
CA: Richmond	01/06/12	0.11	0.30
CO: Denver	01/06/12	0.09	0.18
DE: Dover	05/08/12	-0.03	0.12
FL: Tampa	10/02/12	0.20	0.37
GA: Baxley	08/02/12	0.33	0.31
GA: Savannah	10/15/12	-0.02	0.24
HI: Honolulu	12/07/12	0.2	1.6
IA: Cedar Rapids	05/30/12	0.31	0.32
IA: Cedar Rapids	08/01/12	0.07	0.17
ID: Boise	04/04/12	0.05	0.18
ID: Idaho Falls	01/06/12	0.02	0.15
IL: Morris	03/20/12	0.37	0.34
IL: W. Chicago	10/15/12	0.23	0.19
KS: Topeka	01/26/12	-0.02	0.17
LA: New Orleans	03/29/12	0.17	0.26
MD: Baltimore	01/09/12	0.04	0.12
MD: Baltimore	04/02/12	0.16	0.32
MD: Conowingo	04/17/12	-0.06	0.26
MI: Detroit	04/10/12	0.14	0.18
MN: St. Paul	01/10/12	0.13	0.20
MN: St. Paul	04/03/12	0.34	0.46
MN: Welch	01/10/12	0.16	0.18
MN: Welch	10/02/12	0.04	0.17
MO: Jefferson City	01/06/12	0.05	0.13
MS: Jackson	01/11/12	0.03	0.16
MS: Port Gibson	01/11/12	0.01	0.16
MT: Helena	10/10/12	0.16	0.19
ND: Bismarck	10/02/12	0.04	0.35
NE: Lincoln	01/12/12	0.08	0.14
NJ: Trenton	04/10/12	0.28	0.18
NJ: Waretown	09/04/12	0.00	0.28
NM: Santa Fe	05/11/12	0.159	0.099
NY: Albany	01/26/12	-0.05	0.17
NY: New York City	01/09/12	0.06	0.12

Table 9 (continued)
Iodine-131 in Drinking Water
January–December 2012

Location	Date Collected	¹³¹ I	
		pCi/L	± 2u
NY: New York City	10/10/12	-0.03	0.17
NY: Niagara Falls	10/30/12	-0.21	0.36
NY: Syracuse	05/07/12	0.10	0.24
OH: Cincinnati	10/02/12	-0.09	0.20
OH: Columbus	02/03/12	0.13	0.11
OH: E. Liverpool	02/01/12	0.08	0.26
OH: Painesville	07/19/12	0.07	0.36
OH: Toledo	02/08/12	0.38	0.32
OR: Portland	12/28/12	-0.01	0.18
PA: Columbia	04/10/12	0.18	0.18
PA: Harrisburg	04/04/12	0.26	0.19
PA: Philadelphia/Baxter	05/23/12	-0.01	0.29
PA: Philadelphia/Baxter	07/18/12	0.62	0.22
PA: Philadelphia/Baxter	10/17/12	0.74	0.41
PA: Philadelphia/Belmont	05/23/12	0.37	0.28
PA: Philadelphia/Belmont	07/18/12	2.83	0.41
PA: Philadelphia/Belmont	10/17/12	5.46	0.75
PA: Philadelphia/Queen	05/23/12	0.13	0.34
PA: Philadelphia/Queen	07/18/12	3.65	0.45
PA: Philadelphia/Queen	10/17/12	3.28	0.52
PA: Pittsburgh	12/05/12	0.79	0.33
RI: Providence	10/02/12	0.02	0.20
SC: Barnwell	01/25/12	0.29	0.32
SC: Columbia	01/17/12	-0.04	0.15
SC: Jenkinsville	10/11/12	-0.15	0.63
SC: Seneca *	10/08/12	2.2	1.9
TN: Chattanooga	05/18/12	0.06	0.25
TN: Knoxville	10/04/12	0.14	0.29
TN: Oak Ridge/#360	10/02/12	0.13	0.23
TN: Oak Ridge/#371	10/02/12	0.08	0.19
TN: Oak Ridge/#4442	10/02/12	0.15	0.19
TN: Oak Ridge/#768	10/02/12	0.00	0.19
TN: Oak Ridge/#772	10/02/12	0.07	0.41
TX: Austin	01/26/12	0.10	0.25
VA: Ashland	11/13/12	0.14	0.16
VA: Lynchburg	10/03/12	0.17	0.33
WA: Richland	01/10/12	0.21	0.36
WI: Madison	10/03/12	0.50	0.37

*The sample from Seneca, SC, was received at NAREL 15 days after collection. The measurement uncertainty for this sample is large because of the longer-than-usual decay time.

This page intentionally left blank

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.

Milk samples are collected quarterly at each of the sampling sites. 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
October–December 2012

Location	Date Collected	K g/L ± 2u	¹³⁷ Cs pCi/L ± 2u	¹⁴⁰ Ba pCi/L ± 2u	¹³¹ I pCi/L ± 2u
AR: Little Rock	12/13/12	1.59 0.18	ND	ND	ND
AZ: Phoenix	12/19/12	1.70 0.19	ND	ND	ND
CA: Los Angeles	12/18/12	1.66 0.20	ND	ND	ND
CA: San Francisco	10/17/12	1.88 0.22	ND	ND	ND
CT: Hartford	11/19/12	1.72 0.21	ND	ND	ND
DE: Wilmington	10/15/12	1.61 0.20	ND	ND	ND
FL: Plant City	10/16/12	1.66 0.19	ND	ND	ND
HI: Hilo	10/22/12	1.71 0.20	ND	ND	ND
IA: Des Moines	10/22/12	1.63 0.19	ND	ND	ND
KS: Wichita	12/05/12	1.68 0.20	ND	ND	ND
KY: Louisville	10/03/12	1.70 0.20	ND	ND	ND
MA: Boston	12/20/12	1.62 0.20	ND	ND	ND
MD: Baltimore	10/16/12	1.62 0.19	ND	ND	ND
MI: Detroit	10/29/12	1.76 0.20	ND	ND	ND
NJ: Trenton	10/09/12	1.73 0.20	ND	ND	ND
NV: Las Vegas	11/26/12	1.72 0.20	ND	ND	ND
NV: Reno	11/13/12	1.66 0.20	ND	ND	ND
NY: Buffalo	10/29/12	1.64 0.19	ND	ND	ND
NY: Syracuse	11/02/12	1.61 0.20	ND	ND	ND
OH: Cincinnati	12/03/12	1.68 0.19	ND	ND	ND
OR: Portland	12/10/12	1.68 0.20	ND	ND	ND
PA: Pittsburgh	10/16/12	1.57 0.19	ND	ND	ND
TN: Chattanooga	10/03/12	1.68 0.19	ND	ND	ND
TN: Knoxville	10/03/12	1.58 0.19	ND	ND	ND
TN: Memphis	10/15/12	1.62 0.19	ND	ND	ND
TX: Dallas	10/22/12	1.70 0.20	ND	ND	ND
VT: Montpelier	10/22/12	1.70 0.21	ND	ND	ND
WA: Spokane	10/30/12	1.66 0.19	ND	ND	ND
WA: Tacoma	12/17/12	1.63 0.19	ND	ND	ND
WV: Charleston	10/03/12	1.60 0.18	ND	ND	ND

Note: ND = Not detected
NR = No result (not analyzed within 5 half-lives of collection)

For More Information

Environmental Radiation Data (ERD) is published quarterly by the U.S. Environmental Protection Agency's Office of Radiation and Indoor Air.

Requests for information concerning the operation of RadNet and the data that are generated should be directed as follows:

Requests for information concerning the operation of RadNet, the data that are generated, or publication and distribution of ERD should be directed to:

Charles M. Petko
Office of the Director
National Analytical Radiation Environmental Laboratory
540 South Morris Avenue
Montgomery, Alabama 36115-2601
email: petko.charles@epa.gov

Requests for information concerning policies of the Office of Radiation and Indoor Air should be directed to:

Jonathan Edwards
USEPA - ORIA
Radiation Protection Division (MC6608J)
1200 Pennsylvania Ave. N.W.
Washington, DC 20460
email: edwards.jonathan@epa.gov

This page intentionally left blank