United States
Environmental Protection
Agency
Office of Radiation and Indoor Air

National Air and
Radiation Environmental Laboratory
540 South Morris Avenue
Montgomery, AL 36115-2601

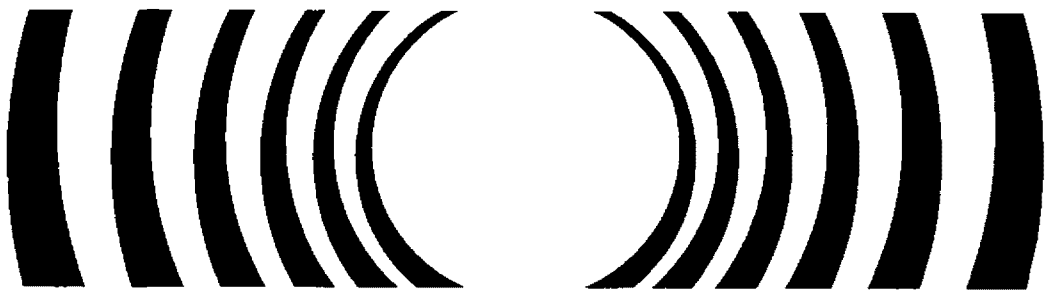
EPA 402-R-93-087
October 1993

Radiation

EPA

Environmental Radiation Data Report 68

October-December 1991



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REPORT 68

October–December 1991

United States Environmental Protection Agency

Office of Radiation and Indoor Air

Preface

Environmental Radiation Data (ERD) is compiled and distributed 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). Data from similar networks operated by contributing States, Canada, Mexico, and the Pan American Health Organization are reported in the ERD when available.

ERAMS was established in 1973 by the United States Environmental Protection Agency. It is comprised of a nationwide network of sampling stations that provide air, surface and drinking water, and milk samples from which environmental radiation levels are derived. The major emphasis for ERAMS is upon identifying trends in the accumulation of long-lived radionuclides in the environment.

Sampling locations are selected to provide optimal population coverage while functioning to monitor fallout from nuclear devices and other forms of radioactive contamination of the environment. The radiation analyses performed on these samples include gross alpha and gross beta levels, gamma analyses for fission products, and specific analyses for uranium, plutonium, strontium, iodine, radium, krypton, and tritium. This monitoring effort also provides ancillary information on natural background levels and on routine and accidental releases into the environment from stationary sources.

The radiochemical procedures used by NAREL to analyze the ERAMS samples are contained in the *Eastern Environmental Radiation Facility Radiochemistry Procedures Manual* (EPA 520/5–84–006). Station operation and sample collection are in accordance with procedures contained in the *ERAMS Manual* (EPA 520/5–84–007, 008, 009).

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Data Reporting Rationale

Frequently, there is little or no radioactivity in environmental media. Thus, the results of laboratory analyses should show a distribution of negative and positive numbers about zero. A negative value occurs when a previously determined background value is subtracted from a sample value that is less than that of the background. From July 1975 to March 1991, ERAMS data were reported as calculated, whether the results were negative, zero, or positive. Since April 1991, negative results have been denoted as "not detectable," or "ND." For gamma analyses only, results less than the 2σ counting error are also denoted as "not detectable."

All data are stored in the NAREL sample database as generated, and these values are available for statistical evaluation. However, caution should be exercised in the use of the data in this report for statistical analysis, since the removal of negative numbers produces a positive bias in the distribution of results.

Reported Error Terms

Each reported value for specific analyses will be accompanied by a counting error term at the 2σ (95%) confidence level. Error terms are therefore reported as counting errors. At the very low levels characteristic of most ERAMS measurements, counting error is the greatest contributor to overall error.

Significant Figures

No more than three significant figures will be reported. A datum that contains more than three figures will be rounded off to three figures.

Reporting Levels

The reporting units, smallest increments for reporting, and typical minimum detectable levels (MDL's) for each isotope are shown in Table 1. MDL is defined as the 3σ error of the background. Reporting increments are sometimes considerably smaller than MDL's to avoid truncation errors in averaging.

Averages

Averages will be calculated along with appropriate error terms in an annual summary and analysis of ERAMS data. In calculating these averages, all values of individual data, including negative numbers, will be utilized. Averages will not be included in ERD quarterly reports.

Table 1

ERAMS Reporting Increments and Minimum Detectable Levels for Radionuclide Analyses

Radionuclide	Media	Reporting Units	Reporting Increments	Minimum Detectable Levels
Gross Alpha	Water	pCi/L	1 pCi/L	2 pCi/L
† Gross Beta	Air	pCi/m^3	0.01 pCi/m^3	0.01 pCi/m^3
	Water	pCi/L	1 pCi/L	1 pCi/L
	Precipitation	nCi/m^2	0.01 nCi/m^2	0.01 nCi/m^2
	(specific radiochemical analyses)			
Tritium	Water	nCi/L	0.1 nCi/L	0.2 nCi/L
	Milk	nCi/L	0.1 nCi/L	0.2 nCi/L
Carbon-14	Milk	pCi/L	1 pCi/L	15 pCi/L
Krypton-85	Ambient Air	pCi/m^3	0.1 pCi/m^3	2 pCi/m^3
†† Plutonium-238,239,240	Air	aCi/m^3	0.1 aCi/m^3	0.015 pCi
	Milk	pCi/L	0.001 pCi/L	0.015 pCi
	Water	pCi/L	0.001 pCi/L	0.015 pCi
‡ Uranium-234,235,238	Air	aCi/m^3	0.1 aCi/m^3	0.015 pCi
	Milk	pCi/L	0.001 pCi/L	0.015 pCi
	Water	pCi/L	0.001 pCi/L	0.015 pCi
Radium-226	Water	pCi/L	0.1 pCi/L	0.1 pCi/L
Strontium-90	Milk	pCi/L	0.1 pCi/L	1 pCi/L
	Water	pCi/L	0.1 pCi/L	1 pCi/L
‡‡ Strontium-89	Milk	pCi/L	1 pCi/L	5 pCi/L
‡‡ Iodine-131	Milk	pCi/L	1 pCi/L	10 pCi/L
	Water	pCi/L	1 pCi/L	10 pCi/L
	Water	pCi/L	0.1 pCi/L	0.4 pCi/L
Iodine-129	Milk	fCi/L	0.1 fCi/L	0.4 fCi/L
Cesium-137	Milk	pCi/L	1 pCi/L	10 pCi/L
	Water	pCi/L	1 pCi/L	10 pCi/L
‡‡ Barium-140	Milk	pCi/L	1 pCi/L	10 pCi/L
	Water	pCi/L	1 pCi/L	10 pCi/L
Potassium	Milk	g/L	0.1 g/L	0.12 g/L
	Water	g/L	0.1 g/L	0.12 g/L
Potassium-40	Water	pCi/L	1 pCi/L	100 pCi/L

† The value of MDL for precipitation in terms of nCi/m^2 would be dependent on precipitation (mm).

†† This value of MDL for air in terms of pCi/m^3 would be dependent on the air volume. Measurement by alpha spectroscopy that includes contributions of plutonium-239 and plutonium-240. MDL for all media given per sample.

‡ This value of MDL for air in terms of pCi/m^3 would be dependent on the air volume. MDL for all media given per sample.

‡‡ Activity as of the day of counting.

1. Air Program

Airborne Particulates and Precipitation

Gross beta radioactivity measurements and certain specific analyses are performed on air particulates and precipitation samples as indicator measurements in assessing the general (national) impact of all contributing sources on environmental levels of radiation.

Airborne particulates are collected continuously at field stations representing wide geographic coverage, including present and potential sources of environmental radioactivity. Sampling sites are located throughout the United States.

Filters (10-cm diameter synthetic fiber) from air samplers are changed twice weekly and field measurements are made with a G-M survey meter† at 5 hours and 29 hours after collection to allow for radon and thoron daughter product 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 analyses in a low background beta counter. Gamma scans are performed on all filters showing gross beta counts greater than $1\,pCi/m^3$. The laboratory obtained values are usually lower than the field estimates due to the decay of naturally occurring radionuclides between the times of the two measurements.

Precipitation samples are collected at those field stations collecting air filters. These samples are also sent to NAREL where they are composited monthly for gamma scans, tritium, and gross beta activity measurements. A composite of the March, April, and May precipitation samples is analyzed for plutonium-238, -239, -240, and uranium-234, -235, and -238.

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

Tables 2–4 contain the data from airborne particulate samples for October–December 1991. Tables 5–7 contain the data from precipitation samples for October–December 1991. Table 8 contains the data from tritium in precipitation samples for October–December 1991 at the selected sites.

† The counts at five hours for the Montgomery, Alabama, station are performed on a low background beta counter.

Table 2

Gross Beta in Airborne Particulates

October 1991

Location	Number of Samples	5-Hour Field Estimate (pCi/m^3)			NAREL Lab Measurement (pCi/m^3)		
		Max	Min	Avg	Max	Min	Avg
AL:Montgomery	3	0.0	0.0	0.0	0.02	0.01	0.01
AR:Little Rock	8	0.6	0.2	0.5	0.01	0.00	0.01
AZ:Phoenix	8	4.0	0.3	1.4	0.03	0.01	0.02
CA:Berkeley	9	0.3	0.0	0.1	0.01	0.00	0.01
CA:Los Angeles	9	1.0	0.3	0.6	0.05	0.02	0.03
CO:Denver	9	1.8	0.4	0.9	0.02	0.01	0.01
CT:Hartford	9	0.2	0.0	0.1	0.02	0.01	0.01
DE:Wilmington	8	0.5	0.0	0.2	0.01	0.01	0.01
FL:Jacksonville	9	0.1	0.0	0.1	0.01	0.00	0.01
FL:Miami	3	0.1	0.0	0.1	0.00	0.00	0.00
HI:Honolulu	10	0.2	0.1	0.1	0.00	0.00	0.00
IA:Iowa City	9	0.6	0.1	0.2	0.02	0.01	0.01
ID:Boise	8	1.1	0.3	0.7	0.03	0.01	0.01
ID:Idaho Falls	8	0.0	0.0	0.0	0.01	0.01	0.01
IL:Chicago	10	1.1	0.2	0.5	0.02	0.01	0.01
IN:Indianapolis	9	0.8	0.0	0.4	0.02	0.01	0.01
KS:Topeka	8	2.3	0.6	1.4	0.02	0.01	0.01
KY:Frankfort	3	0.6	0.5	0.6	0.01	0.01	0.01
LA:New Orleans	9	0.4	0.1	0.1	0.02	0.01	0.01
MA:Lawrence	9	0.1	0.0	0.1	0.01	0.00	0.01
ME:Augusta	8	0.2	0.0	0.1	0.02	0.00	0.01
MI:Lansing	8	0.4	0.1	0.2	0.01	0.00	0.01
MN:Minneapolis	8	0.6	0.1	0.3	0.02	0.00	0.01
MO:Jefferson City	9	1.1	0.2	0.5	0.02	0.01	0.01
MS:Jackson	9	1.0	0.1	0.5	0.02	0.01	0.01
NC:Charlotte	9	0.2	0.1	0.2	0.03	0.01	0.02
NC:Wilmington	10	0.0	0.0	0.0	0.02	0.00	0.01
ND:Bismarck	7	2.8	0.3	1.1	0.02	0.00	0.01
NE:Lincoln	9	2.4	0.1	1.0	0.02	0.01	0.01
NH:Concord	9	0.2	0.1	0.1	0.01	0.00	0.01
NJ:Trenton	9	1.3	0.1	0.6	0.01	0.01	0.01
NM:Santa Fe	8	1.1	0.2	0.6	0.02	0.01	0.01
NV:Las Vegas	9	0.3	0.1	0.2	0.03	0.01	0.02
NY:Albany	5	0.1	0.0	0.1	0.02	0.01	0.01
NY:Niagara Falls	9	0.3	0.1	0.2	0.02	0.01	0.01
NY:Syracuse	1	0.0	0.0	0.0	0.01	0.01	0.01
NY:Yaphank	10	0.2	0.1	0.2	0.01	0.01	0.01

Table 2 (continued)

Gross Beta in Airborne Particulates

October 1991

Location	Number of Samples	5-Hour Field Estimate (pCi/m^3)			NAREL Lab Measurement (pCi/m^3)		
		Max	Min	Avg	Max	Min	Avg
OH:Columbus	6	0.4	0.1	0.2	0.01	0.01	0.01
OH:Painesville	9	0.5	0.1	0.2	0.03	0.01	0.01
OH:Ross	9	0.0	0.0	0.0	0.04	0.01	0.02
OK:Oklahoma City	8	1.1	0.0	0.4	0.02	0.01	0.01
OR:Portland	9	0.0	0.0	0.0	0.03	0.00	0.01
PA:Harrisburg	9	0.9	0.2	0.4	0.02	0.01	0.01
PA:Pittsburgh	8	0.0	0.0	0.0	0.03	0.01	0.01
RI:Providence	9	0.0	0.0	0.0	0.02	0.00	0.01
SC:Barnwell	2	0.1	0.1	0.1	0.01	0.00	0.00
SC:Columbia	10	1.0	0.2	0.4	0.03	0.01	0.02
SD:Pierre	5	0.4	0.3	0.4	0.02	0.01	0.01
TN:Knoxville	7	2.2	0.6	1.1	0.04	0.01	0.02
TN:Nashville	9	2.0	0.1	0.7	0.03	0.01	0.02
TX:Austin	9	0.3	0.1	0.2	0.03	0.00	0.01
TX:El Paso	9	1.4	0.3	0.8	0.03	0.01	0.02
UT:Salt Lake City	9	0.5	0.0	0.3	0.03	0.01	0.02
VA:Lynchburg	9	1.3	0.2	0.9	0.02	0.01	0.01
VA:Virginia Beach	3	0.1	0.1	0.1	0.01	0.01	0.01
WA:Olympia	8	0.4	0.1	0.2	0.01	0.00	0.01
WA:Spokane	9	0.7	0.2	0.4	0.02	0.01	0.02
WI:Madison	8	1.3	0.2	0.4	0.02	0.01	0.01
WV:Charleston	3	0.3	0.2	0.3	0.02	0.01	0.02

Minimum Detectable Limit for field estimates – 0.1 pCi/m^3.

Minimum Detectable Limit for laboratory measurement – 0.01 pCi/m^3.

Table 3

Gross Beta in Airborne Particulates

November 1991

Location	Number of Samples	5-Hour Field Estimate (pCi/m^3)			NAREL Lab Measurement (pCi/m^3)		
		Max	Min	Avg	Max	Min	Avg
AL:Montgomery	1	0.0	0.0	0.0	0.02	0.02	0.02
AR:Little Rock	8	0.4	0.1	0.2	0.03	0.00	0.01
AZ:Phoenix	6	2.8	0.4	1.0	0.03	0.01	0.01
CA:Berkeley	8	0.3	0.1	0.2	0.02	0.00	0.01
CA:Los Angeles	8	1.3	0.4	0.8	0.04	0.01	0.03
CO:Denver	7	2.1	0.1	0.5	0.02	0.00	0.01
CT:Hartford	8	0.1	0.0	0.1	0.02	0.00	0.01
DE:Wilmington	9	0.6	0.0	0.3	0.02	0.00	0.01
FL:Jacksonville	7	0.2	0.0	0.1	0.03	0.01	0.01
HI:Honolulu	6	0.2	0.1	0.1	0.00	0.00	0.00
IA:Iowa City	8	0.5	0.1	0.2	0.02	0.01	0.01
ID:Boise	8	0.6	0.1	0.3	0.02	0.00	0.01
ID:Idaho Falls	9	0.0	0.0	0.0	0.03	0.00	0.01
IL:Chicago	8	1.1	0.1	0.3	0.03	0.01	0.02
IN:Indianapolis	8	0.6	0.0	0.3	0.02	0.01	0.02
KS:Topeka	2	0.3	0.3	0.3	0.02	0.01	0.01
KY:Frankfort	2	0.5	0.1	0.3	0.02	0.01	0.01
LA:New Orleans	7	0.3	0.1	0.1	0.02	0.01	0.01
MA:Lawrence	8	0.2	0.0	0.1	0.02	0.00	0.01
ME:Augusta	8	0.2	0.0	0.1	0.02	0.00	0.01
MI:Lansing	8	0.5	0.0	0.2	0.02	0.01	0.01
MN:Minneapolis	8	0.3	0.0	0.1	0.02	0.01	0.01
MO:Jefferson City	7	0.4	0.2	0.3	0.03	0.01	0.02
MS:Jackson	8	0.4	0.0	0.2	0.02	0.01	0.02
NC:Charlotte	9	0.3	0.0	0.2	0.05	0.01	0.02
NC:Wilmington	6	0.0	0.0	0.0	0.03	0.01	0.01
ND:Bismarck	1	0.1	0.1	0.1	0.02	0.02	0.02
NE:Lincoln	5	0.6	0.0	0.3	0.02	0.01	0.02
NH:Concord	8	0.2	0.0	0.1	0.02	0.00	0.01
NJ:Trenton	8	2.2	0.1	0.6	0.02	0.01	0.01
NM:Santa Fe	9	0.5	0.1	0.4	0.01	0.00	0.01
NV:Las Vegas	8	0.8	0.1	0.4	0.02	0.00	0.01
NY:Albany	4	0.1	0.0	0.1	0.02	0.01	0.01
NY:Niagara Falls	8	0.4	0.1	0.2	0.02	0.01	0.01
NY:Syracuse	1	0.1	0.1	0.1	0.02	0.02	0.02
NY:Yaphank	6	0.4	0.1	0.2	0.01	0.00	0.01
OH:Columbus	6	0.2	0.1	0.1	0.05	0.01	0.02

Table 3 (continued)

Gross Beta in Airborne Particulates

November 1991

Location	Number of Samples	5-Hour Field Estimate (pCi/m^3)			NAREL Lab Measurement (pCi/m^3)		
		Max	Min	Avg	Max	Min	Avg
OH:Painesville	7	0.3	0.1	0.1	0.02	0.01	0.01
OH:Ross	9	0.0	0.0	0.0	0.04	0.01	0.02
OK:Oklahoma City	7	0.6	0.0	0.3	0.03	0.01	0.02
OR:Portland	9	0.0	0.0	0.0	0.03	0.00	0.01
PA:Harrisburg	7	0.8	0.1	0.3	0.03	0.01	0.01
PA:Pittsburgh	9	0.0	0.0	0.0	0.02	0.01	0.01
RI:Providence	7	0.0	0.0	0.0	0.02	0.00	0.01
SC:Barnwell	2	0.1	0.0	0.1	0.02	0.01	0.01
SC:Columbia	7	0.8	0.0	0.4	0.04	0.01	0.02
SD:Pierre	6	0.3	0.1	0.2	0.03	0.01	0.02
TN:Knoxville	6	2.0	0.3	0.7	0.03	0.01	0.02
TN:Nashville	6	1.3	0.1	0.4	0.05	0.01	0.03
TX:Austin	7	0.3	0.1	0.2	0.02	0.00	0.01
TX:El Paso	7	1.3	0.6	0.9	0.02	0.01	0.01
UT:Salt Lake City	7	0.2	0.1	0.1	0.02	0.00	0.01
VA:Lynchburg	7	1.3	0.1	0.6	0.02	0.01	0.01
VA:Virginia Beach	2	0.1	0.1	0.1	0.01	0.01	0.01
WA:Olympia	7	0.1	0.0	0.0	0.01	0.00	0.00
WA:Spokane	8	0.4	0.1	0.2	0.03	0.00	0.01
WI:Madison	9	0.5	0.1	0.2	0.02	0.01	0.01
WV:Charleston	2	0.0	0.0	0.0	0.02	0.01	0.01

Minimum Detectable Limit for field estimates – 0.1 pCi/m^3.

Minimum Detectable Limit for laboratory measurement – 0.01 pCi/m^3.

Table 4

Gross Beta in Airborne Particulates

December 1991

Location	Number of Samples	5-Hour Field Estimate (pCi/m^3)			NAREL Lab Measurement (pCi/m^3)		
		Max	Min	Avg	Max	Min	Avg
AL:Montgomery	8	3.3	0.0	1.0	0.02	0.01	0.01
AR:Little Rock	8	0.3	0.0	0.2	0.01	0.00	0.01
AZ:Phoenix	7	2.1	0.1	0.6	0.02	0.01	0.01
CA:Berkeley	9	0.8	0.1	0.3	0.02	0.00	0.01
CA:Los Angeles	5	1.5	0.1	0.7	0.04	0.01	0.02
CO:Denver	9	0.9	0.2	0.4	0.02	0.01	0.01
CT:Hartford	9	0.1	0.0	0.0	0.01	0.00	0.01
DE:Wilmington	9	0.3	0.0	0.1	0.01	0.01	0.01
FL:Jacksonville	9	0.1	0.0	0.1	0.01	0.00	0.01
FL:Miami	3	0.1	0.0	0.0	0.01	0.00	0.00
HI:Honolulu	8	0.1	0.1	0.1	0.00	0.00	0.00
IA:Iowa City	8	0.2	0.0	0.1	0.02	0.01	0.01
ID:Boise	8	0.6	0.0	0.4	0.04	0.01	0.02
ID:Idaho Falls	9	0.0	0.0	0.0	0.02	0.01	0.01
IL:Chicago	9	0.3	0.1	0.2	0.02	0.01	0.01
IN:Indianapolis	8	0.4	0.0	0.2	0.02	0.01	0.01
KS:Topeka	7	1.2	0.3	0.6	0.02	0.01	0.01
KY:Frankfort	2	0.0	0.0	0.0	0.01	0.01	0.01
LA:New Orleans	8	0.2	0.0	0.1	0.01	0.01	0.01
MA:Lawrence	8	0.1	0.0	0.0	0.01	0.01	0.01
ME:Augusta	8	0.1	0.0	0.0	0.01	0.01	0.01
MI:Lansing	9	0.2	0.0	0.1	0.01	0.01	0.01
MN:Minneapolis	7	0.2	0.0	0.1	0.02	0.01	0.01
MO:Jefferson City	9	0.5	0.1	0.3	0.02	0.01	0.01
MS:Jackson	8	0.2	0.0	0.1	0.02	0.01	0.01
NC:Charlotte	8	0.3	0.1	0.1	0.02	0.00	0.01
NC:Wilmington	9	0.0	0.0	0.0	0.01	0.01	0.01
NE:Lincoln	4	0.3	0.1	0.2	0.01	0.01	0.01
NH:Concord	9	0.1	0.0	0.0	0.01	0.01	0.01
NJ:Trenton	9	0.5	0.1	0.2	0.01	0.00	0.01
NM:Santa Fe	7	0.3	0.1	0.2	0.01	0.01	0.01
NV:Las Vegas	7	0.4	0.0	0.2	0.03	0.01	0.02
NY:Albany	4	0.1	0.0	0.0	0.01	0.01	0.01
NY:Niagara Falls	8	0.1	0.1	0.1	0.02	0.01	0.01
NY:Syracuse	3	0.0	0.0	0.0	0.02	0.01	0.01
NY:Yaphank	6	0.2	0.0	0.1	0.01	0.01	0.01
OH:Columbus	4	0.1	0.0	0.0	0.01	0.01	0.01

Table 4 (continued)

Gross Beta in Airborne Particulates

December 1991

Location	Number of Samples	5-Hour Field Estimate (pCi/m^3)			NAREL Lab Measurement (pCi/m^3)		
		Max	Min	Avg	Max	Min	Avg
OH:Painesville	9	0.1	0.0	0.1	0.01	0.01	0.01
OH:Ross	9	0.0	0.0	0.0	0.02	0.01	0.01
OH:Toledo	5	0.3	0.1	0.2	0.01	0.01	0.01
OK:Oklahoma City	5	0.5	0.0	0.2	0.02	0.01	0.01
OR:Portland	9	0.0	0.0	0.0	0.03	0.00	0.01
PA:Harrisburg	10	0.5	0.0	0.2	0.02	0.01	0.01
PA:Pittsburgh	5	0.0	0.0	0.0	0.02	0.01	0.01
RI:Providence	9	0.0	0.0	0.0	0.02	0.01	0.01
SC:Barnwell	2	0.2	0.0	0.1	0.02	0.01	0.01
SC:Columbia	9	0.5	0.0	0.3	0.03	0.01	0.01
SD:Pierre	5	0.2	0.1	0.2	0.02	0.01	0.01
TN:Knoxville	2	0.5	0.5	0.5	0.01	0.01	0.01
TN:Nashville	8	0.2	0.1	0.1	0.01	0.01	0.01
TX:Austin	8	0.2	0.0	0.1	0.01	0.00	0.01
TX:El Paso	8	2.0	0.1	0.7	0.03	0.00	0.01
UT:Salt Lake City	9	0.4	0.0	0.1	0.03	0.01	0.02
VA:Lynchburg	6	0.6	0.1	0.2	0.01	0.01	0.01
VA:Virginia Beach	3	0.1	0.1	0.1	0.01	0.01	0.01
WA:Olympia	9	0.6	0.0	0.1	0.02	0.00	0.00
WA:Spokane	9	0.2	0.1	0.1	0.04	0.00	0.01
WI:Madison	9	0.2	0.0	0.1	0.02	0.01	0.01

Minimum Detectable Limit for field estimates - 0.1 pCi/m^3.

Minimum Detectable Limit for laboratory measurement - 0.01 pCi/m^3.

Table 5

Gross Beta and Specific Gamma in Precipitation

October 1991

Location	Depth (mm)	Gross Beta Activity nCi/m^2	$\pm 2\sigma$	Specific Gamma Activity pCi/L	$\pm 2\sigma$
AL:Montgomery	6.0	0.01	0.00	ND	
AR:Little Rock	28.0	0.04	0.01	^{7}Be:	28.9±27.3
AZ:Phoenix	30.0	0.04	0.01	ND	
CA:Berkeley	2.2	0.01	0.00	ND	
CO:Denver	8.6	0.03	0.00	^{7}Be:	59.8±53.6
CT:Hartford	52.0	0.06	0.02	^{7}Be:	57.9±25.1
DE:Wilmington	25.0	0.05	0.01	ND	
FL:Jacksonville	132.6	0.14	0.05	^{212}Pb:	9.3±6.1
FL:Miami	192.0	0.12	0.06	ND	
HI:Honolulu	13.0	0.01	0.00	^{214}Bi:	8.3±6.6
ID:Boise	8.0	0.04	0.00	ND	
ID:Idaho Falls	8.0	0.03	0.00	ND	
IL:Chicago	166.0	0.15	0.06	ND	
LA:New Orleans	27.0	0.04	0.01	ND	
ME:Augusta	88.0	0.35	0.05	ND	
MI:Lansing	113.6	0.06	0.04	^{212}Pb:	6.9±5.7
MN:Minneapolis	44.0	0.13	0.02	ND	
MO:Jefferson City	40.0	0.04	0.01	ND	
MS:Jackson	42.0	0.01	0.01	ND	
NC:Charlotte	10.0	0.01	0.00	ND	
NC:Wilmington	85.0	0.09	0.03	ND	
ND:Bismarck	12.0	0.05	0.01	ND	
NH:Concord	85.4	0.38	0.05	^{7}Be:	31.9±26.3
NJ:Trenton	34.4	0.11	0.02	^{7}Be:	67.6±23.1
NY:Albany	60.4	0.13	0.03	^{7}Be:	34.7±24.9
NY:Niagara Falls	12.0	0.03	0.01	^{7}Be:	50.3±45.1
NY:Syracuse	8.0	0.02	0.00	^{7}Be:	28.0±27.0
NY:Yaphank	63.0	0.11	0.03	ND	
OH:Painesville	99.4	0.26	0.05	ND	
OH:Toledo	107.0	0.12	0.04	ND	
OR:Portland	50.0	0.06	0.02	ND	
PA:Harrisburg	95.2	0.12	0.03	ND	
SC:Barnwell	39.6	0.15	0.02	^{214}Pb:	19.7±8.5
SC:Columbia	135.8	0.36	0.06	ND	
TN:Knoxville	17.6	0.04	0.01	^{7}Be:	57.6±27.1
				^{212}Pb:	11.3±6.3
TN:Nashville	65.0	0.03	0.02	ND	

Table 5 (continued)

Gross Beta and Specific Gamma in Precipitation

October 1991

Location	Depth (mm)	Gross Beta Activity nCi/m^2	$\pm 2\sigma$	Specific Gamma Activity pCi/L	$\pm 2\sigma$
TX:Austin	22.0	0.04	0.01	^{214}Pb: 7.2	±6.0
				^{212}Pb: 11.6	±6.0
TX:El Paso	7.0	0.01	0.00	^{7}Be: 34.5	±21.7
				^{212}Pb: 10.5	±6.2
UT:Salt Lake City	35.4	0.07	0.02	ND	
WA:Olympia	49.0	0.05	0.02	^{212}Pb: 11.6	±6.0
WI:Madison	85.6	0.06	0.03	^{7}Be: 23.0	±21.1
				^{214}Bi: 10.7	±6.3

Note: σ = Counting Error. ND = Not Detectable.

Table 6

Gross Beta and Specific Gamma in Precipitation

November 1991

Location	Depth (mm)	Gross Beta Activity nCi/m^2	$\pm 2\sigma$	Specific Gamma Activity pCi/L	$\pm 2\sigma$
AL:Montgomery	73.0	0.04	0.03	ND	
AR:Little Rock	115.0	0.04	0.04	ND	
AZ:Phoenix	18.4	0.01	0.01	ND	
CO:Denver	69.4	0.10	0.03	ND	
CT:Hartford	80.0	0.03	0.03	^{7}Be:	31.2±22.0
				^{214}Bi:	22.5±6.4
				^{212}Pb:	6.6±6.6
DE:Wilmington	13.0	0.09	0.01	^{7}Be:	86.6±35.3
FL:Jacksonville	8.8	0.01	0.00	ND	
FL:Miami	48.6	0.02	0.02	ND	
HI:Honolulu	9.0	0.02	0.00	ND	
ID:Boise	33.0	0.04	0.01	ND	
ID:Idaho Falls	195.6	0.46	0.08	ND	
IL:Chicago	64.8	0.14	0.03	ND	
LA:New Orleans	143.0	0.08	0.05	ND	
ME:Augusta	10.0	0.09	0.01	^{7}Be:	57.1±27.2
				^{212}Pb:	6.0±6.0
				^{214}Pb:	10.0±5.8
MI:Lansing	34.2	0.04	0.01	ND	
MN:Minneapolis	19.0	0.02	0.01	^{7}Be:	40.0±28.7
MO:Jefferson City	66.0	0.22	0.03	ND	
MS:Jackson	8.0	0.00	0.00	ND	
NC:Charlotte	40.0	0.09	0.02	ND	
NC:Wilmington	50.0	0.07	0.02	^{7}Be:	39.6±21.9
ND:Bismarck	22.0	0.05	0.01	ND	
NH:Concord	114.4	0.02	0.04	ND	
NJ:Trenton	46.4	0.05	0.02	ND	
NV:Las Vegas	8.0	0.11	0.01	^{7}Be:	61.7±35.8
NY:Albany	84.0	0.20	0.04	ND	
NY:Niagara Falls	40.0	0.09	0.02	^{7}Be:	56.3±28.6
NY:Syracuse	14.0	0.02	0.01	ND	
NY:Yaphank	12.0	0.04	0.01	ND	
OH:Painesville	96.0	0.52	0.06	^{7}Be:	87.1±38.5
OH:Toledo	42.0	0.06	0.02	^{7}Be:	83.4±29.5
OR:Portland	142.0	0.11	0.05	^{7}Be:	85.3±36.2
PA:Harrisburg	75.2	0.07	0.03	^{7}Be:	59.6±25.0
SC:Barnwell	39.6	0.13	0.02	ND	
SC:Columbia	30.8	0.05	0.01	ND	

Table 6 (continued)

Gross Beta and Specific Gamma in Precipitation

November 1991

Location	Depth (mm)	Gross Beta Activity nCi/m^2	$\pm 2\sigma$	Specific Gamma Activity pCi/L	$\pm 2\sigma$
TN:Knoxville	58.0	0.09	0.02	^{212}Pb: 6.8	6.0
TN:Nashville	29.0	0.04	0.01	ND	
TX:Austin	48.0	0.06	0.02	ND	
UT:Salt Lake City	34.6	0.02	0.01	ND	
VA:Lynchburg	6.0	0.15	0.01	ND	
WA:Olympia	28.4	0.03	0.01	^{214}Pb: 14.8	6.3
				^{7}Be: 36.2	27.3
WI:Madison	111.0	0.22	0.05	^{7}Be: 25.9	23.1

Note: σ = Counting Error. ND = Not Detectable.

Table 7

Gross Beta and Specific Gamma in Precipitation

December 1991

Location	Depth (mm)	Gross Beta Activity nCi/m^2	$\pm 2\sigma$	Specific Gamma Activity pCi/L	$\pm 2\sigma$
AL:Montgomery	59.6	0.01	0.02	ND	
AR:Little Rock	120.0	0.09	0.04	ND	
AZ:Phoenix	31.6	0.01	0.01	ND	
CT:Hartford	68.0	0.19	0.03	^{7}Be: 71.5	±34.9
FL:Jacksonville	8.6	0.01	0.00	ND	
FL:Miami	15.4	0.03	0.01	ND	
HI:Honolulu	40.0	0.04	0.02	ND	
ID:Boise	5.0	0.01	0.00	ND	
ID:Idaho Falls	4.6	0.03	0.00	ND	
IL:Chicago	59.0	0.09	0.02	ND	
LA:New Orleans	93.2	0.09	0.03	^{212}Pb: 7.7	±6.6
MN:Minneapolis	19.0	0.02	0.01	ND	
MO:Jefferson City	32.0	0.02	0.01	ND	
MS:Jackson	42.0	0.02	0.01	ND	
NC:Charlotte	230.0	0.29	0.08	ND	
NC:Wilmington	45.0	0.07	0.02	^{7}Be: 56.8	±25.5
NJ:Trenton	76.0	0.12	0.03	^{7}Be: 64.8	±29.2
NM:Santa Fe	288.0	0.11	0.09	ND	
NV:Las Vegas	4.0	0.08	0.01	ND	
NY:Albany	45.2	0.06	0.02	ND	
NY:Niagara Falls	46.0	0.06	0.02	ND	
NY:Syracuse	8.0	0.00	0.00	ND	
NY:Yaphank	109.0	0.16	0.04	^{7}Be: 60.9	±29.5
OH:Painesville	62.0	0.17	0.03	ND	
OR:Portland	90.6	0.17	0.04	^{7}Be: 48.0	±42.5
PA:Harrisburg	74.8	0.11	0.03	^{7}Be: 34.0	±23.2
SC:Columbia	74.2	0.13	0.03	ND	
TN:Knoxville	109.0	0.07	0.04	ND	
TN:Nashville	64.0	0.03	0.02	ND	
TX:Austin	90.0	0.03	0.03	ND	
TX:El Paso	53.0	0.06	0.02	ND	
UT:Salt Lake City	34.8	0.03	0.01	ND	
VA:Lynchburg	104.0	0.42	0.06	ND	
WA:Olympia	157.4	0.03	0.06	ND	
WI:Madison	53.2	0.03	0.02	^{7}Be: 31.4	±24.8

Note: σ = Counting Error. ND = Not Detectable.

Table 8

Tritium in Precipitation

October–December 1991

Location	October 1991 nCi/L	October 1991 $\pm 2\sigma$	November 1991 nCi/L	November 1991 $\pm 2\sigma$	December 1991 nCi/L	December 1991 $\pm 2\sigma$
AL:Montgomery	0.1	0.2	0.2	0.2	0.1	0.2
AR:Little Rock	0.1	0.2	0.1	0.2	0.1	0.2
AZ:Phoenix	0.1	0.2	0.2	0.2	0.1	0.2
CA:Berkeley	0.1	0.2	NS		NS	
CO:Denver	0.1	0.2	0.2	0.2	NS	
CT:Hartford	0.2	0.2	0.1	0.2	0.2	0.2
DE:Wilmington	0.2	0.2	0.1	0.2	NS	
FL:Jacksonville	0.2	0.2	0.1	0.2	0.1	0.2
FL:Miami	0.3	0.2	0.2	0.2	0.1	0.2
HI:Honolulu	0.1	0.2	0.2	0.2	0.2	0.2
ID:Boise	0.1	0.2	0.1	0.2	0.1	0.2
ID:Idaho Falls	0.1	0.2	0.1	0.2	0.1	0.2
IL:Chicago	0.1	0.2	0.2	0.2	0.1	0.2
LA:New Orleans	0.2	0.2	0.1	0.2	0.1	0.2
ME:Augusta	0.1	0.2	0.1	0.2	NS	
MI:Lansing	0.1	0.2	0.1	0.2	NS	
MN:Minneapolis	0.2	0.2	0.1	0.2	0.2	0.2
MO:Jefferson City	0.2	0.2	0.2	0.2	0.1	0.2
MS:Jackson	0.3	0.2	0.2	0.2	0.1	0.2
NC:Charlotte	0.3	0.2	0.1	0.2	0.2	0.2
NC:Wilmington	0.3	0.2	0.2	0.2	0.2	0.2
ND:Bismarck	0.2	0.2	0.1	0.2	NS	
NH:Concord	0.2	0.2	0.2	0.2	NS	
NJ:Trenton	0.2	0.2	0.2	0.2	0.1	0.2
NM:Santa Fe	NS		NS		0.2	0.2
NV:Las Vegas	NS		0.2	0.2	0.1	0.2
NY:Albany	0.2	0.2	0.3	0.2	0.2	0.2
NY:Niagara Falls	0.2	0.2	0.3	0.2	0.2	0.2
NY:Syracuse	0.2	0.2	0.3	0.2	0.2	0.2
NY:Yaphank	0.2	0.2	0.1	0.2	0.1	0.2
OH:Painesville	0.1	0.2	0.1	0.2	0.2	0.2
OH:Toledo	0.2	0.2	0.1	0.2	NS	
OR:Portland	0.1	0.2	0.1	0.2	0.2	0.2
PA:Harrisburg	0.2	0.2	0.1	0.2	0.2	0.2
SC:Barnwell	0.1	0.2	0.7	0.2	NS	
SC:Columbia	0.4	0.2	0.2	0.2	0.1	0.2
TN:Knoxville	0.1	0.2	0.2	0.2	0.1	0.2
TN:Nashville	0.3	0.2	0.1	0.2	0.2	0.2
TX:Austin	0.2	0.2	0.1	0.2	0.1	0.2
TX:El Paso	0.2	0.2	NS		0.1	0.2

Table 8 (continued)

Tritium in Precipitation

October–December 1991

Location	October 1991 nCi/L	±2σ	November 1991 nCi/L	±2σ	December 1991 nCi/L	±2σ
UT:Salt Lake City	0.1	0.2	0.1	0.2	0.1	0.2
VA:Lynchburg	NS		0.1	0.2	0.1	0.2
WA:Olympia	0.1	0.2	0.2	0.2	0.1	0.2
WI:Madison	0.1	0.2	0.2	0.2	0.2	0.2

Note: σ = Counting Error. NS = No Sample.

Plutonium and Uranium in Airborne Particulates and Precipitation

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

Concentrations of the specific isotopes of plutonium-238, -239, and -240 and uranium-234, -235, and -238 are determined by alpha spectroscopy following chemical separation. The volume of air represented by the semiannual composite ranges from 60,000 to 250,000 cubic meters.

Plutonium and uranium results are published when they become available.

Tables 9–10 contain the plutonium and uranium results for air samples for the period January–December 1991. Table 11 contains the plutonium and uranium in precipitation data for January–June 1991. Values are based upon composites of the March, April, and May samples. Samples from these three months only are analyzed annually because, due to the spring rains, they usually contain the year's highest concentrations of plutonium and uranium.

Table 9

Plutonium and Uranium In Airborne Particulates

January–June 1991 Composites

Location	^{238}Pu aCi/m^3	±2σ	$^{239-240}Pu$ aCi/m^3	±2σ	^{234}U aCi/m^3	±2σ	^{235}U aCi/m^3	±2σ	^{238}U aCi/m^3	±2σ
AL:Montgomery	ND		ND		6.5	0.9	0.4	0.2	4.6	0.7
AR:Little Rock	0.2	0.4	0.2	0.3	22.3	3.3	1.2	0.7	21.5	3.2
AZ:Phoenix	2.2	1.1	1.1	0.7	46.8	4.8	2.3	1.0	38.3	4.2
CA:Berkeley	0.2	0.3	ND		6.1	1.2	0.3	0.3	6.1	1.2
CA:Los Angeles	0.2	0.2	0.1	0.1	12.9	1.8	0.3	0.3	10.7	1.6
CO:Denver	0.9	0.6	0.9	0.6	33.1	3.3	1.5	0.6	27.9	3.0
CT:Hartford	0.7	0.5	0.1	0.2	20.0	2.8	0.7	0.5	21.5	3.0
DE:Wilmington	ND		ND		10.3	1.4	0.3	0.2	8.8	1.2
FL:Jacksonville	ND		0.1	0.2	18.8	2.2	0.6	0.3	17.5	2.1
FL:Miami	0.3	0.4	0.1	0.1	12.6	1.9	0.8	0.4	11.4	1.7
HI:Honolulu	0.1	0.2	0.1	0.1	4.9	0.9	0.2	0.2	3.3	0.7
IA:Iowa City	0.5	0.4	0.1	0.2	19.8	2.6	1.9	0.8	18.9	2.6
ID:Boise	1.3	0.6	0.4	0.4	27.2	2.5	1.2	0.5	25.3	2.3
ID:Idaho Falls	0.4	0.3	0.3	0.2	18.7	1.8	1.0	0.4	16.0	1.7
IL:Chicago	1.0	1.2	0.6	0.7	40.2	6.4	1.8	1.3	41.5	6.4
IN:Indianapolis	0.7	0.8	0.3	0.6	46.3	5.9	1.4	0.9	41.4	5.5
KS:Topeka	0.1	0.2	0.1	0.1	8.0	1.1	0.3	0.2	8.3	1.2
KY:Frankfort	ND		0.1	0.2	6.5	1.2	0.3	0.2	6.1	1.2
LA:New Orleans	0.3	0.3	0.1	0.1	12.3	1.7	0.6	0.4	9.2	1.4
MA:Lawrence	0.1	0.3	ND		15.4	2.1	1.0	0.5	12.3	1.8
ME:Augusta	0.3	0.6	ND		48.6	7.2	1.3	1.2	46.4	6.9
MI:Lansing	0.1	0.2	0.1	0.3	20.7	3.1	1.0	0.6	16.6	2.7
MN:Minneapolis	0.9	0.4	0.2	0.2	21.8	2.1	0.8	0.4	18.3	1.9
MO:Jefferson City	0.7	0.6	0.1	0.4	20.7	3.5	0.8	0.6	18.9	3.2
NC:Charlotte	0.2	0.3	0.1	0.2	15.3	1.9	0.9	0.4	11.9	1.7
NC:Wilmington	ND		0.3	0.3	12.5	1.7	0.5	0.3	9.4	1.4
ND:Bismarck	ND		0.1	0.2	21.2	3.1	0.3	0.4	19.4	2.9
NE:Lincoln	0.4	0.4	0.2	0.2	14.5	2.2	0.6	0.4	13.5	2.1
NH:Concord	ND		ND		17.1	2.5	1.0	0.5	12.9	2.0
NJ:Trenton	0.3	0.5	0.1	0.3	17.5	2.8	0.6	0.5	13.2	2.3
NM:Santa Fe	0.5	0.8	0.5	0.5	19.6	2.9	ND		17.2	2.7
NV:Las Vegas	16.1	3.3	0.6	0.7	100	9	5.3	1.7	60.8	6.2
NY:Albany	ND		0.1	0.2	22.5	3.0	1.2	0.6	23.2	3.0
NY:New York City	0.3	0.6	0.3	0.4	29.6	4.1	1.9	0.9	25.6	3.9
NY:Niagara Falls	0.4	0.5	0.3	0.4	33.9	4.4	2.1	0.9	31.7	4.1
NY:Syracuse	0.8	0.7	0.1	0.3	17.0	2.8	0.7	0.5	14.4	2.6
NY:Yaphank	0.2	0.3	0.1	0.3	16.1	2.4	0.5	0.4	16.7	2.4

Table 9 (continued)

Plutonium and Uranium In Airborne Particulates

January–June 1991 Composites

Location	^{238}Pu aCi/m^3	$\pm 2\sigma$	$^{239-240}Pu$ aCi/m^3	$\pm 2\sigma$	^{234}U aCi/m^3	$\pm 2\sigma$	^{235}U aCi/m^3	$\pm 2\sigma$	^{238}U aCi/m^3	$\pm 2\sigma$
OH:Columbus	0.1	0.2	ND		13.3	1.6	0.5	0.3	12.1	1.5
OH:Painesville	ND		ND		16.1	2.8	0.5	0.4	12.2	2.3
OH:Ross	1.8	0.8	0.2	0.3	45.3	5.3	2.7	1.2	39.8	5.0
OH:Toledo	0.5	0.5	0.2	0.3	24.5	3.1	1.2	0.6	24.0	3.1
OK:Oklahoma City	0.2	0.2	0.1	0.1	10.9	1.6	0.2	0.2	9.6	1.4
OR:Portland	0.2	0.3	ND		9.1	1.5	0.3	0.3	8.5	1.4
PA:Harrisburg	0.3	0.5	0.2	0.3	20.4	3.0	0.9	0.5	18.3	2.8
PA:Pittsburgh	ND		0.1	0.1	25.9	2.9	1.0	0.4	24.9	2.8
RI:Providence	0.7	0.8	0.1	0.5	28.8	3.6	1.0	0.7	24.3	3.3
SC:Barnwell	0.4	0.8	ND		17.6	3.4	0.9	0.9	16.9	3.2
SC:Columbia	0.3	0.3	0.1	0.2	27.6	2.7	1.3	0.4	25.4	2.5
SD:Pierre	ND		0.3	0.4	17.4	2.7	0.9	0.6	14.2	2.3
TN:Knoxville	0.2	0.4	0.5	0.4	26.2	3.3	1.1	0.6	21.8	3.0
TN:Nashville	ND		0.2	0.2	18.0	2.2	0.8	0.4	16.7	2.1
TX:Austin	0.2	0.3	0.1	0.2	11.3	1.8	0.6	0.4	9.3	1.6
TX:El Paso	ND		ND		78.2	11.4	3.5	2.2	67.8	10.3
UT:Salt Lake City	0.4	0.5	0.6	0.5	26.2	3.4	0.6	0.5	25.3	3.3
VA:Lynchburg	ND		0.1	0.2	230	16	6.3	1.0	13.0	1.6
VA:Virginia Beach	0.3	0.5	0.1	0.4	24.3	3.4	0.8	0.6	19.2	3.0
WA:Olympia	0.3	0.2	0.2	0.2	5.7	0.8	1.1	0.3	3.9	0.6
WA:Spokane	0.4	0.5	0.3	0.4	26.4	3.5	0.8	0.5	20.9	3.0
WI:Madison	ND		0.2	0.3	23.6	3.1	1.1	0.6	26.1	3.4
WV:Charleston	ND		0.3	0.3	20.8	2.6	1.0	0.5	20.9	2.6

Note: σ = Counting Error. NA = No Analysis. ND = Not Detectable.

Table 10

Plutonium and Uranium In Airborne Particulates

July–December 1991 Composites

Location	^{238}Pu		$^{239-240}Pu$		^{234}U		^{235}U		^{238}U	
	aCi/m^3	$\pm 2\sigma$	aCi/m^3	$\pm 2\sigma$	aCi/m^3	$\pm 2\sigma$	aCi/m^3	$\pm 2\sigma$	aCi/m^3	$\pm 2\sigma$
AL:Montgomery	0.6	0.3	ND		17.5	1.9	1.0	0.4	14.9	1.7
AR:Little Rock	0.4	0.7	0.6	0.5	24.9	2.3	1.3	0.5	20.9	2.0
AZ:Phoenix	0.5	0.6	0.9	0.7	38.7	5.4	1.3	0.9	30.5	4.7
CA:Berkeley	0.2	0.3	0.2	0.2	8.6	1.2	0.4	0.3	8.6	1.3
CA:Los Angeles	0.3	0.2	0.1	0.2	16.1	1.9	0.6	0.3	15.3	1.8
CO:Denver	0.2	0.4	0.6	0.5	18.8	2.0	0.7	0.3	17.8	1.9
CT:Hartford	0.2	0.2	ND		7.0	1.2	0.5	0.3	6.7	1.1
DE:Wilmington	0.2	0.3	ND		8.9	1.6	0.2	0.2	5.6	1.2
FL:Jacksonville	0.3	0.2	ND		18.9	2.1	0.8	0.4	17.2	2.0
FL:Miami	0.3	0.3	ND		16.2	2.2	0.9	0.6	12.2	1.9
HI:Honolulu	0.2	0.3	ND		5.8	1.0	0.6	0.3	4.2	0.8
IA:Iowa City	0.3	0.5	0.1	0.3	28.3	3.8	1.2	0.7	26.1	3.6
ID:Boise	0.8	1.0	0.1	0.4	46.2	6.1	2.5	1.3	36.6	5.2
ID:Idaho Falls	ND		0.2	0.3	23.0	3.2	0.9	0.6	20.1	2.9
IL:Chicago	0.4	0.6	0.2	0.4	34.3	4.6	1.1	0.8	31.6	4.4
IN:Indianapolis	0.6	0.5	0.1	0.4	32.5	4.1	1.6	0.9	31.0	3.9
KS:Topeka	0.5	0.3	0.1	0.2	17.6	2.0	0.9	0.4	17.1	1.9
KY:Frankfort	0.2	0.2	0.1	0.2	12.1	1.8	0.7	0.4	11.0	1.7
LA:New Orleans	0.1	0.1	0.1	0.1	7.1	0.9	0.1	0.1	7.8	0.9
MA:Lawrence	0.2	0.1	0.1	0.1	11.8	1.6	0.4	0.3	11.7	1.5
ME:Augusta	0.2	0.2	0.1	0.1	11.4	1.4	0.8	0.4	8.4	1.2
MI:Lansing	0.2	0.2	ND		15.5	1.7	0.6	0.3	13.0	1.5
MN:Minneapolis	0.2	0.2	0.1	0.2	15.9	1.8	0.6	0.3	16.3	1.8
MO:Jefferson City	0.3	0.2	0.2	0.1	15.8	1.9	0.8	0.4	15.8	1.9
MS:Jackson	0.5	0.2	ND		12.7	1.6	0.6	0.3	12.5	1.6
NC:Charlotte	0.4	0.2	0.4	0.2	15.8	1.9	1.0	0.4	15.5	1.8
NC:Wilmington	0.1	0.2	0.2	0.2	8.0	1.2	0.2	0.2	7.9	1.2
ND:Bismarck	0.3	0.2	0.6	0.4	23.9	2.6	0.8	0.5	22.1	2.5
NE:Lincoln	0.6	0.4	ND		30.3	4.1	1.0	0.8	29.4	4.1
NH:Concord	0.2	0.1	0.1	0.1	9.4	1.3	0.4	0.3	8.0	1.2
NJ:Trenton	0.3	0.2	ND		11.2	1.6	0.4	0.3	11.7	1.7
NM:Santa Fe	ND		0.2	0.2	13.5	1.8	0.5	0.3	13.5	1.8
NV:Las Vegas	0.8	0.7	0.4	0.4	81.8	7.7	3.1	1.2	54.5	6.0
NY:Albany	0.3	0.2	0.1	0.1	13.5	2.0	0.8	0.5	14.2	2.0
NY:Niagara Falls	0.3	0.3	0.1	0.1	38.7	3.2	1.7	0.6	40.3	3.3
NY:Syracuse	ND		0.2	0.2	13.3	1.8	0.8	0.5	13.8	2.0
NY:Yaphank	0.3	0.2	0.1	0.2	7.8	1.2	0.3	0.2	7.1	1.1

Table 10 (continued)

Plutonium and Uranium In Airborne Particulates

July–December 1991 Composites

Location	^{238}Pu aCi/m^3	$\pm 2\sigma$	$^{239-240}Pu$ aCi/m^3	$\pm 2\sigma$	^{234}U aCi/m^3	$\pm 2\sigma$	^{235}U aCi/m^3	$\pm 2\sigma$	^{238}U aCi/m^3	$\pm 2\sigma$
OH:Columbus	0.4	0.2	ND		21.5	2.3	0.5	0.3	13.7	1.7
OH:Painesville	0.4	0.3	0.1	0.2	11.9	1.6	0.6	0.3	11.2	1.5
OH:Ross	0.5	0.7	ND		34.3	4.7	1.9	0.9	41.1	5.2
OH:Toledo	0.4	0.6	8.2	1.8	20.1	3.6	1.1	0.7	22.0	3.8
OK:Oklahoma City	0.4	0.3	ND		20.4	2.4	0.2	0.2	18.8	2.3
OR:Portland	0.9	0.7	0.2	0.4	14.4	2.4	0.6	0.5	14.1	2.4
PA:Harrisburg	0.2	0.1	0.1	0.1	10.8	1.3	0.5	0.2	10.2	1.2
PA:Pittsburgh	0.5	0.2	0.1	0.1	15.7	2.3	0.8	0.5	13.8	2.1
RI:Providence	ND		ND		16.2	2.2	1.1	0.5	12.6	1.9
SC:Barnwell	0.3	0.2	0.5	0.3	15.4	1.9	0.8	0.4	13.3	1.7
SC:Columbia	0.6	0.4	0.1	0.1	26.8	2.5	1.3	0.4	26.4	2.5
SD:Pierre	0.3	0.2	0.2	0.2	13.4	1.7	0.8	0.5	10.7	1.6
TN:Knoxville	0.4	0.2	ND		24.1	3.2	0.9	0.6	18.9	2.8
TN:Nashville	0.5	0.3	0.2	0.3	17.4	2.3	0.8	0.4	17.6	2.3
TX:Austin	0.1	0.2	0.2	0.2	12.2	1.5	0.3	0.3	10.4	1.5
TX:El Paso	0.5	0.7	ND		51.2	6.2	2.5	1.1	38.0	5.0
UT:Salt Lake City	0.5	0.4	0.2	0.2	16.7	1.7	3.2	0.7	11.3	1.4
VA:Lynchburg	3.9	1.4	0.1	0.3	281	21	7.0	1.7	25.2	3.4
VA:Virginia Beach	0.2	0.2	0.1	0.1	13.7	1.7	0.8	0.4	12.8	1.7
WA:Olympia	ND		ND		5.2	1.0	0.2	0.2	4.2	0.9
WA:Spokane	0.2	0.4	0.4	0.4	33.4	3.8	1.1	0.8	25.9	3.4
WI:Madison	0.1	0.1	0.1	0.2	15.7	1.9	0.6	0.3	15.1	1.9
WV:Charleston	0.3	0.4	ND		20.7	3.0	1.0	0.6	16.1	2.6

Note: σ = Counting Error. NA = No Analysis. ND = Not Detectable.

Table 11

Plutonium and Uranium Analyses
Selected Precipitation Composite Samples

January–June 1991

Location	^{238}Pu		$^{239-240}Pu$		^{234}U		^{235}U		^{238}U	
	pCi/L	$\pm 2\sigma$	pCi/L	$\pm 2\sigma$	pCi/L	$\pm 2\sigma$	pCi/L	$\pm 2\sigma$	pCi/L	$\pm 2\sigma$
AL:Montgomery	ND		ND		0.062	0.021	0.006	0.006	0.029	0.014
AR:Little Rock	ND		ND		0.085	0.029	0.009	0.008	0.026	0.014
AZ:Phoenix	ND		ND		0.130	0.050	0.030	0.022	0.080	0.038
CA:Berkeley	ND		0.006	0.007	0.169	0.044	0.005	0.007	0.043	0.021
CO:Denver	ND		ND		0.065	0.022	0.008	0.007	0.023	0.011
CT:Hartford	ND		0.003	0.006	0.030	0.026	0.002	0.006	0.018	0.011
DE:Wilmington	0.001	0.002	0.001	0.002	0.076	0.023	0.003	0.004	0.023	0.011
FL:Jacksonville	0.002	0.003	ND		0.066	0.021	ND		0.003	0.004
FL:Miami	ND		0.001	0.002	0.071	0.026	0.003	0.004	0.025	0.012
HI:Honolulu	ND		ND		0.080	0.041	ND		0.053	0.030
ID:Boise	ND		ND		0.071	0.029	0.002	0.004	0.041	0.019
ID:Idaho Falls	0.001	0.006	ND		0.071	0.023	0.007	0.007	0.029	0.016
IL:Chicago	ND		ND		0.072	0.021	0.013	0.008	0.023	0.012
LA:New Orleans	ND		0.001	0.002	0.032	0.015	0.003	0.004	0.021	0.013
ME:Augusta	ND		0.002	0.004	0.106	0.038	0.006	0.009	0.057	0.029
MI:Lansing	ND		0.002	0.005	0.021	0.014	0.011	0.010	0.009	0.011
MN:Minneapolis	0.001	0.004	ND		0.081	0.023	0.001	0.003	0.021	0.012
MO:Jefferson City	0.001	0.003	ND		0.085	0.031	ND		0.008	0.017
MS:Jackson	ND		0.001	0.002	0.088	0.024	0.006	0.006	0.025	0.012
NC:Charlotte	ND		0.002	0.003	0.036	0.016	0.007	0.008	0.015	0.009
NC:Wilmington	ND		ND		0.071	0.023	0.004	0.005	0.023	0.014
ND:Bismarck	0.001	0.002	0.001	0.002	0.042	0.020	0.007	0.007	0.020	0.011
NH:Concord	0.002	0.003	0.003	0.004	0.086	0.025	ND		0.030	0.014
NJ:Trenton	0.003	0.003	ND		0.079	0.025	0.003	0.005	0.012	0.009
NM:Santa Fe	0.002	0.005	0.002	0.005	0.156	0.049	0.006	0.009	0.028	0.022
NV:Las Vegas	ND		ND		0.113	0.028	0.005	0.011	0.044	0.023
NY:Albany	ND		ND		0.068	0.021	0.002	0.003	0.027	0.013
NY:New York City	ND		ND		0.086	0.026	0.002	0.004	0.047	0.019
NY:Niagara Falls	ND		0.002	0.003	0.055	0.020	0.015	0.011	0.017	0.011
NY:Syracuse	ND		ND		0.096	0.036	ND		0.038	0.021
NY:Yaphank	0.003	0.004	ND		0.077	0.026	0.002	0.004	0.018	0.012
OH:Painesville	0.002	0.005	0.001	0.002	0.044	0.023	0.003	0.009	0.003	0.009
OH:Toledo	ND		ND		0.090	0.029	0.004	0.008	0.016	0.011
OR:Portland	ND		ND		0.055	0.021	0.008	0.008	0.030	0.017
PA:Harrisburg	0.001	0.002	ND		0.063	0.020	0.001	0.003	0.024	0.012
RI:Providence	ND		ND		0.112	0.029	ND		0.029	0.013
SC:Barnwell	ND		ND		0.074	0.025	0.022	0.013	0.018	0.011

Table 11 (continued)

Plutonium and Uranium Analyses
Selected Precipitation Composite Samples

January–June 1991

Location	^{238}Pu		$^{239-240}Pu$		^{234}U		^{235}U		^{238}U	
	pCi/L	$\pm 2\sigma$	pCi/L	$\pm 2\sigma$	pCi/L	$\pm 2\sigma$	pCi/L	$\pm 2\sigma$	pCi/L	$\pm 2\sigma$
SC:Columbia	ND		0.001	0.003	0.065	0.021	0.001	0.005	0.028	0.013
TN:Knoxville	0.001	0.007	ND		0.068	0.026	0.004	0.005	0.020	0.013
TN:Nashville	0.002	0.003	0.001	0.002	0.074	0.021	0.010	0.008	0.015	0.009
TX:Austin	0.001	0.002	ND		0.083	0.027	ND		0.031	0.016
TX:El Paso	ND		ND		0.183	0.053	0.007	0.009	0.105	0.039
UT:Salt Lake City	0.001	0.002	0.003	0.004	0.048	0.022	0.007	0.006	0.043	0.016
VA:Lynchburg	0.001	0.004	ND		0.095	0.025	0.011	0.008	0.026	0.012
WA:Olympia	ND		0.003	0.004	0.099	0.030	0.002	0.003	0.029	0.014
WI:Madison	0.002	0.003	ND		0.069	0.024	0.002	0.004	0.028	0.015
WV:Charleston	ND		ND		0.053	0.019	0.004	0.005	0.018	0.010

Note: σ = Counting Error. NA = No Analysis. ND = Not Detectable.

Krypton-85

Krypton-85 is a long-lived noble gas with a half-life of 10.8 years. It is released into the atmosphere by nuclear reactor operations, fuel reprocessing, weapons tests, and research and defense related activities. Krypton-85 also occurs naturally in minor quantities primarily from the neutron capture of stable krypton-84 as well as spontaneous fission and neutron-induced fission of uranium. Krypton-85 in the atmosphere has been monitored to identify and establish baseline levels and long-term trends.

Krypton-85 analysis began in January 1973 with sample collections and analyses being performed for 12 sampling locations. These locations were selected to provide atmospheric coverage of the United States with considerations being given to the proximity to fuel reprocessing plants, nuclear reactors, and wide geographic coverage.

Dry compressed air samples, collected at each location, are purchased from commercial air suppliers and shipped to the NAREL, where the krypton-85 is cryogenically separated and counted in a liquid scintillation system.

The last Kr-85 results were for 1976, 1977, and 1979. They were published in *Environmental Radiation Data: Report 30.*

2. Water Program

The ERAMS water program provides data on ambient radiation levels in the nation's rivers, streams, and drinking water supplies.

Surface Water

Quarterly grab samples are taken downstream from operating or future nuclear facilities at 58 stations. Surface water samples are analyzed for tritium quarterly and specific gamma activity annually. Tritium is a primary radioactive pollutant from nuclear power plants and weapons production activities. Tritium concentrations are determined by liquid scintillation counting of distilled samples. Gamma scans are performed annually to determine levels of gamma emitting radionuclides.

Table 12 contains the tritium concentration data for October–December 1991. Table 13 contains the surface water annual gamma results for January–December 1991.

Table 12

Tritium in Surface Water

October–December 1991

Location	Source	Date Collected	^3H nCi/L	$\pm 2\sigma$
AL:Decatur	Tennessee River	10/08/91	0.1	0.2
AL:Gordon	Chattahoochee River	10/16/91	0.1	0.2
AL:Scottsboro	Tennessee River	10/08/91	0.2	0.2
AR:Little Rock	Arkansas River	10/07/91	0.3	0.2
CA:Clay Station	Folsom S. Canal	10/18/91	0.2	0.2
CA:Diablo Canyon	Pacific Ocean	12/31/91	0.1	0.2
CA:Eureka	Humboldt Bay	10/10/91	0.1	0.2
CA:San Onofre	Pacific Ocean	12/06/91	0.1	0.2
CO:Platteville	South Platte River	10/09/91	0.2	0.2
CT:East Haddam	Connecticut River	10/10/91	0.2	0.2
CT:Waterford	Long Island Sound	10/10/91	0.2	0.2
FL:Crystal River	Gulf Of Mexico	10/09/91	0.2	0.2
FL:Ft. Pierce	Atlantic Ocean	10/08/91	0.1	0.2
FL:Homestead	Biscayne Bay	10/14/91	0.1	0.2
GA:Baxley	Altamaha River	10/09/91	0.2	0.2
IA:Cedar Rapids	Cedar River	10/15/91	0.2	0.2
IL:E. Moline	Mississippi River	10/08/91	0.1	0.2
IL:Morris	Illinois River	10/23/91	0.3	0.2
IL:Zion	Lake Michigan	12/31/91	0.2	0.2
KS:Leroy	Neosho River	10/07/91	0.1	0.2
LA:New Orleans	Mississippi River	10/22/91	0.2	0.2
MA:Plymouth	Cape Cod Bay	10/09/91	0.1	0.2
MD:Conowingo	Susquehanna River	10/08/91	0.1	0.2
MD:Lusby	Chesapeake Bay	10/15/91	0.2	0.2
ME:Wiscasset	Montseway Bay	10/29/91	0.3	0.2
MI:Bridgman	Lake Michigan	10/15/91	0.3	0.2
MI:Monroe	Lake Erie	10/19/91	0.2	0.2
MI:South Haven	Lake Michigan	10/20/91	0.2	0.2
MN:Monticello	Mississippi River	10/08/91	0.1	0.2
MN:Red Wing	Mississippi River	11/13/91	0.2	0.2
MS:Port Gibson	Mississippi River	10/08/91	0.1	0.2
NC:Charlotte	Catawba River	10/08/91	0.6	0.2
NC:Southport	Atlantic Ocean	10/10/91	0.2	0.2
NE:Rulo	Missouri River	10/02/91	0.2	0.2
NJ:Bayside	Delaware River	10/15/91	0.2	0.2
NJ:Oyster Creek	Oyster Creek	10/23/91	0.1	0.2
NV:Boulder City	Colorado River	10/09/91	0.1	0.2

Table 12 (continued)

Tritium in Surface Water

October–December 1991

Location	Source	Date Collected	^3H nCi/L	$\pm 2\sigma$
NY:Chelsea	Hudson River	10/21/91	0.2	0.2
NY:Ossining	Hudson River	10/11/91	0.4	0.2
NY:Oswego	Lake Ontario	12/13/91	0.5	0.2
NY:Oswego	Lake Ontario	10/23/91	0.2	0.2
OH:Toledo	Lake Erie	10/07/91	0.2	0.2
OR:Bradwood	Columbia River	10/28/91	0.1	0.2
PA:Danville	Susquehanna River	10/09/91	0.2	0.2
PA:Philadelphia	Schuylkill River	10/30/91	0.2	0.2
PA:Philadelphia	Delaware River	10/30/91	0.2	0.2
PA:Philadelphia	Schuylkill River	10/30/91	0.2	0.2
SC:Allendale	Savannah River	10/29/91	2.6	0.2
SC:Broad River	Broad River	10/22/91	0.3	0.2
SC:Hartsville	Lake Robinson	10/14/91	3.6	0.2
TN:Kingston	Clinch River	10/01/91	0.2	0.2
TX:El Paso	Rio Grande	10/11/91	0.2	0.2
TX:Matagorda	Colorado River	10/16/91	0.2	0.2
VA:Doswell	North Anna River	10/10/91	4.3	0.2
VA:Newport News	James River	10/23/91	0.2	0.2
VT:Vernon	Connecticut River	10/23/91	0.1	0.2
WA:Northport	Columbia River	11/13/91	0.2	0.2
WA:Richland	Columbia River	11/19/91	0.2	0.2
WI:Two Creeks	Lake Michigan	10/07/91	0.3	0.2
WI:Victory	Mississippi River	10/07/91	0.2	0.2
WV:Wheeling	Ohio River	10/15/91	0.3	0.2

Note: σ = Counting Error.

Table 13

Surface Water
Annual Gamma Analysis

January–December 1991

Location	Source	Date Collected	Specific Gamma Activity pCi/L $\pm 2\sigma$
AL:Decatur	Tennessee River	04/04/91	ND
AL:Gordon	Chattahoochee River	04/11/91	ND
AL:Scottsboro	Tennessee River	04/05/91	^{212}Pb: 10.7±5.4
			^{214}Bi: 15.8±6.7
AR:Little Rock	Arkansas River	04/18/91	^{212}Pb: 8.8±5.3
CA:Clay Station	Folsom S. Canal	04/18/91	ND
CA:Diablo Canyon	Pacific Ocean	05/15/91	ND
CA:Eureka	Humboldt Bay	04/11/91	^{40}K: 325±48
CO:Platteville	South Platte River	04/05/91	ND
CT:East Haddam	Connecticut River	04/08/91	ND
CT:Waterford	Long Island Sound	04/08/91	^{40}K: 319±50
FL:Crystal River	Gulf Of Mexico	04/15/91	ND
FL:Ft. Pierce	Atlantic Ocean	04/09/91	^{214}Pb: 18.5±7.8
			^{214}Bi: 16.0±9.2
FL:Homestead	Biscayne Bay	04/04/91	^{40}K: 324±76
			^{212}Pb: 8.1±6.4
IA:Cedar Rapids	Cedar River	04/18/91	ND
IL:E. Moline	Mississippi River	04/23/91	^{214}Pb: 10.8±4.1
			^{214}Bi: 18.6±5.3
IL:Morris	Illinois River	04/02/91	^{214}Bi: 34.3±6.2
			^{212}Pb: 6.7±4.5
			^{214}Pb: 22.5±5.1
KS:Leroy	Neosho River	04/03/91	^{214}Bi: 33.3±8.3
			^{214}Pb: 26.6±7.7
LA:New Orleans	Mississippi River	04/04/91	^{214}Pb: 15.1±7.8
MA:Plymouth	Cape Cod Bay	04/17/91	^{214}Pb: 51.0±7.8
			^{214}Bi: 74.2±9.3
MD:Conowingo	Susquehanna River	04/16/91	ND
MD:Lusby	Chesapeake Bay	04/08/91	^{40}K: 49.8±49.2
			^{214}Pb: 22.9±8.1
ME:Wiscasset	Montseway Bay	04/09/91	^{40}K: 77.9±34.6
			^{214}Bi: 24.7±5.3
			^{214}Pb: 10.8±5.1
MI:Bridgman	Lake Michigan	04/05/91	^{214}Pb: 6.9±4.4
MI:Charlevoix	Lake Michigan	04/08/91	^{40}K: 41.5±30.8
MI:Monroe	Lake Erie	04/08/91	^{40}K: 63.7±55.8

Table 13 (continued)

Surface Water
Annual Gamma Analysis

January–December 1991

Location	Source	Date Collected	Specific Gamma Activity pCi/L $\pm 2\sigma$
MI:South Haven	Lake Michigan	04/07/91	^{214}Bi: 74.4±12.4
			^{214}Pb: 43.4±10.5
MN:Monticello	Mississippi River	04/23/91	^{214}Pb: 23.8±7.7
			^{214}Bi: 42.5±8.4
			^{212}Pb: 6.2±6.0
MN:Red Wing	Mississippi River	05/13/91	^{214}Pb: 45.5±9.2
			^{212}Pb: 12.8±7.1
			^{214}Bi: 64.7±10.4
MS:Port Gibson	Mississippi River	04/09/91	^{214}Pb: 7.1±4.5
			^{214}Bi: 22.6±6.1
NC:Charlotte	Catawba River	07/02/91	ND
NC:Southport	Atlantic Ocean	04/10/91	^{40}K: 64.4±51.0
			^{212}Pb: 12.0±7.6
NE:Rulo	Missouri River	04/02/91	^{214}Pb: 12.3±4.5
			^{214}Bi: 23.8±5.4
NJ:Bayside	Delaware River	04/16/91	^{40}K: 55.7±43.3
NJ:Oyster Creek	Oyster Creek	04/17/91	^{212}Pb: 5.7±4.5
			^{214}Bi: 41.1±5.8
			^{214}Pb: 24.9±4.8
			^{40}K: 161±38
NV:Boulder City	Colorado River	05/03/91	^{212}Pb: 6.7±5.3
NY:Chelsea	Hudson River	04/08/91	^{214}Pb: 6.7±5.2
NY:Ossining	Hudson River	04/29/91	ND
NY:Oswego	Lake Ontario	06/19/91	ND
OH:Toledo	Lake Erie	04/04/91	ND
OR:Bradwood	Columbia River	05/30/91	ND
PA:Danville	Susquehanna River	04/17/91	ND
PA:Philadelphia	Delaware River	04/23/91	ND
PA:Philadelphia	Schuylkill R.-Queen	04/23/91	ND
PA:Philadelphia	Schuylkill R.-Belmont	04/23/91	ND
SC:Allendale	Savannah River	04/30/91	^{214}Bi: 12.9±7.9
SC:Broad River	Broad River	04/25/91	^{214}Pb: 7.1±4.4
SC:Hartsville	Lake Robinson	04/15/91	^{214}Pb: 8.9±5.2
			^{214}Bi: 22.9±5.7
TN:Daisy	Tennessee River	04/16/91	^{212}Pb: 6.8±5.4
TN:Kingston	Clinch River	04/08/91	^{214}Pb: 6.5±5.1

Table 13 (continued)

Surface Water
Annual Gamma Analysis

January–December 1991

Location	Source	Date Collected	Specific Gamma Activity pCi/L $\pm 2\sigma$
TX:El Paso	Rio Grande	06/04/91	^{214}Bi: 36.1±7.1
			^{212}Pb: 13.9±5.5
			^{214}Pb: 19.3±6.2
TX:Matagorda	Colorado River	04/16/91	^{214}Pb: 8.4±6.3
			^{212}Pb: 9.7±6.0
			^{214}Bi: 12.8±7.4
VA:Doswell	North Anna River	04/04/91	^{214}Pb: 27.3±7.0
VA:Newport News	James River	04/18/91	^{214}Pb: 19.1±9.9
			^{40}K: 173±95
VT:Vernon	Connecticut River	04/17/91	^{214}Pb: 7.1±5.8
WA:Northport	Columbia River	05/22/91	ND
WA:Richland	Columbia River	04/23/91	^{214}Pb: 22.8±8.5
WI:Two Creeks	Lake Michigan	04/16/91	^{214}Bi: 66.3±8.9
			^{214}Pb: 41.6±7.0
WI:Victory	Mississippi River	04/05/91	ND
WV:Wheeling	Ohio River	04/03/91	ND

Note: σ = Counting Error. ND = Not Detectable.

Drinking Water

This program monitors ambient radiation levels in drinking water at 78 sites. These data serve to assess trends and anomalies in concentrations, and to compare with standards set forth in the EPA "National Interim Primary Drinking Water Regulations." These regulations provide for approval of supplies when the combined radium-226 and radium-228 levels do not exceed 5 pCi/L, when the gross alpha (excluding radon and uranium) levels do not exceed 15 pCi/L, when tritium levels do not exceed 20,000 pCi/L, when the strontium-90 levels do not exceed 8 pCi/L, and when the gross beta levels do not exceed 50 pCi/L.

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

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

Tritium analyses are performed by scintillation counting of the distilled samples. Gross beta and alpha are determined by evaporating an aliquot on a stainless steel planchet for counting. Radium-226 is determined by the standard emanation technique. Strontium-90 is determined by beta counting a strontium carbonate precipitate isolated by ion exchange.

Table 14 contains the data from drinking water samples for October–December 1991. Table 15 contains the data on gross alpha, gross beta, strontium-90, and radium-226 in drinking water for January–December 1991. Tables 16–18 contain the plutonium and uranium in drinking water data for 1989–1991.

Table 14

Tritium in Drinking Water

October–December 1991

Location	Date Collected	^3H nCi/L	$\pm 2\sigma$
AK:Fairbanks	11/12/91	0.2	0.2
AL:Dothan	10/15/91	0.1	0.2
AL:Montgomery	10/06/91	0.1	0.2
AL:Muscle Shoals	10/08/91	0.2	0.2
AR:Little Rock	10/09/91	0.1	0.2
CA:Berkeley	10/08/91	0.1	0.2
CA:Los Angeles	10/08/91	0.1	0.2
CO:Denver	10/07/91	0.2	0.2
CO:Platteville	10/09/91	0.2	0.2
CT:Hartford	10/07/91	0.2	0.2
CZ:Ancon	10/16/91	0.3	0.2
DE:Dover	10/04/91	0.1	0.2
FL:Miami	10/07/91	0.1	0.2
FL:Tampa	10/15/91	0.1	0.2
GA:Baxley	10/11/91	0.2	0.2
GA:Savannah	10/25/91	0.2	0.2
HI:Honolulu	10/29/91	0.1	0.2
IA:Cedar Rapids	10/15/91	0.2	0.2
ID:Boise	10/15/91	0.2	0.2
ID:Idaho Falls	10/15/91	0.2	0.2
IL:Morris	11/25/91	0.1	0.2
IL:W. Chicago	10/03/91	0.2	0.2
KS:Topeka	10/03/91	0.1	0.2
LA:New Orleans	10/09/91	0.3	0.2
MA:Lawrence	10/07/91	0.2	0.2
MD:Baltimore	10/03/91	0.2	0.2
MD:Conowingo	10/08/91	0.2	0.2
ME:Augusta	10/10/91	0.2	0.2
MI:Detroit	10/10/91	0.3	0.2
MN:Minneapolis	10/08/91	0.1	0.2
MN:Red Wing	10/19/91	0.1	0.2
MO:Jefferson City	10/07/91	0.2	0.2
MS:Jackson	10/08/91	0.2	0.2
MS:Port Gibson	10/08/91	0.1	0.2
MT:Helena	10/08/91	0.3	0.2
NC:Charlotte	10/08/91	0.4	0.2
NC:Wilmington	10/10/91	0.1	0.2
ND:Bismarck	10/09/91	0.2	0.2
NE:Lincoln	10/04/91	0.1	0.2
NH:Concord	10/07/91	0.2	0.2
NJ:Trenton	10/18/91	0.1	0.2

Table 14 (continued)

Tritium in Drinking Water

October–December 1991

Location	Date Collected	^3H nCi/L	$\pm 2\sigma$
NJ:Waretown	10/23/91	0.2	0.2
NM:Santa Fe	10/21/91	0.1	0.2
NV:Las Vegas	10/08/91	0.2	0.2
NY:Albany	10/23/91	0.2	0.2
NY:New York City	10/07/91	0.1	0.2
NY:Niagara Falls	10/09/91	0.3	0.2
NY:Syracuse	12/10/91	0.1	0.2
OH:Cincinnati	10/28/91	0.1	0.2
OH:Columbus	10/16/91	0.2	0.2
OH:East Liverpool	10/11/91	0.1	0.2
OH:Painesville	10/10/91	0.4	0.2
OH:Toledo	10/10/91	0.4	0.2
OK:Oklahoma City	12/18/91	0.1	0.2
OR:Portland	10/09/91	0.2	0.2
PA:Columbia	10/10/91	0.2	0.2
PA:Harrisburg	10/07/91	0.1	0.2
PA:Phila.-Baxter	10/30/91	0.1	0.2
PA:Phila.-Queen	10/30/91	0.1	0.2
PA:Philadelphia	10/30/91	0.1	0.2
PA:Pittsburgh	10/10/91	0.1	0.2
RI:Providence	10/22/91	0.1	0.2
SC:Barnwell	10/09/91	0.2	0.2
SC:Columbia	10/03/91	0.4	0.2
SC:Hartsville	10/15/91	0.1	0.2
SC:Jenkinsville	10/11/91	0.3	0.2
SC:Seneca	10/22/91	0.1	0.2
TN:Chattanooga	11/06/91	0.2	0.2
TN:Knoxville	10/02/91	0.2	0.2
TX:Austin	10/04/91	0.1	0.2
VA:Doswell	11/01/91	0.1	0.2
VA:Lynchburg	10/03/91	0.2	0.2
VA:Virginia Beach	10/10/91	0.2	0.2
WA:Richland	11/19/91	0.2	0.2
WA:Seattle	10/08/91	0.1	0.2
WI:Genoa City	10/08/91	0.1	0.2
WI:Madison	10/04/91	0.2	0.2

Note: σ = Counting Error.

Table 15

Drinking Water
Alpha, Beta, Gamma, Sr-90, and Ra-226 Concentrations

January–December 1991 Composites

Location	Total Solids (mg/L)	Gross Beta pCi/L	±2σ	Gross Alpha pCi/L	±2σ	^{90}Sr pCi/L	±2σ	^{226}Ra pCi/L	±2σ	Specific Gamma Activity pCi/L ±2σ
AK:Fairbanks	100.0	3.1	0.8	ND		ND		NA		ND
AL:Dothan	200.0	2.3	0.9	0.3	0.7	ND		NA		ND
AL:Montgomery	60.0	1.5	0.8	ND		0.1	0.1	NA		ND
AL:Muscle Shoals	80.0	1.5	0.7	0.3	0.6	0.0	0.1	NA		ND
AL:Scottsboro	80.0	1.3	0.7	0.2	0.4	ND		NA		ND
AR:Little Rock	200.0	2.3	0.8	0.4	0.8	0.5	0.5	NA		ND
CA:Berkeley	30.0	0.8	0.7	ND		ND		NA		ND
CA:Los Angeles	400.0	5.4	1.8	0.7	1.3	ND		NA		ND
CO:Denver	100.0	2.3	0.7	1.2	0.8	ND		NA		ND
CO:Platteville	800.0	8.0	2.7	9.2	4.0	0.1	0.2	0.4	0.0	ND
CT:Hartford	30.0	1.0	0.6	0.3	0.4	0.3	0.5	NA		ND
DC:Washington	100.0	2.0	1.0	0.4	0.8	NA		NA		ND
DE:Dover	300.0	3.4	1.2	ND		ND		NA		ND
FL:Miami	200.0	0.7	0.8	0.3	1.1	0.1	0.3	NA		ND
FL:Tampa	300.0	2.2	0.9	0.6	0.7	0.3	0.1	NA		ND
GA:Baxley	100.0	2.6	0.7	3.3	1.1	ND		1.7	0.0	ND
GA:Savannah	100.0	1.4	0.9	0.1	0.8	ND		NA		ND
HI:Honolulu	200.0	1.4	0.8	ND		ND		NA		ND
IA:Cedar Rapids	100.0	3.2	0.8	0.6	0.6	0.0	0.2	NA		ND
ID:Boise	100.0	1.5	0.8	0.6	0.6	0.0	0.3	NA		^{212}Pb: 8.2±5.9
ID:Idaho Falls	200.0	2.6	1.3	2.0	1.8	ND		0.0	0.0	ND
†IL:Morris	400.0	15.1	2.0	6.4	2.3	0.0	0.1	3.5	0.1	^{40}K: 83.0±51.8
‡IL:W. Chicago	200.0	17.7	2.0	16.2	3.0	0.0	0.1	6.9	0.1	ND
KS:Topeka	400.0	7.5	1.6	0.3	0.7	ND		NA		ND
LA:New Orleans	100.0	3.4	1.0	0.4	0.7	0.2	0.3	NA		ND
MA:Lawrence	80.0	1.4	0.9	0.1	0.5	0.3	0.1	NA		ND
MD:Baltimore	80.0	1.7	0.8	ND		ND		NA		ND
MD:Conowingo	200.0	2.6	0.9	0.6	0.6	0.2	0.1	NA		ND
ME:Augusta	30.0	1.4	0.8	0.2	0.5	0.0	0.2	NA		ND
MI:Detroit	80.0	2.6	0.9	0.7	0.6	0.6	0.0	NA		ND
MI:Grand Rapids	100.0	2.1	1.0	0.3	0.8	0.5	0.4	NA		ND
MN:Minneapolis	100.0	3.0	1.0	0.1	0.6	0.0	0.4	NA		^{212}Pb: 6.9±6.3
§MN:Red Wing	300.0	7.0	1.5	5.1	2.1	0.1	0.1	2.5	0.0	ND
MO:Jefferson City	300.0	6.0	1.2	0.9	1.0	0.0	0.2	NA		ND
MS:Jackson	60.0	2.1	0.9	ND		0.2	0.1	NA		ND

Table 15 (continued)

Drinking Water
Alpha, Beta, Gamma, Sr-90, and Ra-226 Concentrations

January–December 1991 Composites

Location	Total Solids (mg/L)	Gross Beta pCi/L	±2σ	Gross Alpha pCi/L	±2σ	^{90}Sr pCi/L	±2σ	^{226}Ra pCi/L	±2σ	Specific Gamma Activity pCi/L ±2σ
MS:Port Gibson	300.0	5.6	1.6	1.3	1.0	ND		NA		ND
MT:Helena	100.0	2.6	1.1	1.0	1.0	0.0	0.0	NA		ND
NC:Charlotte	50.0	2.0	0.8	0.4	0.5	ND		NA		ND
NC:Wilmington	100.0	3.0	0.9	0.4	0.6	0.4	0.0	NA		ND
ND:Bismarck	300.0	3.4	1.3	ND		0.1	0.3	NA		ND
NE:Lincoln	200.0	9.0	1.7	1.9	1.9	0.5	0.2	0.2	0.0	ND
NH:Concord	70.0	1.7	0.8	0.9	0.6	ND		NA		ND
NJ:Trenton	100.0	2.5	0.9	ND		0.0	0.2	NA		ND
NJ:Waretown	50.0	1.4	0.8	0.7	0.5	0.0	0.3	NA		ND
NM:Santa Fe	400.0	8.0	1.8	9.9	2.7	0.2	0.4	0.1	0.0	ND
NV:Las Vegas	600.0	4.3	2.4	0.9	2.5	0.3	0.4	NA		ND
NY:Albany	60.0	1.3	0.8	0.2	0.4	0.0	0.2	NA		ND
NY:New York City	40.0	0.3	0.8	ND		0.0	0.3	NA		ND
NY:Niagara Falls	100.0	2.0	1.0	0.2	0.8	0.4	0.5	NA		ND
NY:Syracuse	90.0	1.8	0.8	ND		0.4	0.0	NA		^{212}Pb: 9.5±6.1
OH:Cincinnati	200.0	3.1	1.0	0.1	0.6	0.3	0.1	NA		ND
OH:Columbus	200.0	3.4	1.2	0.2	0.6	ND		NA		ND
OH:East Liverpool	200.0	3.2	1.2	ND		0.6	0.5	NA		ND
OH:Painesville	100.0	1.9	0.9	ND		0.1	0.3	NA		ND
OH:Toledo	80.0	2.1	0.7	0.2	0.5	0.0	0.8	NA		ND
OK:Oklahoma City	60.0	2.3	0.7	ND		0.0	1.0	NA		ND
OR:Portland	20.0	0.5	0.6	0.4	0.5	ND		NA		ND
PA:Columbia	200.0	2.3	0.8	ND		0.1	0.4	NA		ND
PA:Harrisburg	40.0	0.6	0.8	0.0	0.5	0.1	0.1	NA		^{40}K: 84.5±26.4 ^{212}Pb: 7.8±6.0
PA:Philadelphia	200.0	1.9	0.9	0.5	0.8	0.0	0.0	NA		ND
PA:Philadelphia	200.0	4.1	1.0	0.2	0.6	0.0	0.0	NA		ND
PA:Philadelphia	200.0	4.5	1.1	0.7	1.1	0.0	0.1	NA		ND
PA:Pittsburgh	200.0	2.4	0.7	0.5	0.4	0.0	0.2	NA		ND
PC:Cristobal	70.0	0.9	0.7	0.0	0.5	ND		NA		ND
RI:Providence	50.0	0.5	0.6	0.4	0.4	0.0	0.5	NA		ND
SC:Barnwell	30.0	0.6	0.8	0.6	0.6	0.0	0.0	NA		ND
SC:Columbia	70.0	1.9	0.8	0.2	0.6	0.2	0.3	NA		ND
SC:Hartsville	30.0	1.0	0.7	1.0	0.6	ND		NA		ND
SC:Jenkinsville	200.0	3.2	1.0	1.2	0.8	0.2	0.3	NA		ND

Table 15 (continued)

Drinking Water
Alpha, Beta, Gamma, Sr-90, and Ra-226 Concentrations

January–December 1991 Composites

Location	Total Solids (mg/L)	Gross Beta pCi/L	±2σ	Gross Alpha pCi/L	±2σ	^{90}Sr pCi/L	±2σ	^{226}Ra pCi/L	±2σ	Specific Gamma Activity pCi/L	±2σ
SC:Seneca	30.0	1.4	0.8	ND		ND		NA		^{212}Pb: 6.7	±6.2
TN:Chattanooga	80.0	1.2	0.9	0.6	0.7	0.2	0.3	NA		ND	
TN:Knoxville	90.0	1.2	0.7	0.1	0.6	0.0	0.5	NA		ND	
TX:Austin	300.0	3.7	1.4	0.1	0.9	ND		NA		ND	
VA:Doswell	200.0	4.3	1.0	0.1	0.6	ND		NA		ND	
VA:Lynchburg	70.0	1.6	0.7	0.1	0.5	0.2	0.2	NA		ND	
VA:Virginia Beach	100.0	2.9	0.8	0.3	0.5	0.4	0.1	NA		ND	
WA:Richland	60.0	1.4	0.8	0.5	0.5	ND		NA		ND	
WA:Seattle	20.0	0.3	0.6	ND		0.3	0.1	NA		ND	
WI:Genoa City	100.0	1.7	0.7	0.4	0.6	ND		NA		ND	
WI:Madison	200.0	1.8	0.9	1.2	1.0	ND		NA		ND	

Note: σ = Counting Error. NA = No Analysis. ND = Not Detectable.

† Morris, IL 2.8 ± 0.6 pCi/L ^{228}Ra.

‡ W. Chicago, IL 3.4 ± 1.1 pCi/L ^{228}Ra.

§ Red Wing, MN 2.5 ± 0.6 pCi/L ^{228}Ra.

Table 16

Plutonium and Uranium Analyses
Selected Drinking Water Composite Samples

January–December 1989

Location	^{238}Pu		$^{239-240}Pu$		^{234}U		^{235}U		^{238}U	
	pCi/l	$\pm 2\sigma$	pCi/l	$\pm 2\sigma$	pCi/l	$\pm 2\sigma$	pCi/l	$\pm 2\sigma$	pCi/l	$\pm 2\sigma$
CO:Denver	ND		ND		0.834	0.096	0.028	0.015	0.482	0.068
CO:Platteville	0.002	0.003	ND		6.431	0.476	0.233	0.045	5.241	0.397
GA:Baxley	0.004	0.006	ND		0.028	0.028	0.028	0.028	0.028	0.028
IL:Chicago	ND		ND		1.419	0.153	0.021	0.014	0.055	0.023
IL:Morris	ND		ND		0.351	0.058	0.018	0.013	0.024	0.015
MN:Red Wing	ND		ND		0.215	0.052	0.011	0.010	0.029	0.016
MT:Helena	0.001	0.002	ND		3.720	0.300	0.106	0.031	2.339	0.206
NE:Lincoln	ND		ND		1.121	0.142	0.039	0.020	0.550	0.084
NM:Santa Fe	ND		0.005	0.013	15.290	1.412	0.393	0.078	9.073	0.865
NV:Las Vegas	0.002	0.004	ND		2.201	0.217	0.047	0.021	1.323	0.146
NY:New York City	ND		0.002	0.004	0.409	0.074	0.005	0.007	0.213	0.050
OH:East Liverpool	ND		ND		0.177	0.052	0.007	0.010	0.094	0.037
SC:Jenkinsville	ND		ND		0.496	0.075	0.016	0.013	0.193	0.043
WI:Madison	ND		0.002	0.008	3.403	0.329	0.052	0.024	0.873	0.115

Notes: σ = Counting Error. ND = Not Detectable.
Minimum Detectable Level for individual isotopes is 0.015 pCi/sample.

Table 17

Plutonium and Uranium Analyses
Selected Drinking Water Composite Samples

January–December 1990

Location	^{238}Pu		$^{239-240}Pu$		^{234}U		^{235}U		^{238}U	
	pCi/l	$\pm 2\sigma$	pCi/l	$\pm 2\sigma$	pCi/l	$\pm 2\sigma$	pCi/l	$\pm 2\sigma$	pCi/l	$\pm 2\sigma$
FL:Miami	ND		0.006	0.010	0.289	0.067	0.017	0.014	0.315	0.068
GA:Baxley	ND		ND		0.119	0.063	0.006	0.007	0.054	0.022
ID:Idaho Falls	0.004	0.006	0.009	0.009	0.797	0.122	0.021	0.014	0.425	0.072
IL:Morris	0.018	0.020	0.029	0.026	0.458	0.084	0.009	0.010	0.099	0.036
IL:W. Chicago	0.010	0.014	ND		1.465	0.196	0.032	0.021	0.180	0.054
MN:Red Wing	ND		0.005	0.010	0.297	0.062	0.003	0.005	0.082	0.030
NE:Lincoln	ND		ND		3.960	0.369	0.073	0.027	2.592	0.258
NM:Santa Fe	ND		0.002	0.004	17.000	1.544	0.478	0.087	11.060	1.027
NV:Las Vegas	0.051	0.033	ND		2.035	0.228	0.060	0.027	1.197	0.154
SC:Jenkinsville	0.040	0.028	0.010	0.020	0.623	0.105	0.029	0.019	0.296	0.067

Notes: σ = Counting Error. ND = Not Detectable.
Minimum Detectable Level for individual isotopes is 0.015 pCi/sample.

Table 18

Plutonium and Uranium Analyses
Selected Drinking Water Composite Samples

January–December 1991

Location	^{238}Pu		$^{239-240}Pu$		^{234}U		^{235}U		^{238}U	
	pCi/l	$\pm 2\sigma$	pCi/l	$\pm 2\sigma$	pCi/l	$\pm 2\sigma$	pCi/l	$\pm 2\sigma$	pCi/l	$\pm 2\sigma$
CO:Platteville	ND		0.003	0.004	7.630	0.590	0.279	0.063	5.810	0.473
GA:Baxley	0.007	0.004	ND		0.172	0.045	ND		0.105	0.036
ID:Idaho Falls	0.004	0.004	ND		0.827	0.106	0.024	0.016	0.558	0.083
IL:Morris	ND		0.001	0.004	0.513	0.081	0.003	0.009	0.153	0.045
IL:W. Chicago	0.007	0.009	0.002	0.004	1.670	0.162	0.015	0.014	0.223	0.049
MN:Red Wing	ND		ND		0.538	0.090	0.005	0.009	0.123	0.041
NE:Lincoln	0.006	0.004	0.004	0.004	3.920	0.266	0.083	0.023	2.560	0.187
NM:Santa Fe	0.003	0.002	0.013	0.007	11.700	0.779	0.309	0.049	6.720	0.466

Notes: σ = Counting Error. ND = Not Detectable.

Minimum Detectable Level for individual isotopes is 0.015 pCi/sample.

3. External Gamma Ambient Monitoring Program

The External Gamma Monitoring Program (EGAMP), which began in October 1978, provides a continuous measurement of ambient gamma exposure rates, including cosmic, at selected sites throughout the continental United States. Data from this program are used to evaluate fluctuations in natural background due to variations in environmental conditions and to provide a means of monitoring any significant increases in ambient gamma levels. The program consists of approximately 22 sites representing wide geographic coverage throughout the country.† Although exposure measurements at these few sites are not totally representative of nationwide exposures, they do indicate national trends.

The EGAMP program utilizes CaF_2:Mn thermoluminescent dosimeters (TLD's). These dosimeters are commercially available glass-bulb type dosimeters with energy compensating shields. A group of three TLD's is located at each station or site. Dosimeters are annealed by the station operator prior to positioning in the field. The dosimeters are returned to NAREL for readout approximately every three months. Several dosimeters are annealed by the station operator as controls and returned with the exposed field dosimeters to correct for any exposures accumulated during shipment.

Publication of EGAMP data has been suspended until problems with the data are resolved.

† Since some of these sites may not return dosimeters each period, the number of sites listed may vary slightly.

4. Milk Program

Pasteurized Milk

This is a cooperative program with the Dairy and Lipid Products Branch, Milk Sanitation Section, Food and Drug Administration. Milk is a reliable indicator of the general population's intake of radionuclides since it is consumed fresh by a large segment of the population and can contain several of the biologically important 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.

Monthly samples are collected at 65 sampling sites with at least one located in each state, Puerto Rico, and the Panama Canal Zone. 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. All samples collected in July are analyzed for strontium-90. Also, for the first month of the three quarters beginning January, April, and October, 10 regional composite samples of milk made up from the states within each of EPA's 10 regions are analyzed for strontium-90.

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

Tables 19–21 contain the concentrations of radionuclides in pasteurized milk for October–December 1991. Table 22 contains the concentrations of strontium-90 in pasteurized milk EPA Regional Composites for October 1991.

Table 19

Radionuclides in Pasteurized Milk

October 1991

Location	Date Collected	K g/L	K ±2σ	^{137}Cs pCi/L	^{137}Cs ±2σ	^{140}Ba pCi/L	^{140}Ba ±2σ	^{131}I pCi/L	^{131}I ±2σ
AL:Montgomery	10/10/91	1.56	0.08	ND		ND		ND	
AR:Little Rock	10/18/91	1.57	0.09	ND		ND		ND	
AZ:Phoenix	10/10/91	1.82	0.08	ND		ND		ND	
CA:Los Angeles	10/07/91	1.79	0.08	ND		ND		ND	
CA:Sacramento	10/01/91	1.64	0.09	ND		ND		ND	
CA:San Francisco	10/01/91	1.62	0.08	ND		ND		ND	
CO:Denver	10/18/91	1.64	0.09	ND		ND		ND	
CT:Hartford	10/07/91	1.79	0.09	ND		ND		ND	
DE:Dover	10/16/91	1.57	0.08	ND		ND		ND	
FL:Tampa	10/08/91	1.64	0.14	ND		ND		ND	
GA:Atlanta	10/02/91	1.63	0.09	ND		ND		ND	
HI:Honolulu	10/29/91	1.44	0.10	ND		ND		ND	
IA:Des Moines	10/02/91	1.57	0.08	ND		ND		ND	
IL:Chicago	10/03/91	1.57	0.10	ND		ND		ND	
IN:Indianapolis	10/08/91	1.53	0.08	ND		ND		ND	
KS:Wichita	10/12/91	1.61	0.12	ND		ND		ND	
KY:Louisville	10/02/91	1.54	0.08	ND		ND		ND	
LA:New Orleans	10/29/91	1.57	0.08	ND		ND		ND	
MA:Boston	10/08/91	1.84	0.08	ND		ND		ND	
MD:Baltimore	10/10/91	1.62	0.08	ND		ND		ND	
ME:Portland	10/02/91	1.60	0.11	ND		ND		ND	
MI:Detroit	10/09/91	1.84	0.08	ND		ND		ND	
MI:Grand Rapids	10/07/91	1.51	0.11	ND		ND		ND	
MI:St. Louis	10/02/91	1.62	0.08	ND		ND		ND	
MN:St. Paul	10/03/91	1.75	0.08	ND		ND		ND	
MO:Kansas City	10/21/91	1.76	0.08	ND		ND		ND	
MS:Jackson	10/02/91	1.74	0.09	2	2	ND		ND	
MT:Helena	10/18/91	1.62	0.08	ND		ND		ND	
NC:Charlotte	10/24/91	1.63	0.12	ND		ND		ND	
ND:Minot	10/30/91	1.56	0.08	ND		ND		ND	
NE:Omaha	10/28/91	1.47	0.08	ND		ND		ND	
NJ:Trenton	10/08/91	1.51	0.12	ND		ND		ND	
NM:Albuquerque	10/10/91	1.63	0.08	ND		ND		ND	
NY:Buffalo	10/07/91	1.61	0.08	ND		ND		ND	
NY:New York City	10/09/91	1.61	0.07	ND		ND		ND	
NY:Syracuse	10/08/91	1.63	0.09	ND		ND		ND	
OH:Cincinnati	10/29/91	1.57	0.08	ND		ND		ND	

Table 19 (continued)

Radionuclides in Pasteurized Milk

October 1991

Location	Date Collected	K g/L	K $\pm 2\sigma$	^{137}Cs pCi/L	^{137}Cs $\pm 2\sigma$	^{140}Ba pCi/L	^{140}Ba $\pm 2\sigma$	^{131}I pCi/L	^{131}I $\pm 2\sigma$
OH:Cleveland	10/29/91	1.63	0.08	ND		ND		ND	
OR:Portland	10/07/91	1.73	0.09	ND		ND		ND	
PA:Philadelphia	10/29/91	1.70	0.08	ND		ND		ND	
PA:Pittsburgh	10/07/91	1.58	0.08	ND		ND		ND	
PC:Cristobal	10/16/91	1.62	0.10	8	4	ND		ND	
PR:San Juan	10/11/91	1.57	0.08	ND		ND		ND	
SD:Rapid City	10/07/91	1.91	0.08	ND		ND		ND	
TN:Chattanooga	10/07/91	1.80	0.09	ND		ND		ND	
TN:Memphis	10/18/91	1.60	0.08	ND		ND		ND	
TX:Austin	10/08/91	1.51	0.12	ND		ND		ND	
TX:Dallas	10/09/91	1.70	0.06	ND		ND		ND	
VA:Norfolk	10/28/91	1.70	0.09	ND		ND		ND	
VT:Montpelier	10/10/91	1.45	0.14	ND		ND		ND	
WA:Seattle	10/01/91	1.91	0.08	ND		ND		ND	
WA:Spokane	10/07/91	1.55	0.08	ND		ND		ND	
WV:Charleston	10/09/91	1.57	0.06	ND		ND		ND	

Note: σ = Counting Error. ND = Not Detectable.

Table 20

Radionuclides in Pasteurized Milk

November 1991

Location	Date Collected	K g/L	K ±2σ	^{137}Cs pCi/L	^{137}Cs ±2σ	^{140}Ba pCi/L	^{140}Ba ±2σ	^{131}I pCi/L	^{131}I ±2σ
AL:Montgomery	11/08/91	1.54	0.08	ND		ND		ND	
AR:Little Rock	11/04/91	1.53	0.08	ND		ND		ND	
AZ:Phoenix	11/06/91	1.56	0.08	ND		ND		ND	
CA:Los Angeles	11/08/91	1.54	0.08	ND		ND		ND	
CA:Sacramento	11/12/91	1.58	0.08	ND		ND		ND	
CA:San Francisco	11/07/91	1.61	0.08	ND		ND		ND	
CO:Denver	11/27/91	1.53	0.08	ND		ND		ND	
CT:Hartford	11/18/91	1.58	0.14	ND		ND		ND	
DE:Wilmington	11/20/91	1.60	0.09	ND		ND		ND	
FL:Tampa	11/13/91	1.58	0.09	ND		ND		ND	
GA:Atlanta	11/11/91	1.44	0.08	ND		ND		ND	
IA:Des Moines	11/12/91	1.56	0.09	ND		ND		ND	
ID:Idaho Falls	11/11/91	1.57	0.08	ND		ND		ND	
IL:Chicago	11/07/91	1.43	0.10	ND		ND		ND	
IN:Indianapolis	11/04/91	1.56	0.08	ND		ND		ND	
KY:Louisville	11/05/91	1.51	0.08	ND		ND		ND	
LA:New Orleans	11/26/91	1.51	0.10	ND		ND		ND	
MA:Boston	11/11/91	1.53	0.08	ND		ND		ND	
MD:Baltimore	11/08/91	1.60	0.08	ND		ND		ND	
MI:Detroit	11/07/91	1.55	0.14	ND		ND		ND	
MN:Minneapolis	11/06/91	1.58	0.08	ND		ND		ND	
MO:Kansas City	11/21/91	2.03	0.10	ND		ND		ND	
MO:St. Louis	11/06/91	1.60	0.08	ND		ND		ND	
MS:Jackson	11/07/91	1.68	0.12	ND		ND		ND	
MT:Helena	11/14/91	1.54	0.09	ND		ND		ND	
NC:Charlotte	11/27/91	1.51	0.08	ND		ND		ND	
ND:Minot	11/26/91	1.53	0.08	ND		ND		ND	
NE:Omaha	11/25/91	1.53	0.08	ND		ND		ND	
NJ:Trenton	11/08/91	1.62	0.06	ND		ND		ND	
NM:Albuquerque	11/27/91	2.03	0.10	ND		ND		ND	
NY:Buffalo	11/04/91	1.58	0.08	ND		ND		ND	
NY:New York City	11/04/91	1.58	0.08	ND		ND		ND	
NY:Syracuse	11/07/91	1.60	0.14	ND		ND		ND	
OH:Cincinnati	11/25/91	1.60	0.08	ND		ND		ND	
OR:Portland	11/04/91	1.54	0.14	ND		ND		ND	
PA:Philadelphia	11/04/91	1.56	0.08	ND		ND		ND	
PA:Pittsburgh	11/04/91	1.56	0.09	ND		ND		ND	

Table 20 (continued)

Radionuclides in Pasteurized Milk

November 1991

Location	Date Collected	K		^{137}Cs		^{140}Ba		^{131}I	
		g/L	$\pm 2\sigma$	pCi/L	$\pm 2\sigma$	pCi/L	$\pm 2\sigma$	pCi/L	$\pm 2\sigma$
PC:Cristobal	11/19/91	1.56	0.08	11	2	ND		ND	
PR:San Juan	11/08/91	1.55	0.08	ND		ND		ND	
SC:Charleston	11/20/91	1.58	0.08	ND		ND		ND	
SD:Rapid City	11/04/91	1.69	0.14	ND		ND		ND	
TN:Knoxville	11/06/91	1.62	0.08	ND		ND		ND	
TX:Austin	11/05/91	1.47	0.11	ND		ND		ND	
TX:Dallas	11/12/91	1.47	0.12	ND		ND		ND	
VT:Burlington	11/04/91	1.49	0.10	ND		ND		ND	
WA:Seattle	11/07/91	1.55	0.12	ND		ND		ND	
WA:Spokane	11/05/91	1.61	0.08	ND		ND		ND	
WV:Charleston	11/12/91	1.59	0.06	ND		ND		ND	

Note: σ = Counting Error. ND = Not Detectable.

Table 21

Radionuclides in Pasteurized Milk

December 1991

Location	Date Collected	K g/L	K $\pm 2\sigma$	^{137}Cs pCi/L	^{137}Cs $\pm 2\sigma$	^{140}Ba pCi/L	^{140}Ba $\pm 2\sigma$	^{131}I pCi/L	^{131}I $\pm 2\sigma$
AL:Montgomery	12/05/91	1.53	0.08	ND		ND		ND	
AR:Little Rock	12/02/91	2.13	0.10	ND		ND		ND	
AZ:Phoenix	12/05/91	1.57	0.12	ND		ND		ND	
CA:Los Angeles	12/05/91	1.63	0.08	ND		ND		ND	
CA:Sacramento	12/02/91	2.26	0.10	ND		ND		ND	
CA:San Francisco	12/03/91	1.49	0.10	ND		ND		ND	
CO:Denver	12/17/91	1.48	0.10	ND		ND		ND	
FL:Tampa	12/09/91	1.59	0.06	ND		ND		ND	
GA:Atlanta	12/02/91	1.56	0.08	ND		ND		ND	
HI:Honolulu	12/09/91	1.55	0.12	ND		ND		ND	
IA:Des Moines	12/02/91	1.51	0.09	ND		ND		ND	
IL:Chicago	12/05/91	1.53	0.08	ND		ND		ND	
IN:Indianapolis	12/04/91	1.62	0.09	ND		ND		ND	
KS:Wichita	12/05/91	1.51	0.08	ND		ND		ND	
KY:Louisville	12/03/91	1.55	0.08	ND		ND		ND	
MA:Boston	12/09/91	1.41	0.10	ND		ND		ND	
MD:Baltimore	12/06/91	1.57	0.08	ND		ND		ND	
ME:Portland	12/02/91	1.57	0.09	ND		ND		ND	
MI:Detroit	12/04/91	1.63	0.06	ND		ND		ND	
MI:Grand Rapids	12/02/91	1.69	0.07	ND		ND		ND	
MN:St. Paul	12/04/91	1.58	0.08	ND		ND		ND	
MO:Kansas City	12/18/91	1.56	0.08	ND		ND		ND	
MO:St. Louis	12/03/91	1.61	0.06	ND		ND		ND	
MS:Jackson	12/02/91	1.67	0.08	ND		ND		ND	
MT:Helena	12/05/91	1.50	0.08	ND		ND		ND	
NC:Charlotte	12/27/91	1.56	0.06	ND		ND		ND	
ND:Minot	12/30/91	1.63	0.09	ND		ND		ND	
NE:Omaha	12/23/91	1.47	0.08	ND		ND		ND	
NJ:Trenton	12/04/91	1.57	0.09	ND		ND		ND	
NM:Albuquerque	12/16/91	1.60	0.08	ND		ND		ND	
NV:Las Vegas	12/03/91	1.44	0.12	ND		ND		ND	
NY:Buffalo	12/20/91	1.53	0.12	ND		ND		ND	
NY:New York City	12/02/91	1.56	0.08	ND		ND		ND	
NY:Syracuse	12/03/91	1.57	0.14	ND		ND		ND	
OH:Cincinnati	12/31/91	1.58	0.08	ND		ND		ND	
OK:Oklahoma City	12/30/91	1.63	0.09	ND		ND		ND	
OR:Portland	12/04/91	1.47	0.10	ND		ND		ND	

Table 21 (continued)

Radionuclides in Pasteurized Milk

December 1991

Location	Date Collected	K g/L	K ±2σ	^{137}Cs pCi/L	^{137}Cs ±2σ	^{140}Ba pCi/L	^{140}Ba ±2σ	^{131}I pCi/L	^{131}I ±2σ
PA:Philadelphia	12/02/91	1.58	0.06	ND		ND		ND	
PA:Pittsburgh	12/02/91	1.58	0.08	ND		ND		ND	
PC:Cristobal	12/19/91	2.12	0.10	11	4	ND		ND	
SC:Charleston	12/19/91	1.48	0.08	ND		ND		ND	
SD:Rapid City	12/04/91	1.75	0.08	ND		ND		ND	
TN:Knoxville	12/10/91	1.51	0.08	ND		ND		ND	
TN:Memphis	12/16/91	1.51	0.14	ND		ND		ND	
TX:Austin	12/09/91	1.57	0.08	ND		ND		ND	
TX:Ft. Worth	12/05/91	2.12	0.10	ND		ND		ND	
VA:Norfolk	12/27/91	1.80	0.06	ND		ND		ND	
VT:Montpelier	12/11/91	1.50	0.08	ND		ND		ND	
WA:Seattle	12/05/91	1.73	0.08	ND		ND		ND	
WA:Spokane	12/02/91	1.49	0.12	ND		ND		ND	
WV:Charleston	12/10/91	1.69	0.07	ND		ND		ND	

Note: σ = Counting Error. ND = Not Detectable.

Table 22

Strontium-90 in Pasteurized Milk
EPA Regional Composites

October 1991

EPA Region	Collection Date	^{90}Sr pCi/L	$\pm 2\sigma$
I	10/07/91	1.7	0.3
II	10/08/91	1.0	0.3
III	10/18/91	2.4	0.5
IV	10/04/91	2.0	0.3
IX	10/15/91	0.5	0.1
V	10/15/91	1.5	1.3
VI	10/15/91	1.9	0.7
VII	10/18/91	1.5	0.3
VIII	10/20/91	2.1	0.2
X	10/07/91	1.3	0.5

Note: σ = Counting Error. NA = Not Analyzed.

Carbon-14 in Milk

Nine stations, chosen for wide geographical distribution, contribute milk samples for annual analysis of carbon-14. These samples are monitored for carbon-14 levels in the food chain resulting from nuclear testing. The pasteurized milk is freeze-dried and the resulting powder is pelletized for ease of combustion. Analysis consists of combusting the samples and converting the released carbon dioxide through a series of chemical conversions to benzene, which is then assayed for carbon-14 by liquid scintillation.

The samples undergo three main steps in the chemical conversions to benzene prior to liquid scintillation counting. They include (1) combustion of the sample to carbon dioxide, (2) conversion of the carbon dioxide to acetylene, and (3) trimerizations of the acetylene to benzene. The last carbon-14 results were for samples collected during April–May 1982, 1983–1986, and March–May 1987. They were published in *Environmental Radiation Data: Report 54* and *Environmental Radiation Data: Report 59.*

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

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