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Environmental Protection  
Agency

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Environmental Laboratory  
540 South Morris Avenue  
Montgomery, AL 36115-2601

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Radiation

# Environmental Radiation Data Report 72

October-December 1992

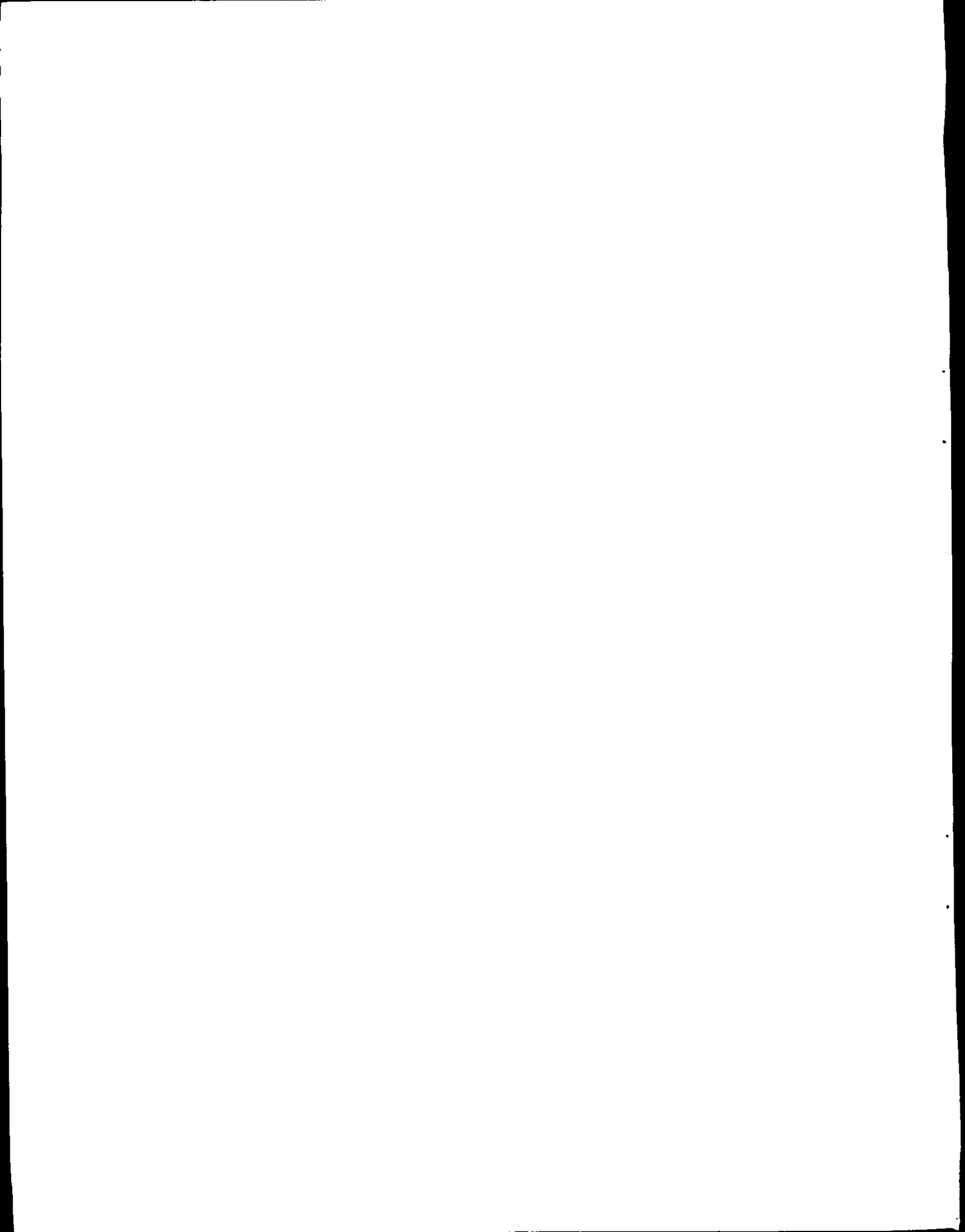
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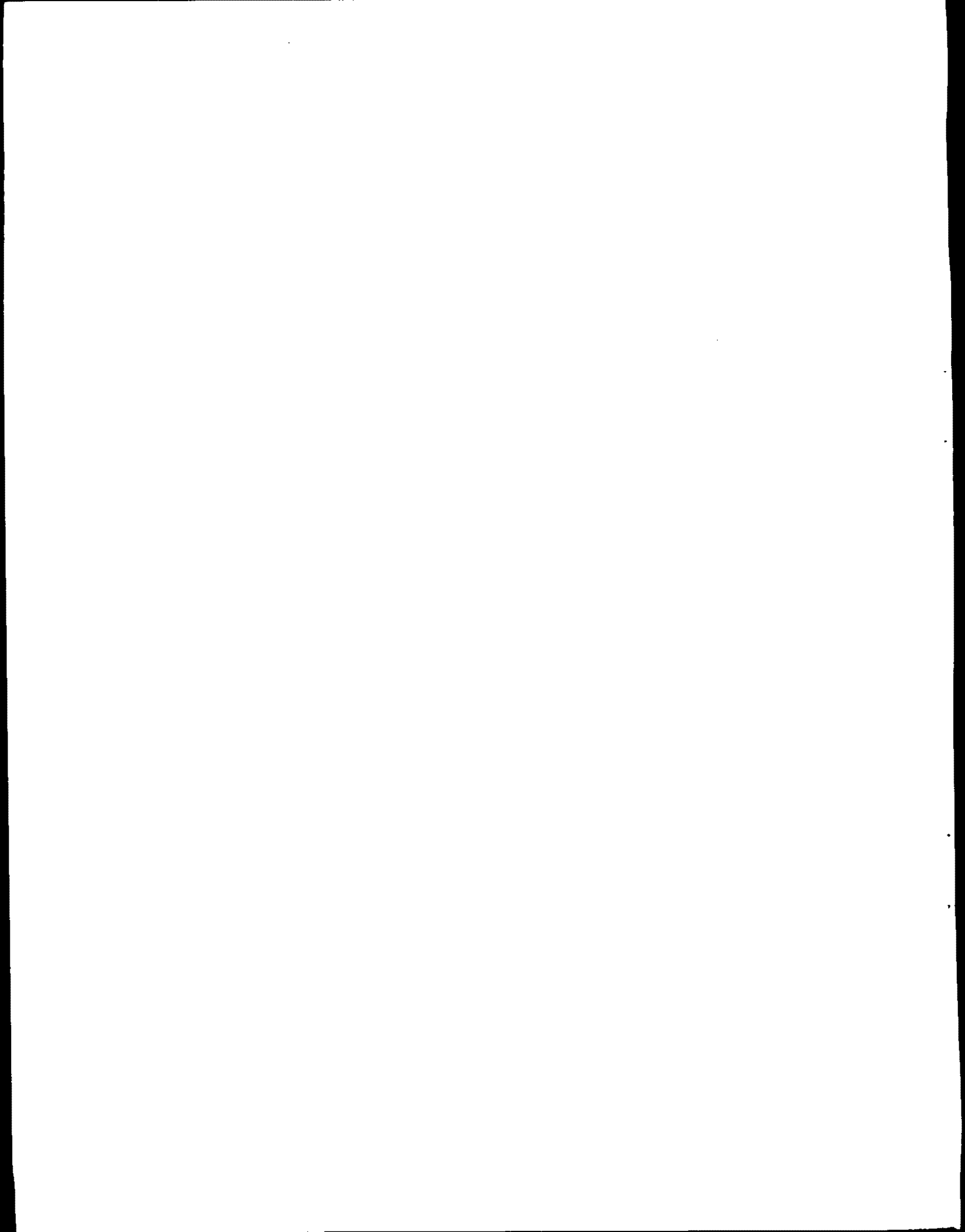
## Preface

*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.

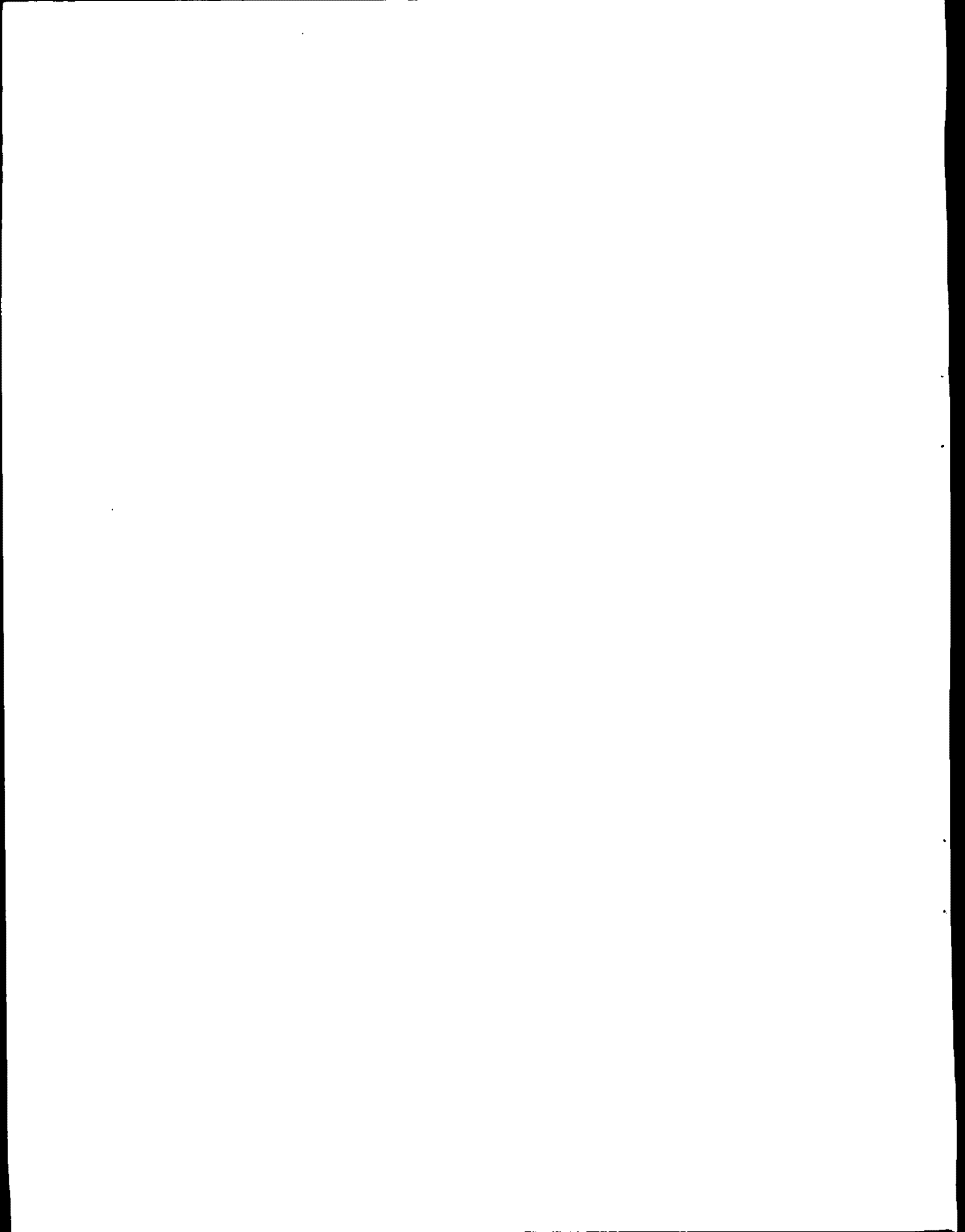
Sampling locations are selected to provide optimal population coverage while functioning to monitor fallout from nuclear devices and other forms of radioactive contamination of the environment. The radiation analyses performed on these samples include gross alpha and gross beta levels, gamma analyses 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).



# Contents

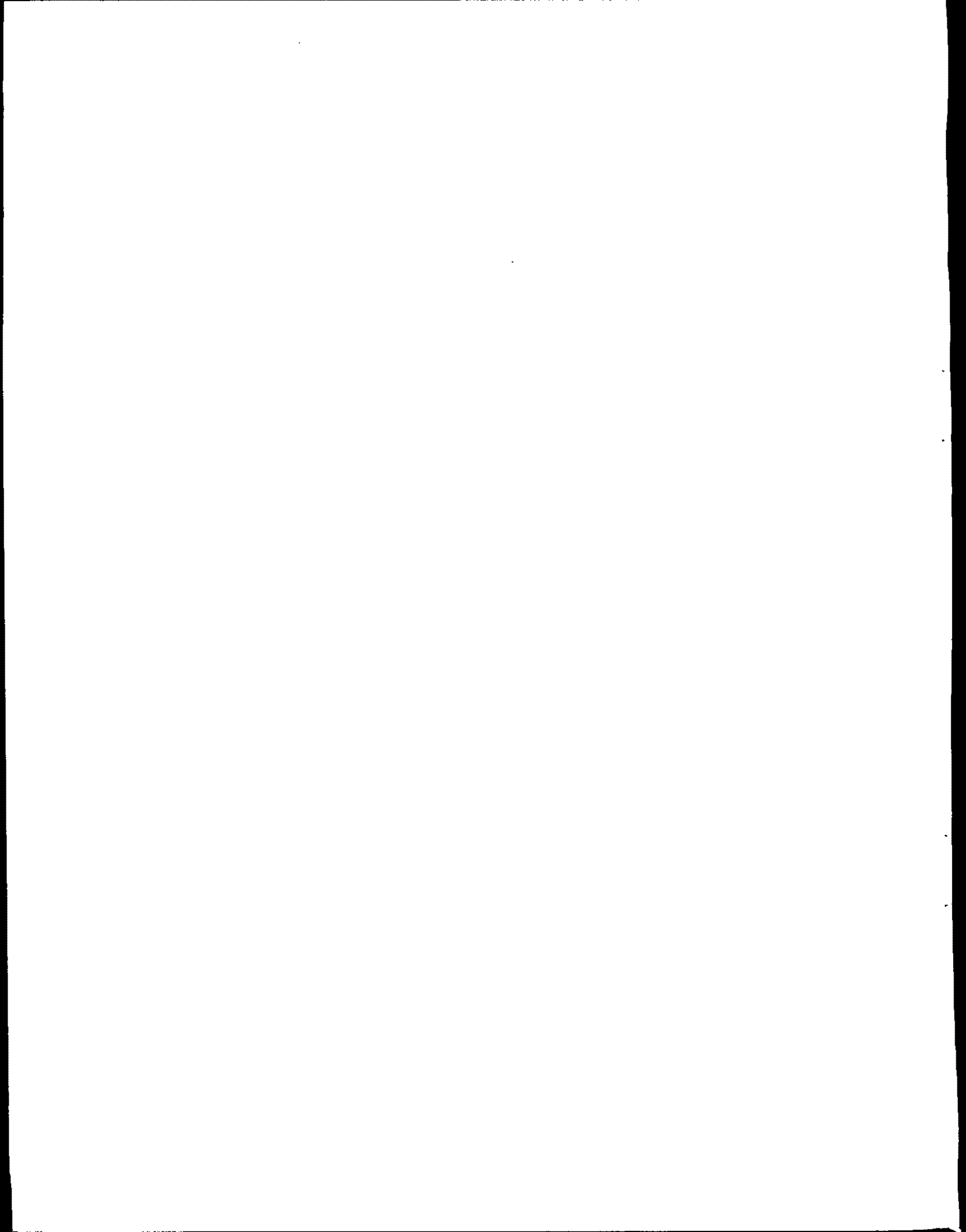
	<i>Page</i>
Data Reporting Rationale	ix
ERAMS Data	1
1. Air Program	1
• Airborne Particulates and Precipitation	1
• Plutonium and Uranium in Airborne Particulates and Precipitation	13
• Krypton-85	16
2. Water Program	17
• Surface Water	17
• Drinking Water	22
3. External Gamma Ambient Monitoring Program	31
4. Milk Program	32
• Pasteurized Milk	32
• Carbon-14 in Milk	40





# Tables

<i>Table</i>		<i>Page</i>
1	ERAMS Reporting Increments and Minimum Detectable Levels for Radionuclide Analyses	xi
2	Gross Beta in Airborne Particulates: October 1992	2
3	Gross Beta in Airborne Particulates: November 1992	4
4	Gross Beta in Airborne Particulates: December 1992	6
5	Gross Beta and Specific Gamma in Precipitation: October 1992	8
6	Gross Beta and Specific Gamma in Precipitation: November 1992	9
7	Gross Beta and Specific Gamma in Precipitation: December 1992	10
8	Tritium in Precipitation: October–December 1992	11
9	Plutonium and Uranium In Airborne Particulates: July–December 1992 Composites	14
10	Tritium in Surface Water: October–December 1992	18
11	Surface Water Annual Gamma Analysis: January–December 1992	20
12	Tritium in Drinking Water: October–December 1992	23
13	Alpha, Beta, Gamma, Sr-90, and Ra-226 Concentrations in Drinking Water: January–December 1992 Composites	25
14	Plutonium and Uranium Analyses In Drinking Water: January–December 1992	28
15	Iodine-131 in Drinking Water: January–December 1992	29
16	Radionuclides in Pasteurized Milk: October 1992	33
17	Radionuclides in Pasteurized Milk: November 1992	35
18	Radionuclides in Pasteurized Milk: December 1992	37
19	Strontium-90 in Pasteurized Milk: October 1992	39



## 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  $2\sigma$  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  $2\sigma$  (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  $3\sigma$  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 <sup>3</sup>	0.01 pCi/m <sup>3</sup>	0.01 pCi/m <sup>3</sup>
	Water	pCi/L	1 pCi/L	1 pCi/L
	Precipitation	nCi/m <sup>2</sup>	0.01 nCi/m <sup>2</sup>	0.01 nCi/m <sup>2</sup>
	(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

**Table 2**  
**Gross Beta in Airborne Particulates**  
**October 1992**

Location	Number of Samples	5-Hour Field Estimate			NAREL Lab Measurement		
		Max	Min	Avg	Max	Min	Avg
AK: Anchorage	9	0.0	0.0	0.0	0.02	0.00	0.01
AL: Montgomery	7	0.9	0.0	0.4	0.11	0.01	0.03
AR: Little Rock	10	0.9	0.3	0.5	0.03	0.01	0.02
AZ: Phoenix	4	1.2	0.4	0.9	0.02	0.01	0.02
CA: Berkeley	8	0.2	0.0	0.1	0.05	0.00	0.02
CA: Los Angeles	10	0.4	0.1	0.3	0.03	0.01	0.02
CO: Denver	9	1.3	0.0	0.9	0.02	0.01	0.01
CT: Hartford	9	2.0	0.0	0.3	0.01	0.00	0.01
FL: Jacksonville	6	0.2	0.0	0.1	0.03	0.00	0.01
FL: Miami	7	0.0	0.0	0.0	0.01	0.00	0.01
IA: Iowa City	8	0.2	0.0	0.1	0.02	0.01	0.01
ID: Boise	8	0.4	0.0	0.1	0.02	0.01	0.01
ID: Idaho Falls	9	0.0	0.0	0.0	0.02	0.01	0.01
IL: Chicago	9	0.4	0.1	0.3	0.03	0.01	0.01
IN: Indianapolis	9	0.3	0.1	0.1	0.03	0.01	0.02
KS: Topeka	7	2.1	0.3	1.0	0.02	0.01	0.01
KY: Frankfort	4	0.7	0.2	0.3	0.03	0.01	0.02
LA: New Orleans	9	0.4	0.1	0.2	0.03	0.01	0.02
MA: Lawrence	7	0.1	0.0	0.0	0.01	0.00	0.01
ME: Augusta	7	0.3	0.0	0.1	0.01	0.00	0.01
MI: Lansing	9	0.3	0.1	0.2	0.01	0.01	0.01
MN: Minneapolis	5	0.3	0.1	0.2	0.03	0.01	0.02
MO: Jefferson City	8	1.4	0.3	0.9	0.02	0.01	0.02
MS: Jackson	9	0.9	0.2	0.5	0.04	0.01	0.02
MT: Helena	1	0.2	0.2	0.2	0.02	0.02	0.02
NC: Charlotte	9	0.3	0.0	0.2	0.03	0.01	0.02
ND: Bismarck	8	2.6	0.1	1.1	0.03	0.01	0.01

**Table 2 (continued)**  
**Gross Beta in Airborne Particulates**  
**October 1992**

Location	Number of Samples	5-Hour Field Estimate			NAREL Lab Measurement		
		Max	Min	Avg	Max	Min	Avg
OH:Painesville	9	0.2	0.0	0.1	0.02	0.01	0.01
OH:Ross	9	0.0	0.0	0.0	0.04	0.01	0.02
OH:Toledo	9	0.6	0.1	0.3	0.02	0.01	0.01
OR:Portland	9	0.0	0.0	0.0	0.01	0.00	0.01
PA:Harrisburg	9	0.6	0.1	0.3	0.02	0.01	0.01
RI:Providence	9	0.1	0.0	0.1	0.01	0.01	0.01
SC:Barnwell	2	0.0	0.0	0.0	0.02	0.01	0.01
SC:Columbia	8	0.7	0.0	0.3	0.04	0.01	0.02
SD:Pierre	4	0.7	0.4	0.5	0.02	0.00	0.01
TN:Knoxville	9	1.9	0.2	0.9	0.04	0.01	0.02
TN:Nashville	9	0.9	0.1	0.3	0.03	0.01	0.02
TX:Austin	9	0.3	0.0	0.1	0.02	0.01	0.01
TX:El Paso	8	0.9	0.3	0.8	0.02	0.01	0.02
UT:Salt Lake City	9	0.8	0.0	0.3	0.02	0.01	0.02
VA:Lynchburg	9	1.1	0.0	0.4	0.02	0.01	0.01
VA:Virginia Beach	2	0.0	0.0	0.0	0.01	0.01	0.01
WA:Olympia	9	0.2	0.0	0.1	0.01	0.00	0.01
WA:Spokane	9	0.8	0.2	0.5	0.02	0.01	0.01
WI:Madison	9	0.3	0.1	0.3	0.06	0.01	0.02

Minimum Detectable Limit for field estimates - 0.1 pCi/m<sup>3</sup>.

Minimum Detectable Limit for laboratory measurement - 0.01 pCi/m<sup>3</sup>.

**Table 3**  
**Gross Beta in Airborne Particulates**  
**November 1992**

Location	Number of Samples	5-Hour Field Estimate			NAREL Lab Measurement		
		Max	Min	Avg	Max	Min	Avg
AK:Anchorage	7	0.0	0.0	0.0	0.01	0.00	0.01
AK:Juneau	8	0.0	0.0	0.0	0.01	0.00	0.00
AL:Montgomery	5	0.6	0.1	0.2	0.01	0.00	0.01
AR:Little Rock	8	0.3	0.1	0.2	0.02	0.00	0.01
AZ:Phoenix	4	0.7	0.0	0.4	0.02	0.01	0.01
CA:Berkeley	8	0.9	0.0	0.3	0.03	0.00	0.01
CA:Los Angeles	7	0.3	0.1	0.2	0.02	0.01	0.02
CO:Denver	7	2.0	0.2	0.8	0.03	0.01	0.01
CT:Hartford	9	0.1	0.0	0.1	0.01	0.00	0.01
FL:Jacksonville	6	0.9	0.0	0.3	0.01	0.00	0.01
FL:Miami	9	0.2	0.0	0.0	0.01	0.00	0.00
IA:Iowa City	8	0.1	0.0	0.1	0.02	0.00	0.01
ID:Boise	8	0.5	0.0	0.3	0.03	0.00	0.01
ID:Idaho Falls	9	0.0	0.0	0.0	0.03	0.00	0.01
IL:Chicago	9	0.3	0.0	0.1	0.03	0.01	0.01
IN:Indianapolis	5	0.8	0.0	0.2	0.02	0.01	0.01
KS:Topeka	8	0.4	0.1	0.2	0.02	0.00	0.01
KY:Frankfort	3	0.1	0.0	0.1	0.01	0.01	0.01
LA:New Orleans	7	0.5	0.1	0.2	0.01	0.00	0.01
MA:Lawrence	8	0.1	0.0	0.0	0.01	0.00	0.01
ME:Augusta	5	0.1	0.0	0.1	0.01	0.00	0.01
MI:Lansing	9	0.1	0.0	0.1	0.02	0.00	0.01
MN:Minneapolis	3	0.1	0.0	0.1	0.01	0.00	0.01
MO:Jefferson City	5	0.2	0.0	0.1	0.02	0.00	0.01
MS:Jackson	7	0.2	0.1	0.1	0.02	0.00	0.01
NC:Charlotte	6	0.1	0.0	0.1	0.02	0.01	0.01
ND:Bismarck	7	0.7	0.2	0.4	0.02	0.01	0.02
NE:Lincoln	5	2.7	0.3	0.9	0.02	0.01	0.02
NH:Concord	8	0.2	0.0	0.1	0.01	0.00	0.01
NJ:Trenton	8	0.4	0.1	0.2	0.01	0.00	0.01
NM:Santa Fe	6	0.4	0.0	0.2	0.02	0.00	0.01
NV:Las Vegas	9	0.4	0.1	0.3	0.03	0.00	0.01
NY:Albany	3	0.1	0.0	0.0	0.01	0.01	0.01
NY:Niagara Falls	7	0.1	0.0	0.1	0.01	0.00	0.01
NY:Syracuse	1	0.0	0.0	0.0	0.00	0.00	0.00
NY:Yaphank	8	0.2	0.0	0.1	0.01	0.00	0.01
OR:Columbus	4	0.1	0.0	0.0	0.01	0.00	0.01

**Table 3 (continued)**  
**Gross Beta in Airborne Particulates**  
**November 1992**

Location	Number of Samples	5-Hour Field Estimate			NAREL Lab Measurement		
		Max	Min	Avg	Max	Min	Avg
		(pCi/m <sup>3</sup> )			(pCi/m <sup>3</sup> )		
OH:Painesville	8	0.1	0.0	0.1	0.01	0.00	0.01
OH:Ross	8	0.0	0.0	0.0	0.18	0.01	0.03
OH:Toledo	9	0.5	0.1	0.2	0.01	0.01	0.01
OR:Portland	8	0.0	0.0	0.0	0.02	0.00	0.01
PA:Harrisburg	9	0.4	0.1	0.2	0.01	0.01	0.01
RI:Providence	8	0.6	0.0	0.1	0.01	0.00	0.01
SC:Barnwell	2	0.0	0.0	0.0	0.03	0.01	0.02
SC:Columbia	7	0.3	0.1	0.2	0.03	0.00	0.01
SD:Pierre	6	0.3	0.2	0.3	0.02	0.01	0.02
TN:Knoxville	8	0.6	0.1	0.3	0.04	0.01	0.01
TN:Nashville	7	0.4	0.1	0.1	0.03	0.01	0.02
TX:Austin	7	2.2	0.0	0.4	0.02	0.01	0.01
TX:El Paso	7	1.1	0.6	0.8	0.02	0.01	0.02
UT:Salt Lake City	7	0.3	0.0	0.1	0.03	0.00	0.01
VA:Lynchburg	7	0.6	0.1	0.2	0.02	0.01	0.01
VA:Virginia Beach	2	0.1	0.0	0.1	0.01	0.00	0.00
WA:Olympia	8	0.1	0.0	0.1	0.02	0.00	0.01
WA:Spokane	9	0.4	0.1	0.2	0.03	0.00	0.01
WI:Madison	9	0.3	0.1	0.1	0.02	0.00	0.01

Minimum Detectable Limit for field estimates - 0.1 pCi/m<sup>3</sup>.

Minimum Detectable Limit for laboratory measurement - 0.01 pCi/m<sup>3</sup>.

**Table 4**  
**Gross Beta in Airborne Particulates**  
**December 1992**

Location	Number of Samples	5-Hour Field Estimate			NAREL Lab Measurement		
		Max	Min	Avg	Max	Min	Avg
		(pCi/m <sup>3</sup> )			(pCi/m <sup>3</sup> )		
AK:Anchorage	8	0.0	0.0	0.0	0.02	0.00	0.01
AK:Juneau	8	0.0	0.0	0.0	0.01	0.00	0.01
AL:Montgomery	6	0.6	0.1	0.3	0.02	0.01	0.01
AR:Little Rock	7	0.2	0.1	0.2	0.03	0.01	0.02
AZ:Phoenix	8	1.4	0.2	0.6	0.02	0.00	0.02
CA:Berkeley	10	0.4	0.0	0.1	0.01	0.00	0.01
CA:Los Angeles	8	0.3	0.0	0.2	0.02	0.01	0.01
CO:Denver	9	0.5	0.0	0.2	0.02	0.01	0.01
CT:Hartford	9	0.1	0.0	0.0	0.02	0.00	0.01
FL:Jacksonville	6	0.1	0.0	0.1	0.02	0.00	0.01
FL:Miami	8	0.1	0.0	0.0	0.02	0.00	0.01
IA:Iowa City	8	0.1	0.0	0.1	0.03	0.01	0.02
ID:Boise	10	0.3	0.0	0.2	0.04	0.00	0.01
ID:Idaho Falls	9	0.0	0.0	0.0	0.02	0.00	0.01
IL:Chicago	9	0.2	0.1	0.1	0.02	0.00	0.01
IN:Indianapolis	8	0.2	0.1	0.1	0.03	0.00	0.01
KS:Topeka	6	0.4	0.1	0.2	0.02	0.01	0.01
KY:Frankfort	3	0.1	0.0	0.1	0.01	0.01	0.01
LA:New Orleans	6	0.2	0.1	0.1	0.01	0.01	0.01
MA:Lawrence	8	0.1	0.0	0.1	0.03	0.01	0.01
ME:Augusta	9	0.2	0.0	0.1	0.03	0.01	0.01
MI:Lansing	7	0.1	0.0	0.1	0.03	0.01	0.02
MN:Minneapolis	5	0.1	0.0	0.0	0.03	0.02	0.02
MO:Jefferson City	9	0.5	0.1	0.2	0.03	0.01	0.02
MS:Jackson	8	0.4	0.0	0.2	0.03	0.01	0.01
NC:Charlotte	4	0.0	0.0	0.0	0.02	0.01	0.01
ND:Bismarck	5	1.4	0.2	0.5	0.04	0.01	0.02
NE:Lincoln	3	0.3	0.1	0.2	0.02	0.02	0.02
NH:Concord	9	0.1	0.0	0.1	0.02	0.01	0.01
NJ:Trenton	7	0.3	0.1	0.2	0.02	0.00	0.01
NM:Santa Fe	7	0.2	0.1	0.1	0.03	0.01	0.01
NV:Las Vegas	9	0.3	0.1	0.2	0.03	0.01	0.01
NY:Albany	5	0.1	0.0	0.0	0.02	0.01	0.01
NY:Niagara Falls	8	0.1	0.0	0.1	0.02	0.01	0.01
NY:Syracuse	4	0.1	0.0	0.1	0.02	0.01	0.01
NY:Yaphank	6	0.2	0.1	0.2	0.02	0.01	0.01
OH:Columbus	3	0.0	0.0	0.0	0.01	0.01	0.01



**Table 4 (continued)**  
**Gross Beta in Airborne Particulates**  
**December 1992**

Location	Number of Samples	5-Hour Field Estimate (pCi/m <sup>3</sup> )			NAREL Lab Measurement (pCi/m <sup>3</sup> )		
		Max	Min	Avg	Max	Min	Avg
OH:Painesville	7	0.1	0.0	0.1	0.03	0.01	0.02
OH:Ross	10	0.0	0.0	0.0	0.03	0.01	0.02
OH:Toledo	9	0.3	0.1	0.2	0.04	0.01	0.02
OR:Portland	9	0.0	0.0	0.0	0.02	0.00	0.00
PA:Harrisburg	9	0.3	0.1	0.2	0.02	0.01	0.01
RI:Providence	7	0.1	0.0	0.0	0.02	0.01	0.01
SC:Barnwell	1	0.0	0.0	0.0	0.01	0.01	0.01
SC:Columbia	9	0.5	0.0	0.1	0.02	0.00	0.01
SD:Pierre	9	0.4	0.1	0.2	0.06	0.00	0.02
TN:Knoxville	8	0.7	0.1	0.3	0.02	0.00	0.01
TN:Nashville	9	0.4	0.0	0.1	0.02	0.01	0.01
TX:Austin	8	0.6	0.0	0.2	0.02	0.01	0.01
TX:El Paso	6	1.0	0.2	0.6	0.03	0.01	0.02
UT:Salt Lake City	5	0.3	0.0	0.1	0.01	0.01	0.01
VA:Lynchburg	4	0.6	0.1	0.2	0.01	0.01	0.01
VA:Virginia Beach	4	0.1	0.1	0.1	0.01	0.01	0.01
WA:Olympia	9	0.3	0.0	0.1	0.01	0.00	0.00
WA:Spokane	9	0.1	0.0	0.0	0.03	0.00	0.01
WI:Madison	9	0.3	0.1	0.2	0.03	0.01	0.02
WV:Charleston	1	0.1	0.1	0.1	0.00	0.00	0.00

Minimum Detectable Limit for field estimates - 0.1 pCi/m<sup>3</sup>.

Minimum Detectable Limit for laboratory measurement - 0.01 pCi/m<sup>3</sup>.

**Table 5**  
**Gross Beta and Specific Gamma in Precipitation**  
**October 1992**

Location	Depth (mm)	Gross Beta Activity		Specific Gamma
		nCi/m <sup>2</sup>	±2σ	Activity pCi/L ±2σ
AL:Montgomery	95.0	0.08	0.03	ND
AR:Little Rock	10.0	0.06	0.01	<sup>7</sup> Be: 167±43
AZ:Phoenix	4.0	0.01	0.00	ND
CA:Berkeley	44.2	0.03	0.01	ND
CT:Hartford	40.0	0.05	0.01	ND
FL:Jacksonville	16.6	0.01	0.00	ND
FL:Miami	63.4	0.08	0.02	ND
ID:Boise	11.2	0.02	0.00	ND
ID:Idaho Falls	19.2	0.08	0.01	ND
IL:Chicago	18.6	0.04	0.01	ND
LA:New Orleans	0.0	0.00	0.00	ND
ME:Augusta	91.0	0.18	0.03	ND
MI:Lansing	70.0	0.16	0.03	ND
MN:Minneapolis	43.0	0.12	0.02	ND
MO:Jefferson City	17.0	0.04	0.01	<sup>7</sup> Be: 73.5±35.3
MS:Jackson	20.4	0.03	0.01	ND
NC:Charlotte	80.0	0.04	0.02	ND
NC:Wilmington	110.0	0.04	0.03	ND
NH:Concord	51.2	0.19	0.02	<sup>7</sup> Be: 44.5±30.4
NJ:Trenton	18.0	0.08	0.01	<sup>7</sup> Be: 68.5±24.7
NV:Las Vegas	19.0	0.31	0.02	ND
NY:Albany	63.6	0.35	0.03	<sup>7</sup> Be: 75.4±27.0
NY:Niagara Falls	42.0	0.06	0.01	ND
NY:Syracuse	8.0	0.01	0.00	ND
NY:Yaphank	16.0	0.14	0.01	ND
OH:Painesville	99.8	0.09	0.03	<sup>7</sup> Be: 72.6±29.8
OH:Toledo	47.0	0.13	0.02	ND
OR:Portland	49.8	0.06	0.01	ND
PA:Harrisburg	48.6	0.09	0.02	<sup>7</sup> Be: 55.0±50.2
SC:Barnwell	158.0	0.09	0.04	ND
SC:Columbia	103.6	0.07	0.03	ND
TN:Knoxville	50.0	0.02	0.01	ND
TN:Nashville	20.4	0.03	0.01	ND
TX:Austin	40.0	0.02	0.01	ND
UT:Salt Lake City	4.0	0.04	0.00	ND
VA:Lynchburg	71.6	0.24	0.03	ND
WA:Olympia	44.0	0.05	0.01	ND
WI:Madison	38.6	0.04	0.01	ND

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

**Table 6**  
**Gross Beta and Specific Gamma in Precipitation**  
**November 1992**

Location	Depth (mm)	Gross Beta Activity		Specific Gamma
		nCi/m <sup>2</sup>	±2σ	pCi/L ±2σ
AK:Juneau	32.0	0.01	0.01	ND
AL:Montgomery	154.0	0.09	0.04	ND
AR:Little Rock	112.0	0.13	0.04	ND
CA:Berkeley	3.6	0.00	0.00	ND
CT:Hartford	107.0	0.20	0.04	ND
FL:Jacksonville	60.8	0.20	0.03	ND
FL:Miami	111.8	0.05	0.03	ND
ID:Boise	36.6	0.03	0.01	ND
ID:Idaho Falls	13.4	0.08	0.01	ND
IL:Chicago	93.4	0.11	0.03	ND
LA:New Orleans	167.0	0.04	0.04	ND
ME:Augusta	65.0	0.08	0.02	<sup>214</sup> Pb: 6.7±4.1
MI:Lansing	109.0	0.15	0.04	ND
MN:Minneapolis	60.0	0.06	0.02	ND
MO:Jefferson City	163.0	0.30	0.06	ND
NC:Charlotte	134.0	0.06	0.03	ND
NC:Wilmington	93.2	0.14	0.03	<sup>7</sup> Be: 57.4±29.1
ND:Bismarck	26.6	0.05	0.01	ND
NH:Concord	32.8	0.03	0.01	ND
NJ:Trenton	101.4	0.12	0.03	ND
NM:Santa Fe	2.0	0.00	0.00	ND
NY:Albany	90.4	0.20	0.03	<sup>7</sup> Be: 43.6±23.9
NY:Niagara Falls	81.0	0.14	0.03	<sup>7</sup> Be: 37.8±32.8
NY:Syracuse	16.0	0.01	0.00	ND
NY:Yaphank	32.0	0.03	0.01	ND
OH:Painesville	117.2	0.28	0.05	ND
OH:Toledo	130.0	0.54	0.06	ND
OR:Portland	58.8	0.05	0.02	<sup>7</sup> Be: 41.4±35.5
PA:Harrisburg	67.8	0.09	0.02	<sup>7</sup> Be: 42.0±30.1
SC:Barnwell	81.4	0.13	0.03	ND
SC:Columbia	93.8	0.29	0.04	ND
TN:Knoxville	131.0	0.07	0.03	ND
TN:Nashville	98.6	0.08	0.03	<sup>7</sup> Be: 41.8±28.9
TX:Austin	70.0	0.08	0.02	<sup>212</sup> Pb: 7.6±5.2
UT:Salt Lake City	71.6	0.05	0.02	ND
VA:Lynchburg	81.0	0.73	0.05	ND
WA:Olympia	215.0	0.16	0.06	ND
WI:Madison	104.6	0.09	0.03	ND

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

**Table 7**  
**Gross Beta and Specific Gamma in Precipitation**  
**December 1992**

Location	Depth (mm)	Gross Beta Activity		Specific Gamma
		nCi/m <sup>2</sup>	±2σ	Activity pCi/L ±2σ
AL:Montgomery	84.0	0.11	0.03	<sup>7</sup> Be: 52.3±23.3
AR:Little Rock	78.0	0.11	0.03	<sup>7</sup> Be: 39.1±29.9
AZ:Phoenix	84.0	0.02	0.02	<sup>212</sup> Pb: 5.1±4.7
CA:Berkeley	149.6	0.04	0.04	ND
CO:Denver	25.8	0.11	0.01	ND
CT:Hartford	104.0	0.23	0.04	<sup>7</sup> Be: 42.1±22.6
FL:Jacksonville	41.8	0.01	0.01	ND
FL:Miami	17.2	0.01	0.00	ND
ID:Boise	15.0	0.02	0.01	ND
ID:Idaho Falls	44.6	0.05	0.01	ND
IL:Chicago	32.2	0.09	0.01	ND
LA:New Orleans	124.0	0.05	0.03	ND
MN:Minneapolis	17.0	0.03	0.01	<sup>7</sup> Be: 75.8±34.8
MO:Jefferson City	61.0	0.05	0.02	ND
MS:Jackson	84.0	0.06	0.02	ND
NC:Charlotte	126.0	0.25	0.05	ND
NC:Wilmington	47.0	0.03	0.01	ND
ND:Bismarck	5.0	0.04	0.00	ND
NJ:Trenton	111.8	0.60	0.06	<sup>7</sup> Be: 94.3±28.3
NM:Santa Fe	20.0	0.03	0.01	ND
NV:Las Vegas	12.0	0.01	0.00	<sup>212</sup> Pb: 10.1±5.8
NY:Albany	47.6	0.27	0.03	<sup>7</sup> Be: 51.4±23.4
NY:Niagara Falls	49.0	0.07	0.02	<sup>7</sup> Be: 37.6±29.8
NY:Syracuse	8.0	0.01	0.00	ND
NY:Yaphank	47.0	0.06	0.01	<sup>7</sup> Be: 48.3±22.6
OH:Painesville	22.6	0.12	0.01	<sup>7</sup> Be: 70.2±25.8
OH:Toledo	56.0	0.05	0.02	<sup>40</sup> K: 41.3±36.6
OR:Portland	176.4	0.12	0.05	<sup>212</sup> Pb: 5.3±4.7
PA:Harrisburg	76.4	0.24	0.03	<sup>7</sup> Be: 50.6±23.9
SC:Barnwell	48.2	0.09	0.02	<sup>7</sup> Be: 36.5±24.1
SC:Columbia	134.6	0.32	0.05	<sup>212</sup> Pb: 5.2±3.9
TN:Knoxville	135.0	0.15	0.04	ND
TN:Nashville	104.8	0.13	0.03	<sup>7</sup> Be: 50.5±27.3
TX:Austin	60.0	0.04	0.02	ND
TX:El Paso	43.0	0.03	0.01	ND
UT:Salt Lake City	13.4	0.04	0.01	ND
VA:Lynchburg	43.0	0.19	0.02	ND
WA:Olympia	117.0	0.05	0.03	<sup>212</sup> Pb: 8.9±8.3
WI:Madison	54.6	0.04	0.01	ND

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

**Table 8**  
**Tritium in Precipitation**  
**October-December 1992**

Location	October 1992		November 1992		December 1992	
	nCi/L	$\pm 2\sigma$	nCi/L	$\pm 2\sigma$	nCi/L	$\pm 2\sigma$
AK:Juneau	NS		0.4	0.2	NS	
AL:Montgomery	0.1	0.2	0.1	0.2	0.1	0.2
AR:Little Rock	0.2	0.2	0.2	0.2	0.1	0.2
AZ:Phoenix	0.1	0.2	NS		0.1	0.2
CA:Berkeley	0.1	0.2	0.1	0.2	0.1	0.2
CO:Denver	NS		NS		0.1	0.2
CT:Hartford	0.2	0.2	0.1	0.2	0.1	0.2
FL:Jacksonville	0.2	0.2	0.1	0.2	0.1	0.2
FL:Miami	0.1	0.2	0.1	0.2	0.1	0.2
ID:Boise	0.2	0.2	0.1	0.2	0.1	0.2
ID:Idaho Falls	0.2	0.2	0.2	0.2	0.1	0.2
IL:Chicago	0.2	0.2	0.2	0.2	0.1	0.2
LA:New Orleans	0.2	0.2	0.2	0.2	0.1	0.2
ME:Augusta	0.2	0.2	0.1	0.2	NS	
MI:Lansing	0.2	0.2	0.2	0.2	NS	
MN:Minneapolis	0.2	0.2	0.1	0.2	0.1	0.2
MO:Jefferson City	0.1	0.2	0.2	0.2	0.1	0.2
MS:Jackson	0.1	0.2	NS		0.1	0.2
NC:Charlotte	0.2	0.2	0.2	0.2	0.1	0.2
NC:Wilmington	0.2	0.2	0.2	0.2	0.1	0.2
ND:Bismarck	NS		0.2	0.2	0.1	0.2
NH:Concord	0.2	0.2	0.1	0.2	NS	
NJ:Trenton	0.2	0.2	0.1	0.2	0.1	0.2
NM:Santa Fe	NS		0.2	0.2	0.2	0.2
NV:Las Vegas	0.2	0.2	NS		0.1	0.2
NY:Albany	0.3	0.2	0.2	0.2	0.1	0.2
NY:Niagara Falls	0.3	0.2	0.1	0.2	0.1	0.2
NY:Syracuse	0.2	0.2	0.1	0.2	0.1	0.2
NY:Yaphank	0.2	0.2	0.1	0.2	0.1	0.2
OH:Painesville	0.2	0.2	0.2	0.2	0.1	0.2
OH:Toledo	0.1	0.2	0.2	0.2	0.1	0.2
OR:Portland	0.1	0.2	0.3	0.2	0.1	0.2
PA:Harrisburg	0.2	0.2	0.1	0.2	0.1	0.2
SC:Barnwell	0.3	0.2	0.2	0.2	0.5	0.2
SC:Columbia	0.2	0.2	0.1	0.2	0.2	0.2
TN:Knoxville	0.1	0.2	0.1	0.2	0.1	0.2
TN:Nashville	0.2	0.2	0.2	0.2	0.1	0.2
TX:Austin	0.2	0.2	0.2	0.2	0.1	0.2
TX:El Paso	NS		NS		0.1	0.2
UT:Salt Lake City	0.2	0.2	0.1	0.2	0.1	0.2

**Table 8 (continued)**  
**Tritium in Precipitation**  
**October-December 1992**

Location	October 1992		November 1992		December 1992	
	nCi/L	$\pm 2\sigma$	nCi/L	$\pm 2\sigma$	nCi/L	$\pm 2\sigma$
VA:Lynchburg	0.2	0.2	0.1	0.2	0.2	0.2
WA:Olympia	0.1	0.2	0.2	0.2	0.1	0.2
WI:Madison	0.1	0.2	0.1	0.2	0.1	0.2

Note:  $\sigma$  = 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.

Table 9 contains the plutonium and uranium results for the period July–December 1992.

**Table 9**  
**Plutonium and Uranium In Airborne Particulates**  
**July-December 1992 Composites**

Location	<sup>238</sup> Pu		<sup>239-240</sup> Pu		<sup>234</sup> U		<sup>235</sup> U		<sup>238</sup> U	
	aCi/m <sup>3</sup>	±2σ	aCi/m <sup>3</sup>	±2σ	aCi/m <sup>3</sup>	±2σ	aCi/m <sup>3</sup>	±2σ	aCi/m <sup>3</sup>	±2σ
AK:Anchorage	0.3	0.4	0.3	0.3	14.9	2.6	1.1	0.6	10.5	2.1
AK:Juneau	0.1	0.2	0.3	0.3	5.3	1.3	0.1	0.3	3.2	1.0
AL:Montgomery	0.1	0.2	0.1	0.2	11.5	1.4	0.5	0.3	10.5	1.3
AR:Little Rock	0.3	0.4	ND		29.6	3.6	0.5	0.5	20.9	2.9
AZ:Phoenix	0.1	0.4	ND		43.5	5.5	1.0	0.7	37.1	5.0
CA:Berkeley	0.3	0.2	0.1	0.2	6.1	1.0	0.2	0.2	5.3	0.9
CA:Los Angeles	0.5	0.4	ND		22.8	2.8	1.3	0.6	18.8	2.5
CO:Denver	0.4	0.4	0.4	0.3	22.3	2.5	1.0	0.5	22.6	2.6
CT:Hartford	0.3	0.2	ND		9.5	1.3	0.5	0.3	7.1	1.1
DE:Wilmington	0.1	0.2	0.6	0.3	9.1	1.7	0.9	0.6	8.9	1.7
FL:Jacksonville	0.1	0.2	0.9	0.4	18.1	2.4	1.0	0.5	17.1	2.3
FL:Miami	0.1	0.2	ND		17.0	1.9	0.6	0.3	14.6	1.7
HI:Honolulu	0.1	0.3	0.3	0.3	7.1	1.7	0.6	0.5	3.8	1.2
IA:Iowa City	0.1	0.3	0.2	0.2	11.1	1.6	0.4	0.3	11.3	1.6
ID:Boise	0.3	0.6	0.4	0.4	25.3	3.3	0.8	0.6	21.3	2.9
ID:Idaho Falls	0.2	0.3	0.7	0.5	29.6	3.5	1.5	0.7	28.5	3.4
IL:Chicago	0.2	0.3	0.3	0.3	25.0	3.0	1.5	0.7	24.8	3.0
IN:Indianapolis	0.3	0.4	0.2	0.2	28.0	3.4	2.1	0.9	30.2	3.5
KS:Topeka	ND		0.1	0.1	15.1	2.1	0.5	0.4	15.1	2.1
KY:Frankfort	0.2	0.2	0.5	0.2	10.8	1.5	0.6	0.3	8.8	1.3
LA:New Orleans	ND		0.1	0.2	15.6	2.1	1.1	0.5	14.0	2.0
MA:Lawrence	0.2	0.2	0.1	0.1	8.4	1.1	0.2	0.2	7.6	1.1
ME:Augusta	0.4	0.3	ND		9.9	1.3	0.8	0.4	10.2	1.3
MI:Lansing	0.3	0.3	0.4	0.2	10.7	1.4	0.3	0.2	9.5	1.3
MN:Minneapolis	0.3	0.3	ND		14.0	1.8	0.4	0.3	12.6	1.7
MO:Jefferson City	0.3	0.2	ND		12.7	1.6	0.7	0.4	10.1	1.4
MS:Jackson	0.1	0.2	0.2	0.2	14.2	1.6	0.8	0.4	14.9	1.7
NC:Charlotte	0.2	0.3	ND		21.3	2.5	1.1	0.5	17.7	2.2
NC:Wilmington	ND		0.4	0.3	15.9	2.1	1.4	0.6	14.2	2.0
ND:Bismarck	ND		0.1	0.2	18.5	2.1	0.6	0.4	16.2	2.0
NE:Lincoln	ND		0.6	0.5	18.5	3.4	1.5	0.9	20.6	3.5
NH:Concord	0.2	0.2	ND		7.9	1.1	0.3	0.2	6.5	1.0
NJ:Trenton	0.5	0.4	0.2	0.2	7.7	1.4	0.6	0.4	7.1	1.3
NM:Santa Fe	0.1	0.2	0.2	0.2	17.9	2.1	0.7	0.4	17.3	2.0
NV:Las Vegas	0.7	1.0	3.6	1.8	105	12	3.4	1.8	61.9	8.3
NY:Albany	ND		ND		11.9	1.4	1.0	0.4	12.8	1.5
NY:Niagara Falls	0.1	0.2	ND		33.9	3.3	2.0	0.7	30.7	3.1



**Table 9 (continued)**  
**Plutonium and Uranium In Airborne Particulates**  
**July-December 1992 Composites**

Location	$^{238}\text{Pu}$		$^{239-240}\text{Pu}$		$^{234}\text{U}$		$^{235}\text{U}$		$^{238}\text{U}$	
	aCi/m <sup>3</sup>	$\pm 2\sigma$	aCi/m <sup>3</sup>	$\pm 2\sigma$	aCi/m <sup>3</sup>	$\pm 2\sigma$	aCi/m <sup>3</sup>	$\pm 2\sigma$	aCi/m <sup>3</sup>	$\pm 2\sigma$
NY:Syracuse	0.2	0.4	ND		10.8	1.6	0.3	0.3	10.2	1.5
NY:Yaphank	0.1	0.1	ND		4.9	0.8	0.5	0.2	4.4	0.7
OH:Columbus	0.2	0.2	0.1	0.1	20.7	2.3	1.2	0.5	14.9	1.9
OH:Painesville	0.3	0.3	ND		10.8	1.7	1.0	0.5	10.1	1.7
OH:Ross	0.4	0.7	0.4	0.5	38.9	6.0	2.7	1.5	38.2	5.9
OH:Toledo	0.6	0.3	0.1	0.2	18.8	2.2	0.7	0.4	16.5	2.1
OR:Portland	0.1	0.3	0.1	0.2	10.7	2.1	0.8	0.6	10.5	2.1
PA:Harrisburg	0.2	0.3	0.7	0.3	10.0	1.3	0.4	0.3	9.2	1.2
RI:Providence	0.5	0.4	ND		11.6	1.8	0.5	0.4	9.3	1.6
SC:Barnwell	0.1	0.1	0.1	0.1	7.1	0.8	0.3	0.2	7.2	0.8
SC:Columbia	ND		0.1	0.2	23.5	2.8	1.4	0.6	26.0	2.9
SD:Pierre	0.2	0.3	0.3	0.2	10.2	1.4	0.5	0.3	7.8	1.2
TN:Knoxville	0.3	0.3	0.2	0.2	15.9	1.7	0.5	0.3	12.4	1.5
TN:Nashville	ND		0.3	0.4	18.6	3.5	1.2	1.0	18.4	3.4
TX:Austin	ND		0.2	0.2	13.0	1.7	0.6	0.3	11.5	1.6
TX:El Paso	1.3	1.3	0.2	0.4	80.0	9.7	3.3	1.9	65.3	8.6
UT:Salt Lake City	0.6	0.7	1.0	0.7	29.7	3.9	0.8	0.6	25.7	3.6
VA:Lynchburg	0.1	0.3	ND		155	11	4.3	1.0	10.8	1.6
VA:Virginia Beach	0.2	0.2	0.1	0.1	15.9	2.3	0.7	0.5	14.1	2.1
WA:Olympia	ND		0.2	0.2	6.3	1.1	0.3	0.2	4.5	0.9
WA:Spokane	1.2	1.1	0.9	0.8	43.1	6.5	2.0	1.4	36.4	5.9
WI:Madison	0.3	0.3	0.1	0.1	14.1	1.9	0.4	0.5	15.0	2.0

Note:  $\sigma$  = 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 10 contains the tritium concentration data for October–December 1992. Table 11 contains the surface water annual gamma results for January–December 1992.

**Table 10**  
**Tritium in Surface Water**  
**October–December 1992**

Location	Source	Date Collected	<sup>3</sup> H	
			nCi/L	±2σ
AL:Decatur	Tennessee River	10/08/92	0.2	0.2
AL:Gordon	Chattahoochee River	10/13/92	0.1	0.2
AL:Scottsboro	Tennessee River	10/08/92	0.2	0.2
AR:Little Rock	Arkansas River	10/21/92	0.2	0.2
CA:Clay Station	Folsom S. Canal	10/27/92	0.1	0.2
CA:Eureka	Humboldt Bay	10/22/92	0.2	0.2
CA:San Onofre	Pacific Ocean	12/04/92	0.2	0.2
CO:Platteville	South Platte River	10/21/92	0.2	0.2
CT:East Haddam	Connecticut River	10/26/92	0.3	0.2
CT:Waterford	Long Island Sound	10/26/92	0.1	0.2
FL:Crystal River	Gulf Of Mexico	11/09/92	0.2	0.2
FL:Ft. Pierce	Atlantic Ocean	10/21/92	0.2	0.2
FL:Homestead	Biscayne Bay	10/27/92	0.1	0.2
IA:Cedar Rapids	Cedar River	10/28/92	0.1	0.2
ID:Buhl	Snake River	12/01/92	0.2	0.2
IL:E. Moline	Mississippi River	10/19/92	0.2	0.2
IL:Morris	Illinois River	11/03/92	0.4	0.2
IL:Zion	Lake Michigan	11/15/92	0.3	0.2
KS:Leroy	Neosho River	12/29/92	0.1	0.2
LA:New Orleans	Mississippi River	10/26/92	0.2	0.2
MA:Plymouth	Cape Cod Bay	10/21/92	0.2	0.2
MD:Conowingo	Susquehanna River	11/03/92	0.2	0.2
MD:Lusby	Chesapeake Bay	11/02/92	0.1	0.2
ME:Wiscasset	Montseway Bay	10/20/92	0.2	0.2
MI:Bridgman	Lake Michigan	10/27/92	0.3	0.2
MI:Charlevoix	Lake Michigan	10/22/92	0.2	0.2
MI:Monroe	Lake Erie	10/26/92	0.2	0.2
MI:South Haven	Lake Michigan	10/27/92	0.2	0.2
MN:Red Wing	Mississippi River	11/03/92	0.2	0.2
MS:Port Gibson	Mississippi River	10/20/92	0.1	0.2
NC:Charlotte	Catawba River	10/21/92	0.3	0.2
NC:Southport	Atlantic Ocean	10/22/92	0.2	0.2
NE:Rulo	Missouri River	10/19/92	0.2	0.2
NJ:Bayside	Delaware River	10/20/92	0.2	0.2
NJ:Oyster Creek	Oyster Creek	10/22/92	0.2	0.2
NV:Boulder City	Colorado River	11/04/92	0.2	0.2
NY:Chelsea	Hudson River	10/26/92	0.1	0.2

**Table 10 (continued)**  
**Tritium in Surface Water**  
**October–December 1992**

Location	Source	Date Collected	<sup>3</sup> H	
			nCi/L	±2σ
NY:Ossining	Hudson River	12/04/92	0.1	0.2
NY:Oswego	Lake Ontario	12/22/92	0.2	0.2
OH:Toledo	Lake Erie	10/23/92	0.2	0.2
OR:Bradwood	Columbia River	11/10/92	0.2	0.2
PA:Danville	Susquehanna River	10/21/92	0.1	0.2
PA:Philadelphia	Schuylkill R.-Belmont	10/29/92	0.2	0.2
PA:Philadelphia	Delaware River	10/29/92	0.1	0.2
PA:Philadelphia	Schuylkill R.-Queen	10/29/92	0.2	0.2
SC:Allendale	Savannah River	10/30/92	1.3	0.2
SC:Broad River	Broad River	11/06/92	0.4	0.2
SC:Hartsville	Lake Robinson	11/16/92	2.6	0.2
TN:Kingston	Clinch River	11/06/92	0.4	0.2
TX:El Paso	Rio Grande	11/17/92	0.1	0.2
TX:Matagorda	Colorado River	10/13/92	0.3	0.2
VA:Doswell	North Anna River	10/01/92	4.0	0.2
VA:Newport News	James River	10/13/92	0.2	0.2
VT:Vernon	Connecticut River	11/13/92	0.2	0.2
WA:Richland	Columbia River	10/20/92	0.2	0.2
WI:Two Creeks	Lake Michigan	10/26/92	0.1	0.2
WI:Victory	Mississippi River	10/12/92	0.2	0.2
WV:Wheeling	Ohio River	10/20/92	0.2	0.2

Note: σ = Counting Error.

**Table 11**  
**Surface Water**  
**Annual Gamma Analysis**  
**January-December 1992**

Location	Source	Date Collected	Specific Gamma Activity pCi/L $\pm 2\sigma$
AL:Decatur	Tennessee River	04/14/92	ND
AL:Gordon	Chattahoochee River	04/16/92	ND
AL:Scottsboro	Tennessee River	04/15/92	ND
AR:Little Rock	Arkansas River	06/10/92	ND
CA:Clay Station	Folsom S. Canal	04/14/92	ND
CA:Diablo Canyon	Pacific Ocean	04/08/92	<sup>40</sup> K: 327 $\pm$ 44
CA:Eureka	Humboldt Bay	04/09/92	<sup>40</sup> K: 293 $\pm$ 68
CA:San Onofre	Pacific Ocean	06/10/92	<sup>40</sup> K: 306 $\pm$ 63
CO:Platteville	South Platte River	04/15/92	ND
CT:East Haddam	Connecticut River	04/08/92	ND
CT:Waterford	Long Island Sound	04/08/92	<sup>40</sup> K: 248 $\pm$ 45
FL:Crystal River	Gulf Of Mexico	04/04/92	ND
FL:Ft. Pierce	Atlantic Ocean	04/07/92	<sup>40</sup> K: 226 $\pm$ 45
FL:Homestead	Biscayne Bay	04/20/92	<sup>40</sup> K: 353 $\pm$ 49
GA:Baxley	Altamaha River	04/07/92	<sup>40</sup> K: 63.7 $\pm$ 28.0
IA:Cedar Rapids	Cedar River	04/08/92	ND
IL:E. Moline	Mississippi River	04/10/92	ND
IL:Morris	Illinois River	04/03/92	ND
IL:Zion	Lake Michigan	05/15/92	ND
KS:Leroy	Neosho River	07/01/92	ND
LA:New Orleans	Mississippi River	04/01/92	ND
MA:Plymouth	Cape Cod Bay	04/03/92	ND
MD:Conowingo	Susquehanna River	04/06/92	ND
MD:Lusby	Chesapeake Bay	04/13/92	<sup>40</sup> K: 121 $\pm$ 38
ME:Wiscasset	Montseway Bay	04/07/92	<sup>40</sup> K: 186 $\pm$ 41
MI:Bridgman	Lake Michigan	04/13/92	ND
MI:Charlevoix	Lake Michigan	04/06/92	ND
MI:Monroe	Lake Erie	04/06/92	ND
MI:South Haven	Lake Michigan	04/13/92	ND
MN:Monticello	Mississippi River	04/08/92	ND
MN:Red Wing	Mississippi River	05/14/92	ND
MS:Port Gibson	Mississippi River	04/07/92	ND
NC:Charlotte	Catawba River	04/02/92	ND
NC:Southport	Atlantic Ocean	05/11/92	<sup>40</sup> K: 191 $\pm$ 43
NE:Rulo	Missouri River	05/02/92	ND
NJ:Bayside	Delaware River	04/14/92	<sup>40</sup> K: 128 $\pm$ 39
NJ:Oyster Creek	Oyster Creek	04/16/92	<sup>40</sup> K: 242 $\pm$ 43

**Table 11 (continued)**  
**Surface Water**  
**Annual Gamma Analysis**  
**January-December 1992**

Location	Source	Date Collected	Specific Gamma Activity pCi/L $\pm 2\sigma$
NV:Boulder City	Colorado River	04/02/92	ND
NY:Chelsea	Hudson River	04/06/92	ND
NY:Ossining	Hudson River	04/15/92	ND
NY:Oswego	Lake Ontario	06/24/92	ND
OH:Toledo	Lake Erie	04/03/92	ND
OR:Bradwood	Columbia River	05/11/92	ND
PA:Danville	Susquehanna River	04/15/92	ND
PA:Philadelphia	Schuylkill R.-Queen	04/21/92	ND
PA:Philadelphia	Delaware River	04/21/92	ND
PA:Philadelphia	Schuylkill R.-Belmont	04/23/92	ND
SC:Allendale	Savannah River	04/30/92	ND
SC:Broad River	Broad River	04/15/92	ND
SC:Hartsville	Lake Robinson	04/06/92	ND
TN:Daisy	Tennessee River	04/22/92	ND
TN:Kingston	Clinch River	04/07/92	ND
TX:El Paso	Rio Grande	04/09/92	ND
TX:Matagorda	Colorado River	04/07/92	ND
VA:Doswell	North Anna River	04/09/92	ND
VT:Vernon	Connecticut River	05/02/92	ND
WA:Northport	Columbia River	05/26/92	ND
WA:Richland	Columbia River	06/11/92	ND
WI:Two Creeks	Lake Michigan	04/13/92	ND
WI:Victory	Mississippi River	04/14/92	ND
WV:Wheeling	Ohio River	04/03/92	ND

Note:  $\sigma$  = 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 12 contains the data from drinking water samples for October–December 1992. Table 13 contains the data on gross alpha, gross beta, strontium-90, and radium-226 in drinking water for January–December 1992. Table 14 contains the plutonium and uranium in drinking water data for January–December 1992. Table 15 contains the I-131 in drinking water results for January–December 1992.



**Table 12**  
**Tritium in Drinking Water**  
**October-December 1992**

Location	Date Collected	<sup>3</sup> H	
		nCi/L	±2σ
AK:Fairbanks	10/30/92	0.1	0.2
AL:Decatur	10/08/92	0.1	0.2
AL:Dothan	10/13/92	0.2	0.2
AL:Montgomery	10/14/92	0.1	0.2
AL:Muscle Shoals	10/08/92	0.1	0.2
AL:Scottsboro	10/08/92	0.2	0.2
AR:Little Rock	10/20/92	0.3	0.2
CA:Berkerley	10/19/92	0.2	0.2
CA:Los Angeles	10/20/92	0.2	0.2
CO:Denver	10/20/92	0.1	0.2
CO:Platteville	10/21/92	0.2	0.2
CT:Hartford	10/19/92	0.2	0.2
DE:Dover	10/19/92	0.2	0.2
FL:Miami	10/21/92	0.1	0.2
FL:Tampa	11/03/92	0.2	0.2
GA:Savannah	10/27/92	0.2	0.2
HI:Honolulu	10/20/92	0.1	0.2
IA:Cedar Rapids	10/28/92	0.1	0.2
ID:Boise	10/19/92	0.3	0.2
ID:Idaho Falls	10/30/92	0.2	0.2
IL:Morris	10/23/92	0.1	0.2
IL:W. Chicago	10/26/92	0.2	0.2
KS:Topeka	10/19/92	0.2	0.2
LA>New Orleans	10/23/92	0.2	0.2
MA:Lawrence	10/26/92	0.1	0.2
MD:Baltimore	10/19/92	0.2	0.2
MD:Conowingo	11/03/92	0.2	0.2
ME:Augusta	11/02/92	0.1	0.2
MI:Detroit	11/06/92	0.3	0.2
MI:Grand Rapids	10/27/92	0.3	0.2
MN:Minneapolis	11/10/92	0.2	0.2
MN:Red Wing	11/03/92	0.2	0.2
MO:Jefferson City	10/20/92	0.2	0.2
MS:Jackson	10/20/92	0.1	0.2
MS:Port Gibson	10/20/92	0.1	0.2
MT:Helena	10/20/92	0.2	0.2
NC:Charlotte	10/21/92	0.5	0.2
NC:Wilmington	10/22/92	0.2	0.2
ND:Bismarck	10/20/92	0.1	0.2
NE:Lincoln	10/19/92	0.2	0.2
NH:Concord	10/19/92	0.3	0.2

**Table 12 (continued)**  
**Tritium in Drinking Water**  
**October-December 1992**

Location	Date Collected	<sup>3</sup> H	
		nCi/L	±2σ
NJ:Trenton	10/19/92	0.3	0.2
NJ:Waretown	10/22/92	0.2	0.2
NV:Las Vegas	10/19/92	0.2	0.2
NY:Albany	10/19/92	0.2	0.2
NY:New York City	10/21/92	0.2	0.2
NY:Niagara Falls	10/19/92	0.2	0.2
NY:Syracuse	12/14/92	0.1	0.2
OH:Cincinnati	11/24/92	0.1	0.2
OH:Columbus	11/04/92	0.1	0.1
OH:East Liverpool	11/25/92	0.2	0.2
OH:Painesville	10/20/92	0.3	0.2
OH:Toledo	10/23/92	0.3	0.2
OK:Oklahoma City	10/27/92	0.1	0.2
OR:Portland	10/23/92	0.2	0.2
PA:Columbia	10/20/92	0.2	0.2
PA:Harrisburg	10/27/92	0.2	0.2
PA:Philadelphia-Baxter	10/29/92	0.1	0.2
PA:Philadelphia-Queen	10/29/92	0.1	0.2
PA:Philadelphia	10/29/92	0.1	0.2
PA:Pittsburgh	11/25/92	0.3	0.2
PC:Corozal	10/21/92	0.1	0.2
RI:Providence	10/23/92	0.1	0.2
SC:Barnwell	10/22/92	0.2	0.2
SC:Hartsville	11/09/92	0.2	0.2
SC:Jenkinsville	11/06/92	0.2	0.2
SC:Seneca	11/10/92	0.2	0.2
TN:Chattanooga	11/16/92	0.1	0.2
TN:Knoxville	10/26/92	0.2	0.2
TX:Austin	10/20/92	0.1	0.2
VA:Doswell	11/03/92	0.1	0.2
VA:Lynchburg	10/21/92	0.1	0.2
VA:Virginia Beach	10/20/92	0.1	0.2
WA:Richland	10/20/92	0.2	0.2
WA:Seattle	10/20/92	0.2	0.2
WI:Genoa City	10/12/92	0.2	0.2
WI:Madison	10/19/92	0.2	0.2

Note: σ = Counting Error.

**Table 13**  
**Drinking Water**  
**Alpha, Beta, Gamma, Sr-90, and Ra-226 Concentrations**  
**January-December 1992 Composites**

Location	Total Solids (mg/L)	Gross Beta		Gross Alpha		<sup>90</sup> Sr		<sup>226</sup> Ra		Specific Gamma Activity	
		pCi/L	±2σ	pCi/L	±2σ	pCi/L	±2σ	pCi/L	±2σ	pCi/L	±2σ
AK:Fairbanks	140.0	3.5	0.8	1.6	1.3	ND		0.1	0.0	ND	
AL:Decatur	86.8	3.4	0.7	1.6	0.8	ND		0.2	0.0	ND	
AL:Dothan	164.0	1.7	0.6	0.9	1.3	ND		ND		ND	
AL:Montgomery	55.2	1.6	0.6	0.4	0.5	0.0	0.0	ND		ND	
AL:Muscle Shoals	81.6	1.5	35.9	0.2	0.5	0.1	0.3	ND		ND	
AL:Scottsboro	87.8	2.3	0.6	0.4	0.5	0.1	0.4	ND		ND	
AR:Little Rock	27.6	0.8	0.5	0.2	0.3	0.1	0.3	ND		ND	
CA:Berkeley	31.6	0.8	0.5	0.4	0.4	ND		ND		ND	
CA:Los Angeles	319.0	5.7	1.6	3.3	2.4	ND		0.1	0.0	ND	
CO:Denver	137.4	2.6	0.7	1.8	1.2	0.0	0.3	0.1	0.0	ND	
CO:Platteville	433.2	6.9	1.5	14.3	4.9	ND		0.2	0.0	ND	
CT:Hartford	33.6	1.0	0.6	0.1	0.4	0.0	0.3	ND		ND	
CZ:Ancon	70.0	1.1	0.6	0.2	0.5	0.0	0.3	ND		ND	
DE:Dover	230.0	2.9	1.0	0.6	1.5	0.0	0.1	ND		ND	
FL:Miami	160.0	2.6	0.8	2.0	1.5	0.0	0.3	0.3	0.0	ND	
FL:Tampa	497.6	3.6	0.9	1.6	2.1	0.1	0.5	ND		ND	
GA:Baxley	170.0	3.6	0.8	2.9	1.9	0.0	0.3	1.8	0.0	ND	
GA:Savannah	120.0	1.7	0.6	0.4	0.7	0.1	0.3	ND		ND	
HI:Honolulu	160.0	0.7	0.6	0.0	0.7	ND		ND		ND	
IA:Cedar Rapids	120.0	2.7	0.7	0.7	0.8	0.1	0.2	ND		ND	
ID:Boise	110.0	0.9	0.6	0.8	0.7	0.3	0.1	ND		ND	
ID:Idaho Falls	218.8	3.3	1.2	1.2	1.4	0.0	0.0	0.1	0.0	ND	
IL:Morris	528.0	6.3	1.5	9.6	4.9	0.0	0.0	1.5	0.0	ND	
†IL:W. Chicago	288.8	18.8	2.2	29.4	5.6	0.0	0.0	5.2	0.1	ND	
KS:Topeka	277.6	6.6	1.5	0.4	1.6	0.1	0.1	ND		ND	
LA:New Orleans	150.0	3.5	0.9	2.6	1.4	0.1	0.3	0.1	0.0	ND	
MA:Lawrence	98.2	2.0	0.6	0.6	0.7	0.1	0.1	ND		ND	
MD:Baltimore	90.0	2.0	0.7	ND		0.2	0.0	NA		ND	
MD:Conowingo	160.0	2.6	0.8	0.6	1.0	0.1	0.0	ND		ND	
ME:Augusta	36.0	1.2	0.6	0.7	0.5	0.3	0.4	ND		ND	
MI:Detroit	81.7	1.6	0.7	1.0	0.7	0.5	0.5	ND		ND	
MI:Grand Rapids	130.0	2.0	0.8	1.4	1.2	0.4	0.1	ND		ND	
MN:Minneapolis	94.0	2.8	0.8	0.4	0.6	0.2	0.0	ND		ND	
†MN:Red Wing	236.3	7.2	1.4	11.9	3.3	ND		2.7	0.1	ND	
MO:Jefferson City	280.0	5.1	1.1	2.8	2.3	0.1	0.2	0.1	0.0	ND	

Table 13 (continued)

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

January-December 1992 Composites

Location	Total Solids (mg/L)	Gross Beta		Gross Alpha		<sup>90</sup> Sr		<sup>226</sup> Ra		Specific Gamma Activity pCi/L ±2σ
		pCi/L	±2σ	pCi/L	±2σ	pCi/L	±2σ	pCi/L	±2σ	
MS:Jackson	71.0	2.0	0.7	0.2	0.4	0.1	0.1	ND		ND
MS:Port Gibson	403.2	7.6	1.5	2.4	2.9	ND		0.3	0.0	ND
MT:Helena	69.0	3.6	1.0	0.4	0.7	0.1	0.0	ND		ND
NC:Charlotte	45.0	1.0	0.7	ND		0.0	0.2	ND		ND
NC:Wilmington	98.0	1.4	0.7	0.4	0.6	0.1	0.2	57.1	68.2	ND
ND:Bismarck	300.0	4.2	1.1	2.2	2.0	0.0	0.2	26.1	47.4	ND
NE:Lincoln	282.0	9.8	1.6	8.5	3.0	0.1	0.2	0.2	0.0	ND
NH:Concord	79.0	1.7	0.7	0.5	0.6	ND		ND		ND
NJ:Trenton	86.0	1.4	0.7	0.5	0.6	ND		ND		ND
NJ:Waretown	52.0	2.2	0.7	1.1	0.7	0.3	0.2	45.1	62.7	ND
NM:Santa Fe	324.8	8.1	1.7	14.7	4.3	0.1	0.2	0.1	0.0	ND
NV:Las Vegas	634.0	8.4	2.3	12.2	6.2	0.1	0.2	0.2	0.0	ND
NY:Albany	68.8	0.6	0.6	0.0	0.0	0.2	0.2	ND		ND
NY:New York City	38.5	1.2	0.6	0.2	0.4	0.2	0.2	ND		ND
NY:Niagara Falls	100.0	1.7	0.7	0.5	0.6	0.4	0.3	ND		ND
NY:Syracuse	97.0	2.3	0.8	0.4	0.7	0.1	0.2	ND		ND
OH:Cincinnati	160.0	2.9	1.2	ND		0.2	0.2	ND		ND
OH:Columbus	350.0	4.5	1.2	ND		0.2	0.2	ND		ND
OH:East Liverpool	170.0	3.3	1.0	0.0	0.9	0.4	0.2	ND		ND
OH:Painesville	140.0	2.2	0.7	0.2	0.7	0.5	0.3	ND		ND
OH:Toledo	110.0	2.1	0.6	0.2	0.6	0.1	0.2	ND		ND
OK:Oklahoma City	59.0	2.4	0.6	0.1	0.3	0.2	0.2	85.4	97.5	ND
OR:Portland	18.0	0.8	0.5	0.2	0.3	ND		ND		ND
PA:Columbia	134.2	2.2	0.6	ND		0.2	0.2	ND		ND
PA:Harrisburg	38.5	1.1	0.6	0.6	0.5	0.0	0.2	ND		ND
PA:Philadelphia	210.0	4.5	0.9	0.5	1.2	0.2	0.2	ND		ND
PA:Philadelphia	160.0	3.1	0.8	1.3	1.1	0.2	0.2	ND		ND
PA:Philadelphia	130.0	2.3	0.8	0.8	0.8	0.0	0.2	ND		ND
PA:Pittsburgh	150.0	2.0	0.7	0.2	0.9	0.1	0.2	ND		ND
RI:Providence	54.0	1.4	0.6	0.2	0.4	0.1	0.2	ND		ND
SC:Barnwell	28.0	1.0	0.6	0.8	0.5	0.1	0.1	ND		ND
SC:Columbia	69.0	2.1	0.7	0.1	0.5	0.2	0.2	ND		ND
SC:Hartsville	28.0	1.2	0.6	1.2	0.5	0.1	0.1	ND		ND
SC:Jenkinsville	164.0	4.7	1.0	3.0	1.6	0.0	0.1	0.5	0.0	ND
SC:Seneca	31.3	1.1	0.6	ND		0.0	0.2	ND		ND

**Table 13 (continued)**  
**Drinking Water**  
**Alpha, Beta, Gamma, Sr-90, and Ra-226 Concentrations**  
**January–December 1992 Composites**

Location	Total Solids (mg/L)	Gross Beta		Gross Alpha		<sup>90</sup> Sr		<sup>226</sup> Ra		Specific Gamma Activity pCi/L ±2σ
		pCi/L	±2σ	pCi/L	±2σ	pCi/L	±2σ	pCi/L	±2σ	
TN:Chattanooga	79.5	1.8	0.7	0.4	0.6	0.3	0.2	ND		ND
TN:Knoxville	97.0	1.6	0.6	0.2	0.5	0.1	0.2	ND		ND
TX:Austin	160.0	3.1	1.2	0.6	0.9	0.1	0.2	ND		ND
VA:Doswell	190.0	5.3	1.0	0.3	1.2	0.2	0.2	ND		ND
VA:Lynchburg	52.4	0.8	0.5	0.0	0.0	0.2	0.2	ND		ND
VA:Virginia Beach	140.0	1.5	0.6	4.7	1.8	0.1	0.2	0.1	0.0	ND
WA:Richland	100.0	2.5	0.8	0.1	0.5	0.0	0.2	52.5	58.1	ND
WA:Seattle	28.8	1.1	0.5	0.3	0.3	ND		ND		ND
WI:Genoa City	56.0	1.0	0.7	0.3	0.5	0.0	0.2	ND		ND
WI:Madison	231.0	2.2	0.8	4.9	2.1	0.0	0.2	0.8	0.0	ND

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

† W. Chicago, IL  $3.3 \pm 0.7$  pCi/L <sup>228</sup>Ra.

‡ Red Wing, MN  $3.2 \pm 0.7$  pCi/L <sup>228</sup>Ra.

**Table 14**  
**Plutonium and Uranium Analyses**  
**Selected Drinking Water Composite Samples**

January-December 1992

Location	<sup>238</sup> Pu		<sup>239-240</sup> Pu		<sup>234</sup> U		<sup>235</sup> U		<sup>238</sup> U	
	pCi/l	±2σ	pCi/l	±2σ	pCi/l	±2σ	pCi/l	±2σ	pCi/l	±2σ
AK:Fairbanks	0.005	0.006	ND		0.116	0.031	0.006	0.007	0.113	0.030
AL:Decatur	0.002	0.005	ND		0.084	0.026	0.002	0.004	0.034	0.016
CA:Los Angeles	0.000	0.005	0.000	0.003	0.789	0.075	0.017	0.009	0.438	0.052
CO:Denver	0.008	0.007	0.001	0.002	1.940	0.157	0.071	0.022	1.520	0.131
CO:Platteville	0.022	0.024	0.005	0.014	7.550	0.973	0.315	0.142	5.690	0.790
FL:Miami	0.006	0.007	0.004	0.005	0.478	0.077	0.018	0.014	0.434	0.073
GA:Baxley	0.002	0.007	0.000	0.001	0.068	0.019	0.004	0.004	0.038	0.015
ID:Idaho Falls	0.005	0.005	0.001	0.002	0.825	0.085	0.024	0.012	0.382	0.053
IL:Morris	0.008	0.020	0.040	0.026	0.422	0.062	0.008	0.008	0.029	0.017
IL:W. Chicago	0.013	0.017	0.032	0.025	2.020	0.239	0.032	0.027	0.183	0.065
LA:New Orleans	0.009	0.009	ND		0.533	0.060	0.021	0.011	0.374	0.049
MN:Red Wing	0.014	0.025	ND		0.789	0.177	0.018	0.025	0.238	0.094
MO:Jefferson City	0.008	0.009	0.002	0.003	0.306	0.043	0.016	0.009	0.213	0.035
MS:Port Gibson	0.002	0.005	0.011	0.007	0.117	0.032	0.003	0.006	0.084	0.026
ND:Bismarck	0.007	0.007	0.003	0.004	0.191	0.042	0.006	0.007	0.146	0.036
NE:Lincoln	ND		ND		3.900	0.395	0.134	0.051	2.810	0.309
NM:Santa Fe	0.012	0.015	0.012	0.015	9.500	0.825	0.287	0.095	4.750	0.491
NV:Las Vegas	0.008	0.013	0.009	0.013	2.880	0.247	0.109	0.036	1.860	0.182
SC:Jenkinsville	ND		0.004	0.005	0.666	0.063	0.020	0.009	0.319	0.041
VA:Virginia Beach	0.003	0.008	0.003	0.005	0.064	0.022	0.004	0.007	0.031	0.016
WI:Madison	0.007	0.007	0.002	0.004	1.230	0.102	0.016	0.009	0.270	0.040

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

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

**Table 15**  
**Iodine-131 in Drinking Water**  
**January-December 1992**

Location	Date Collected	pCi/L	$\pm 2\sigma$
AK:Fairbanks	07/09/92	ND	
AL:Dothan	01/07/92	0.2	0.1
AL:Montgomery	01/17/92	ND	
AL:Muscle Shoals	01/06/92	0.1	0.1
AL:Scottsboro	07/07/92	0.1	0.1
AR:Little Rock	01/23/92	ND	
CA:Berkeley	07/15/92	ND	
CA:Los Angeles	01/07/92	0.2	0.1
CO:Denver	10/20/92	ND	
CO:Platteville	01/15/92	ND	
FL:Miami	01/03/92	ND	
FL:Tampa	11/03/92	ND	
GA:Baxley	01/15/92	ND	
GA:Savannah	10/27/92	ND	
IA:Cedar Rapids	01/03/92	0.1	0.1
ID:Boise	01/10/92	ND	
ID:Idaho Falls	01/08/92	ND	
IL:W. Chicago	01/10/92	0.1	0.1
KS:Topeka	01/02/92	ND	
LA:New Orleans	01/02/92	0.1	0.1
MD:Baltimore	01/02/92	ND	
MD:Conowingo	07/06/92	ND	
ME:Augusta	01/07/92	0.2	0.1
MI:Detroit	07/07/92	ND	
MI:Grand Rapids	10/27/92	ND	
MN:Minneapolis	01/15/92	ND	
MN:Red Wing	01/15/92	ND	
MS:Jackson	01/06/92	ND	
MT:Helena	07/02/92	ND	
NC:Wilmington	10/22/92	ND	
ND:Bismarck	01/02/92	ND	
NE:Lincoln	07/07/92	ND	
NJ:Trenton	07/06/92	ND	
NJ:Waretown	07/16/92	ND	
NM:Santa Fe	01/06/92	ND	
NV:Las Vegas	01/06/92	ND	
NY:Albany	07/07/92	ND	
NY:New York City	01/06/92	ND	
NY:Niagara Falls	10/19/92	ND	
OH:Cincinnati	11/24/92	ND	

**Table 15 (continued)**  
**Iodine-131 in Drinking Water**  
**January-December 1992**

Location	Date Collected	pCi/L	$\pm 2\sigma$
OH:East Liverpool	11/26/92	ND	
OH:Painesville	01/02/92	ND	
OH:Toledo	01/07/92	ND	
OK:Oklahoma City	01/15/92	ND	
OR:Portland	01/02/92	ND	
PA:Columbia	01/23/92	0.1	0.1
PA:Harrisburg	01/13/92	ND	
PA:Philadelphia-Baxter	01/08/92	0.3	0.1
PA:Philadelphia-Queen	01/08/92	0.1	0.1
PA:Philadelphia	01/08/92	ND	
PA:Pittsburgh	11/26/92	ND	
RI:Providence	01/22/92	0.1	0.1
SC:Barnwell	01/16/92	ND	
SC:Columbia	01/02/92	0.1	0.1
SC:Hartsville	01/13/92	0.1	0.1
SC:Jenkinsville	07/24/92	ND	
SC:Seneca	11/10/92	ND	
TN:Chattanooga	01/09/92	ND	
TN:Knoxville	01/02/92	ND	
TX:Austin	01/02/92	ND	
VA:Doswell	11/03/92	ND	
VA:Lynchburg	01/02/92	ND	
VA:Virginia Beach	01/17/92	ND	
WA:Richland	10/20/92	0.1	0.1
WA:Seattle	01/03/92	ND	
WI:Genoa City	01/13/92	ND	
WI:Madison	01/02/92	ND	

$\sigma$  = Counting Error.  
 ND = Not Detectable.



### 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  $\text{CaF}_2:\text{Mn}$  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.

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† 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 16-18 contain the concentrations of radionuclides in pasteurized milk for October-December 1992. Table 19 contains the concentrations of strontium-90 in pasteurized milk EPA Regional Composites for October 1992.

**Table 16**  
**Radionuclides in Pasteurized Milk**  
**October 1992**

Location	Date Collected	K		<sup>137</sup> Cs		<sup>140</sup> Ba		<sup>131</sup> I	
		g/L	±2σ	pCi/L	±2σ	pCi/L	±2σ	pCi/L	±2σ
AL:Montgomery	10/09/92	1.62	0.08	ND		ND		ND	
AR:Little Rock	10/06/92	1.47	0.08	ND		ND		ND	
AZ:Phoenix	10/08/92	1.58	0.08	ND		ND		ND	
CA:Los Angeles	10/02/92	2.13	0.06	ND		ND		ND	
CA:Sacramento	10/02/92	1.66	0.07	ND		ND		ND	
CA:San Francisco	10/02/92	1.61	0.08	ND		ND		ND	
CT:Hartford	10/05/92	1.61	0.08	ND		ND		ND	
DE:Wilmington	10/07/92	1.66	0.08	ND		ND		ND	
GA:Atlanta	10/09/92	1.70	0.07	ND		ND		ND	
HI:Honolulu	10/01/92	1.61	0.06	ND		ND		ND	
IA:Des Moines	10/05/92	1.55	0.10	ND		ND		ND	
IL:Chicago	10/08/92	1.63	0.05	ND		ND		ND	
KS:Wichita	10/26/92	1.68	0.05	ND		ND		ND	
KY:Louisville	10/06/92	1.56	0.14	ND		ND		ND	
LA:New Orleans	10/27/92	1.58	0.12	ND		ND		ND	
MA:Boston	10/07/92	1.58	0.07	ND		ND		ND	
MD:Baltimore	10/01/92	1.66	0.08	ND		ND		ND	
ME:Portland	10/07/92	1.54	0.14	ND		ND		ND	
MI:Detroit	10/08/92	1.66	0.07	ND		ND		ND	
MI:Grand Rapids	10/05/92	1.58	0.07	ND		ND		ND	
MO:Kansas City	10/21/92	1.66	0.08	ND		ND		ND	
MS:Jackson	10/12/92	1.55	0.08	ND		ND		ND	
MT:Helena	10/27/92	1.63	0.08	ND		ND		ND	
ND:Minot	10/29/92	1.60	0.09	ND		ND		ND	
NE:Omaha	10/28/92	1.52	0.06	ND		ND		ND	
NJ:Trenton	10/07/92	1.58	0.08	ND		ND		ND	
NV:Las Vegas	10/20/92	1.50	0.14	ND		ND		ND	
NY:Buffalo	10/07/92	1.72	0.07	ND		ND		ND	
NY:Syracuse	10/05/92	1.75	0.07	ND		ND		ND	
OH:Cincinnati	10/30/92	1.66	0.08	ND		ND		ND	
OH:Cleveland	10/20/92	1.51	0.12	ND		ND		ND	
OK:Oklahoma City	10/06/92	1.50	0.07	ND		ND		ND	
PA:Philadelphia	10/05/92	1.55	0.05	ND		ND		ND	
PA:Pittsburgh	10/05/92	1.56	0.14	ND		ND		ND	
PC:Cristobal	10/02/92	1.55	0.07	11	2	ND		ND	
PR:San Juan	10/09/92	1.66	0.08	ND		ND		ND	
SC:Charleston	10/09/92	1.51	0.09	ND		ND		ND	

**Table 16 (continued)**  
**Radionuclides in Pasteurized Milk**  
**October 1992**

Location	Date Collected	K		<sup>137</sup> Cs		<sup>140</sup> Ba		<sup>131</sup> I	
		g/L	±2σ	pCi/L	±2σ	pCi/L	±2σ	pCi/L	±2σ
SD:Rapid City	10/01/92	1.60	0.05	ND		ND		ND	
TN:Chattanooga	10/13/92	1.56	0.10	ND		ND		ND	
TN:Knoxville	10/07/92	1.63	0.06	ND		ND		ND	
TN:Memphis	10/01/92	1.69	0.07	ND		ND		ND	
TX:Austin	10/13/92	1.66	0.07	ND		ND		ND	
TX:Ft. Worth	10/22/92	1.56	0.09	ND		ND		ND	
VA:Norfolk	10/02/92	1.61	0.08	ND		ND		ND	
VT:Montpelier	10/28/92	1.57	0.08	ND		ND		ND	
WA:Seattle	10/01/92	1.49	0.10	ND		ND		ND	
WA:Spokane	10/05/92	1.73	0.12	ND		ND		ND	
WV:Charleston	10/14/92	1.54	0.08	ND		ND		ND	

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

**Table 17**  
**Radionuclides in Pasteurized Milk**  
 November 1992

Location	Date Collected	K		<sup>137</sup> Cs		<sup>140</sup> Ba		<sup>131</sup> I	
		g/L	±2σ	pCi/L	±2σ	pCi/L	±2σ	pCi/L	±2σ
AL:Montgomery	11/05/92	1.73	0.07	ND		ND		ND	
AZ:Phoenix	11/18/92	1.61	0.05	ND		ND		ND	
CA:Los Angeles	11/02/92	1.47	0.14	ND		ND		ND	
CA:Sacramento	11/30/92	1.68	0.06	ND		ND		ND	
CA:San Francisco	11/12/92	1.61	0.08	ND		ND		ND	
DE:Dover	11/10/92	1.55	0.08	ND		ND		ND	
GA:Atlanta	11/03/92	1.64	0.07	ND		ND		ND	
HI:Honolulu	11/23/92	1.69	0.12	ND		ND		ND	
IA:Des Moines	11/02/92	1.57	0.06	ND		ND		ND	
IL:Chicago	11/05/92	1.60	0.08	ND		ND		ND	
IN:Indianapolis	11/02/92	1.51	0.08	ND		ND		ND	
KS:Wichita	11/23/92	1.67	0.08	ND		ND		ND	
KY:Louisville	11/02/92	1.58	0.11	ND		ND		ND	
LA:New Orleans	11/23/92	1.63	0.06	5	2	ND		ND	
MA:Boston	11/06/92	1.55	0.08	ND		ND		ND	
MD:Baltimore	11/06/92	1.69	0.08	ND		ND		ND	
ME:Portland	11/03/92	1.62	0.09	ND		ND		ND	
MI:Detroit	11/05/92	1.60	0.06	ND		ND		ND	
MI:Grand Rapids	11/02/92	1.63	0.08	ND		ND		ND	
MN:St. Paul	11/04/92	1.61	0.08	ND		ND		ND	
MO:Kansas City	11/23/92	1.54	0.08	ND		ND		ND	
MS:Jackson	11/02/92	1.60	0.07	ND		ND		ND	
MT:Helena	11/17/92	1.55	0.10	ND		ND		ND	
NC:Charlotte	11/29/92	1.58	0.07	ND		ND		ND	
ND:Minot	11/30/92	1.73	0.07	ND		ND		ND	
NE:Omaha	11/23/92	1.63	0.08	ND		ND		ND	
NJ:Trenton	11/06/92	1.57	0.08	ND		ND		ND	
NM:Albuquerque	11/03/92	1.41	0.07	ND		ND		ND	
NV:Las Vegas	11/10/92	1.56	0.07	ND		ND		ND	
NY:Buffalo	11/17/92	1.57	0.08	ND		ND		ND	
NY:Syracuse	11/04/92	1.50	0.09	ND		ND		ND	
OH:Cincinnati	11/25/92	1.64	0.08	ND		ND		ND	
OH:Cleveland	11/18/92	1.56	0.07	ND		ND		ND	
OK:Oklahoma City	11/10/92	1.66	0.07	ND		ND		ND	
PA:Philadelphia	11/02/92	1.66	0.10	ND		ND		ND	
PA:Pittsburgh	11/02/92	1.56	0.05	ND		ND		ND	
PC:Cristobal	11/24/92	1.59	0.05	8	1	ND		ND	

Table 17 (continued)  
 Radionuclides in Pasteurized Milk  
 November 1992

Location	Date Collected	K g/L $\pm 2\sigma$	<sup>137</sup> Cs pCi/L $\pm 2\sigma$	<sup>140</sup> Ba pCi/L $\pm 2\sigma$	<sup>131</sup> I pCi/L $\pm 2\sigma$
PR:San Juan	11/12/92	1.59 0.07	ND	ND	ND
SC:Charleston	11/17/92	1.59 0.05	ND	ND	ND
SD:Rapid City	11/01/92	1.69 0.07	ND	ND	ND
TN:Chattanooga	11/17/92	1.62 0.07	ND	ND	ND
TN:Knoxville	11/11/92	1.64 0.14	ND	ND	ND
TN:Memphis	11/10/92	1.54 0.10	ND	ND	ND
TX:Dallas	11/05/92	1.66 0.08	ND	ND	ND
VA:Norfolk	11/26/92	1.64 0.10	ND	ND	ND
VT:Montpelier	11/30/92	1.48 0.10	ND	ND	ND
WA:Seattle	11/06/92	1.64 0.06	ND	ND	ND
WA:Spokane	11/02/92	1.56 0.08	ND	ND	ND
WV:Charleston	11/10/92	1.56 0.09	ND	ND	ND

Note:  $\sigma$  = Counting Error. ND = Not Detectable.

**Table 18**  
**Radionuclides in Pasteurized Milk**  
 December 1992

Location	Date Collected	K		<sup>137</sup> Cs	<sup>140</sup> Ba	<sup>131</sup> I
		g/L	±2σ	pCi/L ±2σ	pCi/L ±2σ	pCi/L ±2σ
AL:Montgomery	12/10/92	1.56	0.07	ND	ND	ND
AR:Little Rock	12/02/92	1.57	0.07	ND	ND	ND
AZ:Phoenix	12/08/92	1.67	0.07	ND	ND	ND
CA:Los Angeles	12/08/92	1.64	0.08	ND	ND	ND
CA:San Francisco	12/03/92	1.75	0.07	ND	ND	ND
CO:Denver	12/31/92	1.57	0.06	ND	ND	ND
DE:Dover	12/09/92	1.64	0.09	ND	ND	ND
GA:Atlanta	12/03/92	1.47	0.12	ND	ND	ND
HI:Honolulu	12/28/92	1.50	0.12	ND	ND	ND
IA:Des Moines	12/08/92	1.63	0.08	ND	ND	ND
IL:Chicago	12/03/92	1.68	0.07	ND	ND	ND
IN:Indianapolis	12/07/92	1.66	0.07	ND	ND	ND
KS:Wichita	12/21/92	1.59	0.06	ND	ND	ND
KY:Louisville	12/08/92	1.75	0.07	ND	ND	ND
LA:New Orleans	12/21/92	1.57	0.09	ND	ND	ND
MA:Boston	12/07/92	1.64	0.08	ND	ND	ND
MD:Baltimore	12/04/92	1.75	0.05	ND	ND	ND
ME:Portland	12/09/92	1.63	0.06	ND	ND	ND
MI:Detroit	12/03/92	1.68	0.07	ND	ND	ND
MI:Grand Rapids	12/07/92	1.60	0.08	ND	ND	ND
MN:St. Paul	12/09/92	1.61	0.08	ND	ND	ND
MO:Kansas City	12/10/92	1.57	0.08	ND	ND	ND
MO:St. Louis	12/02/92	1.64	0.05	ND	ND	ND
MS:Jackson	12/08/92	1.32	0.07	ND	ND	ND
MT:Helena	12/14/92	1.63	0.07	ND	ND	ND
NC:Charlotte	12/31/92	1.58	0.08	ND	ND	ND
ND:Minot	12/28/92	1.67	0.08	ND	ND	ND
NE:Omaha	12/17/92	1.61	0.07	ND	ND	ND
NJ:Trenton	12/08/92	1.66	0.10	ND	ND	ND
NM:Albuquerque	12/23/92	1.60	0.07	ND	ND	ND
NV:Las Vegas	12/01/92	1.61	0.09	ND	ND	ND
NY:Buffalo	12/07/92	1.78	0.07	ND	ND	ND
OH:Cincinnati	12/31/92	1.61	0.08	ND	ND	ND
OH:Cleveland	12/16/92	1.67	0.08	ND	ND	ND
OR:Portland	12/03/92	1.84	0.07	ND	ND	ND
PA:Philadelphia	12/07/92	1.62	0.08	ND	ND	ND
PA:Pittsburgh	12/07/92	1.58	0.08	ND	ND	ND

**Table 18 (continued)**  
**Radionuclides in Pasteurized Milk**  
**December 1992**

Location	Date Collected	K		<sup>137</sup> Cs		<sup>140</sup> Ba		<sup>131</sup> I	
		g/L	±2σ	pCi/L	±2σ	pCi/L	±2σ	pCi/L	±2σ
PC:Cristobal	12/23/92	1.47	0.08	6	2	ND		ND	
PR:San Juan	12/15/92	1.69	0.07	ND		ND		ND	
SC:Charleston	12/09/92	1.38	0.13	ND		ND		ND	
SD:Rapid City	12/09/92	1.63	0.07	ND		ND		ND	
TN:Chattanooga	12/15/92	1.69	0.07	ND		ND		ND	
TN:Memphis	12/02/92	1.66	0.08	ND		ND		ND	
TX:Austin	12/07/92	1.56	0.06	ND		ND		ND	
TX:Dallas	12/29/92	1.62	0.14	ND		ND		ND	
VA:Norfolk	12/28/92	1.60	0.09	ND		ND		ND	
VT:Montpelier	12/21/92	1.51	0.12	ND		ND		ND	
WA:Seattle	12/03/92	1.67	0.07	ND		ND		ND	
WA:Spokane	12/07/92	1.54	0.14	ND		ND		ND	
WV:Charleston	12/08/92	1.62	0.06	ND		ND		ND	

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



**Table 19**  
**Strontium-90 in Pasteurized Milk**  
**EPA Regional Composites**

October 1992

EPA Region	Collection Date	<sup>90</sup> Sr	
		pCi/L	±2σ
I	10/15/92	1.6	0.5
II	10/15/92	1.3	0.2
III	10/15/92	1.6	0.3
IV	10/15/92	1.1	0.5
V	10/15/92	1.9	0.6
VI	10/15/92	1.2	0.2
VII	10/15/92	1.5	0.3
VIII	10/15/92	1.3	0.5
IX	10/15/92	0.5	0.7
X	10/15/92	1.6	0.6

Note: σ = Counting Error.

## 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*.

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