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Environmental Protection
Agency

Eastern Environmental
Radiation Facility
1890 Federal Drive
Montgomery, AL 36109

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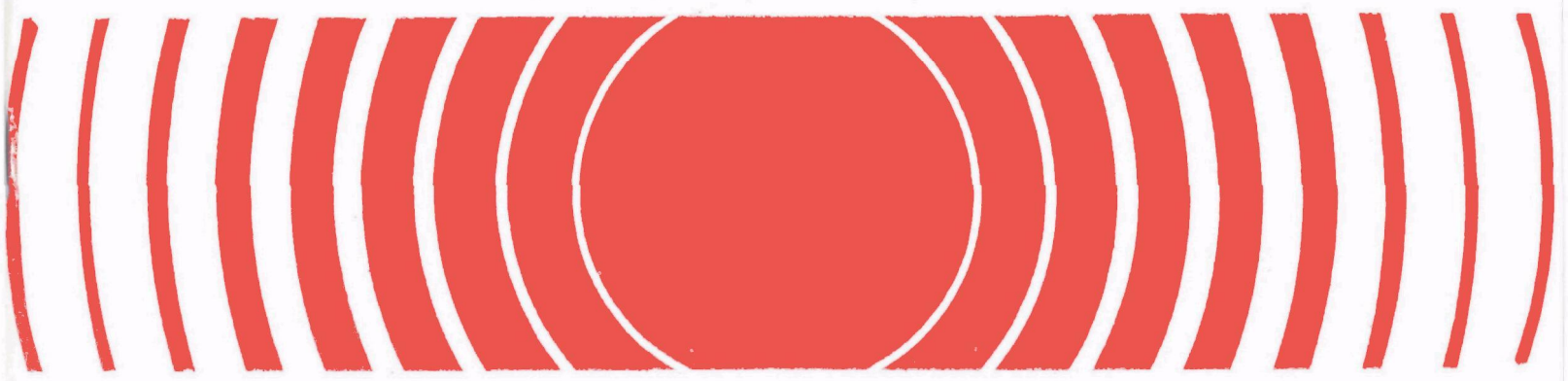
January - March 1984



E N V I R O N M E N T A L

R A D I A T I O N

D A T A

REPORT 37

January - March 1984

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Office of Radiation Programs

Preface

Environmental Radiation Data (ERD) is compiled and distributed quarterly by the Office of Radiation Programs' Eastern Environmental Radiation Facility (EERF), 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 U. S. Environmental Protection Agency's Office of Radiation Programs (ORP). The ERAMS is comprised of nationwide 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 toward 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 enviromnent. 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 releases into the environment from stationary sources such as nuclear power reactors, fuel fabrication facilities, and reprocessing plants.

E N V I R O N M E N T A L R A D I A T I O N

D A T A

CONTENTS

DATA - Reporting Rationale and Procedures

The intent of EPA's Office of Radiation Programs in establishing the Environmental Radiation Ambient Monitoring System was to provide continuous, accurate and usable environmental radiation data for the public. Therefore, new data reporting procedures were developed to allow better interpretation of the data. The most significant change in this reporting procedure is that all specific radionuclide analyses will be reported as the counting results indicate, whether the number is negative, zero, or positive.

Reporting Rationale

Frequently, concentrations of a radionuclide in environmental media are close to zero. When the actual concentration of a nuclide is zero, the net counting results should statistically show a distribution of negative and positive numbers about zero. This occurs when the background count is subtracted from a sample which has only background activity. Prior to July 1975, ERAMS data were not reported numerically when the results were less than a specified reporting level or minimum detectable level. The present reporting procedure allows all the data to be reported and evaluated statistically without an arbitrary cutoff of small or negative numbers. This approach will facilitate estimates of bias in the nuclide analyses and will allow better evaluation of distributions and trends in environmental data.

When reviewing the data in this report, caution should be exercised in the interpretation of individual negative values. Obviously, a negative activity value does not have physical significance. Such numbers, however, are significant when taken together with other observations which indicate that the true value of a distribution is near zero. When an average of several measurements produces a result less than zero, this indicates a negative bias in the measurement procedure.

(1) Reported Values

Specific Analyses - All specific radionuclide analyses will be reported as the counting results indicate, whether the number is negative, zero, or positive. Numerical values given are as of sample collection date.

Gross Analyses - The actual value of gross radioactivity measurements will be reported, unless the value is below the minimum detectable level (MDL) at the 2 sigma confidence level, then < minimum detectable level will be reported.

MDL is defined as the 3 sigma error of the background. A tabulation of MDL's is given in the following table.

(2) Reported Error Terms

Each reported value for specific analyses will be accompanied by a counting error term at the 2 sigma (95%) confidence interval. Potassium concentrations are determined by specific activity analyses. 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.

(3) Significant Figures

All reported values will be rounded to no more than three significant figures. The last significant figure will be increased by one if the figure following is five or greater, otherwise it is left unchanged.

(4) Reporting Levels

The reporting units, smallest increments for reporting, and minimum detectable levels for each isotope are shown in table 1. Smallest increments are sometimes considerably smaller than minimum detectable amounts to avoid truncation errors in averaging.

(5) 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	.01 pCi/m^3	.01 pCi/m^3
	Water	pCi/l	1 pCi/l	1 pCi/l
	Precipitation	nCi/m^2	.01 nCi/m^2	.01 $nCi/m^{2(a)}$
Tritium	Water	nCi/l	.1 nCi/l	.2 nCi/l
	Milk	nCi/l	.1 nCi/l	.2 nCi/l
Carbon-14	Milk	pCi/l	1 pCi/l	15 pCi/l
Krypton-85	Ambient Air	pCi/m^3	.1 pCi/m^3	2 pCi/m^3
Plutonium-238, 239	Air	aCi/m^3	.1 aCi/m^3	.015 pCi[(b)] per sample
	Milk	pCi/l	.001 pCi/l	.015 pCi per sample
	Water	pCi/l	.001 pCi/l	.015 pCi per sample
Uranium-234, 235,238	Air	aCi/m^3	.1 aCi/m^3	.015 pCi[(b)] per sample
	Milk	pCi/l	.001 pCi/l	.015 pCi per sample
	Water	pCi/l	.001 pCi/l	.015 pCi per sample
Radium-226	Water	pCi/l	.1 pCi/l	.1 pCi/l

Radionuclide	Media	Reporting Units	Reporting Increments	Minimum Detectable Levels
Strontium-90	Milk	pCi/l	.1 pCi/l	1 pCi/l
	Water	pCi/l	.1 pCi/l	1 pCi/l
Strontium-89	Milk	pCi/l	1 pCi/l	5 pCi/l(c)
Iodine-131	Milk	pCi/l	1 pCi/l	10 pCi/l(c)
	Water	pCi/l	1 pCi/l	10 pCi/l(c)
	Water (specific radiochemical analysis)	pCi/l	.1 pCi/l	.4 pCi/l
Iodine-129	Milk	fCi/l	.1 fCi/l	.4 fCi/l
Iodine-127	Milk	g/l	10 g/l	10 g/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(c)
	Water	pCi/l	1 pCi/l	10 pCi/l(c)
Potassium	Milk	g/l	.1 g/l	.12 g/l
	Water	g/l	.1 g/l	.12 g/l
Potassium-40	Water	pCi/l	1 pCi/l	100 pCi/l

(a) The value in terms of nCi/m^2 would be dependent on precipitation (mm).
(b) This value in terms of pCi/m^3 would be dependent on the air volume.
(c) Activity as of the day of counting.

ENVIRONMENTAL RADIATION AMBIENT MONITORING SYSTEM (ERAMS)

SECTION I. 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, Virgin Islands, and the Panama Canal.

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 EERF for more sensitive analyses in a low background beta counter. Gamma scans are performed on all filters showing laboratory gross beta counts greater than 1 pCi/m^3. The lower gross beta values reported for laboratory measurements are largely due to the decay of radionuclides which occurred between the times of the field estimates and laboratory measurements.

Precipitation samples are collected at the field stations where air filters are collected. These samples are also sent to EERF where they are composited monthly for tritium, gross beta activity measurements and gamma scans. Plutonium-238, -239, and uranium-234, -235, and -238 analyses are performed on samples which exceed 2 pCi/liter gross alpha.

May.

Tables 2 - 4 present the monthly average gross beta concentrations in airborne particulates for January - March 1984.

Tables 5 - 7 present the monthly average gross beta concentration in precipitation January - March 1984.

The tritium in precipitation samples for January - March 1984 at the selected stations are shown in Table 8.

A compilation of individual measurements is available from the EPA, EERF, Montgomery, AL 36193.

TABLE 2

AIRBORNE PARTICULATES
GROSS BETA CONCENTRATION
JANUARY 1984

LOCATION	# SAM	5-HR FIELD ESTIMATE			EERF LAB MEASUREMENT		
		MAX	MIN	AVG	MAX	MIN	AVG
		(pCi/m^3)			(pCi/m^3)		
AL:MONTGOMERY	9	1.0	0.2	0.4	0.02	0.01	0.02
CA:BERKELEY	8	0.1	0.0	0.1	0.02	0.01	0.01
CA:LOS ANGELES	9	0.9	0.3	0.6	0.03	0.01	0.02
CT:HARTFORD	9	0.1	0.0	0.1	0.02	0.01	0.01
DE:WILMINGTON	8	0.2	0.0	0.1	0.02	0.01	0.01
FL:JACKSONVILLE	8	0.2	0.0	0.1	0.01	0.00	0.01
FL:MIAMI	9	0.1	0.0	0.0	0.01	0.00	0.01
GA:ATLANTA	2	0.1	0.1	0.1	0.02	0.01	0.01
HI:HONOLULU	9	0.1	0.0	0.1	0.01	0.00	0.00
IA:IOWA CITY	8	0.1	0.0	0.1	0.02	0.01	0.02
ID:BOISE	9	0.2	0.0	0.1	0.06	0.02	0.03
ID:IDAHO FALLS	9	0.0	0.0	0.0	0.03	0.01	0.02
IL:CHICAGO	3	0.1	0.0	0.1	0.02	0.01	0.01
ME:AUGUSTA	9	0.1	0.0	0.1	0.02	0.01	0.02
MI:LANSING	1	0.0	0.0	0.0	0.01	0.01	0.01
MN:MINNEAPOLIS	9	0.1	0.0	0.0	0.03	0.00	0.02
MO:JEFFERSON CITY	9	0.2	0.1	0.1	0.02	0.01	0.01
MS:JACKSON	9	0.5	0.1	0.2	0.03	0.01	0.02
ND:BISMARCK	9	1.4	0.0	0.3	0.02	0.00	0.01
NH:CONCORD	9	0.1	0.0	0.0	0.01	0.01	0.01
NV:LAS VEGAS	9	0.5	0.2	0.3	0.02	0.00	0.01
NY:ALBANY	5	0.0	0.0	0.0	0.02	0.01	0.01
NY:NEW YORK CITY	7	0.1	0.0	0.1	0.02	0.01	0.01
NY:NIAGARA FALLS	9	0.4	0.0	0.1	0.02	0.01	0.01
NY:SYRACUSE	6	0.1	0.0	0.0	0.02	0.01	0.01
OH:COLUMBUS	8	0.1	0.0	0.0	0.03	0.01	0.02
OH:PAINESVILLE	9	0.0	0.0	0.0	0.02	0.01	0.01
OH:TOLEDO	9	0.1	0.0	0.1	0.02	0.01	0.02
OR:PORTLAND	9	0.0	0.0	0.0	0.02	0.00	0.01
PA:HARRISBURG	9	0.1	0.0	0.0	0.03	0.01	0.02
RI:PROVIDENCE	5	0.2	0.0	0.1	0.02	0.01	0.01
SC:BARNWELL	2	0.1	0.0	0.1	0.01	0.01	0.01
SC:COLUMBIA	9	0.4	0.1	0.2	0.03	0.01	0.02
SD:PIERRE	9	0.2	0.0	0.1	0.02	0.00	0.01
TN:KNOXVILLE	9	3.4	0.2	0.9	0.07	0.01	0.02
TN:NASHVILLE	4	0.0	0.0	0.0	0.02	0.01	0.02
TX:EL PASO	9	2.3	0.4	0.9	0.02	0.01	0.02
UT:SALT LAKE CITY	8	0.0	0.0	0.0	0.03	0.00	0.01

TABLE 2 (CONTINUED)

AIRBORNE PARTICULATES
GROSS BETA CONCENTRATION
JANUARY 1984

LOCATION	# SAM	5-HR FIELD ESTIMATE			EERF LAB MEASUREMENT		
		MAX	MIN	AVG	MAX	MIN	AVG
		(pCi/m^3)			(pCi/m^3)		
VA:LYNCHBURG	9	0.4	0.1	0.2	0.02	0.01	0.01
VA:VIRGINIA BEACH	7	0.1	0.1	0.1	0.01	0.00	0.01
WA:SEATTLE	9	0.0	0.0	0.0	0.02	0.00	0.00
WA:SPOKANE	9	0.2	0.0	0.1	0.03	0.00	0.01
WI:MADISON	9	0.1	0.0	0.0	0.02	0.01	0.01
WV:CHARLESTON	5	0.2	0.1	0.2	0.02	0.00	0.01

MINIMUM DETECTABLE LIMIT FOR FIELD ESTIMATES - .1 pCi/m^3
MINIMUM DETECTABLE LIMIT FOR LAB MEASUREMENT - .01 pCi/m^3

TABLE 3

AIRBORNE PARTICULATES
GROSS BETA CONCENTRATION
FEBRUARY 1984

LOCATION	# SAM	5-HR FIELD ESTIMATE			EERF LAB MEASUREMENT		
		MAX	MIN	AVG	MAX	MIN	AVG
		(pCi/m^3)			(pCi/m^3)		
AL:MONTGOMERY	8	0.9	0.1	0.5	0.02	0.01	0.01
CA:BERKELEY	8	0.6	0.0	0.1	0.02	0.00	0.00
CA:LOS ANGELES	8	0.7	0.1	0.5	0.03	0.01	0.01
CT:HARTFORD	8	0.2	0.0	0.1	0.01	0.00	0.01
DE:WILMINGTON	6	0.1	0.0	0.1	0.01	0.00	0.01
FL:JACKSONVILLE	6	0.2	0.0	0.1	0.01	0.01	0.01
FL:MIAMI	8	0.0	0.0	0.0	0.01	0.00	0.01
GA:ATLANTA	4	0.1	0.0	0.1	0.01	0.01	0.01
HI:HONOLULU	7	0.1	0.0	0.1	0.01	0.00	0.00
IA:IOWA CITY	8	0.2	0.0	0.1	0.02	0.01	0.01
ID:BOISE	8	0.2	0.0	0.1	0.05	0.00	0.02
ID:IDAHO FALLS	8	0.0	0.0	0.0	0.03	0.01	0.02
IL:CHICAGO	6	0.3	0.0	0.1	0.01	0.01	0.01
KS:TOPEKA	7	0.6	0.2	0.3	0.01	0.00	0.01
ME:AUGUSTA	8	0.1	0.0	0.1	0.01	0.01	0.01
MI:LANSING	8	0.2	0.0	0.1	0.01	0.01	0.01
MN:MINNEAPOLIS	8	0.2	0.0	0.1	0.01	0.01	0.01
MO:JEFFERSON CITY	8	0.5	0.1	0.3	0.02	0.01	0.01
MS:JACKSON	8	0.4	0.1	0.2	0.02	0.01	0.01
ND:BISMARCK	8	0.3	0.0	0.1	0.03	0.01	0.01
NH:CONCORD	8	0.1	0.0	0.0	0.01	0.00	0.01
NV:LAS VEGAS	8	0.3	0.1	0.2	0.02	0.01	0.01
NY:ALBANY	4	0.0	0.0	0.0	0.01	0.01	0.01
NY:NEW YORK CITY	8	0.1	0.0	0.1	0.01	0.00	0.01
NY:NIAGARA FALLS	7	0.2	0.0	0.1	0.01	0.01	0.01
NY:SYRACUSE	5	0.1	0.0	0.0	0.01	0.01	0.01
OH:COLUMBUS	8	0.6	0.0	0.1	0.01	0.01	0.01
OH:PAINESVILLE	8	0.2	0.0	0.1	0.01	0.01	0.01
OH:TOLEDO	8	0.1	0.0	0.1	0.02	0.01	0.01
OR:PORTLAND	8	0.0	0.0	0.0	0.01	0.00	0.00
PA:HARRISBURG	8	0.6	0.0	0.2	0.01	0.01	0.01
RI:PROVIDENCE	5	0.1	0.0	0.0	0.01	0.00	0.01
SC:BARNWELL	1	0.0	0.0	0.0	0.01	0.01	0.01
SC:COLUMBIA	8	1.3	0.0	0.3	0.02	0.01	0.01
SD:PIERRE	8	0.4	0.1	0.2	0.02	0.01	0.01
TN:KNOXVILLE	8	1.2	0.2	0.7	0.02	0.01	0.01
TN:NASHVILLE	4	0.7	0.4	0.6	0.01	0.01	0.01
TX:AUSTIN	8	2.9	0.0	1.2	0.02	0.01	0.01

TABLE 3 (CONTINUED)

AIRBORNE PARTICULATES
GROSS BETA CONCENTRATION
FEBRUARY 1984

LOCATION	# SAM	5-HR FIELD ESTIMATE			EERF LAB MEASUREMENT		
		MAX	MIN	AVG	MAX	MIN	AVG
		(pCi/m^3)			(pCi/m^3)		
TX:EL PASO	8	0.8	0.2	0.6	0.02	0.01	0.02
UT:SALT LAKE CITY	8	0.0	0.0	0.0	0.04	0.00	0.02
VA:LYNCHBURG	8	0.5	0.1	0.3	0.02	0.01	0.01
WA:SEATTLE	7	0.1	0.0	0.0	0.01	0.00	0.00
WA:SPOKANE	8	0.1	0.1	0.1	0.02	0.00	0.01
WI:MADISON	8	0.3	0.0	0.1	0.01	0.01	0.01

MINIMUM DETECTABLE LIMIT FOR FIELD ESTIMATES - .1 pCi/m^3
MINIMUM DETECTABLE LIMIT FOR LAB MEASUREMENT - .01 pCi/m^3

TABLE 4

AIRBORNE PARTICULATES
GROSS BETA CONCENTRATION
MARCH 1984

LOCATION	# SAM	5-HR FIELD ESTIMATE			EERF LAB MEASUREMENT		
		MAX	MIN	AVG	MAX	MIN	AVG
		(pCi/m^3)			(pCi/m^3)		
AL:MONTGOMERY	9	0.7	0.1	0.4	0.01	0.01	0.01
CA:BERKELEY	8	0.0	0.0	0.0	0.02	0.00	0.00
CA:LOS ANGELES	9	0.7	0.2	0.5	0.02	0.01	0.01
CO:DENVER	6	0.0	0.0	0.0	0.02	0.01	0.01
CT:HARTFORD	9	0.1	0.0	0.0	0.01	0.00	0.01
DE:WILMINGTON	9	0.2	0.0	0.1	0.01	0.00	0.01
FL:JACKSONVILLE	9	0.2	0.0	0.1	0.01	0.01	0.01
FL:MIAMI	9	0.0	0.0	0.0	0.01	0.00	0.01
GA:ATLANTA	2	0.1	0.0	0.1	0.01	0.01	0.01
HI:HONOLULU	8	0.4	0.1	0.2	0.01	0.00	0.01
IA:IOWA CITY	9	0.3	0.0	0.1	0.02	0.01	0.01
ID:BOISE	8	1.2	0.1	0.4	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	0.2	0.0	0.1	0.05	0.00	0.01
KS:TOPEKA	9	0.3	0.1	0.2	0.01	0.00	0.00
ME:AUGUSTA	9	0.1	0.0	0.0	0.02	0.01	0.01
MI:LANSING	9	0.1	0.0	0.1	0.01	0.01	0.01
MN:MINNEAPOLIS	9	0.1	0.0	0.0	0.01	0.01	0.01
MO:JEFFERSON CITY	9	0.3	0.1	0.2	0.02	0.01	0.01
MS:JACKSON	9	0.2	0.1	0.1	0.02	0.01	0.01
ND:BISMARCK	9	0.4	0.0	0.1	0.01	0.01	0.01
NH:CONCORD	9	0.1	0.0	0.0	0.01	0.00	0.01
NM:SANTA FE	6	0.4	0.2	0.3	0.01	0.01	0.01
NV:LAS VEGAS	9	0.4	0.1	0.2	0.02	0.01	0.01
NY:ALBANY	4	0.0	0.0	0.0	0.02	0.01	0.01
NY:NEW YORK CITY	9	0.1	0.1	0.1	0.01	0.00	0.01
NY:NIAGARA FALLS	9	0.1	0.0	0.1	0.01	0.00	0.01
NY:SYRACUSE	4	0.0	0.0	0.0	0.01	0.01	0.01
NY:YAPHANK	2	0.0	0.0	0.0	0.01	0.00	0.00
OH:COLUMBUS	9	0.1	0.0	0.0	0.02	0.01	0.01
OH:PAINESVILLE	9	0.1	0.0	0.0	0.01	0.00	0.01
OH:TOLEDO	9	0.1	0.0	0.1	0.02	0.01	0.01
OR:PORTLAND	9	0.0	0.0	0.0	0.01	0.00	0.00
PA:HARRISBURG	9	0.2	0.0	0.1	0.02	0.01	0.01
RI:PROVIDENCE	5	0.2	0.0	0.1	0.01	0.00	0.01
SC:BARNWELL	3	0.0	0.0	0.0	0.01	0.01	0.01
SC:COLUMBIA	9	0.3	0.1	0.2	0.02	0.01	0.01
SD:PIERRE	8	0.3	0.0	0.1	0.01	0.01	0.01

TABLE 4 (CONTINUED)

AIRBORNE PARTICULATES
GROSS BETA CONCENTRATION
MARCH 1984

LOCATION	# SAM	5-HR FIELD ESTIMATE			EERF LAB MEASUREMENT		
		MAX	MIN	AVG	MAX	MIN	AVG
		(pCi/m^3)			(pCi/m^3)		
TN:KNOXVILLE	8	0.6	0.1	0.3	0.03	0.01	0.01
TN:NASHVILLE	5	0.8	0.2	0.7	0.01	0.01	0.01
TX:AUSTIN	8	1.6	0.7	1.1	0.01	0.01	0.01
TX:EL PASO	10	1.5	0.3	0.6	0.02	0.01	0.02
UT:SALT LAKE CITY	9	0.1	0.0	0.0	0.01	0.00	0.01
VA:LYNCHBURG	9	0.5	0.1	0.2	0.01	0.00	0.01
WA:SEATTLE	7	0.0	0.0	0.0	0.01	0.00	0.00
WA:SPOKANE	9	0.1	0.1	0.1	0.01	0.00	0.00
WI:MADISON	9	0.3	0.0	0.1	0.01	0.00	0.01

MINIMUM DETECTABLE LIMIT FOR FIELD ESTIMATES - .1 pCi/m^3
MINIMUM DETECTABLE LIMIT FOR LAB MEASUREMENT - .01 pCi/m^3

TABLE 5

GROSS BETA CONCENTRATION IN PRECIPITATION

JANUARY 1984

LOCATION	DEPTH	ACT. ± 2s		SPECIFIC GAMMA ACT.
	(mm)	(nCi/m^2)		(pCi/l)
AL:MONTGOMERY	145.0	0.23	0.07	ND
CA:BERKELEY	17.2	0.01	0.01	ND
CT:HARTFORD	42.0	0.06	0.02	ND
FL:JACKSONVILLE	102.1	0.20	0.05	ND
FL:MIAMI	5.0	0.01	0.00	ND
ID:BOISE	59.5	0.10	0.03	ND
IL:CHICAGO	25.8	0.17	0.02	ND
MN:MINNEAPOLIS	8.2	0.07	0.01	ND
MS:JACKSON	48.1	0.14	0.03	ND
ND:BISMARCK	12.6	0.02	0.01	ND
NY:ALBANY	44.8	0.08	0.02	ND
NY:NEW YORK CITY	10.5	0.03	0.01	ND
NY:NIAGARA FALLS	24.4	0.08	0.01	ND
OH:PAINESVILLE	30.0	0.14	0.02	ND
OH:TOLEDO	17.5	0.01	0.01	ND
OR:PORTLAND	12.0	0.01	0.01	ND
PA:HARRISBURG	57.5	0.01	0.02	ND
SC:BARNWELL	67.5	0.02	0.03	ND
SC:COLUMBIA	125.0	0.10	0.06	ND
SD:PIERRE	5.0	0.02	0.00	ND
TN:KNOXVILLE	23.0	0.03	0.01	ND
TN:NASHVILLE	30.0	0.19	0.03	ND
TX:AUSTIN	20.0	0.02	0.01	ND
TX:EL PASO	20.0	0.08	0.02	ND
VA:LYNCHBURG	196.9	1.57	0.19	ND
VA:VIRGINIA BEACH	72.5	0.14	0.04	ND
WI:MADISON	20.0	1.50	0.05	ND

ND NO GAMMA ACTIVITY DETECTABLE
s SIGMA COUNTING ERROR

TABLE 6

GROSS BETA CONCENTRATION IN PRECIPITATION

FEBUARY 1984

LOCATION	DEPTH	ACT. ± 2s		SPECIFIC GAMMA ACT.
	(mm)	(nCi/m^2)		(pCi/l)
AL:MONTGOMERY	120.0	0.20	0.06	ND
CA:BERKELEY	52.9	0.02	0.03	ND
CO:DENVER	9.0	0.01	0.00	ND
CT:HARTFORD	67.7	0.14	0.04	ND
FL:JACKSONVILLE	73.2	0.11	0.04	ND
FL:MIAMI	25.0	0.04	0.01	ND
ID:BOISE	54.5	0.04	0.03	ND
ID:IDAHO FALLS	13.8	0.00	0.00	ND
IL:CHICAGO	16.0	0.03	0.01	ND
MI:LANSING	42.3	0.11	0.03	ND
MN:MINNEAPOLIS	39.5	0.32	0.04	ND
MS:JACKSON	46.3	0.03	0.02	ND
ND:BISMARCK	8.9	0.02	0.01	ND
NY:ALBANY	79.8	0.05	0.03	ND
NY:NIAGARA FALLS	33.9	0.04	0.02	ND
OH:COLUMBUS	17.5	0.01	0.01	ND
OH:PAINESVILLE	38.1	0.07	0.02	ND
OH:TOLEDO	12.5	0.01	0.01	ND
OR:PORTLAND	112.3	0.07	0.06	ND
PA:HARRISBURG	180.0	0.36	0.11	ND
SC:BARNWELL	12.5	0.01	0.01	ND
SC:COLUMBIA	155.0	0.16	0.07	ND
TN:KNOXVILLE	86.3	0.04	0.03	ND
TX:AUSTIN	12.5	0.01	0.01	ND
WI:MADISON	11.3	0.03	0.01	ND

ND NO GAMMA ACTIVITY DETECTABLE
s SIGMA COUNTING ERROR

TABLE 7

GROSS BETA CONCENTRATION IN PRECIPITATION

MARCH 1984

LOCATION	DEPTH	ACT. ± 2s		SPECIFIC GAMMA ACT.
	(mm)	(nCi/m^2)		(pCi/l)
AL:MONTGOMERY	115.0	0.38	0.07	ND
CA:BERKELEY	47.3	0.05	0.02	ND
CO:DENVER	22.0	0.13	0.02	ND
CT:HARTFORD	125.5	0.25	0.07	ND
DC:WASHINGTON	20.0	0.15	0.02	ND
FL:JACKSONVILLE	170.2	0.16	0.08	ND
FL:MIAMI	55.0	0.03	0.02	ND
ID:BOISE	53.8	0.06	0.03	ND
ID:IDAHO FALLS	36.0	0.11	0.02	ND
IL:CHICAGO	123.1	0.21	0.06	ND
MI:LANSING	66.8	0.07	0.03	ND
MN:MINNEAPOLIS	11.9	0.04	0.01	ND
MS:JACKSON	74.4	0.16	0.04	ND
ND:BISMARCK	60.0	0.13	0.04	ND
NY:ALBANY	28.3	0.02	0.01	ND
NY:NEW YORK CITY	7.4	0.00	0.00	ND
NY:NIAGARA FALLS	68.4	0.15	0.04	ND
OH:COLUMBUS	102.0	0.15	0.05	ND
OH:PAINESVILLE	68.1	0.12	0.04	ND
OH:TOLEDO	12.5	0.05	0.01	ND
OR:PORTLAND	132.3	0.25	0.07	ND
PA:HARRISBURG	59.8	0.06	0.03	ND
RI:PROVIDENCE	125.0	0.17	0.06	ND
SC:BARNWELL	156.0	0.14	0.07	ND
SC:COLUMBIA	158.8	0.62	0.11	ND
SD:PIERRE	20.0	0.03	0.01	ND
TN:KNOXVILLE	73.6	0.06	0.04	ND
TN:NASHVILLE	70.0	0.11	0.03	ND
TX:AUSTIN	60.0	0.05	0.03	ND
TX:EL PASO	10.0	0.01	0.01	ND
VA:LYNCHBURG	128.8	0.12	0.06	ND
WA:SEATTLE	32.5	0.03	0.02	ND

ND NO GAMMA ACTIVITY DETECTABLE
s SIGMA COUNTING ERROR

TABLE 8

PRECIPITATION
TRITIUM CONCENTRATION

JANUARY - MARCH 1984

LOCATION	JANUARY nCi/l ± 2s	FEBRUARY nCi/l ± 2s	MARCH nCi/l ± 2s
AL:MONTGOMERY	0.4 0.2	0.1 0.2	0.2 0.2
CA:BERKELEY	0.1 0.2	0.1 0.2	0.1 0.2
CO:DENVER	NS	0.1 0.2	0.2 0.2
CT:HARTFORD	0.2 0.2	0.2 0.2	0.3 0.2
DC:WASHINGTON	NS	NS	0.3 0.2
FL:JACKSONVILLE	0.4 0.2	0.1 0.2	0.3 0.2
FL:MIAMI	0.3 0.2	0.2 0.2	0.2 0.2
ID:BOISE	0.1 0.2	0.1 0.2	0.2 0.2
ID:IDAHO FALLS	NS	0.1 0.2	0.2 0.2
IL:CHICAGO	0.3 0.2	0.2 0.2	0.1 0.2
MI:LANSING	NS	0.1 0.2	0.1 0.2
MN:MINNEAPOLIS	0.5 0.2	0.2 0.2	0.2 0.2
MS:JACKSON	0.2 0.2	0.2 0.2	0.2 0.2
ND:BISMARCK	0.2 0.2	0.3 0.2	0.2 0.2
NY:ALBANY	0.3 0.2	0.1 0.2	0.3 0.2
NY:NEW YORK CITY	0.2 0.2	NS	0.4 0.2
NY:NIAGARA FALLS	0.4 0.2	0.1 0.2	0.4 0.2
OH:COLUMBUS	NS	0.2 0.2	0.1 0.2
OH:PAINESVILLE	0.3 0.2	0.2 0.2	0.2 0.2
OH:TOLEDO	0.2 0.2	0.2 0.2	0.1 0.2
OR:PORTLAND	0.1 0.2	0.1 0.2	0.1 0.2
PA:HARRISBURG	0.2 0.2	0.1 0.2	0.3 0.2
RI:PROVIDENCE	NS	NS	0.5 0.2
SC:BARNWELL	3.5 0.2	0.7 0.2	1.1 0.2
SC:COLUMBIA	0.4 0.2	0.1 0.2	0.3 0.2
SD:PIERRE	0.1 0.2	NS	0.2 0.2
TN:KNOXVILLE	0.4 0.2	0.1 0.2	0.2 0.2
TN:NASHVILLE	0.2 0.2	NS	0.3 0.2
TX:AUSTIN	0.1 0.2	0.1 0.2	0.2 0.2
TX:EL PASO	0.1 0.2	NS	0.2 0.2
VA:LYNCHBURG	0.3 0.2	NS	0.3 0.2
VA:VIRGINIA BEACH	0.4 0.2	NS	NS
WA:SEATTLE	NS	NS	0.2 0.2
WI:MADISON	0.2 0.2	0.2 0.2	NS

NS NO SAMPLE
s SIGMA COUNTING ERROR

Plutonium and Uranium in Airborne Particulates

Environmental radiation levels of plutonium and uranium are determined by the analyses of quarterly composite samples (air filters) collected from the 67 continuously operating airborne particulate samplers.

Analyses of the composited filters consist of ashing, separating by liquid ion exchange, and coprecipitation of the plutonium or uranium.

Concentration of the specific isotopes of plutonium-238, -239, and uranium-234, -235, and -238 are determined by alpha spectroscopy. The volume of air analyzed normally ranges from 25,000 to 40,000 m^3 for each quarterly composite.

Plutonium and uranium in airborne particulates data for July - September 1983 are shown in Table 9.

TABLE 9

PLUTONIUM AND URANIUM IN AIRBORNE PARTICULATES
JULY - SEPTEMBER 1983 COMPOSITES

LOCATION	^{238}Pu aCi/m^3 ± 2s		^{239}Pu aCi/m^3 ± 2s		^{234}U aCi/m^3 ± 2s		^{235}U aCi/m^3 ± 2s		^{238}U aCi/m^3 ± 2s	
AL:MONTGOMERY	0.4	0.6	1.6	0.9	17.6	3.2	0.8	0.6	19.2	3.4
CA:BERKELEY	0.2	0.3	1.1	0.7	18.3	4.3	0.5	0.6	7.4	2.6
CA:LOS ANGELES	0.9	0.9	0.7	0.8	42.4	7.1	2.5	1.4	36.2	6.3
CO:DENVER	0.1	0.4	1.3	0.6	53.2	8.3	2.3	1.2	45.5	7.3
CT:HARTFORD	0.2	0.4	0.7	0.5	14.2	2.7	1.7	0.8	13.1	2.6
DE:WILMINGTON	1.0	0.6	1.3	0.7	12.4	2.2	0.4	0.3	9.5	1.8
FL:JACKSONVILLE	0.2	0.2	0.3	0.4	16.2	2.9	0.6	0.5	15.6	2.8
FL:MIAMI	0.2	0.4	0.6	0.4	21.6	2.9	0.6	0.3	18.9	2.6
HI:HONOLULU	0.1	0.3	0.6	0.5	26.3	4.7	2.2	1.1	16.3	3.4
IA:IOWA CITY	0.2	0.3	0.7	0.6	26.9	4.0	0.8	0.5	30.1	4.4
ID:BOISE	0.7	0.9	1.6	0.9	44.2	7.5	3.2	1.6	34.3	6.2
ID:IDAHO FALLS	1.7	1.1	3.6	1.5	27.2	5.3	1.4	1.0	30.6	5.7
IL:CHICAGO	0.6	0.8	2.4	1.3	58.7	10.0	2.6	1.7	47.6	8.6
IN:INDIANAPOLIS	0.3	0.4	0.7	0.5	28.5	6.9	0.7	1.0	29.1	6.9
ME:AUGUSTA	0.1	0.3	1.1	0.6	12.5	2.4	0.7	0.5	11.4	2.3
MI:LANSING	0.0	0.4	1.0	0.5	16.0	2.6	0.8	0.5	16.9	2.7
MN:MINNEAPOLIS	0.2	0.3	2.0	0.9	19.7	3.5	1.1	0.7	20.4	3.6
MO:JEFFERSON CITY	4.8	1.3	1.1	0.6	20.7	3.8	2.0	0.9	19.3	3.6
MS:JACKSON	1.6	0.8	1.4	0.8	15.9	2.7	1.2	0.8	9.7	2.0
ND:BISMARCK	1.3	1.1	1.9	1.0	33.9	6.3	2.6	1.4	30.1	5.8
NH:CONCORD	0.3	0.4	1.1	0.6	8.1	1.8	0.2	0.3	8.9	1.9
NJ:TRENTON	2.3	1.2	1.0	0.8	16.5	3.7	1.3	0.9	18.4	3.9
NV:LAS VEGAS	0.5	0.6	1.8	1.1	79.3	10.6	2.2	1.2	46.9	7.1
NY:ALBANY	0.2	0.3	1.8	0.8	27.9	4.4	1.8	0.9	26.7	4.3
NY:NIAGARA FALLS	0.0	0.6	1.6	0.9	49.2	7.4	2.6	1.2	50.9	7.5
NY:YAPHANK	-0.1	1.2	2.0	1.3	9.4	3.3	0.1	1.1	9.0	3.0
OH:COLUMBUS	0.8	0.6	0.9	0.6	49.3	6.7	2.1	0.9	49.3	6.7
OH:PAINESVILLE	0.1	0.2	1.0	0.5	20.2	3.6	0.9	0.6	20.9	3.7
OH:TOLEDO	0.3	0.4	0.7	0.5	31.6	5.1	1.3	0.8	35.1	5.5
OK:OKLAHOMA CITY	0.8	1.0	2.7	1.5	62.4	10.2	1.1	1.0	63.0	10.2
OR:PORTLAND	0.3	0.4	0.7	0.5	21.8	3.4	0.6	0.4	12.7	2.3
PA:HARRISBURG	0.3	0.3	0.8	0.6	22.6	3.6	1.2	0.6	22.2	3.5
PA:PITTSBURGH	0.0	0.2	1.0	0.5	50.7	9.2	3.1	1.5	44.2	8.3
RI:PROVIDENCE	0.3	0.4	1.1	0.6	15.4	3.0	0.1	0.2	15.0	3.0
SC:BARNWELL	0.3	0.8	2.2	1.1	30.1	6.8	2.1	1.5	18.6	5.1
SC:COLUMBIA	0.7	0.7	1.0	0.5	34.7	4.5	2.0	0.8	32.0	4.3
SD:PIERRE	1.2	0.7	0.8	0.5	20.6	3.3	0.7	0.5	22.1	3.5
TN:KNOXVILLE	0.1	0.3	0.9	0.5	32.8	5.3	1.3	0.9	31.2	5.1
TN:NASHVILLE	0.8	0.6	1.3	0.7	23.7	4.2	1.1	0.7	20.0	3.8
TX:AUSTIN	0.4	0.8	2.1	1.1	17.3	3.3	1.8	0.9	16.5	3.2

TABLE 9 (CONTINUED)

PLUTONIUM AND URANIUM IN AIRBORNE PARTICULATES
JULY - SEPTEMBER 1983 COMPOSITES

LOCATION	^{238}Pu aCi/m^3 ± 2s		^{239}Pu aCi/m^3 ± 2s		^{234}U aCi/m^3 ± 2s		^{235}U aCi/m^3 ± 2s		^{238}U aCi/m^3 ± 2s	
UT:SALT LAKE CITY	0.6	0.7	2.2	1.0	26.7	4.1	1.1	0.6	27.9	4.2
VA:LYNCHBURG	0.4	0.7	0.8	0.6	415.6	51.8	8.8	2.1	18.5	3.5
WA:SEATTLE	1.0	0.6	2.3	0.9	9.6	2.1	0.5	0.4	6.8	1.7
WA:SPOKANE	1.2	0.9	0.9	0.7	46.0	9.1	1.9	1.5	42.1	8.6
WV:CHARLESTON	0.4	0.6	0.8	0.5	24.2	5.6	3.1	1.7	28.1	6.3

s SIGMA COUNTING ERROR

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 fabrication, fuel reprocessing, and nuclear detonations. 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. Monitoring of krypton-85 in the atmosphere has been conducted 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 annually and shipped to the EERF where the krypton-85 is cryogenically separated and counted in a liquid scintillation system.

The Kr-85 results will be published when they are available.

ERAMS

SECTION II. Water Program

The ERAMS water program provides ambient radiation data to assess the effects of nuclear fallout, the natural radiation environment, and other nuclear sources on the nation's rivers, streams and drinking water supplies.

Surface Water

Grab samples are taken quarterly at 58 stations located downstream from operating or future nuclear facilities.

Surface water monitoring consists of tritium analyses quarterly and gamma scans annually. Tritium is the primary radioactive pollutant from nuclear power plants.

Tritium concentrations are determined by liquid scintillation counting of distilled samples. Gamma scans are performed annually to determine if there is a buildup of other contaminants.

Tritium concentrations for surface water samples for January - March 1984 are given in Table 10.

TABLE 10

SURFACE WATER
TRITIUM CONCENTRATION

JANUARY - MARCH 1984

LOCATION	SOURCE	DATE COLLECTED	nCi/l	± 2s
AL:DECATUR	TENNESSEE RIVER	1/ 6/84	0.3	0.2
AL:DOTHAN	CHATTAHOOCHEE R.	1/12/84	0.2	0.2
AL:SCOTTSBORO	TENNESSEE RIVER	1/ 4/84	0.3	0.2
CA:DIABLO CANYON	PACIFIC OCEAN	1/20/84	0.2	0.2
CA:EUREKA	HUMBOLDT BAY	1/ 5/84	0.2	0.2
CO:GREELEY	SOUTH PLATTE RIVER	1/10/84	0.3	0.2
CT:EAST HADDAM	CONNECTICUT RIVER	3/21/84	0.2	0.2
CT:WATERFORD	LONG ISLAND SOUND	3/15/84	0.2	0.2
FL:CRYSTAL RIVER	GULF OF MEXICO	1/ 5/84	0.2	0.2
FL:FT. PIERCE	ATLANTIC OCEAN	1/18/84	0.2	0.2
FL:HOMESTEAD	BISCAYNE BAY	1/11/84	0.2	0.2
IA:CEDAR RAPIDS	CEDAR RIVER	1/10/84	0.3	0.2
ID:BUHL	SNAKE RIVER	1/20/84	0.2	0.2
IL:MOLINE	MISSISSIPPI RIVER	2/15/83	0.2	0.2
IL:MORRIS	ILLINOIS RIVER	1/ 6/84	0.2	0.2
IL:OREGON	ROCK RIVER	1/31/84	0.2	0.2
IL:ZION	LAKE MICHIGAN	2/21/84	0.2	0.2
LA:NEW ORLEANS	MISSISSIPPI RIVER	1/12/84	0.4	0.2
MA:PLYMOUTH	CAPE CODE BAY	1/ 5/84	0.2	0.2
MA:ROWE	DEERFIELD RIVER	2/ 2/84	0.2	0.2
MD:CONOWINGO	SUSQUEHANNA RIVER	1/10/84	0.3	0.2
MD:LUSBY	CHESAPEAKE BAY	1/10/84	0.3	0.2
ME:WISCASSET	MONTSEWAY BAY	1/10/84	0.2	0.2
MI:CHARLEVOIX	LAKE MICHIGAN	1/ 7/84	0.3	0.2
MI:MONROE	LAKE ERIE	1/ 8/84	0.3	0.2
MN:MONTICELLO	MISSISSIPPI RIVER	1/ 6/84	0.2	0.2
MN:RED WING	MISSISSIPPI RIVER	1/16/84	0.1	0.2
MS:PORT GIBSON	MISSISSIPPI RIVER	1/26/84	0.2	0.2
NC:CHARLOTTE	CATAWBA RIVER	1/12/84	0.5	0.2
NC:SOUTHPORT	ATLANTIC OCEAN	1/ 5/84	0.2	0.2
NE:RULO	MISSOURI RIVER	1/ 4/84	0.2	0.2
NV:BOULDER CITY	COLORADO RIVER	1/10/84	0.4	0.2
NY:OSSINING	HUDSON RIVER	1/ 4/84	0.2	0.2
NY:OSWEGO	LAKE ONTARIO	1/15/84	0.4	0.2
NY:POUGHKEEPSIE	HUDSON RIVER	1/ 4/84	0.2	0.2
OH:TOLEDO	LAKE ERIE	1/ 3/84	0.2	0.2
OR:BRADWOOD	COLUMBIA RIVER	2/ 3/84	0.2	0.2
PA:DANVILLE	SUSQUEHANNA RIVER	1/11/84	0.4	0.2
SC:ALLENDALE	SAVANNAH RIVER	1/ 2/84	6.5	0.3

TABLE 10 (CONTINUED)

SURFACE WATER
TRITIUM CONCENTRATION

JANUARY - MARCH 1984

LOCATION	SOURCE	DATE COLLECTED	nCi/l	± 2s
SC:BROAD RIVER	BROAD RIVER	2/ 8/84	0.3	0.2
SC:HARTSVILLE	LAKE ROBINSON	1/ 3/84	0.7	0.2
TN:DAISY	TENNESSEE RIVER	2/ 9/84	0.5	0.2
TN:KINGSTON	CLINCH RIVER	1/ 6/84	4.8	0.3
TX:EL PASO	RIO GRANDE	1/26/84	0.2	0.2
TX:MATAGORDA	COLORADO RIVER	1/ 9/84	0.2	0.2
VA:DOSWELL	NORTH ANNA RIVER	1/12/84	3.8	0.3
WA:NORTHPORT	COLUMBIA RIVER	1/11/84	0.2	0.2
WA:RICHLAND	COLUMBIA RIVER	1/20/84	0.3	0.2
WI:TWO CREEKS	LAKE MICHIGAN	1/16/84	0.4	0.2
WI:VICTORY	MISSISSIPPI RIVER	1/ 9/84	0.3	0.2
WV:WHEELING	OHIO RIVER	1/24/84	0.1	0.2

s SIGMA COUNTING ERROR

Drinking Water

The drinking water program provides ambient radiation monitoring relevant to the effects of the nuclear power industry, natural environmental levels, and other pertinent sources. 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 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. Radium-226 analyses are performed if the gross alpha exceeds 2 pCi/l; and radium-228 analyses are performed if the radium-226 activity falls between 3 and 5 pCi/l) (c) specific iodine-131 is performed on one quarterly sample per year for each station (d) an annual composite for plutonium-238, -239, uranium-234, -235, -238, for stations which demonstrate gross alpha levels greater than 2 pCi/l.

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

The results of tritium in drinking water analyses for January - March 1984 are shown in Table 11.

All samples were taken as either a single grab sample or composite samples taken over 12 to 14 days.

TABLE 11

DRINKING WATER
TRITIUM CONCENTRATION

JANUARY - MARCH 1984

LOCATION	DATE COLLECTED	nCi/l	± 2s
AK:FAIRBANKS	1/11/84	0.2	0.2
AL:DOTHAN	1/16/84	0.2	0.2
AL:MONTGOMERY	1/10/84	0.3	0.2
AL:MUSCLE SHOALS	1/ 5/84	0.4	0.2
AL:SCOTTSBORO	1/ 4/84	0.3	0.2
CA:BERKELEY	1/11/84	0.2	0.2
CA:LOS ANGELES	1/ 4/84	0.3	0.2
CO:DENVER	1/27/84	0.3	0.2
CO:PLATTEVILLE	1/27/84	0.2	0.2
CT:HARTFORD	1/ 6/84	0.2	0.2
DE:DOVER	1/ 3/84	0.1	0.2
FL:MIAMI	1/ 3/84	0.2	0.2
FL:TAMPA	1/23/84	0.1	0.2
GA:SAVANNAH	1/10/84	3.0	0.2
HI:HONOLULU	1/25/84	0.2	0.2
IA:CEDAR RAPIDS	1/11/84	0.2	0.2
ID:BOISE	1/17/84	0.2	0.2
ID:IDAHO FALLS	1/20/84	0.2	0.2
IL:MORRIS	1/ 4/84	0.2	0.2
IL:W. CHICAGO	1/ 5/84	0.2	0.2
KS:TOPEKA	1/ 4/84	0.3	0.2
LA:NEW ORLEANS	1/30/84	0.3	0.2
MA:LAWRENCE	1/ 4/84	0.2	0.2
MA:ROWE	2/ 2/84	0.3	0.2
MD:BALTIMORE	1/ 3/84	0.2	0.2
MD:CONOWINGO	1/10/84	0.2	0.2
ME:AUGUSTA	1/ 4/84	0.2	0.2
MI:DETROIT	1/ 9/84	0.2	0.2
MI:GRAND RAPIDS	1/12/84	0.2	0.2
MN:MINNEAPOLIS	1/ 3/84	0.4	0.2
MN:RED WING	1/16/84	0.1	0.2
MS:JACKSON	1/12/84	0.2	0.2
MS:PORT GIBSON	1/10/84	0.2	0.2
MT:HELENA	1/ 3/84	0.3	0.2
NC:CHARLOTTE	1/12/84	0.5	0.2
NC:WILMINGTON	1/ 5/84	0.3	0.2
ND:BISMARCK	1/ 4/84	0.4	0.2
NE:LINCOLN	1/11/84	0.4	0.2

TABLE 11 (CONTINUED)

DRINKING WATER
TRITIUM CONCENTRATION

JANUARY - MARCH 1984

LOCATION	DATE COLLECTED	nCi/l ± 2s	
NM:SANTA FE	1/ 4/84	0.2	0.2
NV:LAS VEGAS	1/ 5/84	0.2	0.2
NY:ALBANY	1/11/84	0.2	0.2
NY:NEW YORK CITY	1/ 6/84	0.2	0.2
NY:NIAGARA FALLS	1/ 5/84	0.3	0.2
NY:SYRACUSE	1/10/84	0.3	0.2
OH:CINCINNATI	1/ 3/84	0.3	0.2
OH:COLUMBUS	1/10/84	0.3	0.2
OH:EAST LIVERPOOL	1/12/84	0.1	0.2
OH:PAINESVILLE	1/10/84	0.2	0.2
OH:TOLEDO	1/ 4/84	0.4	0.2
OK:OKLAHOMA CITY	1/ 4/84	0.2	0.2
OR:PORTLAND	1/ 4/84	0.3	0.2
PA:COLUMBIA	1/12/84	0.2	0.2
PA:HARRISBURG	1/11/84	0.2	0.2
PA:PITTSBURGH	1/12/84	0.2	0.2
PC:ANCON	1/19/84	0.2	0.2
RI:PROVIDENCE	1/ 6/84	0.1	0.2
SC:BARNWELL	1/ 4/84	0.1	0.2
SC:COLUMBIA	1/ 3/84	0.5	0.2
SC:HARTSVILLE	2/ 7/84	0.2	0.2
SC:JENKINSVILLE	1/27/84	0.2	0.2
SC:SENECA	1/24/84	0.2	0.2
TN:CHATTANOOGA	1/31/84	0.4	0.2
TN:KNOXVILLE	1/ 4/84	0.1	0.2
TX:AUSTIN	1/ 9/84	0.3	0.2
VA:DOSWELL	2/21/84	0.2	0.2
VA:LYNCHBURG	1/ 3/84	0.2	0.2
VA:VIRGINIA BEACH	1/ 6/84	0.1	0.2
VI:ST. THOMAS	1/26/84	0.1	0.2
WA:RICHLAND	1/20/84	0.4	0.2
WA:SEATTLE	1/ 9/84	0.2	0.2
WI:GENOA CITY	1/10/84	0.2	0.2
WI:MADISON	1/ 5/84	0.2	0.2

s SIGMA COUNTING ERROR

SECTION III. External Gamma Ambient Monitoring Program

The external gamma monitoring program, 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 will be 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 due to weapons fallout, reactor operations, etc. Initially, the program will consist of approximately 22 sites representing a wide geographic coverage throughout the country. Hopefully, at some later date additional sites will be added to the program. Although exposure measurements at these few sites are not totally representative of nationwide exposures, they will be indicative of national trends.

The monitoring 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 four 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 EERF for readout on an approximate one-month cycle. 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.

Results from the period January - March 1984 are shown in Table 12.

TABLE 12

ENVIRONMENTAL GAMMA AMBIENT MONITORING PROGRAM

LOCATION	DATE RANGE	INTEGRATED EXPOSURE	EXPOSURE RATE
		MR	MICRO R/HR ± 2 s *
AL:MONTGOMERY	10384- 20184	4.9	7.0 7.0
AL:MONTGOMERY	20184- 30184	4.4	6.6 7.1
AL:MONTGOMERY	30184- 40284	5.4	6.8 10.5
CA:BERKELEY	11384- 20184	2.7	6.0 5.5
CA:BERKELEY	20184- 30584	4.5	5.9 8.5
CA:BERKELEY	30584- 33084	3.5	5.8 19.0
CO:DENVER	11284- 20684	9.2	15.3 7.1
CO:DENVER	20684- 30284	9.0	15.7 5.1
CO:DENVER	30284- 40384	11.5	14.5 7.1
FL:ORLANDO	11684- 20684	3.1	6.2 9.2
FL:ORLANDO	20684- 32284	6.1	5.8 7.9
ID:BOISE	11284- 20984	7.5	11.1 9.3
ID:BOISE	20984- 30884	7.8	12.0 4.9
ID:BOISE	30884- 40584	7.8	11.3 9.4
IL:CHICAGO	10684- 30284	9.9	7.5 6.7
IL:CHICAGO	30284- 40584	5.9	7.0 8.1
ND:BISMARCK	90683-100583	6.3	9.1 13.6
ND:BISMARCK	11184- 13084	4.1	9.1 7.6
ND:BISMARCK	13084- 22884	6.8	9.8 12.3
ND:BISMARCK	22884- 40284	8.4	10.2 5.1
NJ:TRENTON	91483-100383	4.5	9.8 8.0
NM:SANTA FE	120783- 11784	13.9	14.2 23.9
NM:SANTA FE	11784- 21784	10.7	14.4 7.1
NM:SANTA FE	21784- 30984	6.9	14.4 5.1
NM:SANTA FE	30984- 41084	10.8	13.6 7.4
NV:LAS VEGAS	10984- 13184	3.8	7.2 7.1
NV:LAS VEGAS	13184- 22884	4.2	6.2 11.3
NV:LAS VEGAS	22884- 33084	5.1	7.1 9.6
NY:NEW YORK	121583- 22184	9.4	5.8 12.8
NY:NEW YORK	22184- 31284	5.1	11.2 7.2
OH:COLUMBUS	10984- 20184	3.7	6.6 14.3
OH:COLUMBUS	20184- 30184	4.7	6.9 16.8
OH:COLUMBUS	30184- 40284	5.2	6.6 10.5
OK:OKLAHOMA CITY	122083- 20284	8.2	7.7 5.6
OK:OKLAHOMA CITY	20284- 31284	6.8	7.4 8.0
OK:OKLAHOMA CITY	31284- 41084	5.3	7.4 8.2
OR:PORTLAND	11284- 13184	3.6	7.9 7.7
OR:PORTLAND	13184- 30584	6.1	7.7 9.1
OR:PORTLAND	30584- 40484	5.7	7.7 8.6
PA:HARRISBURG	11384- 13084	2.6	6.5 13.6
PA:HARRISBURG	13084- 30584	5.1	6.2 8.0
PA:HARRISBURG	30584- 40284	4.3	6.1 8.3

TABLE 12 (CONTINUED)

ENVIRONMENTAL GAMMA AMBIENT MONITORING PROGRAM

LOCATION	DATE RANGE	INTEGRATED EXPOSURE	EXPOSURE RATE	
		MR	MICRO R/HR	± 2 s *
RI:PROVIDENCE	10684- 21584	9.5	9.9	3.9
RI:PROVIDENCE	21584- 30584	4.7	11.0	5.6
RI:PROVIDENCE	30584- 41384	10.0	10.4	8.0
SC:BARNWELL	11284- 13084	3.5	8.1	6.3
SC:BARNWELL	13084- 30184	6.2	8.6	7.3
SC:BARNWELL	30184- 40584	6.6	7.6	7.8
SC:COLUMBIA	10684- 12784	4.1	8.2	6.4
SC:COLUMBIA	12784- 22884	6.2	8.0	5.9
SC:COLUMBIA	22884- 33084	6.3	8.7	7.1
TN:KNOXVILLE	10584- 20184	6.5	10.0	6.3
TN:KNOXVILLE	20184- 30284	7.2	10.3	6.7
TN:KNOXVILLE	30284- 40684	8.1	9.4	7.6
VA:RICHMOND	11184- 20284	3.7	7.0	11.2
VA:RICHMOND	20284- 30184	5.8	8.9	12.0
VA:RICHMOND	30184- 40284	6.4	8.1	5.9
VT:MONTPELIER	121283- 12084	7.0	7.5	8.4
VT:MONTPELIER	12084- 21084	3.5	6.9	14.3
VT:MONTPELIER	21084- 30584	4.1	7.3	13.2
VT:MONTPELIER	30584- 40484	4.9	6.6	7.6

* s = SIGMA ERROR (IN PERCENT)

SECTION IV. Milk Program

Pasteurized Milk

This is a cooperative program of the EPA, ORP and the Dairy and Lipid Products Branch, Milk Sanitation Section, Food and Drug Administration. Milk is a reliable indicator of the general populations intake of radionuclides since it is consumed by a large segment of the population and contains several of the biologically important contaminants resulting 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 one or more located in each state, Puerto Rico, and the Panama Canal. These are composite samples representing more than 80 percent of the milk consumed in a given population center.

These samples are analyzed for iodine-131, barium-140, cesium-137, and potassium. All 65 samples are analyzed annually in July for strontium-89, and 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-89 and strontium-90.

Iodine-131, barium-140, cesium-137 and potassium are determined by gamma spectral analysis. Strontium-89 and strontium-90 are determined by beta counting a total strontium precipitate which has been chemically separated by ion-exchange.

The values from the pasteurized milk samples for January - March 1984 are shown in Tables 13 - 15.

Strontium values from regional composite samples collected January - March 1984 are shown in Table 16.

Tritium in Milk

It was previously proposed to analyze all 65 milk samples for tritium in the aqueous and organic phases, on an annual basis (on the April sample). The EERF is currently evaluating alternative analytical techniques anticipating that these analyses will begin during the coming year.

TABLE 13

CONCENTRATIONS OF RADIONUCLIDES IN PASTEURIZED MILK

JANUARY 1984

LOCATION	DATE COLLECTED	K g/l±2s		^{137}Cs pCi/l±2s		^{140}Ba pCi/l±2s		^{131}I pCi/l±2s	
AL:MONTGOMERY	1/ 5/84	1.55	0.12	5	7	-7	8	2	7
AR:LITTLE ROCK	1/ 3/84	1.51	0.08	2	5	-2	6	-1	5
CA:LOS ANGELES	1/17/84	1.60	0.12	-2	7	-4	8	3	7
CA:SACRAMENTO	1/ 3/84	1.59	0.12	2	7	-2	8	-3	7
CA:SAN FRANCISCO	1/ 4/84	1.62	0.12	-4	7	1	8	-3	7
CO:DENVER	1/ 3/84	1.52	0.08	0	5	1	6	-4	5
CT:HARTFORD	1/ 6/84	1.60	0.12	-1	7	-3	8	-2	7
DC:WASHINGTON	1/ 6/84	1.71	0.13	-1	7	-5	8	2	7
FL:TAMPA	1/ 9/84	1.64	0.12	11	7	-6	8	-5	7
HI:HONOLULU	1/ 3/84	1.67	0.09	0	5	2	6	0	5
IA:DES MOINES	1/ 9/84	1.52	0.12	1	7	7	8	-6	7
ID:IDAHO FALLS	1/ 2/84	1.64	0.12	5	7	4	8	4	7
IL:CHICAGO	1/ 9/84	1.57	0.12	-1	7	-5	8	-1	7
IN:INDIANAPOLIS	1/ 6/84	1.49	0.12	2	7	-5	8	4	7
KS:WICHITA	1/ 3/84	1.71	0.13	3	7	1	8	-1	7
KY:LOUISVILLE	1/ 3/84	1.57	0.08	-2	5	1	6	-2	5
LA:NEW ORLEANS	1/ 2/84	1.48	0.12	5	7	-3	8	1	7
MA:BOSTON	1/10/84	1.68	0.13	3	7	-6	8	0	7
MD:BALTIMORE	1/ 6/84	1.63	0.08	0	5	0	6	-2	5
ME:PORTLAND	1/ 4/84	1.57	0.08	2	5	1	6	-6	5
MI:DETROIT	1/ 4/84	1.61	0.12	2	7	0	8	-1	7
MI:GRAND RAPIDS	1/ 3/84	1.59	0.08	0	5	-2	6	2	5
MN:MINNEAPOLIS	1/ 9/84	1.54	0.12	1	7	-3	8	-1.	7
MN:ST PAUL	1/ 4/84	1.63	0.12	-4	7	-2	8	-4.	7
MO:KANSAS CITY	1/ 5/84	1.60	0.12	0	7	-8	8	4	7
MO:ST LOUIS	1/ 4/84	1.59	0.12	5	7	5	8	-2.	7
MS:JACKSON	1/10/84	1.57	0.12	7	7	-4	8	4	7
MT:HELENA	1/ 3/84	1.67	0.13	6	7	-1	8	4	7
NC:CHARLOTTE	1/ 3/84	1.57	0.23	11	14	-2	20	-3	14
ND:MINOT	1/16/84	1.72	0.13	0	7	-6	8	1	7
NE:OMAHA	1/ 6/84	1.44	0.08	2	5	4	6	0	5
NH:MANCHESTER	1/ 9/84	1.58	0.12	-2	7	-5	8	3	7
NJ:TRENTON	1/ 4/84	1.60	0.09	1	5	5	6	0	5
NM:ALBUQUERQUE	1/ 3/84	1.58	0.12	-2	7	1	8	-2	7
NV:LAS VEGAS	1/ 9/84	1.45	0.12	-2	7	6	8	-2	7
NY:BUFFALO	1/ 9/84	1.64	0.12	-1	7	-7	8	0	7
NY:NEW YORK CITY	1/ 9/84	1.70	0.13	0	7	-4	8	3	7
NY:SYRACUSE	1/ 3/84	1.64	0.12	3	7	-4	8	4	7

TABLE 13 (CONTINUED)

CONCENTRATIONS OF RADIONUCLIDES IN PASTEURIZED MILK

JANUARY 1984

LOCATION	DATE COLLECTED	K g/l±2s		^{137}Cs pCi/l±2s		^{140}Ba pCi/l±2s		^{131}I pCi/l±2s	
OH:CINCINNATI	1/ 9/84	1.64	0.12	-2	7	-7	8	5	7
OH:CLEVELAND	1/ 9/84	1.62	0.12	4	7	-6	8	3	7
OK:OKLAHOMA CITY	1/16/84	1.71	0.13	-4	7	-8	8	-1	7
OR:PORTLAND	1/ 9/84	1.57	0.12	1	7	-6	8	-3	7
PA:PHILADELPHIA	1/ 3/84	1.67	0.13	-2	7	0	8	1	7
PA:PITTSBURGH	1/ 3/84	1.54	0.12	1	7	1	8	1	7
PC:CRISTOBAL	1/26/84	1.50	0.12	8	7	-4	8	-3	7
PR:SAN JUAN	1/13/84	1.65	0.23	3	14	-9	19	-1	14
SC:CHARLESTON	1/23/84	1.77	0.23	15	15	5	20	14	14
SD:RAPID CITY	1/26/84	1.46	0.12	2	7	-3	8	1	7
TN:CHATTANOOGA	1/ 3/84	1.58	0.12	6	7	-2	8	7	7
TN:KNOXVILLE	1/ 3/84	1.62	0.12	-2	7	-5	8	2	7
TN:MEMPHIS	1/26/84	1.57	0.12	-2	7	5	8	-2	7
TX:AUSTIN	1/ 2/84	1.54	0.12	4	7	-5	8	6	7
UT:SALT LAKE CITY	1/ 7/84	1.66	0.13	-2	7	4	8	2	7
VA:NORFOLK	1/20/84	1.51	0.12	3	7	4	8	0	7
VT:BURLINGTON	1/ 3/84	1.52	0.12	7	7	-7	8	1	7
WA:SEATTLE	1/ 3/84	1.62	0.09	2	5	2	6	1	5
WA:SPOKANE	1/ 3/84	1.47	0.12	5	7	-5	8	5	7
WI:MILWAUKEE	1/ 3/84	1.64	0.12	-2	7	1	8	0	7
WV:CHARLESTON	1/25/84	1.59	0.12	-2	7	1	8	-4	7
WY:LARAMIE	1/ 9/84	1.65	0.12	-4	7	-6	8	-3	7

s SIGMA COUNTING ERROR

TABLE 14

CONCENTRATIONS OF RADIONUCLIDES IN PASTEURIZED MILK

FEBRUARY 1984

LOCATION	DATE COLLECTED	K g/l±2s		^{137}Cs pCi/l±2s		^{140}Ba pCi/l±2s		^{131}I pCi/l±2s	
AL:MONTGOMERY	2/ 9/84	1.46	0.12	-2	7	1	8	-1	7
AR:LITTLE ROCK	2/ 6/84	1.58	0.12	3	7	6	8	0	7
AZ:PHOENIX	2/ 8/84	1.58	0.12	-1	7	-2	8	4	7
CA:LOS ANGELES	2/ 8/84	1.65	0.12	-1	7	1	8	-7	7
CA:SACRAMENTO	2/ 1/84	1.59	0.08	-2	5	-2	6	-2	5
CA:SAN FRANCISCO	2/ 8/84	1.53	0.12	2	7	4	8	-3	7
CO:DENVER	2/ 1/84	1.44	0.12	-4	7	2	8	-3	7
CO:DENVER	2/29/84	1.51	0.12	-3	7	0	8	-1	7
CT:HARTFORD	2/ 6/84	1.57	0.12	-1	7	-9	8	3	7
DC:WASHINGTON	2/ 3/84	1.54	0.12	1	7	5	8	-4	7
FL:TAMPA	2/ 8/84	1.63	0.12	8	7	1	8	0	7
GA:ATLANTA	2/ 6/84	1.58	0.08	2	5	0	6	0	5
HI:HONOLULU	2/ 7/84	1.65	0.12	-1	7	-3	8	-1	7
IA:DES MOINES	2/ 6/84	1.59	0.08	4	5	-4	6	0	5
ID:IDAHO FALLS	2/ 1/84	1.62	0.12	2	7	5	8	1	7
IL:CHICAGO	2/ 6/84	1.57	0.12	-5	7	-3	8	3	7
IN:INDIANAPOLIS	2/ 6/84	1.59	0.12	-4	7	0	8	1	7
KS:WICHITA	2/ 6/84	1.57	0.12	-1	7	-2	8	0	7
KY:LOUISVILLE	2/ 7/84	1.55	0.12	2	7	-2	8	-1	7
LA:NEW ORLEANS	2/ 2/84	1.59	0.08	5	5	-5	6	2	5
MA:BOSTON	2/ 7/84	1.49	0.12	10	7	0	8	-5	7
MD:BALTIMORE	2/ 3/84	1.63	0.12	5	7	0	8	-5	7
ME:PORTLAND	2/ 7/84	1.80	0.23	4	14	3	20	5	14
MI:DETROIT	2/ 9/84	1.63	0.12	3	7	0	8	-1	7
MN:MINNEAPOLIS	2/ 6/84	1.67	0.13	0	7	-1	8	-1	7
MN:ST PAUL	2/ 1/84	1.87	0.24	9	14	8	20	-9.	14
MO:KANSAS CITY	2/ 8/84	1.51	0.12	0	7	0	8	0	7
MO:ST LOUIS	2/ 8/84	1.62	0.12	4	7	-3	8	1.	7
MS:JACKSON	2/ 7/84	1.56	0.12	3	7	1	8	-3	7
MT:HELENA	2/ 6/84	1.62	0.12	-1	7	-3	8	-1	7
NC:CHARLOTTE	2/ 7/84	1.84	0.24	1	14	-3	20	1	14
ND:MINOT	2/ 6/84	1.57	0.12	-3	7	-1	8	1	7
NE:OMAHA	2/14/84	1.61	0.12	1	7	1	8	-6	7
NH:MANCHESTER	2/ 6/84	1.51	0.12	5	7	-1	8	-3	7
NM:ALBUQUERQUE	2/ 6/84	1.55	0.12	-6	7	0	8	0	7
NY:BUFFALO	2/ 6/84	1.52	0.12	-5	7	2	8	-4	7
NY:NEW YORK CITY	2/ 6/84	1.67	0.13	-1	7	5	8	-7	7
NY:SYRACUSE	2/ 6/84	1.65	0.12	2	7	1	8	3	7

TABLE 14 (CONTINUED)

CONCENTRATIONS OF RADIONUCLIDES IN PASTEURIZED MILK

FEBRUARY 1984

LOCATION	DATE COLLECTED	K g/l±2s	^{137}Cs pCi/l±2s	^{140}Ba pCi/l±2s	^{131}I pCi/l±2s
OH:CINCINNATI	2/ 6/84	1.55 0.12	-1 7	-7 8	-3 7
OH:CLEVELAND	2/ 7/84	1.53 0.12	0 7	-1 8	1 7
OK:OKLAHOMA CITY	2/13/84	1.58 0.12	2 7	5 8	-4 7
OR:PORTLAND	2/14/84	1.65 0.09	3 5	0 6	0 5
PA:PHILADELPHIA	2/ 6/84	1.59 0.08	1 5	-2 6	0 5
PA:PITTSBURGH	2/ 8/84	1.40 0.12	0 7	3 8	5 7
PC:CRISTOBAL	2/23/84	1.57 0.12	11 7	-1 8	-4 7
PR:SAN JUAN	2/ 2/84	1.59 0.16	5 10	1 14	0 10
SD:RAPID CITY	2/23/84	1.62 0.12	8 7	5 8	-2 7
TN:CHATTANOOGA	2/ 7/84	1.53 0.12	2 7	5 8	-6 7
TN:KNOXVILLE	2/ 6/84	1.69 0.23	11 14	9 20	9 14
TN:MEMPHIS	2/23/84	1.52 0.12	-1 7	6 8	0 7
TX:AUSTIN	2/ 6/84	1.50 0.12	3 7	-2 8	5 7
UT:SALT LAKE CITY	2/ 6/84	1.53 0.12	5 7	-1 8	-4 7
VT:BURLINGTON	2/ 3/84	1.66 0.09	0 5	0 6	0 5
WA:SEATTLE	2/ 1/84	1.63 0.12	-1 7	-6 8	1 7
WI:MILWAUKEE	2/ 1/84	1.62 0.08	2 5	-2 6	-4 5
WY:LARAMIE	2/ 7/84	1.57 0.08	-2 5	0 6	1 5

s SIGMA COUNTING ERROR

TABLE 15

CONCENTRATIONS OF RADIONUCLIDES IN PASTEURIZED MILK

MARCH 1984

LOCATION	DATE COLLECTED	K g/l±2s		^{137}Cs pCi/l±2s		^{140}Ba pCi/l±2s		^{131}I pCi/l±2s	
AL:MONTGOMERY	3/ 8/84	1.59	0.12	2	7	-4	8	-2	7
AR:LITTLE ROCK	3/ 6/84	1.57	0.12	0	7	-3	8	4	7
AZ:PHOENIX	3/ 7/84	1.62	0.12	-5	7	-2	8	-5	7
CA:LOS ANGELES	3/20/84	1.52	0.12	-4	7	-8	8	0	7
CA:SACRAMENTO	3/ 1/84	1.71	0.13	3	7	7	8	0	7
CA:SAN FRANCISCO	3/ 5/84	1.59	0.08	0	5	-2	6	-4	5
CT:HARTFORD	3/ 2/84	1.56	0.08	3	5	2	6	0	5
FL:TAMPA	3/ 6/84	1.58	0.12	12	7	-6	8	3	7
GA:ATLANTA	3/ 5/84	1.62	0.12	0	7	-3	8	0	7
HI:HONOLULU	3/ 5/84	1.56	0.12	-5	7	3	8	-3	7
IA:DES MOINES	3/ 5/84	1.62	0.12	-1	7	2	8	-3	7
ID:IDAHO FALLS	3/15/84	1.55	0.12	0	7	-2	8	1	7
IL:CHICAGO	3/ 5/84	1.57	0.08	1	5	-4	6	0	5
KS:WICHITA	3/ 2/84	1.63	0.08	2	5	-3	6	2	5
KY:LOUISVILLE	3/ 6/84	1.47	0.12	0	7	-1	8	5	7
LA:NEW ORLEANS	3/ 8/84	1.61	0.12	5	7	3	8	-3	7
MA:BOSTON	3/ 6/84	1.70	0.13	2	7	-4	8	-5	7
MD:BALTIMORE	3/ 2/84	1.63	0.12	2	7	0	8	5	7
ME:PORTLAND	3/ 7/84	1.63	0.12	5	7	-1	8	0	7
MI:DETROIT	3/ 8/84	1.64	0.12	1	7	-2	8	0	7
MI:GRAND RAPIDS	3/ 6/84	1.65	0.12	2	7	-6	8	2	7
MN:MINNEAPOLIS	3/ 5/84	1.52	0.12	0	7	-3	8	3	7
MN:ST PAUL	3/ 5/84	1.53	0.12	-3	7	2	8	3.	7
MO:KANSAS CITY	3/ 7/84	1.67	0.13	-3	7	0	8	-3	7
MO:ST LOUIS	3/ 7/84	1.54	0.12	-1	7	0	8	-3.	7
MS:JACKSON	3/ 6/84	1.64	0.12	0	7	-4	8	-1	7
MT:HELENA	3/ 6/84	1.65	0.12	-1	7	-6	8	2	7
NC:CHARLOTTE	3/ 5/84	1.69	0.23	3	14	-13	19	10	14
ND:MINOT	3/ 7/84	1.66	0.09	-3	5	-3	6	0	5
ND:MINOT	3/27/84	1.57	0.12	2	7	0	8	3	7
NE:OMAHA	3/ 9/84	1.36	0.12	2	7	2	8	3	7
NH:MANCHESTER	3/ 5/84	1.49	0.12	0	7	2	8	-2	7
NJ:TRENTON	3/ 7/84	1.63	0.12	3	7	-8	8	-1	7
NM:ALBUQUERQUE	3/ 5/84	1.62	0.12	1	7	-5	8	1	7
NV:LAS VEGAS	3/ 6/84	1.60	0.12	-1	7	-7	8	-4	7
NY:BUFFALO	3/ 5/84	1.56	0.12	1	7	1	8	0	7
NY:NEW YORK CITY	3/ 5/84	1.65	0.12	2	7	-6	8	-4	7
NY:SYRACUSE	3/ 5/84	1.62	0.09	3	5	0	6	-2	5

TABLE 15 (CONTINUED)

CONCENTRATIONS OF RADIONUCLIDES IN PASTEURIZED MILK

MARCH 1984

LOCATION	DATE COLLECTED	K g/l±2s	^{137}Cs pCi/l±2s	^{140}Ba pCi/l±2s	^{131}I pCi/l±2s
OH:CINCINNATI	3/12/84	1.63 0.12	-1 7	-2 8	-4 7
OH:CLEVELAND	3/ 7/84	1.56 0.12	1 7	-6 8	3 7
OK:OKLAHOMA CITY	3/ 5/84	1.60 0.08	0 5	-4 6	0 5
OR:PORTLAND	3/ 5/84	1.61 0.12	-1 7	-7 8	1 7
PA:PHILADELPHIA	3/ 5/84	1.61 0.12	2 7	-1 8	0 7
PA:PITTSBURGH	3/ 7/84	1.59 0.08	-1 5	-2 6	0 5
SC:CHARLESTON	3/ 2/84	1.59 0.12	1 7	-2 8	1 7
SC:CHARLESTON	3/27/84	1.70 0.23	7 14	-4 20	-4 14
SD:RAPID CITY	3/16/84	1.51 0.12	-2 7	-1 8	-1 7
TN:CHATTANOOGA	3/ 5/84	1.49 0.12	1 7	1 8	-1 7
TN:KNOXVILLE	3/ 5/84	1.57 0.08	-2 5	5 6	-5 5
TN:MEMPHIS	3/28/84	1.55 0.12	3 7	2 8	-4 7
UT:SALT LAKE CITY	3/ 5/84	1.68 0.13	-2 7	2 8	-1 7
VA:NORFOLK	3/15/84	1.61 0.12	4 7	-1 8	-2 7
VT:BURLINGTON	3/ 5/84	1.59 0.12	1 7	1 8	-4 7
WA:SEATTLE	3/29/84	1.53 0.12	1 7	-6 8	-2 7
WA:SEATTLE	3/ 5/84	1.54 0.12	3 7	-5 8	-3 7
WA:SPOKANE	3/ 5/84	1.55 0.08	2 5	-1 6	2 5
WI:MILWAUKEE	3/ 1/84	1.60 0.12	0 7	1 8	-1 7
WI:MILWAUKEE	3/29/84	1.63 0.12	3 7	-6 8	4 7
WV:CHARLESTON	3/12/84	1.62 0.12	0 7	-4 8	4 7
WY:LARAMIE	3/12/84	1.55 0.12	0 7	-2 8	-4 7

s SIGMA COUNTING ERROR

TABLE 16

STRONTIUM-90 AND STRONTIUM-89 IN PASTEURIZED MILK

EPA REGIONAL COMPOSITES

JANUARY - MARCH 1984

EPA REGION	^{90}Sr pCi/l ± 2s		^{89}Sr pCi/l ± 2s*	
I	2.4	0.4	1	0
II	2.4	0.6	0	1
III	2.3	0.9	1	1
IV	2.8	0.7	0	2
V	2.9	0.4	1	0
VI	2.5	0.6	0	1
VII	2.3	0.7	1	1
VIII	1.8	0.6	1	1
IX	0.8	0.6	1	1
X	1.4	0.4	0	0

s SIGMA COUNTING ERROR
s* ANALYTICAL ERROR TERM WHICH CLOSELY APPROXIMATES THE COUNTING ERROR

Carbon-14 in Milk

Nine stations, chosen for wide geographical distribution, contribute milk samples for annual analysis for carbon-14. These samples have monitored the carbon-14 levels in the food chain resulting from nuclear testing.

Analysis consists of combusting the samples and measuring released carbon dioxide through liquid scintillation.

Data will be published as it becomes available.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO
RESEARCH AND DEVELOPMENT DEPARTMENT
100 EAST ERIE STREET
CHICAGO, ILLINOIS 60611

RADIOLOGICAL MONITORING OF THE CHICAGO AREA WATERWAYS JANUARY TO DECEMBER 1983

The three river systems of the greater Chicago area -- Chicago, Calumet, and Des Plaines -- are under the jurisdiction of the Metropolitan Sanitary District of Greater Chicago (District). They comprise 170 miles (273.6 Km) of waterways. The District maintains a monitoring program of the water quality of these systems with regards to the standards established by the Illinois Pollution Control Board (IPCB) as well as for the purpose of detecting any changes with respect to the water quality of the past and future years. The analyses for total alpha and beta radioactivity have been a part of this overall monitoring program of the river systems since mid-1975. The program is an ongoing activity of the District and this report presents the results for 1983.

Samples for radioactivity were collected in HCl-containing plastic bottles once a month at a predetermined number of locations: 17 on the Chicago River, 12 on the Calumet River, and 19 on the Des Plaines River, the latter system having an additional sampling location, Walnut Lane, in 1983 over the previous years.

A 500 ml aliquot of a water sample was evaporated to approximately 20 ml, transferred into an evaporting dish, evaporated to dryness, and flamed until no vapors were given

off. The remaining solids were scraped loose, ground with a pestle, and then transferred onto a counting planchet. A couple of drops of carbon tetrachloride were added to help evenly spread the solids. Subsequently, the samples were counted 100 minutes for total alpha and 100 minutes for total beta activity by the use of a Beckman Widebeta II proportional counter which was previously calibrated with radium-226 and cesium-137, respectively, for total alpha and total beta determinations.

The results of the determinations for the year 1983 are tabulated in Tables 1-3 in terms of the number of samples analyzed, the yearly low, high, and average ($\bar{x}$) total alpha and total beta concentration for each sampling location; the reported error is given by

$$e = 1.96\ S_{\bar{x}}$$

where $S_{\bar{x}}$ is the standard error of the average net activity.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE 1

CHICAGO RIVER SYSTEM
TOTAL ALPHA AND BETA CONCENTRATION IN WATER
January to December 1983

STATION	TOTAL ALPHA pCi/l					TOTAL BETA pCi/l				
	#SAMPLES ANALYZED	LOW	HIGH	AVERAGE	*ERROR	#SAMPLES ANALYZED	LOW	HIGH	AVERAGE	*ERROR
County Line Road, West Fork, North Branch, Chicago River	12	0.00	9.88	1.48	0.20	12	8.56	28.25	14.13	0.45
County Line Road, Middle Fork, North Branch, Chicago River	10	0.00	6.72	1.33	0.19	10	6.64	22.02	11.47	0.45
County Line Road, Skokie River	12	0.00	5.95	1.00	0.18	12	7.71	16.03	10.44	0.40
Dempster St., North Branch, Chicago River	12	0.00	5.10	1.50	0.20	12	8.10	21.07	12.07	0.41
Central Ave., North Shore Channel	11	0.00	0.67	0.12	0.08	10	0.85	6.76	5.08	0.35
Touhy Avenue, North Shore Channel	11	0.00	0.93	0.20	0.12	12	3.74	12.12	8.81	0.38
Wilson Ave., North Branch, Chicago River	11	0.00	0.85	0.32	0.13	11	6.94	14.79	9.72	0.40
Diversey Ave., North Branch, Chicago River	12	0.00	1.09	0.39	0.13	12	6.58	12.76	9.81	0.39
Grand Ave., North Branch, Chicago River	12	0.00	1.64	0.38	0.13	12	4.69	15.21	8.99	0.38
Outer Drive Bridge, Chicago River	12	0.00	3.62	0.56	0.11	12	2.97	12.30	5.29	0.34
Madison St., South Branch, Chicago River	12	0.00	2.47	0.67	0.12	12	4.44	8.96	6.94	0.35
Damen Avenue, South Branch, Chicago River	12	0.00	1.48	0.41	0.12	12	4.61	9.50	7.15	0.35
Cicero Ave., Chicago Sanitary & Ship Canal	12	0.00	1.01	0.29	0.11	12	4.45	11.29	7.19	0.35
Harlem Ave., Chicago Sanitary & Ship Canal	12	0.00	1.57	0.43	0.12	12	6.25	10.77	8.38	0.36

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE 1 (Continued)

CHICAGO RIVER SYSTEM
TOTAL ALPHA AND BETA CONCENTRATION IN WATER
January to December 1983

STATION	#SAMPLES ANALYZED	TOTAL ALPHA pCi/l LOW	HIGH	AVERAGE	*ERROR	#SAMPLES ANALYZED	TOTAL BETA pCi/l LOW	HIGH	AVERAGE	*ERROR
Route 83, Chicago Sanitary & Ship Canal	12	0.00	2.02	0.48	0.13	12	4.83	11.85	8.08	0.37
Stephens St., Chicago Sanitary & Ship Canal	12	0.00	4.56	0.88	0.15	12	6.27	15.79	10.33	0.39
16th St., Chicago Sanitary & Ship Canal	12	0.00	0.70	0.36	0.14	12	4.07	14.32	9.88	0.39

*ERROR (e) = 1.96 $S_{\bar{x}}$ where $S_{\bar{x}}$ is the standard error of the average net activity.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE 2

CALUMET RIVER SYSTEM
TOTAL ALPHA AND BETA CONCENTRATION IN WATER
January to December 1983

STATION	#SAMPLES ANALYZED	TOTAL ALPHA pCi/l LOW	HIGH	AVERAGE	*ERROR	#SAMPLES ANALYZED	TOTAL BETA pCi/l LOW	HIGH	AVERAGE	*ERROR
Ewing Ave., Calumet River	10	0.00	1.24	0.36	0.12	10	3.04	17.83	5.83	0.36
Wolf Lake, Burnham Ave., (Overflow Ditch)	10	0.00	0.88	0.26	0.11	10	5.82	8.73	6.88	0.37
Indiana Harbor Belt RR Bridge, Grand Calumet River	11	0.00	5.30	1.05	0.21	11	2.48	13.55	11.13	0.43
Wentworth Ave., Little Calumet River	12	0.00	1.72	0.66	0.19	11	7.22	13.12	10.50	0.41
Joe Orr Road, Thorn Creek	10	0.00	10.59	1.97	0.60	10	13.46	27.60	20.03	0.62
130th St., Calumet River	11	0.00	1.33	0.43	0.13	11	5.01	16.04	10.11	0.41
Indiana Ave. @ 135th St., Little Calumet River	10	0.00	1.74	0.47	0.14	10	6.50	16.53	10.70	0.43
Halsted St., Little Calumet River	12	0.00	3.46	0.60	0.16	12	7.14	15.62	12.43	0.42
Ashland Ave. near 135th St., Little Calumet River	10	0.00	2.08	0.87	0.25	10	8.46	16.08	11.93	0.46
Ashland Ave., Cal-Sag Channel	12	0.00	1.36	0.53	0.16	12	6.20	15.95	11.86	0.42
Cicero Ave., Cal-Sag Channel	11	0.00	2.43	0.43	0.15	11	6.81	16.85	10.98	0.42
Route 83 Bridge, Cal-Sag Channel	11	0.00	0.85	0.24	0.14	9	7.20	16.90	11.22	0.47

*ERROR (e) = 1.96 $S_{\bar{x}}$ where $S_{\bar{x}}$ is the standard error of the average net activity.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE 3

DES PLAINES RIVER SYSTEM
TOTAL ALPHA AND BETA CONCENTRATION IN WATER
January to December 1983

STATION	#SAMPLES ANALYZED	TOTAL ALPHA pCi/l LOW	HIGH	AVERAGE	*ERROR	#SAMPLES ANALYZED	TOTAL BETA pCi/l LOW	HIGH	AVERAGE	*ERROR
Lonsmeadow Lane, upstream of Hanover Park Treatment Plant, Du Page River	12	0.00	1.32	0.66	0.59	12	7.40	23.20	12.34	0.44
Lake St., downstream of Hanover Park Treatment Plant, Du Page River	12	0.00	8.84	1.57	0.26	12	8.83	25.24	17.08	0.50
Walnut Lane, downstream of Hanover Park Treatment Plant, W. Br. Du Page River	7	0.00	2.07	0.73	0.27	7	11.99	23.64	19.48	0.69
Elmhurst Road, upstream of O'Hare Treatment Plant, Higgins Creek	12	0.00	3.53	0.79	0.34	12	6.03	25.35	10.37	0.41
Wille Road , downstream of O'Hare Treatment Plant, Higgins Creek	12	0.00	3.06	0.97	0.25	12	7.60	28.36	18.35	0.51
Higgins Road, upstream of Egan Treatment Plant, Salt Creek	11	0.00	2.53	0.93	0.15	11	6.36	11.61	8.57	0.39
Arlington Heights Road, downstream of Egan Treatment Plant,Salt Creek	10	0.00	4.29	1.17	0.25	12	9.29	27.81	15.02	0.47
Devon Ave., Salt Creek	11	0.00	3.07	1.10	0.23	12	9.15	27.34	16.50	0.48
County Line Road, Des Plaines River	11	0.00	1.92	0.54	0.16	12	0.17	18.17	10.13	0.40
County Line Road, Buffalo Creek	12	0.00	5.90	1.09	0.22	12	7.25	11.24	9.63	0.39
Oakton St., Des Plaines River	11	0.42	3.39	1.24	0.24	12	7.24	16.68	11.35	0.42
Belmont Ave., Des Plaines River	12	0.00	1.66	0.75	0.21	12	8.28	27.06	13.05	0.44

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE 3 (Continued)

DES PLAINES RIVER SYSTEM
TOTAL ALPHA AND BETA CONCENTRATION IN WATER
January to December 1983

STATION	$SAMPLES ANALYZED	TOTAL ALPHA pCi/l LOW	HIGH	AVERAGE	*ERROR	$SAMPLES ANALYZED	TOTAL BETA pCi/l LOW	HIGH	AVERAGE	*ERROR
Roosevelt Road, Des Plaines River	12	0.00	11.78	1.55	0.22	12	9.62	19.84	12.21	0.43
Wolf Road, Salt Creek	12	0.00	2.52	0.98	0.27	12	10.17	25.18	16.09	0.49
First Ave., Salt Creek	12	0.00	4.21	1.24	0.25	12	9.19	22.98	16.13	0.49
Osden Ave., Des Plaines River	12	0.00	1.75	0.75	0.19	12	9.67	20.86	12.86	0.44
Willow Springs Road, Des Plaines River	11	0.27	2.39	0.71	0.17	11	8.06	22.12	12.57	0.45
Stephens St., Des Plaines River	12	0.00	1.44	0.57	0.19	12	9.44	20.91	13.21	0.44
Chicago-Elgin Rd., Poplar Creek	10	0.00	2.33	0.66	0.14	11	4.65	17.25	7.76	0.38

*ERROR (e) = 1.96 $S_{\bar{x}}$ where $S_{\bar{x}}$ is the standard error of the average net activity.

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