FILE

January 1990 ER-4180110-184

ROCKY FLATS PLANT

MONTHLY ENVIRONMENTAL MONITORING REPORT

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JANUARY 1990 ENVIRONMENTAL MONITORING REPORT
ROCKY FLATS PLANT

This report summarizes the effluent and environmental monitoring programs at the Rocky Flats Plant for the month of January 1990. The data presented herein are the best information available to the Rocky Flats Plant at this time. Should subsequent analyses indicate that any data presented herein are inaccurate or misleading appropriate revisions will be issued promptly.

Included in the report are monitoring results for radioactive and nonradioactive airborne effluents continuously sampled from Plant buildings, Tables I and II. Tables III through V summarize environmental monitoring data from the Rocky Flats Plant ambient air sampling network. This network is comprised of continuously operating air samplers located on plantsite, around the Plant boundary, and in neighboring communities.

Water sampling results for radioactive constituents are given in Tables VI through VIII. Results are summarized for Plant surface water control ponds, for nearby drinking water reservoirs, and for tap water for neighboring communities. Nitrate monitoring for Great Western Reservoir and Standley Lake, the two drinking water reservoirs which can receive surface water discharges from the Plant, are summarized in Table IX.

The Environmental Protection Agency (EPA) has issued to the Plant a National Pollutant Discharge Elimination System (NPDES) permit for control of surface water discharges. Water sampling results associated with the NPDES permit, as well as applicable discharge limitations imposed by that permit, are reported in Table X. Analytical results for nonradioactive parameters in water at the Walnut Creek at Indiana Street location are summarized in Table XI. Daily flow data for surface water from the two Plant drainage systems are given in Tables XI, XII, and XIII.

The data provided in this report are provided as a matter of comity and should not be construed as an application for a permit or license, or in support of such an application. Approval of the Department of Energy should be obtained prior to publication of any data contained within this report.

Table I. 1990 Plutonium and Uranium Airborne Effluent Data

Month	Plutonium (12/21/89 - 01/25/90) Release (uCi)	Plutonium C_{Max} (pCi/m3)	Uranium (01/02/90 - 01/26/90) Release (uCi)	Uranium C_{Max} (pCi/m3)
CY 1989	4.88	0.145 ± 0.0060	7.60	0.217 ± 0.0231
January	0.29*	0.001 ± 0.0002*	0.08	0.002 ± 0.0006
February				
March				
April				
May				
June				
July				
August				
September				
October				
November				
December				
Year to Date	0.29	0.001 ± 0.0002	0.08	0.002 ± 0.0006

*Results of ten monthly composited plutonium air effluent samples were lost due to poor sample recovery. None of these ten composite samples exceeded the Plant's guide value of 0.020 pCi/m3, based on results of total long-lived alpha screening.

Forty-seven effluent samples are submitted for analysis each month for plutonium. The dissolved samples are divided into two 125 ml aliquotes providing for replicate or backup analysis. A known amount of Pu-242 tracer is added to each aliquot, from which sample recovery is later determined. Following alpha pulse-height analysis of the sample, the recovery is calculated from the counts accumulated in the peak energy areas of interest.

Criteria are established for acceptable sample recovery. When the analysis shows these criteria were not met, the remaining backup aliquot is available for re-analysis of the sample. The 10 subject samples failed the acceptance criteria during both attempted analyses.

NOTE: The plutonium, uranium, americium, and beryllium measured concentrations in this report include values that are less than the corresponding calculated minimum detectable concentrations (MDC's). In some cases, the values are less than zero. This method of reporting began in January 1981. These negative values result when the measured value for the laboratory reagent blank is subtracted from an analytical result which was measured as a smaller value than the reagent blank. This may happen when measuring concentrations which are very close to zero.

Table II. 1990 Tritium and Beryllium Airborne Effluent Data

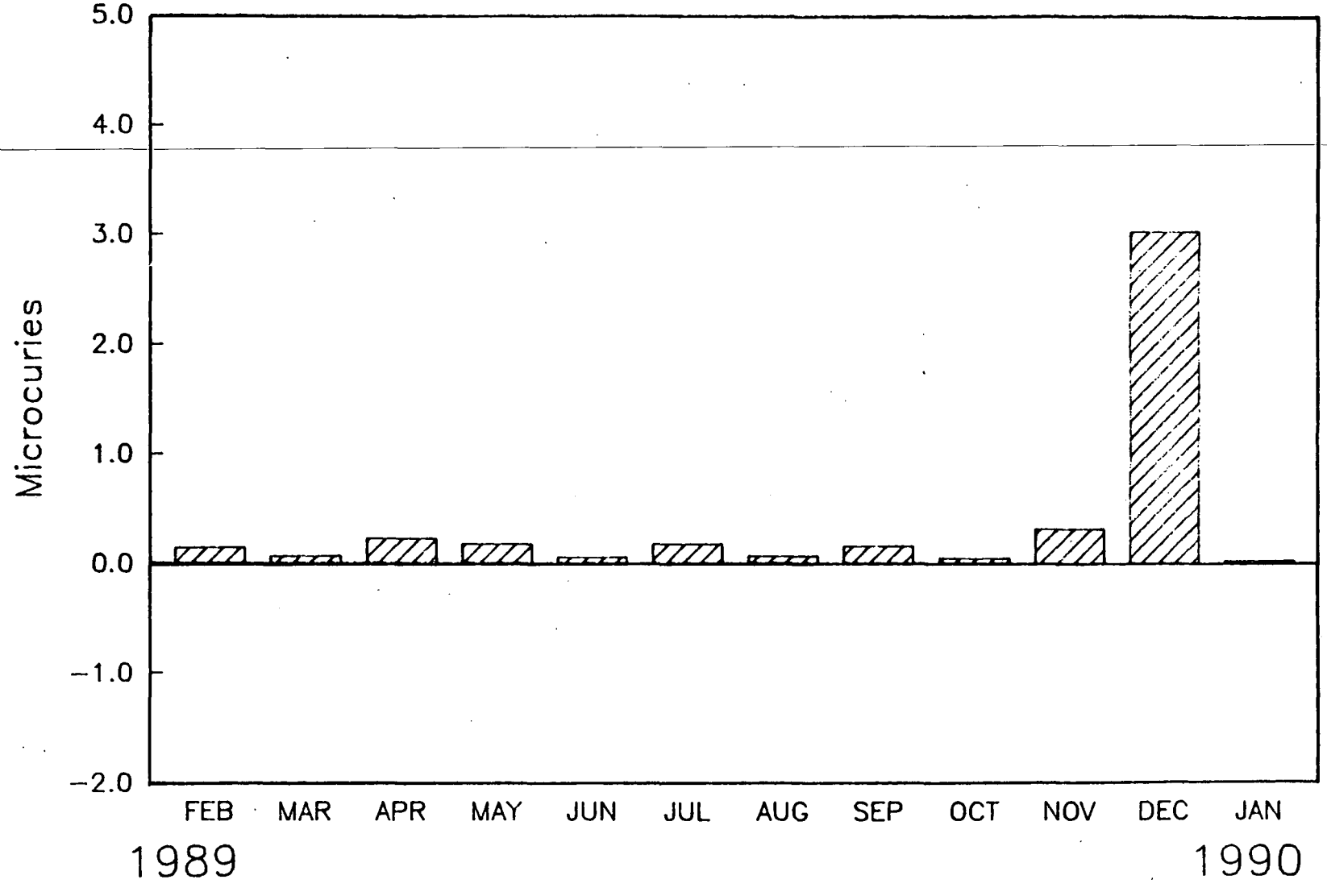
Month	Tritium (01/03/90 - 01/31/90) Release (Ci)	Tritium C_{Max} (pCi/m3)	Beryllium (12/21/89 - 01/26/90) Release (grams)	Beryllium C_{Max} (ug/m3)
CY 1989	0.176	14000 ± 320	0.6442	0.00106
January	0.000	35 ± 6	0.0503*	0.00080
February				
March				
April				
May				
June				
July				
August				
September				
October				
November				
December				
Year to Date	0.000	35 ± 6	0.0503	0.00080

NOTE: Beryllium measured at the remaining 44 locations was below the screening level of 0.1 gram per month.

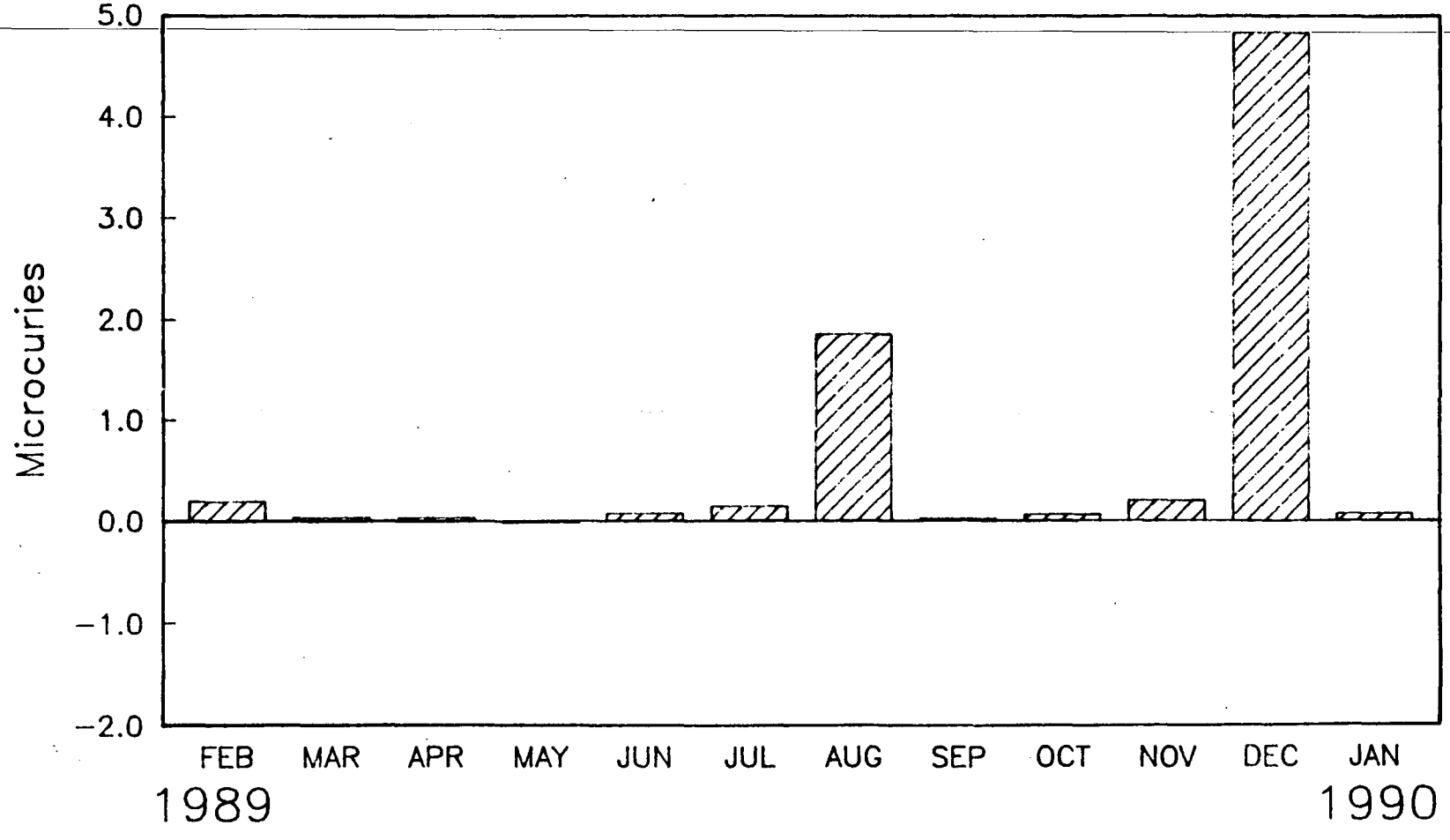
The calibration methodology for the beryllium analyses was changed beginning with the September 1989 samples to improve quality assurance. The previous procedure used the single-point, "simple method of additions," one of the methods recommended by the manufacturer of the graphite furnace atomic absorption analytical equipment.The current method is based on EPA Contract Laboratory Program protocol. It uses multi-point calibration curves, periodic validation of the curve with EPA validation standards, and periodic blank and sample checks to assure absence of equipment contamination and matrix effects during the analysis.

* No blank correction

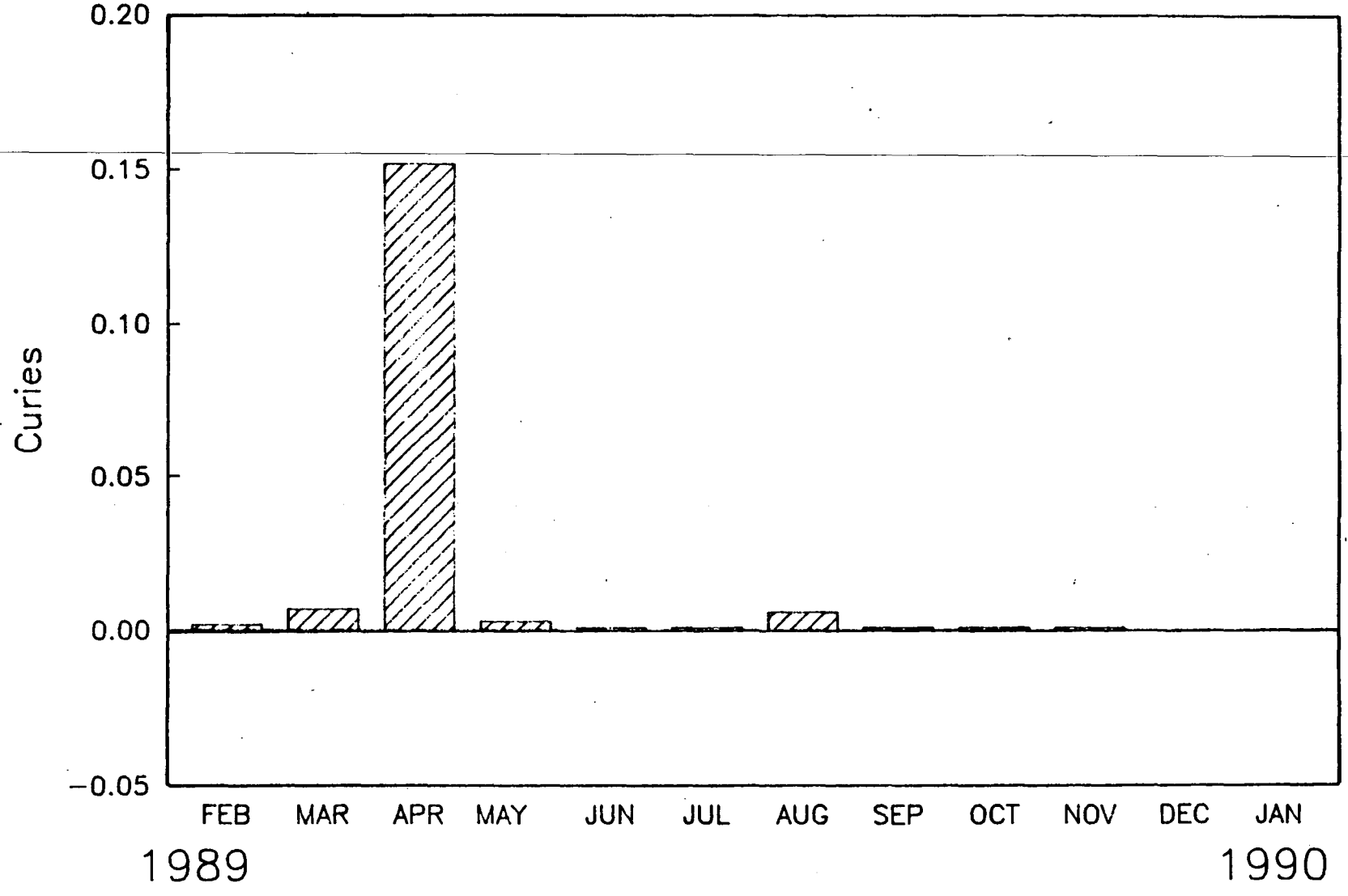
PLUTONIUM MEASURED IN EFFLUENT AIR



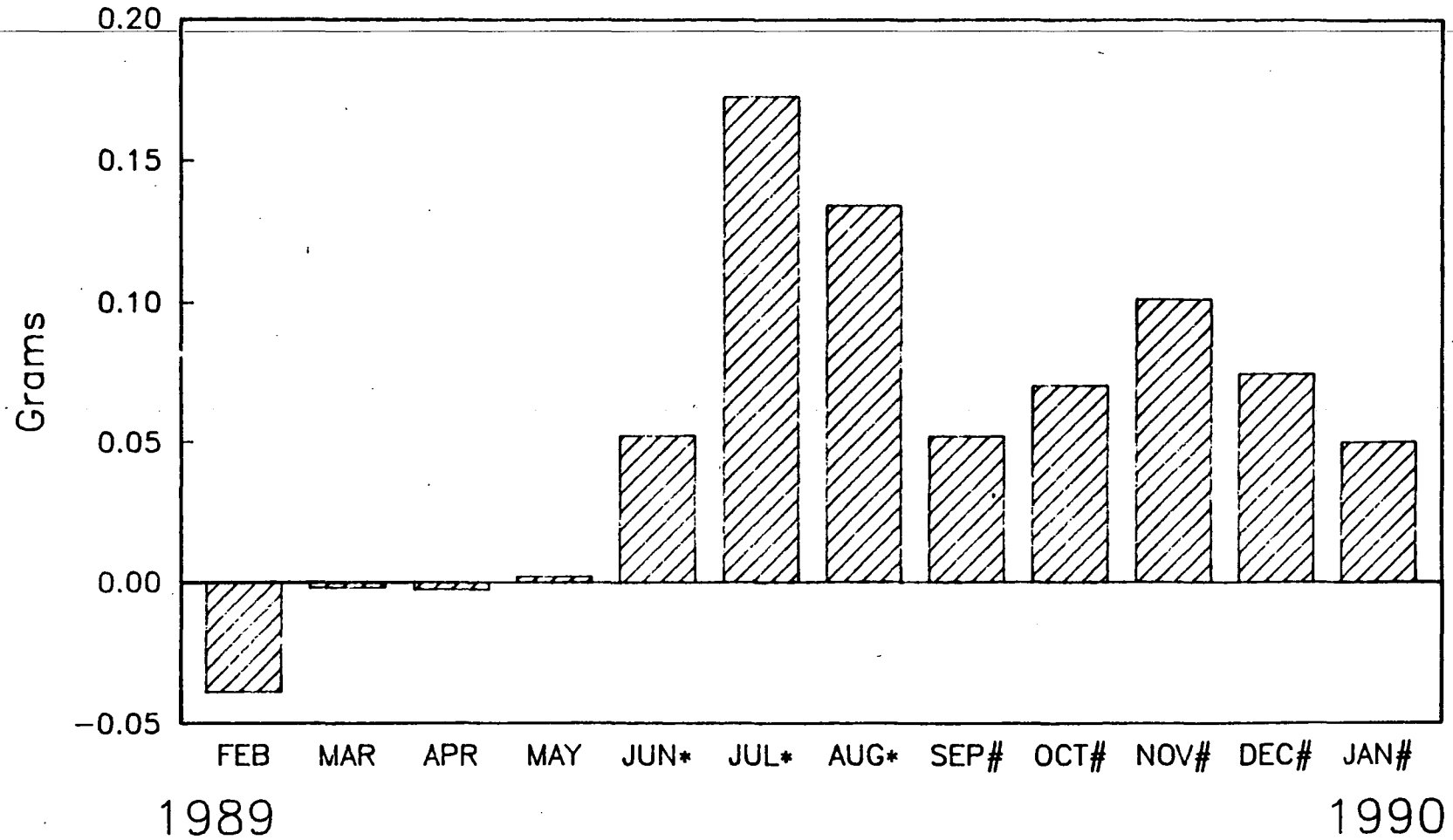
URANIUM MEASURED IN EFFLUENT AIR



TRITIUM MEASURED IN EFFLUENT AIR



BERYLLIUM MEASURED IN EFFLUENT AIR



* NOT BLANK CORRECTED
\# NEW CALIBRATION TECHNIQUE

Table III.

Plutonium Concentration in Ambient Air for Selected Onsite Samplers

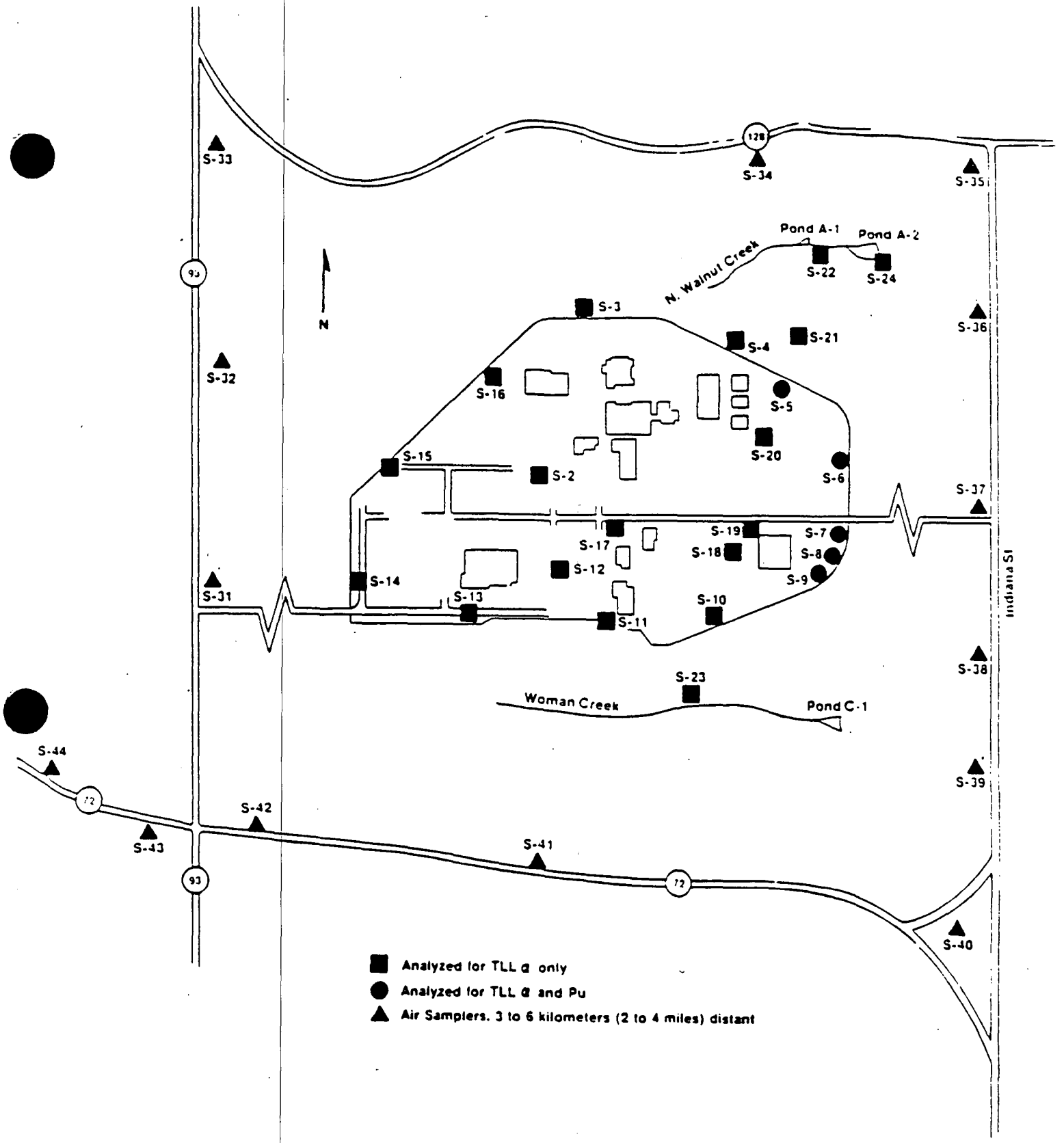
JANUARY 1990

Location	N	Volume (m3)	Avg. Pu Conc. (pCi/m3)	+/- Error (pCi/m3)
S-01	2	19000	0.000000	0.000000
S-02	*			
S-03	*			
S-04	2	20000	0.000179	0.000001
S-05	2	32000	0.000185	0.000027
S-06	**	25000		
S-07	2	32000	0.000063	0.000007
S-08	**	36000		
S-09	2	37000	0.000164	0.000026
S-10	2	33000	0.000002	0.000002
S-11	2	32000	0.000006	0.000003
S-12	2	31000	0.000022	0.000005
S-13	2	33000	0.000003	0.000000
S-14	2	28000	0.000001	0.000002
S-15	2	30000	0.000002	0.000002
S-16	2	34000	0.000003	0.000002
S-17	2	30000	0.000015	0.000005
S-18	2	32000	0.000054	0.000011
S-19	2	32000	0.000032	0.000005
S-20	2	33000	0.000018	0.000007
S-21	2	38000	0.000011	0.000003
S-22	2	32000	0.000001	0.000002
S-23	2	33000	0.000001	0.000002
S-24	2	36000	0.000003	0.000002

* Air samplers S-02 and S-03 were inoperational during this period because of equipment failure.

**Analysis incomplete for this report.

Note: Beginning with the January 1990 samples, plutonium-specific analyses are being performed and reported for all onsite ambient air sampling locations.



Location of Onsite and Plant Perimeter Ambient Air Samplers
(Portions of figure are not to scale.)

JANUARY 1990

Table IV.
Plutonium Concentration in Ambient Air for Perimeter Samplers

Location	N	Volume (m3)	Pu Conc. (pCi/m3)	+/- Error (pCi/m3)
S-31*				
S-32	1	33000	0.000000	0.000001
S-33	1	32000	0.000001	0.000002
S-34	1	32000	0.000001	0.000002
S-35	1	34000	0.000000	0.000001
S-36	1	35000	0.000001	0.000001
S-37	1	30000	0.000003	0.000002
S-38	1	33000	0.000002	0.000002
S-39	1	33000	0.000002	0.000002
S-40*				
S-41	1	34000	0.000001	0.000002
S-42	1	32000	0.000001	0.000002
S-43	1	33000	0.000003	0.000002
S-44	1	32000	0.000000	0.000001

* Plutonium data not available.

** Samplers 31 and 40 were inoperational during this period because of maintenance on the samplers.

PLUTONIUM CONCENTRATIONS IN PERIMETER AMBIENT AIR

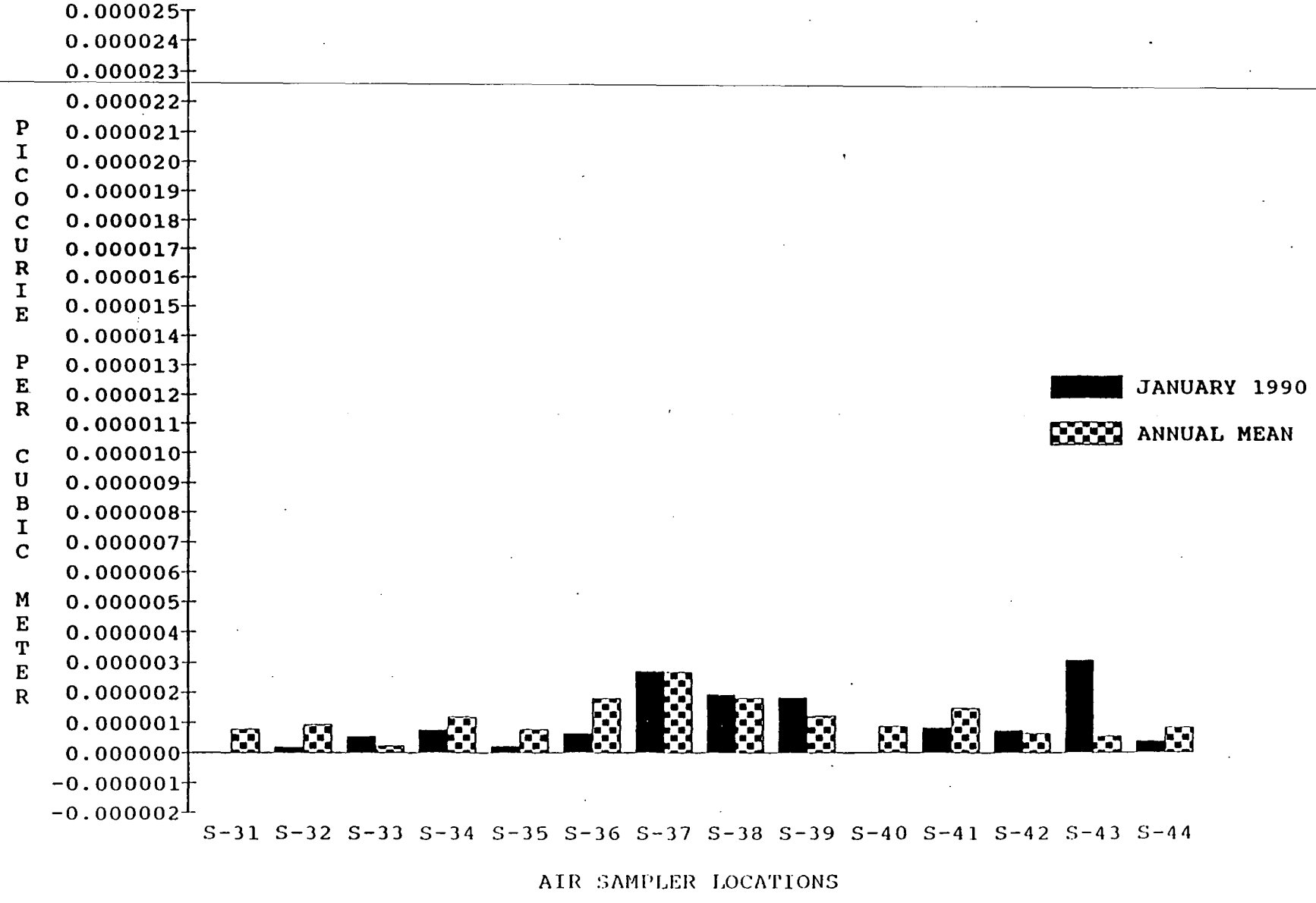


Table V. Plutonium Concentration in Ambient Air for Community Samplers

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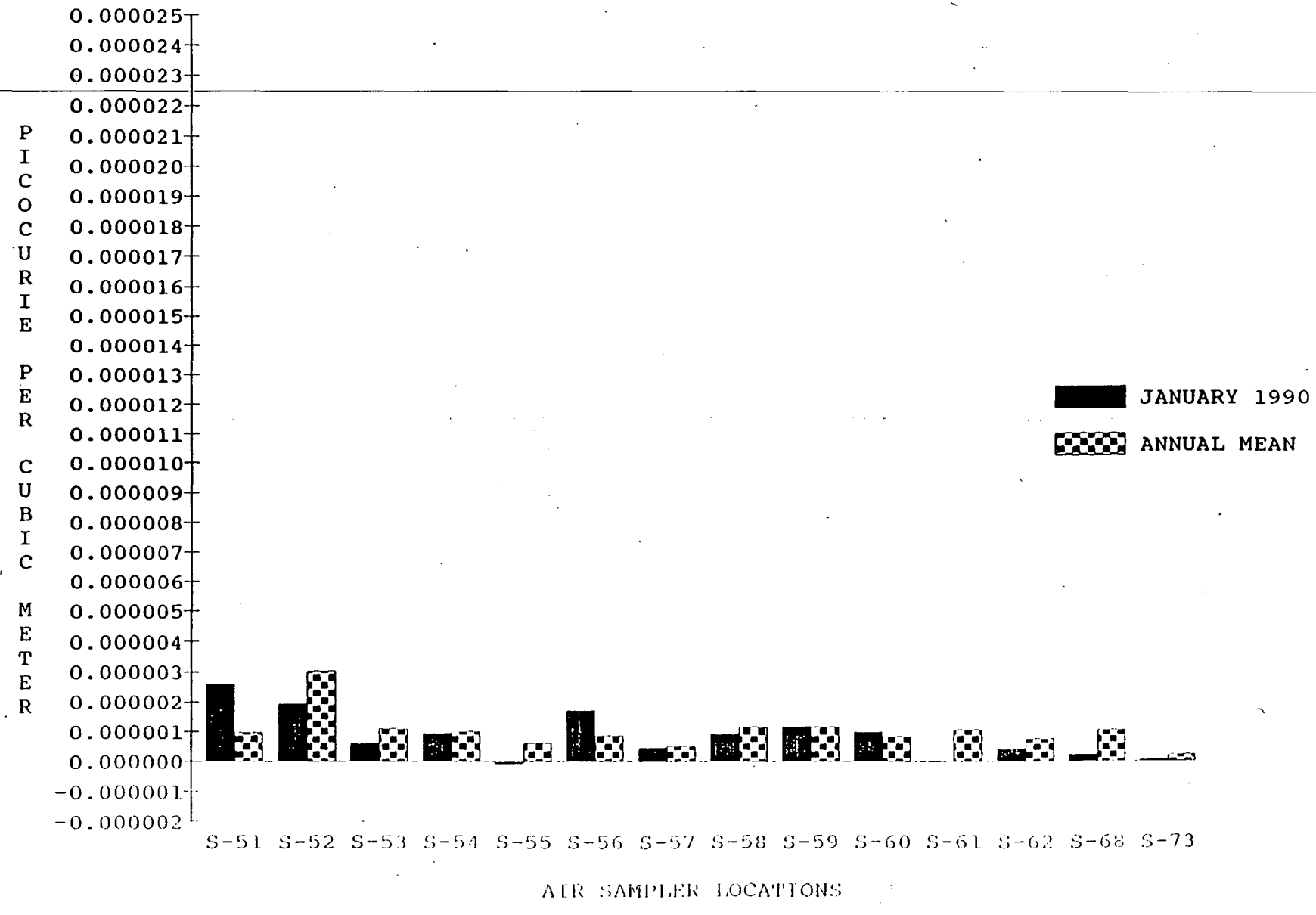
(12/19/89 - 01/16/90)

Location	Community Name	n	Volume (m3)	Pu Conc. (pCi/m3)	+/- Error (pCi/m3)
S-51	MARSHALL	1	31000	0.000003	0.000002
S-52	JEFFCO AIRPORT	1	36000	0.000002	0.000002
S-53	SUPERIOR	1	30000	0.000001	0.000001
S-54	BOULDER	1	34000	0.000001	0.000001
S-55	LAFAYETTE	1	32000	0.000000	0.000001
S-56	BROOMFIELD	1	16000	0.000002	0.000003
S-57	WALNUT CREEK	1	32000	0.000000	0.000001
S-58	WAGNER	1	38000	0.000001	0.000001
S-59	LEYDEN	1	35000	0.000001	0.000002
S-60	WESTMINSTER	1	32000	0.000001	0.000002
S-61	DENVER	*			
S-62	GOLDEN	1	24000	0.000000	0.000002
S-68	LAKEVIEW POINTE	1	38000	0.000000	0.000001
S-73	COTTON CREEK	1	31000	0.000000	0.000001

* Sampler S-61 was inoperational during this period. This sampler has been temporarily removed because of construction activities on the building where it is installed. An interim location for the sampler is being investigated..

PLUTONIUM CONCENTRATIONS IN COMMUNITY AMBIENT AIR



Location of Community Ambient Air Samplers

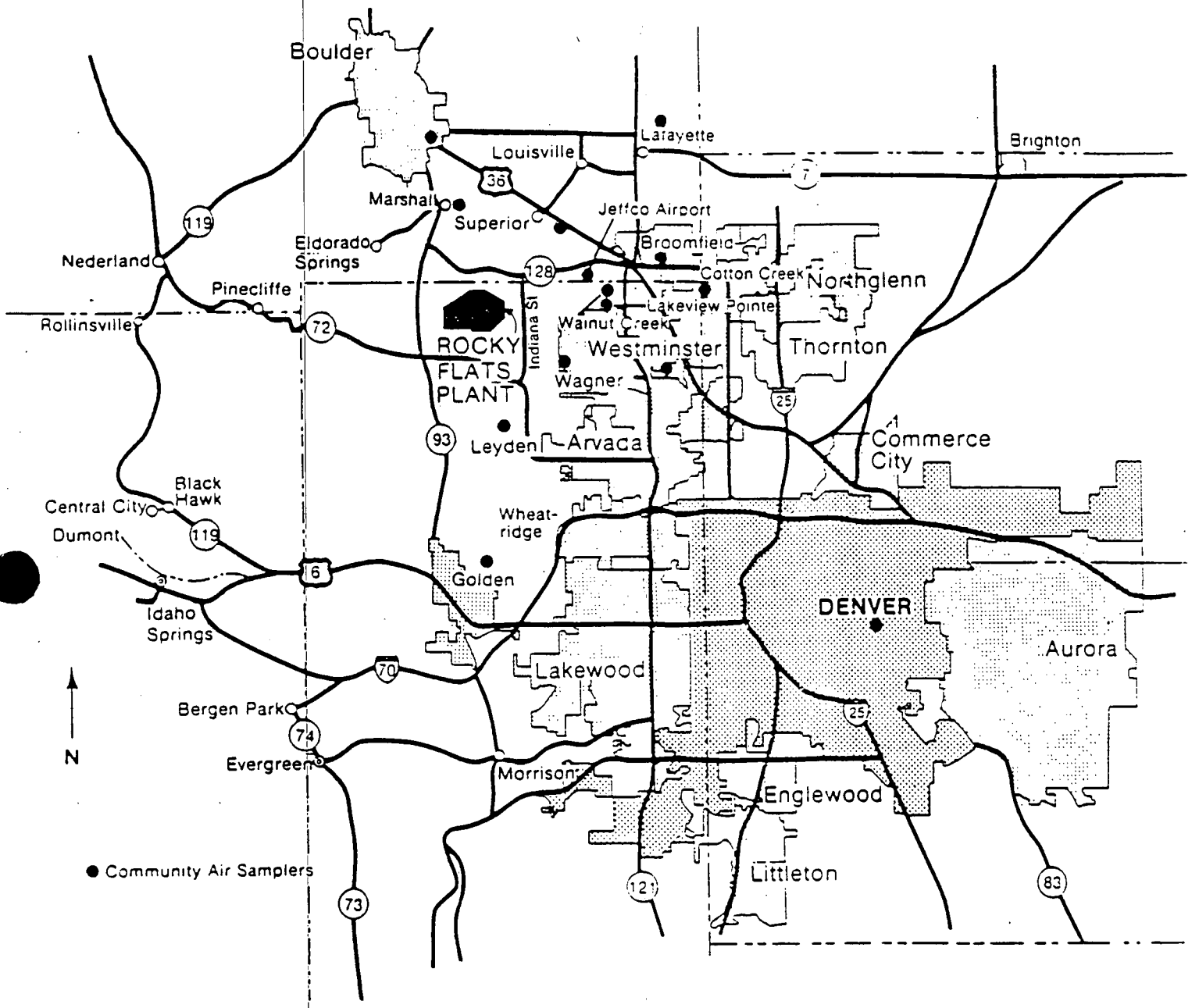


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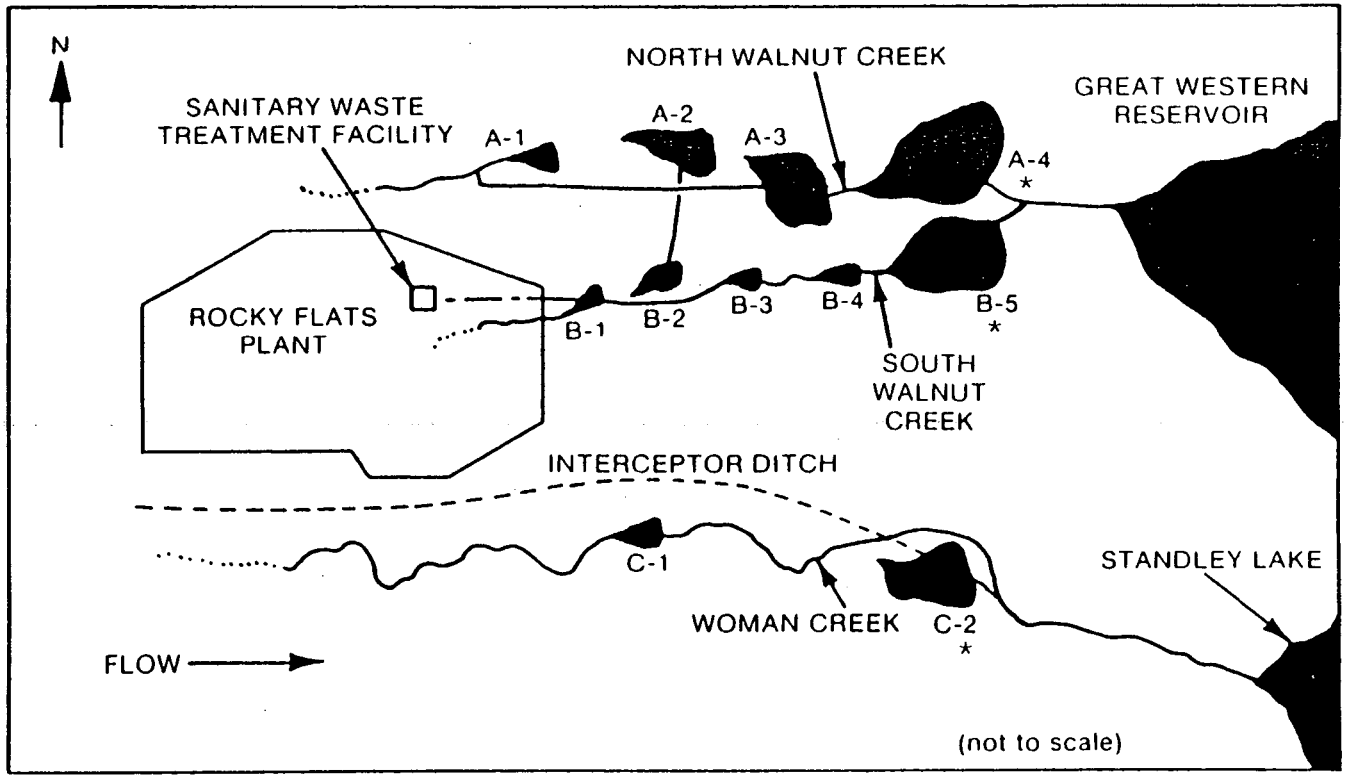
Table VI. Onsite Water Sample Results - Plutonium, Uranium, and Americium

Holding Pond Outfall (pCi/l)

Location	Plutonium	Uranium	Americium
Pond A-4			
No Discharge			
Average Concentration			
Pond B-5			
No Discharge			
Average Concentration			
Pond C-1			
01/02/90-01/05/90	0.003 ± 0.008	2.07 ± 0.19	0.002 ± 0.007
01/08/90-01/12/90	0.009 ± 0.011	1.51 ± 0.15	0.001 ± 0.013
01/15/90-01/19/90	*	*	0.002 ± 0.009
01/22/90-01/26/90	0.048 ± 0.019	*	0.003 ± 0.009
Average Concentration	*	*	0.003 ± 0.005
Pond C-2			
No Discharge			
Average Concentration			
Walnut Creek at Indiana			
No Flow			
Average Concentration			

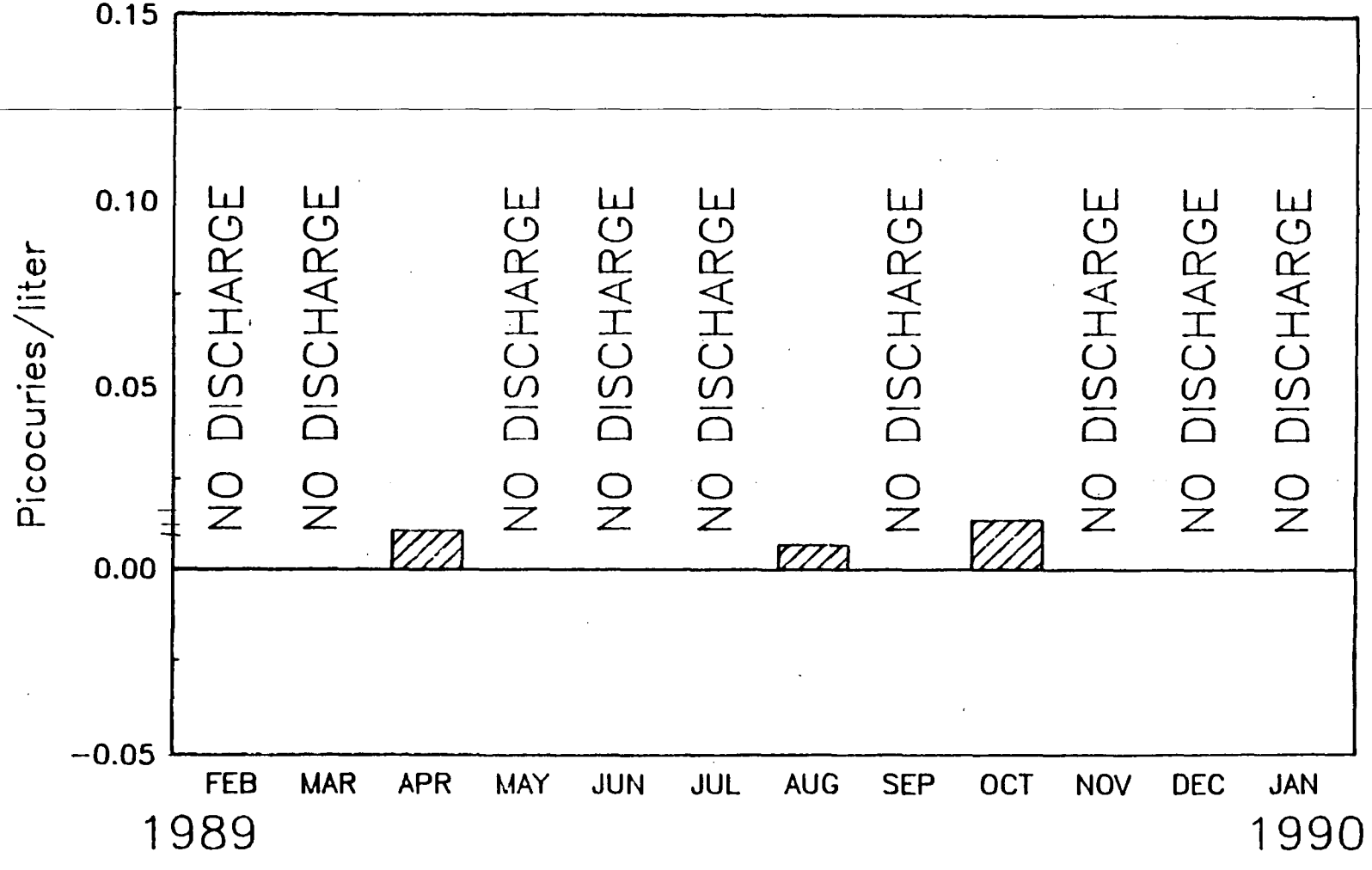
* Incomplete analysis. Sample being re-run because chemical recovery was below quality assurance criteria of 10 %.



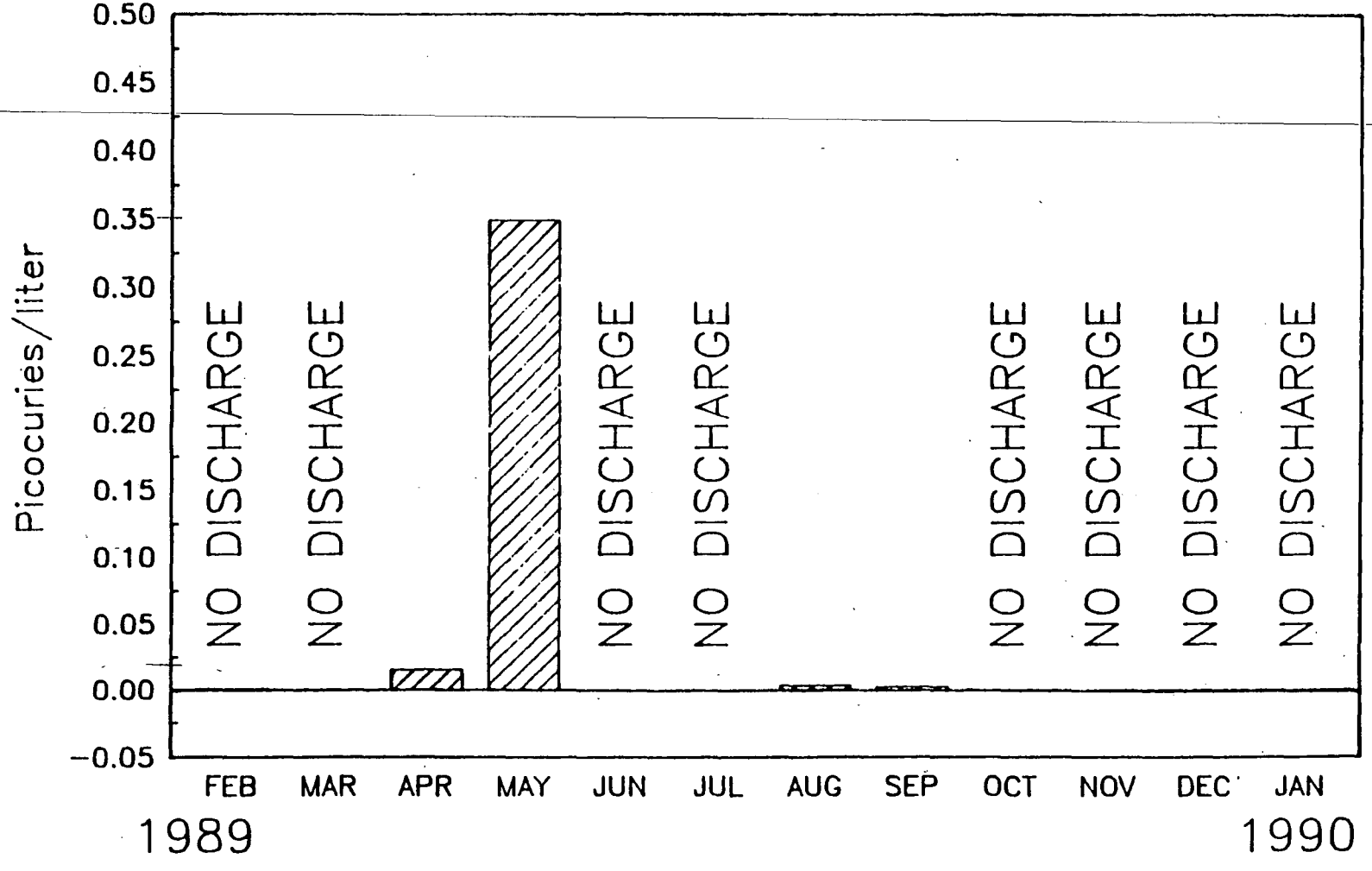
HOLDING PONDS AND LIQUID EFFLUENT WATERCOURSES

* Diversion capabilities exist for indicated locations.

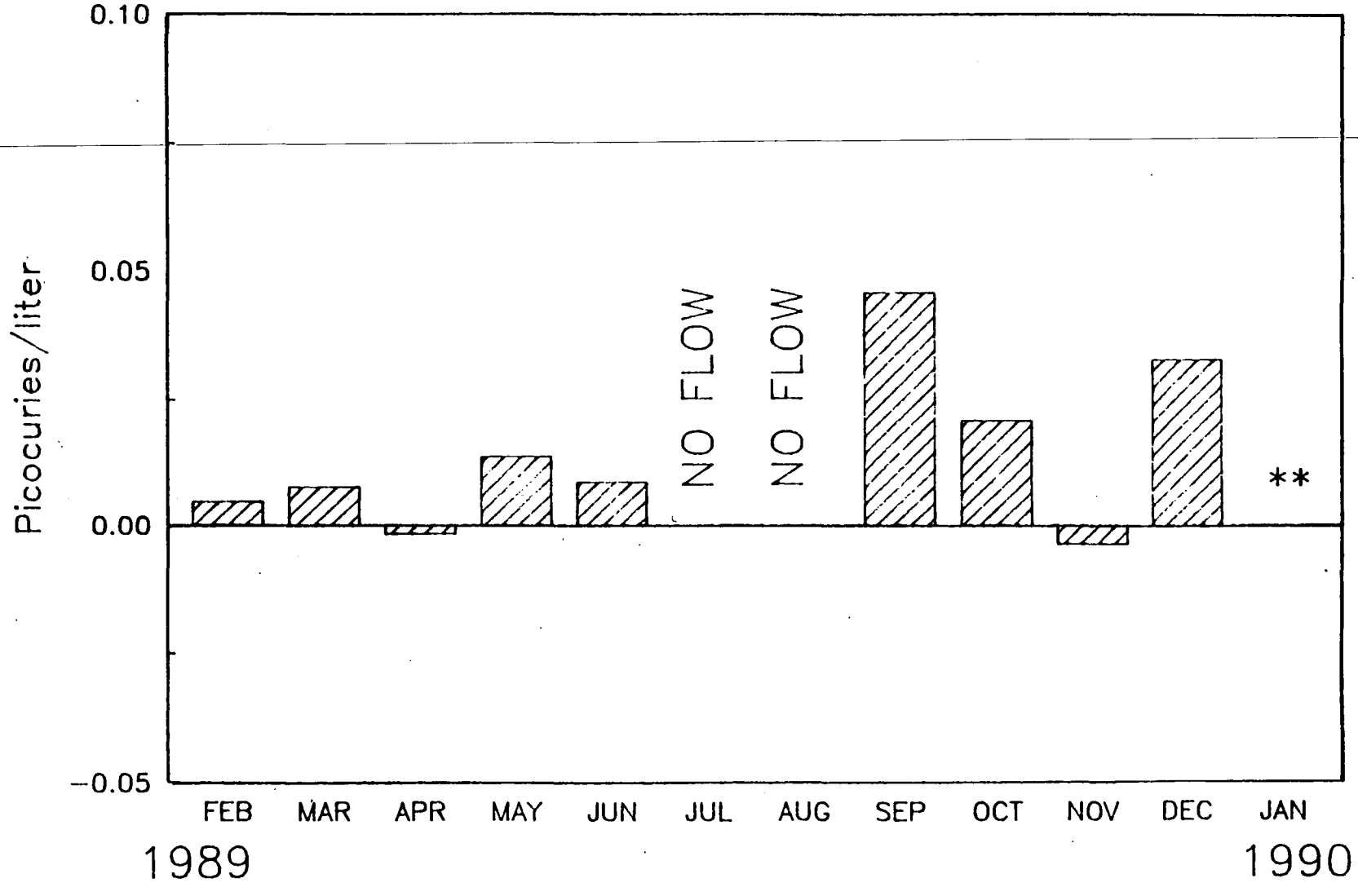
PLUTONIUM IN POND A-4 EFFLUENT WATER



PLUTONIUM IN POND B-5 EFFLUENT WATER

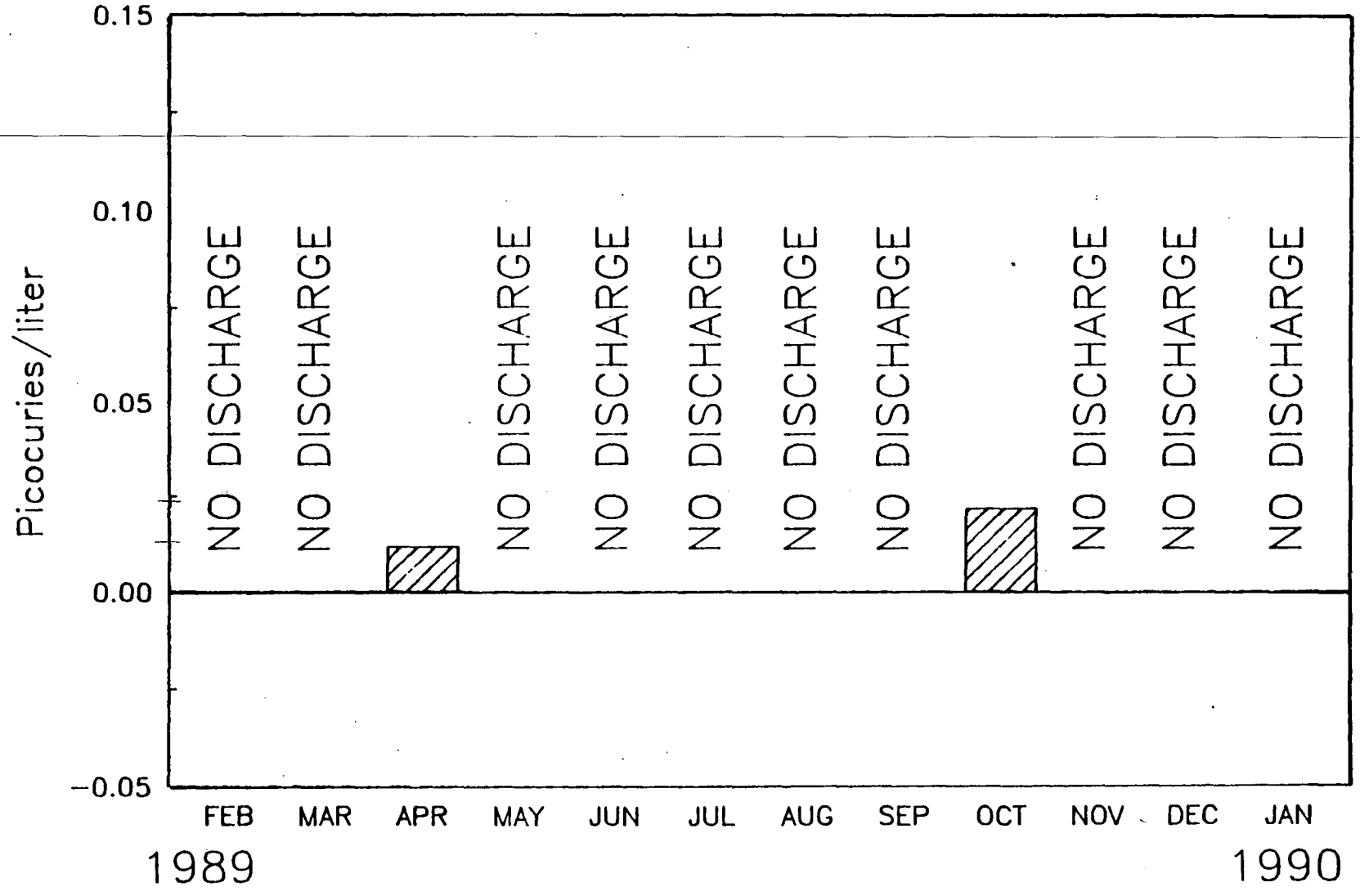


PLUTONIUM IN POND C-1 EFFLUENT WATER



**INCOMPLETE DATA

PLUTONIUM IN POND C-2 EFFLUENT WATER



PLUTONIUM IN WALNUT CREEK AT INDIANA WATER

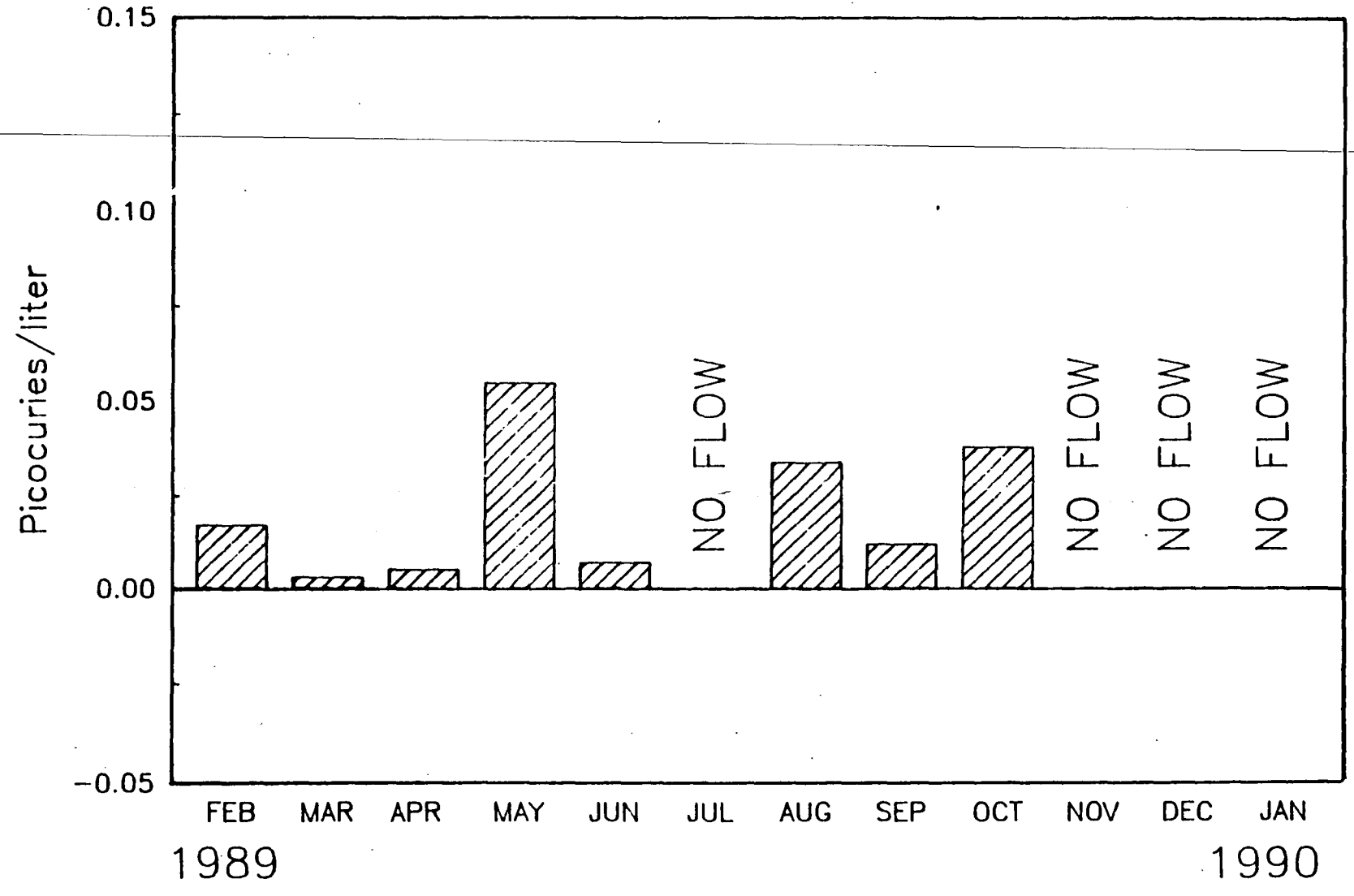


Table VII. Offsite Water Sample Results - Plutonium, Uranium, and Americium

Reservoirs (pCi/l)

Location	n	Plutonium	Uranium	Americium
Great Western	1*	**	1.21 ± 0.13	-0.006 ± 0.009
Standley Lake	1*	**	**	-0.003 ± 0.007

Community Tap Water (pCi/l)

Location	n	Plutonium	Uranium	Americium
Boulder	1*	**	**	0.004 ± 0.012
Broomfield	1*	0.000 ± 0.007	0.68 ± 0.14	-0.004 ± 0.008
Westminster	1*	-0.006 ± 0.006	**	0.000 ± 0.008

* Plutonium, uranium and americium analyses were performed on one sample composited from four weekly grab samples.

Incomplete analysis. Sample being re-run because chemical recovery was below quality assurance criteria of 10%.

DECEMBER 1989

Table VII. Offsite Water Sample Results - Plutonium, Uranium, and Americium

Reservoirs (pCi/l)

Location	n	Plutonium	Uranium	Americium
Great Western	1*	0.002 ± 0.011	1.07 ± 0.09	0.025 ± 0.012
Standley Lake	1 *	0.001 ± 0.010	3.44 ± 0.20**	-0.004 ± 0.011

Community Tap Water (pCi/l)

Location	n	Plutonium	Uranium	Americium
Arvada	1	-0.017 ± 0.030	0.51 ± 0.09	0.018 ± 0.035
Boulder	1 *	0.000 ± 0.011	0.14 ± 0.08	+0.010 ± .012
Broomfield	1 *	0.006 ± 0.013	0.55 ± 0.09	0.001 ± 0.011
Denver	1	-0.006 ± 0.031	1.57 ± 0.11	0.063 ± 0.038***
Golden	1	-0.018 ± 0.030	0.60 ± 0.09	-0.025 ± 0.031
Lafayette	1	0.004 ± 0.034	0.08 ± 0.08	0.020 ± 0.034
Louisville	1	-0.003 ± 0.032	0.16 ± 0.08	0.033 ± 0.034
Thornton	1	-0.003 ± 0.031	0.89 ± 0.09	0.005 ± 0.034
Westminster	1 *	0.001 ± 0.011	0.46 ± 0.08	0.003 ± 0.011

* Plutonium, uranium and americium analyses were performed on one sample composited from four weekly grab samples.

** Previously reported incomplete.

*** This sample is currently being rerun in duplicate to verify this result.

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Table VIII. Onsite and Offsite Water Sample Results - Tritium

Tritium (pCi/l)

Location	n*	CMinimum	CMaximum	CMean
Pond C-1	3	-40 ± 100	30 ± 110	-10 ± 60
Boulder	4	-20 ± 140	90 ± 110	40 ± 60
Broomfield	4	-110 ± 140	90 ± 90	20 ± 90
Great Western	4	-70 ± 140	60 ± 110	10 ± 50
Standley	4	-70 ± 80	70 ± 150	0 ± 60
Westminster	4	-190 ± 140	100 ± 110	0 ± 130

* n- Number of Samples

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Table IX. Offsite Water Sample Results - Nitrate as Nitrogen

Nitrate (as N) at Great Western Reservoir

Sample Date	Nitrate (as N) (mg/l)
01/04/90	<0.02
01/11/90	<0.02
01/19/90	<0.02
01/25/90	<0.02

Nitrate (as N) at Standley Lake

Sample Date	Nitrate (as N) (mg/l)
01/04/90	0.09
01/11/90	<0.02
01/19/90	<0.02
01/25/90	<0.02

NOTE: For some nonradioactive parameters, the concentrations that are measured at or below the minimum detectable concentration (MDC) are assigned to MDC. The less than symbol (<) indicates MDC values and calculated values that include one or more MDC's.

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Table X. NPDES Permit Water Sample Results

Discharge 001 (Pond B-3)
No Discharge

Parameters		Measured 30-Day Average	Limits 30-Day* Average	Measured Daily Maximum	Limits Daily Maximum
Biochem. Oxygen Demand, 5 Day	mg/l	No	10	No	25
Total Suspended Solids	mg/l	Discharge	30	Discharge	NA
Nitrates as N	mg/l		10		NA
Total Chromium	mg/l		0.05		0.1
Total Phosphorus	mg/l		8		NA
Oil and Grease, Visual			NA		NA
Total Residual Chlorine	mg/l		NA		0.5
Fecal Coliforms	#/100 ml		200		NA

Parameter		Measured Daily Minimum	Limits Daily Minimum	Measured Daily Maximum	Limits Daily Maximum
pH	S.U.		6.0		9.0

Discharge 002 (Pond A-3)
No Discharge

Parameters		Measured 30-Day Average	Limits 30-Day* Average	Measured Daily Maximum	Limits Daily Maximum
Nitrates as N	mg/l	No Discharge	10	No Discharge	20

		Measured Daily Minimum	Limits Daily Minimum	Measured Daily Maximum	Limits Daily Maximum
pH	S.U.	No Discharge	6.0	No Discharge	9.0

Discharge 003 (RO Pilot Plant)
No Discharge

Parameter		Measured Daily Minimum	Limits Daily Minimum	Measured Daily Maximum	Limits Daily Maximum
pH	S.U.	No Discharge	6.0	No Discharge	9.0

* This limitation applies when a minimum of 3 consecutive samples are taken during separate weeks.

Table X. NPDES Permit Water Sample Results (Continued)

Discharge 004 (RO Plant)
No Discharge

Parameters		Measured 30-Day Average	Limits 30-Day* Average	Measured Daily Maximum	Limits Daily Maximum
Total Suspended Solids	mg/l	No Discharge	15	No Discharge	25
Total Organic Compounds	mg/l		22		30
Total Phosphorus	mg/l		8		12
Nitrates as N	mg/l		10		20
Total Chromium	mg/l		0.05		0.1
Total Residual Chlorine	mg/l		NA		0.5
		7-Day Average	7-Day Average	30-Day Average	30-Day Average
Fecal Coliform	#/100 ml	No Discharge	400	No Discharge	200
		Daily Minimum	Daily Minimum	Daily Maximum	Daily Maximum
pH	S.U.	No Discharge	6.0	No Discharge	9.0

Discharge 005 (Pond A-4)
No Discharge

Parameters		n	CMinimum	CMaximum	CAverage
pH	S.U.	No Discharge			
Nitrates as N	mg/l				
Nonvolatile Suspended Solids	mg/l				

Discharge 006 (Pond B-5)
No Discharge

Parameters		n	CMinimum	CMaximum	CAverage
pH	S.U.	No Discharge			
Nitrates as N	mg/l				
Nonvolatile Suspended Solids	mg/l				

Discharge 007 (Pond C-2)
No Discharge

Parameters		n	CMinimum	CMaximum	CAverage
pH	S.U.	No Discharge			
Nitrates as N	mg/l				
Nonvolatile Suspended Solids	mg/l				

JANUARY 1990

Table XI. Water Sample Results, Nonradioactive Parameters

Walnut Creek at Indiana Street
No Flow

Parameters		n	CMinimum	CMaximum	CAverage
pH	S.U.	No Flow			
Nitrates as N	mg/l				

Total Volume (gallons) = No Flow

Table XII.
Daily Flow Data Recorded at the
Walnut Creek at Indiana Gaging Station
Ponds A-4 and B-5,
January, 1990

Date	Walnut Creek At Indiana (gallons)	Pond A-4 (Gallons)	Pond B-5 (Gallons)
01/01/90	No Flow	No Discharge	No Discharge
01/02/90	" "	" "	" "
01/03/90	" "	" "	" "
01/04/90	" "	" "	" "
01/05/90	" "	" "	" "
01/06/90	" "	" "	" "
01/07/90	" "	" "	" "
01/08/90	" "	" "	" "
01/09/90	" "	" "	" "
01/10/90	" "	" "	" "
01/11/90	" "	" "	" "
01/12/90	" "	" "	" "
01/13/90	" "	" "	" "
01/14/90	" "	" "	" "
01/15/90	" "	" "	" "
01/16/90	" "	" "	" "
01/17/90	" "	" "	" "
01/18/90	" "	" "	" "
01/19/90	" "	" "	" "
01/20/90	" "	" "	" "
01/21/90	" "	" "	" "
01/22/90	" "	" "	" "
01/23/90	" "	" "	" "
01/24/90	" "	" "	" "
01/25/90	" "	" "	" "
01/26/90	" "	" "	" "
01/27/90	" "	" "	" "
01/28/90	" "	" "	" "
01/29/90	" "	" "	" "
01/30/90	" "	" "	" "
01/31/90	" "	" "	" "
TOTAL	No Flow	No Discharge	No Discharge

Table XIII.
Daily Flow Data Recorded at
Ponds C-1 and C-2 During
January, 1990

(Woman Creek)

Date	Pond C-1 (Gallons)	Pond C-2 (Gallons)
01/02/90	*	No Discharge
01/03/90	*	" "
01/04/90	870,000	" "
01/05/90	610,000	" "
01/08/90	**	" "
01/09/90	**	" "
01/10/90	2,530,000	" "
01/11/90	520,000	" "
01/12/90	530,000	" "
01/15/90	1,530,000	" "
01/16/90	510,000	" "
01/17/90	510,000	" "
01/18/90	510,000	" "
01/19/90	450,000	" "
01/22/90	1,580,000	" "
01/23/90	510,000	" "
01/24/90	500,000	" "
01/25/90	590,000	" "
01/26/90	440,000	" "
01/29/90	**	" "
01/30/90	2,080,000	" "
01/31/90	440,000	" "
Total	14,710,000	No Discharge

* Flow meter inoperable
** No flow reading taken due to high winds.

SITE METEOROLOGY AND CLIMATOLOGY

Meteorological data were collected on the plantsite from instrumentation installed on a 61-meter (200 foot) tower located in the west buffer zone during January 1990. Meteorological information in this report represents 100% data recovery from this instrumentation. Table XIV is the January 1990 summary of the percent frequency of wind directions (16 compass points) divided into four wind speed categories. The compass point designations indicate the true bearing when facing against the wind. These frequency values are represented graphically in the accompaning wind rose. The wind rose vectors also represent the bearing against the wind (i.e., wind along each vector blows toward the center).

The predominance of northwesterly winds is typical of Rocky Flats. The low frequency of winds greater than 7 meters per second (15.6 mph) with easterly components is normal.

The mean temperature recorded for January 1990 was 2.63°C (36.73°F). The maximum temperature recorded was 21.81°C (71.26°F) on 10 January 1990 at 12:30 p.m. The minimum temperature recorded was -13.42°C (7.84°F) on 4 January 1990 at 6:00 a.m.

In January 1990, the Rocky Flats Plant recorded 0.56 centimeters (0.22 inches) of precipitation. The maximum precipitation for a 15 minute period was 0.10 centimeters (0.04 inches) on 19 January 1990 at 4:30 p.m.

The mean wind speed for January 1990 was 5.85 m/s (13.09 mph). The highest wind speed for January 1990 was 38.87 m/s (86.95 mph) on 8 January at 8:00 a.m.

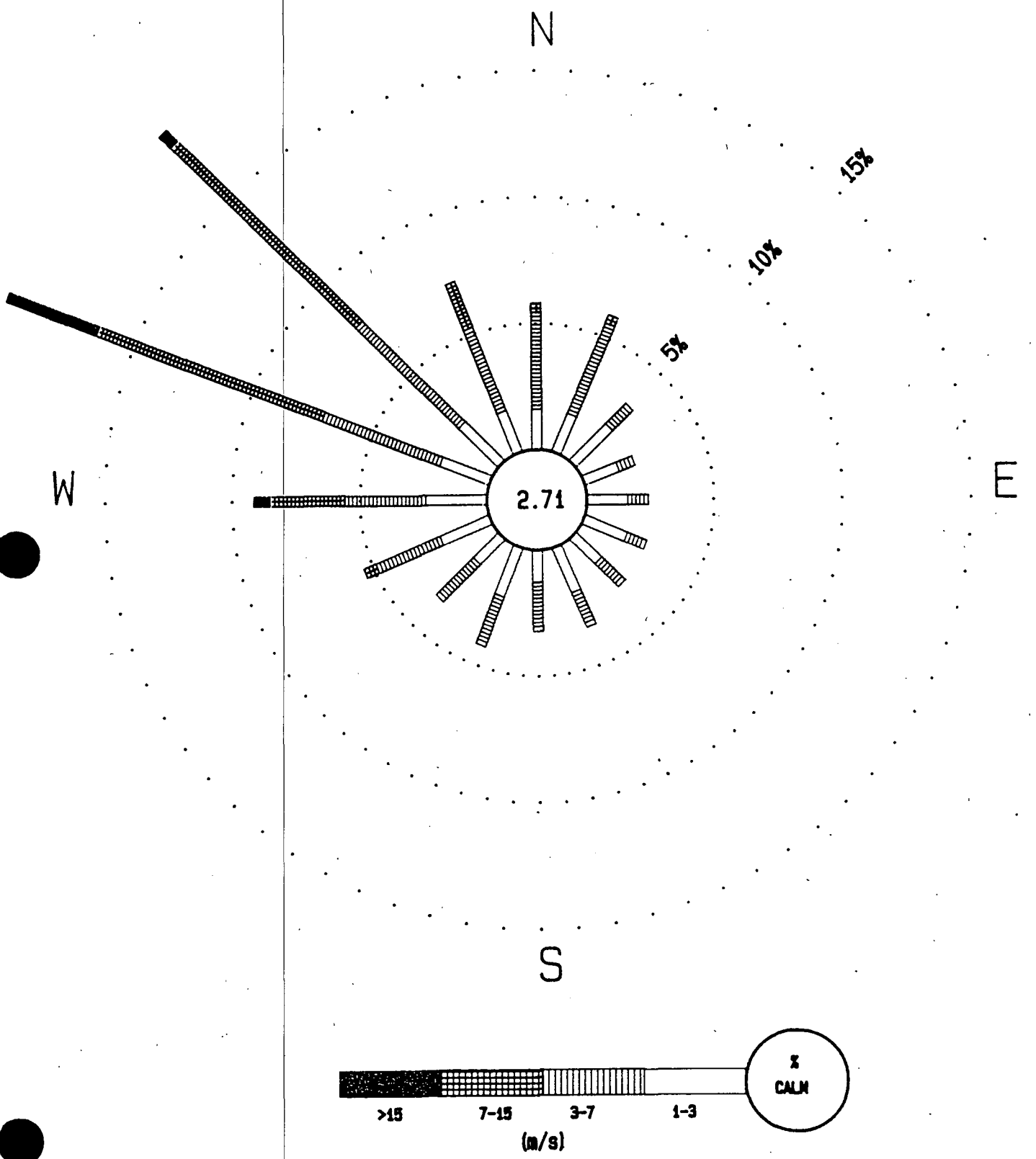
TABLE XIV. Wind Direction Frequency (Percent), by Four Wind-Speed Clases, at the Rocky Flats Plant

(Fifteen-Minute Averages-January 1990)

	Calm	1-3 (m/s)	3-7 (m/s)	7-15 (m/s)	>15 (m/s)	TOTAL
-	2.71	-	-	-	-	2.71
N	-	1.58	3.97	0.17	0.00	5.72
NNE	-	1.58	1.48	0.03	0.00	3.09
NE	-	2.08	1.08	0.00	0.00	3.16
ENE	-	1.41	0.50	0.00	0.00	1.91
E	-	1.55	0.67	0.00	0.00	2.22
ESE	-	1.81	0.77	0.00	0.00	2.58
SE	-	1.34	1.24	0.00	0.00	2.58
SSE	-	1.95	1.41	0.00	0.00	3.36
S	-	1.28	1.95	0.00	0.00	3.23
SSW	-	2.08	2.12	0.00	0.00	4.20
SW	-	1.48	2.12	0.10	0.00	3.70
WSW	-	2.02	2.82	0.40	0.00	5.24
W	-	2.42	3.29	2.99	0.54	9.24
WNW	-	2.02	5.04	9.68	3.90	20.64
NW	-	2.25	5.85	10.58	0.54	19.22
NNW	-	1.75	3.53	1.92	0.00	7.20
TOTALS	2.71	28.60	37.84	25.87	04.98	100. 00

Wind Rose for the Rocky Flats Plant

January 1990



Appendix

RADIATION STANDARDS FOR PROTECTION OF THE PUBLIC

Introduction

The primary standards for protection of the public from radiation are based on radiation dose. Radiation dose is a means of quantifying the biological damage or risk of ionizing radiation. The unit of radiation dose is the rem or the millirem (1 rem = 1,000 mrem). Radiation protection standards for the public are annual standards, based on the projected radiation dose from a year's exposure to or intake of radioactive materials.

Radiation dose is a calculated value. It is calculated by multiplying radioactivity concentrations is air and water or on contaminated surfaces by assumed intake rates (for internal exposures) or exposure times (for external exposure to penetrating radiation), then by the appropriate radiation dose conversion factors. That is:

RADIATION DOSE=
(RADIOACTIVITY CONCENTRATION) X
(INTAKE RATE/EXPOSURE TIME) X
(DOSE CONVERSION FACTOR)

The radioactivity concentrations can be determined either by measurements in the environment or by calculations using computer models. These computer models perform airborne dispersion/dose modeling of measured building radioactivity effluents and estimated diffuse source term emissions (e.g., from resuspension from contaminated soil areas).

The assumed intake rates and dose conversion factors used are based on recommendations of national and international radiation protection advisory organizations, such as the National Council of Radiation Protection and Measurements (NCRP) and the International Commission on Radiological Protection (ICRP).

The radioactive materials of importance in calculating radiation dose to the public from Rocky Flats Plant activities include plutonium, uranium, americium, and tritium. The alpha radiation emissions from the plutonium, uranium, and americium are the primary contributors to the projected radiation dose.

DOE RADIATION PROTECTION STANDARDS FOR THE PUBLIC

ICRP-, NCRP- RECOMMENDED STANDARDS FOR ALL PATHWAYS:

Occa sional Exposures -	500 mrem/year Effective Dose Equivalent*
Prolonged Exposures - (>5 Years)	100 mrem/year Effective Dose Equivalent
Individual Organ -	5,000 mrem/year Dose Equivalent

EPA CLEAN AIR ACT STANDARDS FOR THE AIR PATHWAY ONLY:

Effective Dose Equivalent	10 mrem/year

Potential public radiation dose commitments, which could have resulted from plant operations and from background (i.e., non-Plant) contributions, are calculated from average radionuclide concentrations measured at the Department of Energy (DOE) property boundary and in surrounding communities. Inhalation and water ingestion are the principal potential pathways of human exposure.

Calculation of Potential Plant Contribution to Public Radiation Dose

Pending final revision of its DOE Order for radiation protection standards for the public, DOE adopted an interim radiation protection standard for DOE environmental activities to be implemented in CY1985 (Va85). This interim standard incorporates guidance from the National Council on Radiation Protection and Measurements (NCRP), as well as the Environmental Protection Agency Clean Air Act air emission standards (as implemented in 40 CFR 61, Subpart H). Included in the interim standard is a revision of the dose limits for members of the public. Tables of radiation dose conversion factors currently used for calculating dose from intakes of radioactive materials were issued in July 1988 (US88a, US88b). The dose factors are based on the International Commission on Radiological Protection (ICRP) Publications 30 and 48 methodology and biological models for radiation dosimetry. The DOE interim standard and the dose conversion factor tables are used for assessment of any potential Rocky Flats Plant contribution to public radiation dose. On December 15, 1989, EPA published revised Clean Air Act air emission standards for the DOE facilities (US89). The DOE radiation standards for protection of the public are given below, modified to include the December 15, 1989 EPA Clean Air Act standards for the air pathway.

EPA Clean Air Act Standards for the Air Pathway Only

Secondary radioactivity concentration guides can be calculated from the primary radiation dose standards and used as comparison values for measured radioactivity concentrations. DOE provided guidance for calculating these concentration guides - called "Derived Concentration Guides" - in a 1985 memorandum to its facilities (St85). Derived Concentration Guides (DCGs) are the concentrations which would result in an effective dose equivalent of 100 mrem from one year's chronic exposure or intake. In calculating air inhalation DCGs, DOE assumes that the exposed individual inhales 8,400 cubic meters of air at the calculated DCG during the year. Ingestion DCGs assume a water

DOE DERIVED CONCENTRATION GUIDES FOR RADIONUCLIDES OF INTEREST AT THE ROCKY FLATS PLANT

AIR INHALATION:

Radionuclide	DCG (pCi/m3)
Pu-239, -240	0.02

WATER INGESTION:

Radionuclide	DCG (pCi/l)
Pu-239, -240	30
Am-241	30
U-233, -234, -238	500
H-3	2,000,000

intake of 730 liters at the calculated DCG for the year. The following table lists the air and water DCGs for the principal radionuclides of interest at the Rocky Flats Plant. To determine compliance with the EPA air emissions standards, measured airborne effluent radioactivity emissions and estimated radioactivity resuspension from soil are entered into the EPA-approved atmospheric dispersion/dose calculation computer model, AIRDOE-PC, for calculation of the maximum radiation dose that an individual in the public could receive from the air pathway only.

For comparison with the annual radiation dose standards for protection of the public, the maximum annual effective dose equivalent that a member of the public could receive as a result of Rocky Flats Plant activities is typically less than 1 mrem, or less than 1 percent of the recommended annual standard for all pathways.

REFERENCES

US88a DOE/EH-0070, "External Dose-Rate Conversion Factors for Calculation of Dose to the Public," U.S. Dept. of Energy, Asst. Secretary for Environment, Safety and Health, July 1988.

US88b DOE/HE-0071, "Internal Dose Conversion Fa ctors for Calculation of Dose to the public," U.S. Dept. of Energy, Asst. Secretary of Environment, Safety and Health , July 1988.

US89 U.S. Environmental Protection Agency, Code of Federal Regulations 30 CFR 61, Subpart H, "National Emission Standards of Emissions of Radionuclides other than Radon from Department of Energy Facilities," Washington D.C., December 15, 1989.

Va85 Vaughn, W.A., Asst. Secretary, "Radiation Standards for Protection of the Public in the Vicinity of DOE Facilities," DOE memorandum from Environment, Safety and Health, August 5, 1985.

St86 Stern, R.J., Director tor, "Preparation of Annual Site Environmental Reports for Calendar Year 1985," DOE memorandum, Office of Environmental Guidance, February 18, 1986.

***NOTE:** "Dose equivalent" is a calculated value used to quantify radiation dose; it reflects the degree of biological effect from ionizing radiation. Differences in the biological effect of different types of ionizing radiation (e.g., alpha, beta, gamma, or x-rays) are accounted for in the calculation of dose equivalent.

"Effective dose equivalent" is a calculated value used to allow comparisons of total health risk (based primarily on the risk of cancer mortality) from exposures of different types of ionizing radiation to different body organs. It is calculated by first calculating the dose equivalent to those organs receiving significant exposures, multiplying each organ dose equivalent by a health risk weighting factor, and then summing those products. One millirem effective dose equivalent from natural background radiation would have the same health risk as one millirem effective dose equivalent from artificially-produced source of radiation.