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SURVEY OF ENVIRONMENTAL RADIOACTIVITY FOR PERIOD 1-1-69 to 6-30-69

by

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Ames Laboratory

at

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SURVEY OF ENVIRONMENTAL RADIOACTIVITY FOR PERIOD 1/1/69 - 6/30/69

Milo D. Voss

ABSTRACT

This is the environmental monitoring program of the Ames Laboratory of the USAEC for the Ames Laboratory Research Reactor (ALRR).

The environmental program consists of air samples, soil, vegetation, river water, bottom sediment, precipitation, pond water, ALRR outfall, and well water samples. This report will cover the period from January 1, 1969 to June 30, 1969. As soil and vegetation samples are collected later in the year (usually August) that data will be reported in the annual report.

The ALRR reached full power as of 7/12/65. As of 12/31/68 the ALRR had generated 70,133 megawatt hours of heat. A total of 87,654 megawatt hours of heat has been generated as of 6/30/69.

The data indicate that the ALRR has not contributed a significant amount of radioactivity to the environment in the Ames area. The conclusion is reached that radioactivity levels recorded for environmental samples represent background conditions from atmospheric fallout and naturally occurring radioactivity.

The following levels of radioactivity were recorded for the period:

Sample Media	Individual Samples	Beta Activity	Alpha Activity
Air	102	0.21	0.005
River Water	197	10.42	1.39
ALRR Outfall	127	12.12	1.02
Bottom Sediment	24	9.73	0.54
Precipitation	45	98.28	7.49
Well Water	18	5.35	1.13
Pond Water	18	13.10	0.89

The units are pCi/M^3 for air, pCi/l for river water, precipitation, well water, pond water, and ALRR outfall, and pCi/g for bottom sediment.

II. SAMPLE INFORMATION

A. Air Samples

Daily air samples are taken on top of the Ames Laboratory Research Building. Samples are collected on Whatman No. 41 filters with a Gast sampler which has a flow rate of 3.75 cfm. The air samples are counted on a Sharp Low Beta Matic System for gross alpha and beta activity seven days after collection.

The beta activity range was 0.05 to 1.55 pCi/M^3 with an average of 0.21 pCi/M^3. The alpha activity range was 0.001 to 0.034 pCi/M^3 with an average of 0.004 pCi/M^3. Average levels reported for 1968 were 0.20 pCi/M^3 beta and 0.005 pCi/M^3 alpha.

B. River Water Samples

One liter samples are collected weekly from each of the sample sites

unless the site is dry or frozen solid. These samples are filtered and the soluble and insoluble fractions are counted for gross alpha and beta content.

The beta activity range was 1.10 to 51.2 pCi/l with an average of 10.42 pCi/l. The alpha range was 0.18 to 5.20 pCi/l with an average of 1.39 pCi/l.

Average levels reported for 1968 were 11.00 pCi/l beta and 0.97 pCi/l alpha.

C. ALRR Outfall Samples

One liter samples are collected daily from this site and analyzed for gross beta and alpha content. The samples are filtered and counted as soluble and insoluble fractions.

The beta range was 1.90 pCi/l to 34.80 pCi/l with an average of 12.12 pCi/l. The alpha activity range was 0.18 pCi/l to 2.90 pCi/l with an average level of 1.02 pCi/l.

Average levels reported for 1968 were 11.18 pCi/l beta and 0.70 pCi/l alpha.

D. Bottom Sediment Samples

One quart bottom sediment samples are obtained at or near the river water sites on a quarterly basis. Samples are analyzed for gross alpha and beta activity.

The beta activity range was 5.90 pCi/g to 16.67 pCi/g with an average of 9.73 pCi/g. The alpha activity range was 0.16 pCi/g to 1.34 pCi/g with an average of 0.54 pCi/g.

The average levels reported for 1968 were 9.84 pCi/g beta and 0.46 pCi/g alpha.

E. Precipitation Samples

Precipitation samples are collected on an "as it happens" basis from a site near ALRR. The samples are filtered and counted as soluble and insoluble fractions for gross beta and alpha.

The beta activity range was 11.80 pCi/l to 836.00 pCi/l with an average of 98.28 pCi/l. The alpha activity range was 0.18 pCi/l to 93.70 pCi/l with an average of 7.49 pCi/l.

The average levels reported for 1968 were 81.72 pCi/l beta and 4.14 pCi/l alpha.

F. Well Water Samples

Well water samples are obtained from three sites on a monthly basis and analyzed for gross alpha and beta content. Samples are filtered and counted as soluble and insoluble fractions.

The beta activity range was 2.20 pCi/l to 7.50 pCi/l with an average of 5.35 pCi/l. The alpha activity range was 0.18 pCi/l to 3.50 pCi/l with an average of 1.13 pCi/l.

The average levels reported for 1968 were 7.35 pCi/l beta and 0.98 pCi/l alpha.

G. Pond Water Samples

Pond water samples are collected monthly from three sites: the George Todd site three miles northeast of the ALRR; the Izaak Walton League site three miles east of the ALRR; and the Kelley site five miles south of the ALRR. A one liter sample is filtered and counted as soluble and insoluble fractions for gross alpha and beta.

The beta activity range was 2.40 pCi/l to 29.00 pCi/l with an average

of 13.10 pCi/l. The alpha activity range was 0.36 pCi/l to 1.70 pCi/l with an average of 0.89 pCi/l.

The average level reported for 1968 was 14.90 pCi/l beta and 0.83 pCi/l alpha.

H. Detection Limits

Detection limits are by definition only.

I. Abbreviations Used

ND means not detectable.

Air Samples (pCi/M^3)

1969

Date	Beta Conc.	Alpha Conc.
January (19)	0.10	0.002
February (17)	0.11	0.003
March (17)	0.09	0.002
April (15)	0.21	0.004
May (21)	0.37	0.008
June (13)	0.41	0.007
Average	0.21	0.004
High	1.55	0.034
Low	0.05	0.001

Detection Limits - 0.0066 pCi/M^3 β

0.0026 pCi/M^3 α

River Water Samples (pCi/l)

January 1969

	Beta Activity		Alpha Activity	
Location	Soluble	Insoluble	Soluble	Insoluble
1-DD-U	No Sample	----------	----------	----------
3-On-U	6.18	0.95	0.45	0.32
4-On-D	No Sample	----------	----------	----------
5-Sq-U	7.18	1.05	0.49	0.14
6-Sq-D	8.77	1.13	0.72	0.36
7-Sk-U	7.48	2.55	0.65	0.45
9-CC	8.55	0.77	0.65	ND
10-DM	7.58	0.65	0.68	0.36
11-Sk-S	16.88	1.15	0.09	0.54
Average	8.95	1.18	0.53	0.31
High	16.88	2.55	0.72	0.54
Low	6.18	0.65	0.09	0.14

Detection Limits - 1.00 pCi/l β

0.39 pCi/l α

River Water Samples (pCi/l)

February 1969

	Beta Activity		Alpha Activity	
Location	Soluble	Insoluble	Soluble	Insoluble
1-DD-U	No Sample			
3-On-U	3.88	0.04	0.72	0.45
4-On-D	No Sample			
5-Sq-U	3.70	0.85	0.54	0.36
6-Sq-D	3.77	0.05	0.12	0.48
7-Sk-U	3.65	0.04	0.94	0.45
9-CC	No Sample			
10-DM	5.33	0.48	0.64	0.23
11-Sk-S	13.60	ND	0.12	0.06
Average	5.66	0.24	0.51	0.34
High	13.60	0.85	0.94	0.48
Low	3.65	0.04	0.12	0.06

Detection Limits - 1.00 pCi/l β

0.39 pCi/l α

River Water Samples (pCi/l)

March 1969

	Beta Activity		Alpha Activity	
Location	Soluble	Insoluble	Soluble	Insoluble
1-DD-U	10.20	0.61	0.74	0.18
3-On-U	8.98	10.04	1.08	0.93
4-On-D	No Sample	----------	----------	----------
5-Sq-U	10.82	5.32	0.76	0.87
6-Sq-D	10.38	5.81	1.01	0.87
7-Sk-U	11.98	4.06	1.38	0.90
9-CC	7.90	3.50	1.09	0.53
10-DM	10.10	1.99	0.94	0.68
11-Sk-S	14.68	0.89	0.36	0.43
Average	10.63	4.03	0.92	0.67
High	14.68	10.04	1.38	0.93
Low	7.90	0.61	0.36	0.18

Detection Limits - 1.00 pCi/l β

0.39 pCi/l α

River Water Samples (pCi/l)

April 1969

	Beta Activity		Alpha Activity	
Location	Soluble	Insoluble	Soluble	Insoluble
1-DD-U	3.93	0.90	0.48	0.42
3-On-U	6.93	3.18	1.03	0.90
4-On-D	4.15	1.16	0.63	0.63
5-Sq-U	9.68	3.23	1.67	1.16
6-Sq-D	4.43	3.02	1.23	0.63
7-Sk-U	5.50	2.21	1.39	0.85
9-CC	7.35	2.61	0.82	0.87
10-DM	9.95	5.52	1.57	1.21
11-Sk-S	14.60	1.44	0.54	0.45
Average	7.39	2.59	1.04	0.79
High	14.60	5.52	1.67	1.21
Low	3.93	0.90	0.48	0.42

Detection Limits - 1.00 pCi/l β

0.39 pCi/l α

River Water Samples (pCi/l)

May 1969

	Beta Activity		Alpha Activity	
Location	Soluble	Insoluble	Soluble	Insoluble
1-DD-U	3.48	0.27	0.46	0.32
3-On-U	3.65	1.10	0.64	0.27
4-On-D	3.78	0.98	0.87	0.46
5-Sq-U	6.90	5.73	0.69	0.72
6-Sq-D	5.68	4.50	1.51	1.04
7-Sk-U	5.13	2.44	1.23	0.63
9-CC	3.55	0.69	0.73	0.09
10-DM	6.98	4.80	1.18	0.78
11-Sk-S	8.38	0.76	0.54	0.27
Average	5.28	2.36	0.87	0.51
High	8.38	5.73	1.51	1.04
Low	3.48	0.27	0.46	0.09

Detection Limits - 1.00 pCi/l β

0.39 pCi/l α

River Water Samples (pCi/l)

June 1969

	Beta Activity		Alpha Activity	
Location	Soluble	Insoluble	Soluble	Insoluble
1-DD-U	6.08	0.89	0.43	0.36
3-On-U	6.00	4.93	1.00	0.66
4-On-D	3.08	2.25	0.99	0.59
5-Sq-U	7.38	9.28	0.75	1.33
6-Sq-D	8.96	12.00	0.79	1.20
7-Sk-U	8.12	13.69	1.04	1.69
9-CC	3.45	3.84	0.69	0.62
10-DM	7.86	16.40	0.91	2.02
11-Sk-S	10.16	3.82	0.80	0.57
Average	6.79	7.46	0.82	1.00
High	10.16	16.40	1.04	2.02
Low	3.08	0.89	0.43	0.36

Detection Limits - 1.00 pCi/l β

0.39 pCi/l α

ALRR Outfall Samples (pCi/l)

January - June 1969

	Beta Activity		Alpha Activity	
Date	Soluble	Insoluble	Soluble	Insoluble
January	12.83	0.59	0.31	0.23
February	10.62	0.62	0.69	0.32
March	10.73	1.68	0.41	0.34
April	12.55	1.06	0.74	0.42
May	9.18	1.62	0.65	0.57
June	9.29	1.98	0.64	0.80
Average	10.86	1.26	0.57	0.45
High	12.83	1.98	0.74	0.80
Low	9.18	0.59	0.31	0.23

Detection Limits - 1.00 pCi/l β

0.39 pCi/l α

Bottom Sediment Samples (pCi/g)

Location	Date	Beta Concentration	Alpha Concentration
1-DD-U	3-31-69	8.92	0.49
	6-02-69	7.90	0.42
	Average	8.41	0.46
2-DD-D ALRR Outfall	3-31-69	7.75	0.20
	6-02-69	7.76	0.43
	Average	7.76	0.32
3-On-U	3-31-69	10.49	0.42
	6-02-69	7.43	0.42
	Average	8.96	0.42
4-On-D	3-31-69	No Sample ----------	
	6-02-69	7.62	0.16
	Average	7.62	0.16
5-Sq-U	3-31-69	9.64	0.64
	6-02-69	8.40	0.17
	Average	9.02	0.41
6-Sq-D	3-31-69	7.59	0.17
	6-02-69	7.86	0.19
	Average	7.72	0.18
7-Sk-U	3-31-69	6.06	0.17
	6-02-69	8.75	1.25
	Average	7.41	0.71

Bottom Sediment Samples (pCi/g)

Location	Date	Beta Concentration	Alpha Concentration
9-CC	3-31-69	5.90	0.18
	6-02-69	9.18	0.21
	Average	7.54	0.20
10-DM	3-31-69	No Sample ----------	
	6-02-69	11.39	0.77
	Average	11.39	0.77
11-Sk-S	3-31-69	7.53	0.53
	6-02-69	11.59	0.84
	Average	9.56	0.69
Todd Pond	3-31-69	12.83	1.26
	6-02-69	12.01	1.34
	Average	12.42	1.30
Izaak Walton League Pond	3-31-69	9.05	0.29
	6-02-69	16.67	0.79
	Average	12.86	0.54
Kelley Pond	3-31-69	15.01	0.62
	6-02-69	16.13	0.95
	Average	15.57	0.79
Average for 24 Samples		9.73	0.54
High		16.67	1.34
Low		5.90	0.16

Detection Limits - 0.25 pCi/g β

0.10 pCi/g α

Precipitation Samples (pCi/l)

	Beta Activity		Alpha Activity	
Date	Soluble	Insoluble	Soluble	Insoluble
January	22.13	25.13	1.13	1.20
February	29.00	44.10	0.36	6.63
March	46.54	28.96	2.02	2.96
April	47.30	17.80	2.80	2.58
May	89.99	32.92	3.83	2.72
June	154.32	51.49	9.63	9.03
Average	64.88	33.40	3.30	4.19
Individual High	587.00	249.00	39.70	54.00
Individual Low	9.40	1.50	0.18	0.33

Detection Limits - 1.00 pCi/l β

0.39 pCi/l α

Well Water Samples (pCi/l)

Location	Date	Beta Activity		Alpha Activity	
		Soluble	Insoluble	Soluble	Insoluble
City of Ames	1-06-69	5.40	0.68	0.90	ND
	2-04-69	4.60	0.68	ND	0.18
	3-03-69	5.40	1.20	0.36	ND
	3-31-69	4.20	1.10	ND	1.80
	5-05-69	6.10	ND	0.72	ND
	6-02-69	4.50	0.68	1.60	0.90
Average		5.03	0.72	0.60	0.48
High		6.10	1.20	1.60	1.80
Low		4.20	0.68	0.36	0.18
Iowa State University	1-06-69	5.30	1.50	0.36	ND
	2-04-69	4.90	0.68	3.10	0.36
	3-03-69	6.80	0.68	2.00	0.54
	3-31-69	2.20	3.20	0.90	ND
	5-05-69	2.20	ND	0.18	0.36
	6-02-69	3.40	ND	1.60	ND
Average		4.13	1.01	1.36	0.21
High		6.80	3.20	3.10	0.54
Low		2.20	0.68	0.18	0.36

Well Water Samples (pCi/l)

Location	Date	Beta Activity		Alpha Activity	
		Soluble	Insoluble	Soluble	Insoluble
Arland Martin Acreage	1-06-69	5.10	1.10	ND	ND
	2-04-69	4.20	ND	1.30	ND
	3-03-69	6.40	0.41	0.90	0.36
	3-31-69	6.10	0.14	1.10	ND
	5-05-69	3.00	0.95	0.54	ND
	6-02-69	3.50	ND	0.18	0.18
Average		4.72	0.43	0.67	0.09
High		6.40	1.10	1.30	0.36
Low		3.00	0.14	0.18	0.18
Average for 18 Samples		4.63	0.72	0.87	0.26
High for 18 Samples		6.80	3.20	3.10	1.80
Low for 18 Samples		2.20	0.14	0.18	0.18

Detection Limits - 1.00 pCi/l β

0.39 pCi/l α

Pond Water Samples (pCi/l)

Location	Date	Beta Activity		Alpha Activity	
		Soluble	Insoluble	Soluble	Insoluble
George Todd Pond	1-06-69	12.80	ND	0.18	0.18
	2-04-69	10.40	0.68	0.54	0.36
	3-03-69	27.20	1.80	1.30	0.36
	3-31-69	1.90	0.54	ND	ND
	5-05-69	4.90	1.10	0.54	0.36
	6-02-69	3.90	0.54	1.60	ND
Average		10.18	0.78	0.69	0.21
High		27.20	1.80	1.60	0.36
Low		1.90	0.54	0.18	0.18
Izaak Walton League Pond	1-06-69	22.00	2.20	ND	ND
	2-04-69	19.60	0.14	0.72	0.36
	3-03-69	23.50	ND	0.90	0.72
	3-31-69	6.80	1.60	0.54	0.90
	5-05-69	10.80	2.20	ND	0.72
	6-02-69	3.10	1.20	0.90	0.18
Average		14.30	1.22	0.51	0.48
High		23.50	2.20	0.90	0.90
Low		3.10	0.14	0.54	0.18

Pond Water Samples (pCi/l)

		Beta Activity		Alpha Activity	
Location	Date	Soluble	Insoluble	Soluble	Insoluble
Kelley Pond	1-06-69	14.90	2.00	ND	ND
	2-04-69	12.00	0.41	1.10	ND
	3-03-69	13.20	0.95	0.72	0.90
	3-31-69	17.30	3.20	1.10	0.18
	5-05-69	3.40	1.60	0.18	0.18
	6-02-69	7.30	0.68	0.36	ND
Average		11.35	1.47	0.58	0.21
High		17.30	3.20	1.10	0.90
Low		3.40	0.41	0.18	0.18
Average for 18 Samples		11.94	1.16	0.59	0.30
High for 18 Samples		27.20	3.20	1.60	0.90
Low for 18 Samples		1.90	0.14	0.18	0.18

Detection Limits - 1.00 pCi/l β

0.39 pCi/l α