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October 15, 1945

Tests conducted July 1945

Dr. Louis Hempelmann

W. H. Hinch

Report on the Contamination of Creek Water

uncl.

Work done by: James R. Wilson) CMR-12

Report written by: James F. Tribby)

1352 Report

INTRODUCTION:

Waste water from the Technical Area empties into Los Alamos Creek to the southwest of the area and into Pueblo Creek to the north of the area. Both streams ultimately empty into the Rio Grande River. Since the waste water contains plutonium and polonium it is desirable to check these streams to determine the concentration of these substances in the water at various points from the Technical Area to the Rio Grande River, and perhaps, the Rio Grande itself. The principal source of plutonium is from the old contaminated laundry, D, Sigma, U, V, and M Buildings in the Technical Area, and D.P. Site west. The principal sources of polonium are H Building in the Technical Area and D.P. Site East. The waste water from the new contaminated laundry, highly contaminated with Pu and Po, empties into a sump, which filters a great deal of the contamination from the water before it reaches Los Alamos Creek.

Area V

It is desired in these analyses to detect counts from Pu and Po as low as 20 d/m* or less per liter of creek water. The safe limit for Pu or Po is not known, but 20 d/m per liter of water may be considered of doubtful safety if it is to be used for drinking.

SUMMARY:

Near the drain exit of the old Technical Area laundry, counts ran between 200,000 and 800,000 d/m/L of water for polonium and 2,000 and 13,000 d/m/L for plutonium. Roughly, this corresponds to a daily rate of 2 mg. of Pu in 300 gallons of water emptied into Los Alamos creek from the old laundry alone. In Los Alamos Canyon the d/m/L were much smaller, 300 to 20,000 on Po and 100 to 3,000 on Pu. Near the entrance of Los Alamos Creek into the Rio Grande River the values were 12 d/m/L for Pu and 0 d/m/L for Po. In the Rio Grande River the total counts were 18 d/m/L for both agents. This indicates that both contaminating substances are very rapidly deposited from the water. However, it should be noted that the analyses were made in D Building, under semi-contaminated conditions and values under 100 d/m/L are probably not too reliable.

* Counts will be given as d/m (total disintegrations per minute) which is approximately twice that of the counts recorded by the standard alpha counter.

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By Bertha Grant 4-13-62 (Signature of person making the change, and date)

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Report on the Contamination of Creek Water (continued)

PROCEDURES:

I. Seven one-liter samples were taken from Los Alamos Creek and from the exit of the old Technical Area contaminated laundry on July 15, 1945. Samples 1, 2, and 3 were cloudy and contained considerable solid matter. To remove the soap from the water, 1 gram $Ca(NO_3)_2$ was added to these samples. All solutions were made 1N in HNO_3. Samples 1 to 4 were filtered to remove the soap and other solid matter precipitate. Samples 5,6, and 7 showed no precipitate and required no filtration. Both the filtrate and filter paper of samples 1 to 4 and the original solutions of samples 5 to 7 were analyzed for Pu and Po.

To determine the amount of Po in the solutions, the solutions were evaporated and made 2 N in HCl. Ag plates were placed in the solutions on to which the Po was deposited. Additional plates were left in the solutions until the count was reduced to a relatively negligible amount.

To determine the amount of Pu, the above solutions were then evaporated and made 1N in HNO_3 and 10N in NH_4NO_3. The solutions were extracted twice with methyl-iso-butyl-ketone, and washed with a dilute solution of HNO_3, NH_4NO_3. The methyl-iso-butyl-ketone extract was evaporated on a glass plate and counted. The filter papers from samples 1 to 4 were dissolved in HNO_3, boiled, and the same procedures were followed as in the filtrate.

Results are given as disintegrations per minute per liter of water:

Sample	Position	d/m/L/Pu	d/m/L/Po
1 (filter paper)	Drainage exit of Tech Area laundry, east end.	210	4,200
1 (filtrate)		2,100	77,000
2 (filter paper)	Drainage exit of Tech Area laundry, west end.	130	59,000
2 (filtrate)		13,000	200,000
3 (filter paper)	Laundry water in ditches leading to Los Alamos Creek	7,120	370,000
3 (filtrate)		5,000	820,000

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Sample	Position	d/m/L/Pu	d/m/L/Po
4 (filter paper)	Los Alamos Creek immediately below laundry.	1,300	12,000
4 (filtrate)		3,100	19,000
5 (original solution)	Los Alamos Creek 100 yards downstream.	520	280
6 (original solution)	Los Alamos Creek 200 yards downstream.	200	620
7 (original solution)	Los Alamos Creek 300 yards downstream	80	1,860

II. Eleven one-liter samples of water were taken (August 10, 1945) from Los Alamos Creek from the Technical Area to the Rio Grande, and from Pueblo Creek beside the Post. Sample 11 was taken from the Rio Grande one fourth mile below Otowi Crossing. Two liters of the water were decanted from the solid matter, evaporated to dryness, and counted. A total activity of 18 disintegrations per minute per liter, due both to Po and Pu, was found.

The rest of the one-liter samples (1 to 10) were evaporated and treated with HNO_3 and H_2O_2 to remove excess organic matter. The samples were then made 2 N in HCl and the Po was plated out on silver plates. The solution was again evaporated and made 10N in NH_4NO_3 and 1N in HNO_3. This solution was extracted with methyl-iso-butyl-ketone and washed. The extract was evaporated on glass plates and counted.

Following are the results expressed as disintegrations per minute per liter of water.

Sample	Position	d/m/L/Pu	d/m/L/Po
1	Pueblo Creek NW of Tech Area.	38,000	660
2	Pueblo Creek N of Tech Area	1,440	1,000
3	Los Alamos Creek beside Omega Site (above laundry)	0	48

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Sample	Position	d/m/L/Pu	d/m/L/Po
4	Los Alamos Creek SW of Tech Area	84	2,300
5	Los Alamos Canyon by laundry ditch	144,000	48,000
6	Los Alamos Creek by laundry ditch	62,000	114,000
7	Los Alamos Creek beside D.P. Site	0*	0*
8	Los Alamos Creek below D.P. Site	12*	4*
9	Los Alamos Creek near Loudermilk	12	16
10	Los Alamos Creek near Rio Grande	16	0
11	Rio Grande River 1/4 mile below Otowi Crossing	Total Po and Pu 18	

* The fact that d/m recorded from sample 8 was higher than sample 7 may be accounted for by assuming that all counts less than 100 d/m are probably inaccurate, dna both to the technique in carrying out the analysis and to the semi-contaminated conditions of the laboratory.

Actual separation and analysis was done in room D-320 and the counting in D-3, the CMR-12 counting room.

W. H. Hinch

WHH:mm

CC: Captain Nolan
H. I. Files
J. Tribby

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