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Survey of Los Alamos and Pueblo
Canyon for Radioactive Contamina-
tion and Radioassay Tests Run on
Sewer-Water Samples and Water and
Soil Samples Taken from Los Alamos
and Pueblo Canyons.

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William Kingsley
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Report of the Survey of Los Alamos and Pueblo Canyon for radioactive contamination and radioassay tests run on sewer water samples and water and soil samples taken from Los Alamos and Pueblo Canyons.

Work done by:

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INTRODUCTION:

Chemical sewers and sanitary sewer lines draining the Tech Area, D.P. Site, GMR-12 Laundry, and surrounding residential areas flow into Pueblo and Los Alamos Canyon streams. The water flow formed in these two canyons winds southeastward to the Rio Grande River after joining beside the old Loudermilk camp site east of the junction of Route 4 and the road to Post 1. In order to determine the extent and sources of radioactive contamination in these localities it is necessary to collect and radioassay fluid samples from each of the sewers, soil samples from the ground surrounding the sewer exits, and water and soil samples from selected spots in or near each of the two canyon streams. Some preliminary radioassay work was carried out in July, 1945 and previously reported, but because of the importance of the work and the possibility of increasing amounts of radioactive materials accumulating in the area the analyses and surveys were repeated using more exacting methods.

Four groups of radioassay determinations were run. The first group of assays was made on water samples from all sanitary and chemical sewer outlets. Samples were collected and assayed in July, 1946 and in September, 1946. The second group of assays (October and November, 1946) was made on soil samples taken from the ground surrounding all sewer outlets that were found contaminated when surveyed with a portable alpha survey instrument. In some cases, however, soil samples were collected from the ground surrounding exits where the presence of radioactive contaminants, by instrument survey, was not indicated but was suspected. This was done

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to insure a complete and accurate survey of the entire area and to insure a positive check of spots where any possible contamination might be present even though it might not be detectable by direct instrumentation. Pictures were taken of most of these sample sources. The third group of assays (September, 1946) was made on samples of water taken from stagnant pools in both Pueblo and Los Alamos Canyons. These samples were collected from pools as far down as the Rio Grande River. The fourth group of assays (October and November, 1946) was made on soil samples taken from points in the stream beds in Pueblo and Los Alamos Canyons. As in the case of the soil samples taken from near the sewer exits, pictures were taken of the sources of the soil samples in the canyons where alpha contamination was found to be appreciable by survey with a portable alpha survey meter.

SUMMARY:

Analyses for polonium and plutonium in the sewers in July, 1946 and in September, 1946 showed quite a wide differential margin

All sewer water samples were analyzed for uranium content, but no uranium was detected by the fluorimetric method. Since no amount of uranium was detectable by the method used the analysis for uranium was not continued on the soil and canyon water samples. A procedure using improved methods of removing certain interfering metals and organic matter might possibly show some trace of uranium.

The greatest activity due to polonium was found in fluid samples taken from number 22 sewer which drains DP East filter house. The July, 1946

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analysis showed 46,640 d/m/L for polonium. The September analysis gave 1,854 d/m/L for polonium. The reason for the appreciable drop from 46,640 d/m/L to 1,854 d/m/L may be partially accounted for by the fact that precipitron oil was once eliminated through this exit. This practice was halted in December, 1945 and the polonium from this source is gradually disintegrating. The second and most probable reason for this drop is the fact that the summer rains have diluted the active products and have washed the material over a greater area. The second highest polonium activity was found in fluid samples from sewer number 18 which drains most of the sewage from building number 52, DP East. The analysis showed 20,560 d/m/L in July, 1946, and 19,968 d/m/L in September, 1946.

The highest plutonium result was found in fluid samples taken in July, 1946 from the seepage pits (number 25 sewer) of DP West. The result showed 6,780 d/m/L. In September of 1946, however, this figure had dropped to about 100 d/m/L. The second highest plutonium result was found in a fluid sample taken from number 3 acid sewer which drains contaminated operations in Tech Area. The analysis of this sample showed 1900 d/m/L in July, 1946. The figure showed a drop to 124 d/m/L in September, 1946. This drop is unexplained.

The soil samples collected from Los Alamos and Pueblo Canyons and ground surrounding the sewer exits showed contamination to a varying degree. The two sources of samples showing the highest polonium disintegration rates were from soil surrounding number 18 sewer at DP East (70,000 c/m/50 gms. soil), and from soil surrounding the outlet into

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seepage pits near DP East. This last soil sample was assayed as 24,907 d/m/50 gms soil.

The highest plutonium activity was found in the sewer exit soil samples taken from the ground surrounding the exit of number 3 acid sewer which showed 17,806 d/m/50 gms of soil. The second highest plutonium activity found from samples collected from ground surrounding sewer exits was 3,082 d/m/50 gms of soil at number 4 sanitary sewer exit. This high count near a sanitary sewer draining residential areas may be attributed to the fact that the contaminated sewer, number 3 draining Tech Area chemical drains, is so near the number 4 exit (see map number 1).

The highest soil activity found in either canyon was found in Los Alamos Canyon near where the sump solutions from the GFR-12 Laundry drain into the Los Alamos Canyon stream. The analysis exhibited 10,000 d/m/50 gms soil for polonium and 9,000 d/m/50 gms soil for plutonium.

The highest count recorded by survey with the portable alpha survey meter was 16,000 d/m on the surface of the ground found in Los Alamos Canyon near the drain exit from DP East filter house. Though the portable Victoreen meter was used to survey for possible beta and gamma radiation, no penetrating radiation was detected in any canyon area, except at the immediate area around the exit of "1" building drain which gave a beta reading of nearly 5 mR/hr., one inch from the surface of the ground. This was in September, 1946 and as all work with beta, gamma emitting materials has been discontinued since then, and as the materials have a short half period we may consider that these radioactive materials have since disintegrated to a near zero activity.



ANALYTICAL PROCEDURE:

Step I - One liter samples were collected for all water examinations including 25 sets of sewer samples and 26 sets of water samples from the canyons. To determine the polonium content each sample was wet-ashed separately with peroxide and nitric acid after having been evaporated to near dryness. The residue was redissolved in about 50 cc's of distilled water and made 1 N in HCl. A copper disk 1/64" by 7/8" in diameter was immersed and the solution stirred for a period of one hour, dried, washed in distilled water, and counted in a parallel plate proportional alpha counter for a period of three to five minutes. Additional disks were inserted, stirred, washed, and counted until the counts on the disks dropped to zero.

Step II - Fifty gram samples (29 sets of samples) were used in all soil analyses. The samples were first allowed to digest in approximately 150 cc's of 6N HCl for two hours, filtered, and the supernatant evaporated to near-dryness, and wet ashed. After ashing the solids were dissolved in 50 cc's of 1N HCl and analyzed for polonium as described in Step I.

Step III - The solutions from Steps I and II were again evaporated and wet-ashed to be assayed for plutonium. The remaining salts were dissolved in distilled water, the volume kept at a minimum, and precipitated with ammonium hydroxide. The product was centrifuged in a clinical type centrifuge and the supernatant discarded. The precipitates were dissolved in 2N HCl, using as small a volume as possible, again depending on the amount of precipitate to be dissolved, and then placed in separatory funnels. Three or four drops of FeCl_3 (6.04 gms./250 cc's of 1N HCl) were added to each solution. A few drops of methyl violet were added

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as an indicator and the pH adjusted (to a green color) by using 1N HCl. Ten cc's of cupferron per 25 cc solution were stirred into each of the samples (3 gms cupferron/50 cc's of distilled water). Then a chloroform extraction was carried out on the samples. The chloroform was evaporated on an oil bath at a temperature between 65 and 70 degrees centigrade. Ten cc's of nitric acid were added to each of the samples and the temperature kept constant for 15 or 20 minutes. Perchloric acid was added (5 - 10 cc's) and the temperature boosted to 180 degrees centigrade for one hour, or until the solution evaporated to dryness. The remaining salts were dissolved in distilled water to a volume of not more than four cc's. Two drops of hydroxylamine per four cc's of solution, two drops of lanthanum in solution (1.56 gms of LaNO_3 /376 cc's of 1N HNO_3), and one cc of HF were added to each sample. The solutions were allowed to stand for 15 minutes and then centrifuged at maximum speed in a clinical centrifuge for ten minutes. The supernatants were discarded, the precipitates dissolved in as small a volume of distilled water as possible, and the resulting fluids evaporated on stainless steel plates by using an infra-red source. The plates were then flamed, and counted on a parallel plate proportional alpha counter for three to five minutes.

Step IV - The fluorimetric procedure was used for uranium assay. One liter fluid sewer samples were used. The samples were evaporated down to near-dryness and ashed repeatedly with nitric acid and perchloric acid. After through ashing, the salts were dissolved in 0.5 ml. of sulfuric acid (organic free) and placed in one ml. volumetric flasks.

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Hydrogen peroxide was added and the solution placed in an aluminum heating block and heated to about 180 degrees centigrade until oxidation was completed. Then the flask was filled up to 1 ml. with organic free sulfuric acid, cooled in a dry ice-methanol bath until solidified and examined through a spectroscope with an ultra-violet light source behind the sample. The uranyl ion band, if present, was compared with known, prepared standards. Organic matter and certain metals present in the solution interfere with the detection of uranium in sewage to a great extent and because of incomplete oxidation of organic matter it is almost impossible to obtain accurate results by this method for sewage water, or any water containing excessive amounts of organic matter. However, other methods that we are acquainted with do not give reliable results to the minute degree that we require (1 - 5 micrograms/liter of solution).

Direct Instrument Survey of Canyon: The Portable "PeeWee" alpha survey instrument equipped with a 4 x 6 inch flat probe and headphones, and the portable Victoreen gamma survey meter were used in surveying selected areas near sewer exits and Los Alamos and Pueblo Canyon. As near level surfaces as possible where water had washed or settled at some time were chosen as spots for tests with the instruments. This was done to insure against poor radiation geometry. At best the surface survey of ground area is only indicative of the alpha contamination contained in the upper 0.03 - 0.05 mm of ground surface.

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Part I

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The chart below shows the results of the radioassays of the one liter fluid samples collected from exits of each of twenty-five chemical and sanitary sewer lines draining Tech Area, CMR-12 Laundry, D.P. Site, and the residential area. Maps number 1, 2, and 3 show the locations of these sewer line exits.

Sample Number & Type of Sewer	Septic Tank No.	Date Collected	Source of Sample	Source of Sewage	Po d/m/L	Pu d/m/L	Ce microg./L
#1 Sanitary	7	July, 1946	North of SED Area, North Bldg. T-257 Empties into Pueblo Canyon.	SED Area	124	60	1.9×10^{-4}
#1 Sanitary		Sept., 1946			6.8	4	2.6×10^{-5}
#2 Sanitary	6	July, 1946	North of west residential area, North of T-226. Empties into Pueblo Canyon.	West residential area. Connects Tech Sanitary Sewer.	274	80	7.7×10^{-4}
#2 Sanitary		Sept., 1946			1.2	1.2	1.05×10^{-5}
#3 Chemical	None	July, 1946	North of Bldg. T-191. Empties into Pueblo Canyon.	Collects acid and chemicals from D, H, Sigma, and other Tech Area Bldgs.	5720	1900	1.4×10^{-2}
#3 Chemical		Sept., 1946			248	124	4.5×10^{-3}
#4 Sanitary	5	July, 1946	North of Bldg. T-156. Empties into Pueblo Canyon.	North residential area, Tech Area, P.X., School.	440	180	1.3×10^{-3}
#4 Sanitary		Sept., 1946			4	12	8.6×10^{-5}

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Sample Number & Type of Sewer	Septic Tank No.	Date Collected	Source of Sample	Source of Sewage	Po d/m/L	Pu d/m/L	Pu microg./L
#5 Sanitary	4	July, 1946	North Bldg.T-124 Empties into Pueblo Canyon.	Collects from far north residential area.	40	60	4.3×10^{-4}
#5 Sanitary		Sept., 1946			6.6	0	0
#6 Sanitary	3	July, 1946	North Bldg.T-604 Pueblo Canyon	McKee Housing Area	600	40	2.8×10^{-4}
#6 Sanitary		Sept., 1946			2.8	3.3	2.1×10^{-5}
#7 Sanitary	2	July, 1946	North of old Hanford Area. Pueblo Canyon.	Hanford Area	280	40	2.8×10^{-4}
#7 Sanitary		Sept., 1946			4.2	4.2	2.8×10^{-5}
#8 Sanitary	1	July, 1946	North of contaminated dump. Los Alamos Canyon.	M.P. Area	0	20	1.4×10^{-4}
#8 Sanitary		Sept., 1946			10.0	5.0	3.5×10^{-5}
#9 Sanitary	None	July, 1946	East of Y Bldg. Empties into Los Alamos Canyon	Y Building	200	0	0
#9 Sanitary		Sept., 1946			6.2	17	12.1×10^{-5}

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Sample Number & Type of Sewer	Septic Tank No.	Date Collected	Source of Sample	Source of Sewage	Po d/m/L.	Pu d/m/L.	Pu microg./L
#10 Sanitary	None	July, 1946	From X Bldg. Los Alamos Canyon	X Building	680	20	1.4×10^{-4}
#10 Sanitary		Sept., 1946			16	11	7.8×10^{-5}
#11) #12) Sanitary	None	July, 1946	North of T-470. Los Alamos Canyon.	Theta Building	200	40	2.8×10^{-4}
#11) #12) Sanitary		Sept., 1946			4	7	5×10^{-5}
#13 Sanitary	None	July, 1946	East of H.T. Shop. Los Alamos Canyon.	H. T. Shop	40	60	4.3×10^{-4}
#13		Sept., 1946			2	21	15×10^{-5}
#14 Sanitary	None	July, 1946	East of DP Laundry. Los Alamos Canyon.	DP Laundry	480	210	1.4×10^{-3}
#14 Sanitary		Sept., 1946			354	27	19.2×10^{-5}
#15 Sanitary	None	July, 1946	South Bldg. 1, D.P. Los Alamos Canyon.	No. 1, D.P. West	80	120	8.4×10^{-4}
#15 Sanitary		Sept., 1946			22	9	6.4×10^{-5}

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Sample Number & Type of Sewer	Septic Tank No.	Date Collected	Source of Sample	Source of Sewage	Po d/m/L	Pu d/m/L	Pu microg./L
#16 Sanitary	None	July, 1946	South Bldg. 5, D.P. West. Los Alamos Canyon.	D. P. West Bldg. 2-5	80	0	0
#16 Sanitary		Sept., 1946			16	21	15x10 ⁻⁵
#17 Sanitary	None	July, 1946	South Bldg. 5 D.P. West. Los Alamos Canyon.	Bldg. 9	200	20	1.4x10 ⁻⁴
#17 Sanitary		Sept., 1946			30	21	15x10 ⁻⁵
#18 Sanitary	None	July, 1946	South Bldg. 52 D.P. Los Alamos Canyon.	Building 52	20,560	540	3.7x10 ⁻³
#18 Sanitary		Sept., 1946			19,968	46	32.8x10 ⁻⁵
#19 Sanitary	None	July, 1946	North Bldg. 51 D.P., Los Alamos Canyon.	Building 51	160	0	0
#19 Sanitary		Sept., 1946			42	24	17.1x10 ⁻⁵
#20 Chemical	None	July, 1946	Los Alamos Canyon after passing through seepage pit.	Collected from washers and drains from DP Laundry.	2,000	460	3.3x10 ⁻³
#20 Chemical		Sept., 1946			593	70	50x10 ⁻⁵

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Sample Number & Type of Sewer	Septic Tank No.	Date Collected	Source of Sample	Source of Sewage	Po d/m/L	Pu d/m/L	Pu microg./L
#21 Chemical	None	July, 1946	South of Bldg. 2. Los Alamos Canyon.	Bldg. #2. Exhaust line.	No fluid was available for collection after 3 weeks of attempting to collect a sample.		
#21 Chemical		Sept., 1946			26	34	24.2×10^{-5}
#22 Chemical	None	July, 1946	North Bldg. 53. D.P. Los Alamos Canyon.	Bldg. 53 Filter House	46,640	1,420	1×10^{-2}
#22 Chemical		Sept., 1946			1854	650	464.2×10^{-5}
#23 Chemical	None	July, 1946	West end of #22.	Collected from floor drain of 52, D.P. East.	240	80	5.7×10^{-4}
#23 Chemical		Sept., 1946			22	62	44.2×10^{-5}
#24 Chemical *	None	July, 1946	Through seepage pits. Los Alamos Canyon.	From Bldgs. 2-5 D.P. West	80	80	5.7×10^{-4}
#24 Chemical *		Sept., 1946			43	122	87.1×10^{-5}
#25 Chemical	None	July, 1946	Seepage Pits. Los Alamos Canyon.	Floor drains Bldg. 12, D.P. West	200	6,780	4.8×10^{-2}
#25 Chemical		Sept., 1946			65	97	69.2×10^{-5}

* Dirt sample - 50 gms, dirt extracted with fuming HNO_3 .

Assay results for uranium in all cases were less than 10 microg./L.

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Part II

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The following chart shows the results of the radioassay of soil samples taken from near the exits of sewer lines surveyed with the portable alpha survey instrument. In some instances no radiation was registered on the survey instrument, however, samples were analyzed if any contamination was suspected. The samples were collected during October and November of 1946. For reference see map number 5.

Soil Sample Number & Type of Sewer	Location of Sample	Source of Sewage	Direct Instrument reading, "PeeWee" d/m	Picture No. Ref. No.	Po d/m/L	Pu d/m/L	Remarks
1. Sanitary	North of SBD Area, North of Bldg T-257 Empties into Pueblo Canyon.	SBD Area	neg.		24	80	
2. Sanitary	North of west residential area, North of T-266. Empties into Pueblo Canyon.	Residences in West Area, Connects 100 with Tech Area Sanitary Sewer.		1	68	169	
3. Chemical	North of Bldg. T-191 Empties into Pueblo Canyon.	Collects acid and chemicals from D, H, Sigma, and Tech Area Bldgs.	10,000	2 & 3	23,366	17,806	
4. Sanitary	North of Bldg. T-156 Empties into Pueblo Canyon.	North residential area, Tech Area, School, P.K.	200	4	120	3,082	
9. Sanitary	East of Y Bldg. Empties into Los Alamos Canyon.	Y Bldg.	1000	5	8,323	572	
10. Sanitary	From K Bldg. Los Alamos Canyon.	K Bldg.	3,000	6	272	350	

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Part II (continued)

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Soil Sample Number & Type of Sewer	Location of Sample	Source of Sewage	Direct Instrument reading. "Pee" "ee" d/m	Picture Ref. No.	Po d/m/L	Pu d/m/L	Remarks
15. Sanitary	South Bldg. 1 D.P. Vest. Los Alamos Canyon.	No. 1 D.P. Vest	neg.		26	123	
18. Sanitary	South Bldg. 52 DP East. Los Alamos Canyon.	Bldg. 52	2800	7	79,000	140	
20. Chemical	Los Alamos Canyon after passing through seepage pit.	D.P. Laundry washers and drains.	200	8	2	150	
21. Chemical	South of Bldg. 2 Los Alamos Canyon.	Bldg. 2 Exhaust Line.	1000	9			No sample solid rock wall.
22. Chemical	North Bldg. 53, D.P. Los Alamos Canyon.	Bldg. 53 Filter House	16,000	10	24,907	59	
23. Chemical	Seepage pits. D.P. Vest. Los Alamos Canyon.	Floor drains Bldg. 12 D.P. Vest	800	11	123	200	

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Part IIIa

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The chart below shows the results of the radioassays of one liter water samples collected from stagnant pools in Pueblo Canyon in September, 1946. The areas from which the samples were collected are indicated on map number 4. Each sample was assayed for polonium and plutonium.

Sample Number	Number of Samples	Position	Po d/m/l.	Pu d/m/l.	Pu mic./l.
#1	2	Head of Canyon between sewer outlets 1 and 2.	0	100	7.2×10^{-4}
#2	1	Taken downstream 50 - 75 yards below outlet of #2 sewer.	0	100	7.2×10^{-4}
#3	2	Taken 25 - 30 yards below where #3 acid sewer empties into Pueblo Stream.	0	23,500	0.168
#4	2	Taken 400 - 500 yards below where #3 acid sewer empties into Pueblo Canyon.	0	5,000	35.7×10^{-3}
#5	2	Taken at point where #6 sanitary sewer empties into Pueblo Stream north of McKee Area.	0	3,000	21.4×10^{-3}
#6	2	Taken one half mile below point where #5 was taken.	0	0	0
#7	1	Taken at Bayou Stream and Pueblo Stream junction.	0	0	0
#8	2	Taken at junction of Los Alamos Canyon Stream and Pueblo Canyon Stream by old Loudermilk Camp Site.	0	2,000	14.3×10^{-3}

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Part IIIa (continued)

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Sample Number	Number of Samples	Position	Po d/m/L	Pu d/m/L	Pu mic./l.
#9*	1	Taken at foot of falls about one fourth mile below Louderrilk Camp Site.	0	500	3.6×10^{-3}
#10	2	Taken one fourth mile below foot of falls in sample #9.	0	1500	10.7×10^{-3}
#11	1	Taken opposite Loudermilk gravel pit.	0	1,000	7.2×10^{-3}
#12*	2	500 yards below point of new well drillings.	10	425	3.1×10^{-3}
#13	1	Opposite water trough beside new Pojoaque cut off.	0	85	6×10^{-4}
#14	2	500 yards south on Pojoaque cut off.	0	105	7.5×10^{-4}
#15	2	Rio Grande River at outlet of Pueblo and Los Alamos Streams.	0	0	0
#16	2	Rio Grande River bottoms below outlet as above.	0	0	0

* Samples taken were 50 gram dirt samples digested in conc. HCl before routine analysis. Figures are in disintegrations/minute/50gms.

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Part IIIB

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The chart below shows the results of radioassays of the water samples taken from Los Alamos Canyon streams. The liter samples were used in each analysis. The samples were collected in September, 1946. They were collected from stagnant pools, and the source of each sample may be seen on map number 4. Each sample was assayed for polonium and plutonium.

Sample Number	Number of Samples	Position	Po d/m/l	Pu d/m/l	Pu mic/l
#1	2	Between Omega Building and Post 12.	0	0	0
#2	2	100 - 150 yards below Omega Building.	0	500	3.6×10^{-3}
#3	2	Los Alamos Canyon south of D Building.	0	750	5.4×10^{-3}
#4	2	Stream draining from contaminated laundry sump and laundry sewer.	10,500	7,780	5.5×10^{-2}
#5	1	Spot in canyon streams about opposite D.P. West Buildings 1 and 2	8,000	9,000	6.4×10^{-2}
#6	2	Canyon outlet draining from seepage pits into Los Alamos Canyon.	850	3,500	2.5×10^{-2}
#7	1	Spot about 1,000 yards below #6.	240	375	2.7×10^{-3}
#8	1	Spot about one half mile below D.P. Site.	50	225	1.6×10^{-3}

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Part IIIb (continued)

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Sample Number	Number of Samples	Position	Po d/m/l	Pu d/m/l	Pu mic./l
#9	2	900 yards upstream from Loudermilk.	35	185	1.3×10^{-3}
#10	2	Loudermilk junction.	0	385	2.8×10^{-3}

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Part IVa

The chart below shows the results and photograph reference numbers of soil samples gathered at points along Pueblo Canyon which were radiocassayed for polonium and plutonium. The soil samples were collected during October and November, 1946. Fifty gram samples were used.

Soil Samples - Pueblo Canyon Sample number and position.	Direct Instrument reading. "Pee Wee"	Picture Reference No.	Po d/m/50gms	Pu d/m/50gms.	Remarks
1. 500 yards below #1 sewer outlet into Pueblo Canyon.	40	12	10	16	
2. Outlet of sewers 3 & 4 into Pueblo Stream.	2600	13	340	271	
3. 25 yards below 3 & 4 sewer outlets.	300	14	68	238	
4. 100 yards below # 3 and 4 sewer outlets. Under rock overhang.	400	15			No sample due to solid rock formations where the monitoring was carried out.
5. 225 yards below # 3 and 4 sewer outlet.	300	16			No sample due to frozen ground.
6. Under Quaje water line	100	17	30	32	
7. At U. S. Forest Service Fence	100	18	22	23	

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Soil Samples - Pueblo Canyon Sample number and position.	Direct Instrument reading, "Pee Wee"	Picture Reference No.	Po d/m/50gms	Pu d/m/50gms	Remarks
8. 100 yards below Forest Service Fence	140	19	16	98	
9. 300 yards below Forest Service Fence	100	20	26	34	
10. 300 yards below outlet of canyon north of Hanford Area.	negative	21	10	20	
11. 300 yards above area boundary fence.	negative	22	18	27	
12. Bayo road crossing on Pueblo Stream.	negative	23	8	17	
13. Opposite Pueblo Canyon cave ruins.	negative	24	8	17	
14. Under bridge by old Loudermilk camp site.	negative		4	7	

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Part IVb

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The chart below shows the results and photograph reference numbers of soil samples gathered at points along Los Alamos Canyon which were radioassayed for polonium and plutonium. The soil samples were collected during October and November, 1946.

Los Alamos Canyon Sample number and position	Direct Instrument reading, "PeeWee"	Picture Reference No.	Po d/m/50gms.	Pu d/m/50gms	Remarks
1. Location of drainage of 11 and 12 sewers into Los Alamos Canyon.	negative	25	100	225	
2. Below old Tech Area Laundry	150	26	125	500	
3. Opposite M.P. Park Area	200	27	60	50	
4. Cozsa Site Gate	150	28	6	16	
5. Contaminated Laundry Outlet	1200	29	10,000	9,855	
6. 300 - 300 yards below laundry outlet.	1200	30	357	224	
7. 200 yards below position #6	200	31	75	50	
8. Area opposite D.P. East Guard Tower.	150	32	34	70	
9. Area 400 yards above Los Alamos Canyon gate.	200	33	42	86	
10. Area 200 yards above Los Alamos Canyon gate.	150	34	36	40	

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Part IVb (continued)

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Los Alamos Canyon Sample number and position	Direct Instrument reading, "Pee Wee"	Picture Reference No.	Po d/m/50gms	Pu d/m/50gms	Remarks
11. 100 yards above Los Alamos Canyon gate.	100	35	25	15	
12. Los Alamos stream crosses road for fourth time.	100	36	28	17	
13. Fifth Crossing	50	37	35	21	
14. Sixth Crossing	150	38	70	30	
15. Falls below old Loudermilk Site	negative		negative	negative	

~~SECRET~~