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MDT-45-59

orig 3 to WBL 2/1/54  
2 to CLM  
2 to H. Chen files 1/10/54  
3 papers 4/1/54  
submitted to reports (in Dept office) 2/1/54, completed 2/1/54  
\* He sent 2 to Dr. DeWitt  
1 to Southwick

LRL FALLOUT INFORMATION  
APRIL 5 - NOVEMBER 15, 1958

The work reported herein is authorized by the chiefs of LRL Health Chemistry Sections, N. B. Garden and O. L. Meadors, of Berkeley and Livermore respectively. Responsibility for the work was assigned to their Airborne Activity Control groups under direction of M. D. Thaxter and J. R. Murrow.

This report was written by M. D. Thaxter with the collaboration of J. Young.

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ABSTRACT

"Hardtack" fallout was estimated by the two LRL sites independently by analysis of filter collections of air-dusts at both sites and by several other methods at the Berkeley site. Examination of various data permits some conclusions and comparisons within the report period as well as in the light of previous fallout periods. Activity graphs and an appendix of data with brief description of methods employed are submitted.

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During the report period, fallout data was collected by LRL by both the Berkeley and Livermore sites. These sites are 45 miles apart in the San Francisco Bay Area in central California.

The Livermore data is confined to the collection of dust aerosols, as concentrated from air at 4 CFM on filters, and may be roughly divided into two categories of samplings: "daily" and "weekly." The daily sample is taken at a single on-site location whereas the weekly samples were taken at 11 places located 2 to 12 miles from the site.

The Berkeley data involves samples taken by various means:

- a) A "daily" dust aerosol concentrated from air at 4 CFM on filters.
- b) "Horizontal" fallout trays, at 5 locations on the project and one about 70 miles afield to the N. W.
- c) Vertical cloth screens, vane-guided to be normal to the to the prevailing wind, at the same six locations as in "b)."
- d) Rainwater samples, on site.
- e) Tap-water samples, on site (public water supply.)
- f) Gamma surveys at 3' above outdoor pavement, at author's residence 3 miles off site.

Items "a)" and "d)" have become routinized; "b)" and "c)" are exploratory in nature and the data are sparse; "e)" and "f)" were terminated prior to the conclusion of the period. A description of the methods employed will be found with the data in the appendix.

Herewith will be found copy of letter (MDT-611-58) presenting information covering a period of especial interest, namely Oct. 15--Nov. 10, 1958. This letter was a reply to the request of Gordon M. Dunning, Chief, Radiation Effects of Weapons Branch, DBM, AEC, Washington, D. C., in connection with the fallout incident which suffered some national and California publicity. Its data covers some information of non-LRL origin and differences in treatment of data are noted.

Attention is called to a correction in the factor employed for converting LRL Livermore counts-per-minute to  $\mu\text{c}/\text{m}^3$ . A critical re-examination of the counting equipment and procedures dictates the figure "17.9" should have read "24.8." This would have increased the magnitude but not the trends of the concentrations reported.

Examination of the information indicates the following:

- 1) A parallelism exists between the two sites in the daily samples, as to trend. (This testifies that the isotopes involved are not of local but rather are of external--or "fallout"--origin.)

On the whole, the Livermore values are higher than Berkeley's. The reason for this is not established, but other information (not in this report) suggests the possibility that greater area ventilation at Berkeley may be related, particularly in the windy months of June, July, and August.

- 2) Compared with previous years, an increase in averaged fallout concentrations was observed. (An estimated six fold in the last 7 years;  $1\frac{1}{2}$  fold since last year.)
- 3) A decrease in activity was noted as Hardtack I, progressed to a low in July and August. (A similar decrease was observed during June, July, and August of the previous three years.)
- 4) Hardtack I was preceded and followed by a period of activity 4-10 times greater. (Closely before, in time, to these peaks were two series of publicly-reported Soviet experiments. Causality is not rigidly demonstrated, but it is interesting to note this same picture also appeared in the 1957 and 1956 record.) Following the 1958 rise in mid-October, it was observed that during Hardtack II one fallout incident occurred which appeared clearly to be of continental origin.
- 5) Rainfall is not sufficiently frequent in the LRL area to reflect fallout trends during the spring, summer, and fall. Quantities of fallout material transiting the area concomitant with rain will bring substantial quantities to ground collectors. During Hardtack, 30 fold variations in radioactive rainfall (expressed as mc/mi<sup>2</sup>) were observed; such could not be related to air dusts sampled near ground level.
- 6) Based on sparse data, horizontal fallout trays and vertical cloth screens evaluated by radioautograph and/or counting techniques showed parallel trends to filter paper counting data.
- 7) No correlation was found between fallout variations in air or rainwater and gamma values 3 feet above ground. In fact the gamma values did not vary significantly over many months.
- 8) During the reporting period no correlation was apparent between tap-water and either rainfall activity or air dusts. (Prior to this period a heavy rainout was followed by a sharp increase in tap-water activity.)

APPENDIX

1. "Daily" Air Samples, LRL Berkeley
2. Air Samples, LRL Livermore
  - a) Air Intake, Bldg 125, "Daily"
  - b) Off Site, "Weekly"
3. Graph: Berkeley & Livermore "Daily" Air Samples
4. Rain Samples, LRL Berkeley
5. Tap Water Samples, LRL Berkeley
6. Tray and Cloth Samplers, LRL Berkeley
7. Gamma Survey Readings, LRL Berkeley
8. Copy of Letter MDT-611-58

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Air samples taken daily M, T, W, Th, F, and F - M at 4 CFM thru 4" x 9" HV-70 paper at Building 70 air intake. Beta-gamma activity estimated periodically thereafter by disposing collections about Geiger tube in 1" thick lead pig. Conversion to  $\mu\text{c}/\text{m}^3$  is obtained by the expression

$$\frac{\text{counts/min} \times 15.9}{\text{m}^3}$$

employing an average of 6 counting determinations for 1 minute for each entry. The instrument is standardized daily to a  $\text{U}^{238}$  foil cylinder sealed in epoxy resin. Background average for year is 21 counts per minute, maximum 26 c/m, minimum 16 c/m.

Alpha activity is determined on a proportional chamber gas-flow counter standardized daily to  $\text{Pu}^{239}$ . Background is 1 count per minute.

Sampling Times (PST) & Dates	Volume Cubic Meters	Net Counts Per Minute After Sampling Terminated (Figures in parentheses are hours and minutes decay)		$\mu\text{c}/\text{M}^3$
		Combined Beta-Gamma	Alpha	
0816 4/4 0804 4/7	487	226(0,44); 165(51,17)	114(0,34); 0(49,26)	5.38
0804 4/7 0759 4/8	162	160(0,45); 105(49,44)	145(0,34); 0(49,34)	10.3
0759 4/8 0750 4/9	161.8	69(0,40); 42(51,58)	98(0,37); 1(51,48)	4.13
0750 4/9 0744 4/10	161	40(0,58); 10(100,29)	130(0,48); 0(100,11)	0.99
0744 4/10 0744 4/11	162.8	105(1,6); 78(76,53)	84(0,55); 0(76,53)	7.62
0744 4/11 0807 4/14	490	492(1,17); 451(50,49)	114(0,48); 2(50,30)	14.62
0807 4/14 0744 4/15	160.1	168(1,15); 121(54,57)	164(1,6); 4(55,12)	12.01
0744 4/15 0733 4/16	161.4	112(1,17); 78(51,29)	105(1,5); 0(51,18)	7.68
0733 4/16 0752 4/17	164.8	54(1,2); 25(100,2)	93(0,52); 0(99,51)	2.41
0752 4/17 0751 4/18	162.6	38(1,8); 11(76,25)	76(0,56); 1(76,17)	1.08
0751 4/18 0820 4/21	498.2	284(0,49); 210(122,50)	217(0,40); 1(122,43)	6.70
0820 4/21 0800 4/22	160.4	72(0,59); 44(51,20)	84(0,49); 1(51,10)	4.36
0800 4/22 0816 4/23	164.5	103(0,43); 47(52,56)	186(0,33); 2(52,44)	4.54
0816 4/23 0808 4/24	161.8	111(0,47); 52(97,38)	202(0,38); 1(97,27)	5.11
0808 4/24 0812 4/25	162.2	83(1,8); 41(74,17)	148(0,58); 1(74,5)	4.02
0812 4/25 0743 4/28	484.7	186(0,57); 152(123,37)	145(0,47); 1(123,28)	4.99
0743 4/28 0805 4/29	165.2	103(0,44); 55(50,51)	172(0,33); 1(50,41)	5.29
0805 4/29 0807 4/30	162.9	112(0,40); 48(50,17)	213(0,29); 1(50,8)	4.69

Sampling Times (PST) & Dates	Volume Cubic Meters	Net Counts Per Minute After Sampling Terminated (Figures in parentheses are hours and minutes decay)		$\mu\text{c}/\text{M}^3$
		Combined Beta-Gamma	Alpha	
0807 4/30 0811 5/1	163.2	111(0,47); 54(98,40)	215(0,37); 0(98,24)	5.26
0811 5/1 0805 5/2	162.0	106(0,51); 100(75,9)	54(0,43); 0(74,58)	9.81
0805 5/2 0816 5/5	489.3	203(0,44); 176(50,58)	77(0,33); 2(50,47)	5.72
0816 5/5 0804 5/6	161.5	54(1,11); 27(50,53)	145(1,0); 0(50,26)	2.66
0804 5/6 0751 5/7	161.2	126(0,58); 84(51,10)	154(0,47); 3(50,59)	8.29
0751 5/7 0806 5/8	164.4	62(0,46); 41(101,36)	80(0,37); 0(101,20)	3.97
0806 5/8 0753 5/9	161.2	90(0,47); 38(78,17)	149(0,36); 1(78,3)	3.75
0753 5/9 0811 5/12	490.1	238(1,5); 206(50,44)	103(0,55); 2(50,31)	6.68
0811 5/12 0752 5/13	160.6	72(0,45); 53(53,20)	89(0,36); 1(53,11)	5.25
0752 5/13 0749 5/14	162.4	133(0,56); 85(51,47)	120(0,46); 3(51,36)	8.32
0749 5/14 1041 5/15	182.2	285(0,39); 95(95,54)	659(0,30); 1(95,43)	8.29
1041 5/15 0754 5/16	143.8	172(0,46); 100(75,12)	269(0,35); 0(75,1)	11.09
0754 5/16 0748 5/19	487.4	224(0,43); 209(49,50)	127(0,33); 3(49,37)	6.82
0748 5/19 0805 5/20	164.6	59(0,46); 50(50,21)	45(0,36); 1(50,11)	4.83
0805 5/20 0748 5/21	160.8	90(0,53); 89(52,11)	54(0,43); 2(52,2)	8.80
0748 5/21 0748 5/22	162.7	112(1,11); 67(99,12)	134(1,1); 0(99,12)	6.55
0748 5/22 0745 5/23	162.4	75(3,25); 50(80,19)	67(3,15); 0(80,15)	4.90
0745 5/23 0835 5/26	493.8	146(1,0); 137(55,41)	61(1,0); 2(55,36)	4.41

Sampling Times (PST) & Dates	Volume Cubic Meters	Net Counts Per Minute After Sampling Terminated (Figures in parentheses are hours and minutes decay)		$\mu\text{c}/\text{M}^3$
		Combined Beta-Gamma	Alpha	
0835 5/26 0925 5/27	163.8	54(1,5); 35(48,49)	58(1,5); 1(48,40)	3.40
0925 5/27 0809 5/28	154.1	31(7,40); 21(123,11)	33(7,35); 0(123,3)	2.27
0809 5/28 0830 5/29	165.0	84(0,34); 32(99,24)	141(0,25); 0(99,11)	3.08
0830 5/29 0805 6/2	648.0	159(2,3); 114(50,50)	42(1,57); 2(50,42)	2.80
0805 6/2 0812 6/3	163.5	62(1,31); 40(50,22)	38(1,26); 1(50,17)	3.89
0812 6/3 0830 6/4	164.7	34(1,23); 17(50,5)	26(1,15); 0(49,55)	1.64
0830 6/4 0820 6/5	161.6	44(0,25); 18(98,34)	86(0,20); 0(98,25)	1.77
0820 6/5 0845 6/6	165.5	86(0,46); 31(75,0)	132(0,36); 0(74,50)	2.98
0845 6/6 0746 6/9	481.4	73(1,3); 54(50,3)	72(0,53); 2(49,52)	1.78
0746 6/9 0803 6/10	164.6	53(0,39); 24(49,11)	120(0,30); 0(49,2)	2.32
0803 6/10 0754 6/11	161.7	57(0,45); 29(50,51)	111(0,36); 2(50,39)	2.86
0754 6/11 1033 6/12	180.7	48(0,32); 20(96,21)	82(0,24); 2(96,9)	1.76
1033 6/12 0753 6/13	144.6	66(1,1); 20(75,31)	147(0,52); 1(75,21)	2.20
0753 6/13 0750 6/16	487.8	167(0,53); 114(50,41)	155(0,40); 3(50,31)	3.72
0750 6/16 0743 6/17	161.9	76(0,48); 44(50,50)	96(0,38); 2(50,39)	4.32
0743 6/17 0748 6/18	163.3	70(0,49); 49(53,38)	83(0,33); 1(53,22)	4.77
0748 6/18 0910 6/19	172.0	89(0,42); 60(97,35)	141(0,33); 0(97,22)	5.55
0910 6/19 0906 6/20	162.2	94(0,38); 59(74,5)	117(0,29); 1(73,54)	5.78

Sampling Times (PST) & Dates	Volume Cubic Meters	Net Counts Per Minute After Sampling Terminated (Figures in parentheses are hours and minutes decay)		$\mu\text{c}/\text{M}^3$
		Combined Beta-Gamma	Alpha	
0906 6/20 0801 6/23	480.7	89(0,56); 72(55,17)	83(0,47); 0(55,10)	2.38
0801 6/23 1420 6/24	205.6	78(0,48); 34(44,25)	44(0,53); 3(44,19)	2.63
1420 6/24 1040 6/25	137.8	104(0,35); 22(48,2)	212(0,32); 2(48,4)	2.54
1040 6/25 0854 6/26	150.8	80(0,33); 30(100,13)	101(0,58); 0(100,1)	3.16
0854 6/26 0900 6/27	163.4	124(0,43); 66(76,40)	142(0,37); 0(76,24)	6.42
0900 6/27 0822 6/30	482.7	140(1,31); 94(50,48)	152(1,8); 3(50,36)	3.10
0812 6/30 0752 7/1	160.4	63(0,44); 28(49,56)	138(0,33); 2(49,45)	2.78
0752 7/1 0745 7/2	161.9	25(1,40); 13(122,59)	54(1,30); 0(122,49)	1.28
0745 7/2 0756 7/3	163.9	36(0,52); 6(99,13)	124(0,43); 0(98,59)	0.58
0756 7/3 0810 7/7	652.4	46(0,42); 31(50,29)	98(0,33); 2(50,19)	0.76
0810 7/7 0714 7/8	156.4	44(0,55); 6(51,49)	92(0,45); 1(51,39)	0.61
0714 7/8 0739 7/9	165.6	95(0,52); 32(51,3)	193(0,42); 3(50,51)	3.07
0739 7/9 0742 7/10	163.0	114(1,2); 35(99,21)	256(0,51); 1(99,10)	3.41
0742 7/10 0734 7/11	161.8	64(0,53); 17(75,38)	181(0,41); 0(75,26)	1.67
0734 7/11 0746 7/14	489.5	82(0,58); 46(50,28)	63(0,49); 1(50,19)	1.49
0746 7/14 0736 7/15	161.6	48(0,36); 17(51,0)	71(0,26); 2(50,49)	1.67
0736 7/15 0737 7/16	162.8	35(0,55); 18(50,12)	80(0,44); 2(49,59)	1.76
0737 7/16 0740 7/17	163.0	41(1,1); 10(98,55)	53(0,49); 0(98,45)	0.98

Sampling Times (PST) & Dates	Volume Cubic Meters	Net Counts Per Minute After Sampling Terminated (Figures in parentheses are hours and minutes decay)		$\mu\text{mc}/\text{M}^3$
		Combined Beta-Gamma	Alpha	
0740 7/17 0723 7/18	160.8	33(1,0); 9(75,32)	87(0,48); 0(75,22)	0.89
0723 7/18 0803 7/21	492.6	84(0,48); 47(50,30)	123(0,38); 2(50,20)	1.52
0803 7/21 0749 7/22	161.1	32(0,44); 4(53,4)	92(0,33); 2(52,56)	0.39
0749 7/22 0742 7/23	161.9	31(0,49); 9(49,44)	67(0,39); 1(49,33)	0.85
0742 7/23 0734 7/24	161.8	24(0,52); 7(99,31)	40(0,42); 0(99,21)	0.68
0734 7/24 0735 7/25	162.8	48(0,36); 9(75,50)	113(0,27); 0(75,40)	0.88
0735 7/25 0748 7/28	489.6	34(1,6); 22(51,4)	84(0,56); 1(50,50)	0.71
0748 7/28 0742 7/29	162.0	21(1,10); 5(50,40)	63(1,0); 2(49,54)	0.49
0742 7/29 0735 7/30	161.9	41(0,46); 12(53,46)	120(0,40); 0(53,36)	1.18
0735 7/30 0748 7/31	164.2	61(1,0); 9(101,36)	177(0,48); 0(101,26)	0.87
0748 7/31 0755 8/1	163.5	40(2,40); 15(77,48)	68(2,29); 0(77,39)	1.46
0755 8/1 0825 8/4	491.5	133(1,10); 58(51,0)	206(1,0); 7(50,48)	1.88
0825 8/4 0805 8/5	160.4	59(1,5); 17(51,2)	178(0,57); 4(50,53)	1.69
0805 8/5 0819 8/6	164.3	78(0,51); 13(50,41)	236(0,42); 4(50,40)	1.26
0819 8/6 0805 8/7	161.4	47(1,1); 11(99,15)	170(0,49); 0(99,5)	1.08
0805 8/7 0740 8/8	159.9	28(1,33); 14(76,1)	57(1,27); 0(75,51)	1.39
0820 8/8 0805 8/11	487	134(1,39); 116(51,31)	80(1,30); 4(51,16)	3.5
0805 8/11 0805 8/12	162.7	80(1,32); 42(50,55)	138(1,24); 2(50,45)	4.11

Sampling Times (PST) & Dates	Volume Cubic Meters	Net Counts Per Minute After Sampling Terminated (Figures in parentheses are hours and minutes decay)		$\mu\text{c}/\text{M}^3$
		Combined Beta-Gamma	Alpha	
0805 8/12 0817 8/13	164.1	88(1,23); 30(53,28)	259(1,12); 3(53,18)	2.91
0817 8/13 0808 8/14	161.7	47(1,45); 20(99,17)	141(1,35); 1(99,8)	1.97
0808 8/14 0820 8/15	164.1	82(1,6); 18(74,39)	185(0,56); 1(74,29)	1.74
0820 8/15 0815 8/18	487.5	98(0,47); 57(50,55)	150(0,38); 3(50,45)	1.86
0815 8/18 0810 8/19	162.1	43(0,44); 17(50,41)	108(0,34); 3(50,29)	1.67
0810 8/19 0840 8/20	166.1	49(0,45); 14(49,51)	121(0,36); 2(49,41)	1.34
0840 8/20 0804 8/21	158.6	52(0,44); 15(99,23)	101(0,30); 0(99,16)	1.50
0804 8/21 0812 8/22	163.6	61(0,47); 10(75,37)	137(0,38); 0(75,27)	0.97
0812 8/22 0841 8/25	491.4	55(0,41); 21(49,50)	123(0,32); 4(49,41)	0.68
0841 8/25 0816 8/26	160.0	65(1,5); 8(50,54)	214(1,0); 4(50,45)	0.80
0816 8/26 0816 8/27	162.7	57(0,44); 7(51,22)	143(0,34); 3(51,13)	0.68
0816 8/27 0814 8/28	162.5	71(0,44); 36(122,34)	82(0,35); 0(122,22)	3.52
0818 8/28 0759 8/29	160.6	45(1,9); 23(99,12)	109(0,56); 0(99,2)	2.28
0759 8/29 0816 9/2	652.7	108(0,52); 47(50,59)	212(0,43); 4(50,52)	1.14
0816 9/2 0809 9/3	161.9	58(0,54); 29(50,46)	107(0,43); 3(50,36)	2.85
0809 9/3 0820 9/4	163.9	38(1,33); 15(98,53)	74(1,24); 1(98,43)	1.46
0820 9/4 0758 9/5	160.3	101(0,55); 26(75,35)	302(0,45); 1(75,24)	2.58
0759 9/5 0831 9/8	491.7	165(0,52); 130(50,24)	170(0,40); 6(50,12)	4.20

Sampling Times (FST) & Dates	Volume Cubic Meters	Net Counts Per Minute After Sampling Terminated (Figures in parentheses are hours and minutes decay)		$\mu\text{C}/\text{M}^3$
		Combined Beta-Gamma	Alpha	
0831 9/8 0827 9/9	162.2	80(0,47); 31(50,38)	146(0,36); 2(50,27)	3.04
0827 9/9 0812 9/10	161.0	31(0,48); 12(53,58)	51(0,38); 1(53,48)	1.19
0812 9/10 0810 9/11	162.5	37(1,0); 16(101,35)	71(0,46); 0(101,24)	1.57
0810 9/11 0813 9/12	163.0	50(0,49); 12(77,53)	94(0,39); 0(77,43)	1.17
0813 9/12 0818 9/15	488.7	182(0,48); 70(50,25)	383(0,40); 7(50,11)	2.28
0818 9/15 0806 9/16	161.3	135(0,46); 44(50,29)	340(0,36); 3(50,19)	4.34
0806 9/16 0816 9/17	163.8	168(0,54); 19(55,46)	468(0,45); 4(55,36)	1.84
0816 9/17 0755 9/18	160.3	78(1,39); 22(99,5)	235(1,3); 1(98,55)	2.18
0755 9/18 0837 9/19	167.4	204(0,47); 38(74,44)	514(0,37); 3(74,34)	3.61
0837 9/19 0816 9/22	485.7	157(1,5); 87(50,42)	212(0,55); 9(50,29)	2.85
0816 9/22 0825 9/23	163.7	129(0,47); 32(50,29)	387(0,38); 2(50,19)	3.11
0825 9/23 0816 9/24	161.7	69(1,31); 27(53,30)	156(1,22); 2(53,19)	2.66
0816 9/24 0826 9/25	163.8	118(0,51); 27(97,53)	351(0,42); 1(97,27)	2.62
0826 9/25 0810 9/26	160.9	83(1,29); 24(74,30)	137(1,20); 0(74,20)	2.38
0810 9/26 0800 9/29	487.0	160(0,53); 53(51,3)	360(0,42); 5(50,54)	1.73
0800 9/29 0805 9/30	163.3	121(0,50); 4(50,52)	285(0,39); 4(50,42)	0.39
0805 9/30 0856 10/1	168.5	150(0,49); 7(49,30)	489(0,31); 5(49,21)	0.66
0856 10/1 0810 10/2	157.5	171(0,42); 15(101,3)	502(0,34); 1(100,55)	1.51

Sampling Times (PST) & Dates	Volume Cubic Meters	Net Counts Per Minute After Sampling Terminated (Figures in parentheses are hours and minutes decay)		$\mu\text{c}/\text{M}^3$
		Combined Beta-Gamma	Alpha	
0810 10/2 0810 10/3	162.7	185(0,43); 20(77,22)	569(0,33); 1(77,14)	1.95
0810 10/3 0810 10/6	488.1	241(0,51); 153(50,44)	136(0,40); 3(50,35)	4.98
0810 10/6 0800 10/7	161.6	101(0,55); 37(51,36)	231(0,46); 4(51,7)	3.64
0800 10/7 0756 10/8	162.2	153(1,3); 30(123,45)	315(0,53); 0(123,35)	2.94
0756 10/8 0835 10/9	167.1	113(1,1); 20(100,44)	294(0,51); 0(100,35)	1.90
0835 10/9 0855 10/10	165.0	220(0,45); 19(76,46)	642(0,35); 1(76,34)	1.83
0855 10/10 0832 10/13	485.5	75(2,9); 33(51,15)	135(1,59); 4(50,56)	1.08
0832 10/13 0803 10/14	159.4	89(0,54); 22(49,39)	205(0,44); 6(49,28)	2.19
0803 10/14 0820 10/15	165.0	85(0,37); 11(26,21)	209(0,28); 3(26,12)	1.06
0820 10/15 0817 10/16	162.8	141(0,35); 20(98,39)	374 (0,25); 0(98,30)	1.95
0817 10/16 0759 10/17	161.1	363(0,54); 46(75,24)	1157(0,42); 1(75,7)	4.54
0759 10/17 0833 10/20	493.0	341(0,36); 229(55,54)	431(0,27); 3(55,44)	7.39
0833 10/20 0816 10/21	161.3	436(0,34); 298(51,5);	461(0,24); 7(51,2)	29.38
0816 10/21 0805 10/22	162.1	664(0,40); 370(50,51)	701(0,32); 8(51,22)	36.29
0805 10/22 0815 10/23	164.2	253(1,29); 152(98,52)	104(1,20); 0(99,2)	14.72
0815 10/23 0805 10/24	162.1	287(0,49); 170(75,44)	246(0,40); 2(75,33)	16.67
0805 10/24 0824 10/27	491.6	586(0,35); 421(53,44)	417(0,27); 6(53,32)	13.62
0824 10/27 0805 10/28	161.0	298(0,41); 125(51,12)	512(0,33); 8(51,1)	12.34

Sampling Times (PST) & Dates	Volume Cubic Meters	Net Counts Per Minute After Sampling Terminated (Figures in parentheses are hours and minutes decay)		$\mu\text{c}/\text{M}^3$
		Combined Beta-Gamma	Alpha	
0805 10/28 0740 10/29	161.0	469(3,13); 245(49,38)	651(3,3); 11(49,25)	24.20
0740 10/29 0827 10/30	168.2	579(0,53); 257(98,18)	767(0,43); 4(98,5)	24.29
0827 10/30 0756 10/31	159.7	462(0,40); 267(77,22)	248(0,32); 6(75,0)	26.58
0756 10/31 0829 11/3	497.9	1313(0,33); 873(50,5)	632(0,24); 20(49,20)	27.87
0829 11/3 0800 11/4	159.9	93(0,43); 33(54,35)	213(0,34); 2(54,24)	3.28
0800 11/4 0806 11/5	163.6	196(0,50); 91(55,27)	296(0,41); 4(55,22)	8.84
0806 11/5 0736 11/6	159.8	161(0,43); 44(99,38)	358(0,34); 0(99,22)	4.38
0736 11/6 0830 11/7	169.0	134(1,3); 20(75,8)	261(0,54); 0(74,58)	1.88
0834 11/7 0836 11/10	489.3	148(1,27); 93(48,42)	153(1,17); 5(48,32)	3.02
0840 11/10 0805 11/11	158.7	284(0,40); 140(53,35)	387(0,32); 0(53,16)	14.03
0805 11/11 0800 11/12	162.1	199(0,30); 47(49,56)	446(0,21); 2(49,47)	4.61
0800 11/12 0805 11/13	163.3	94(2,46); 58(98,48)	87(2,36); 1(98,38)	5.65
0805 11/13 0756 11/14	161.7	83(0,46); 50(75,24)	80(0,33); 0(75,13)	4.92
0756 11/14 0826 11/17	491.5	272(1,17); 177(49,16)	285(1,9); 8(49,6)	5.73

University of California Ernest O. Lawrence Radiation Laboratory  
Livermore, California

Air samples are taken daily on site and counted as described for UCRL-Berkeley (above) with the exception of a slightly different conversion factor, viz:

$$\frac{\text{counts/min} \times 24.8}{\text{m}^3}$$

Their Building 125 intake is the sampling location.

"Weekly" samples are taken using identical equipment and rates at 11 stations beyond the site and counted as above.

Air Samples LRL Livermore

Sampling Period	Volume Cubic Meters	Net Counts Per Minute After Sampling Terminated (Figures in parentheses are hours and minutes decay)		$\mu\text{pc}/\text{M}^3$
		Combined Beta-Gamma	Alpha	
4/4 4/7	489	140(0,6); 108(48,0)	167(0,4); 0(48,0)	5.5
4/7 4/8	163	174(0,6); 56(47,0)	196(0,4); 29(47,0)	8.5
4/8 4/9	156	129(0,6); 29(48,0)	276(0,4); 2(48,0)	4.6
4/9 4/10	163	204(0,6); 13(96,0)	794(0,4); 0(96,0)	2.0
4/10 4/11	163	176(0,6); 82(72,0)	287(0,4); 1(72,0)	12.5
4/11 4/14	489	642(0,6); 422(48,0)	491(0,4); 1(48,0)	21.4
4/14 4/16	329	559(0,6); 308(54,0)	738(0,4); 10(54,0)	22.6
4/16 4/17	163	61(0,6); 35(144,0)	36(0,4); 0(144,0)	5.3
4/17 4/18	163	73(0,6); 5(71,0)	93(0,4); 0(71,0)	0.8
4/18 4/21	481	442(0,6); 150(48,0)	448(0,4); 18(48,0)	7.7
4/21 4/22	163	106(0,6); 13(48,0)	136(0,4); 1(48,0)	2.0
4/22 4/23	163	154(0,6); 42(48,0)	341(0,4); 7(48,0)	6.4
4/23 4/24	163	223(0,6); 48(96,0)	279(0,4); 0(96,0)	7.3
4/24 4/25	163	380(0,6); 50(72,0)	526(0,4); 1(72,0)	7.6
4/25 4/28	489	264(0,6); 151(48,0)	137(0,4); 2(48,0)	7.7
4/28 4/29	163	132(0,6); 72(51,0)	215(0,4); 1(51,0)	11.0
4/29 4/30	163	324(0,6); 53(50,0)	878(0,4); 0(50,0)	8.1
4/30 5/1	170	545(0,6); 97(25,0)	207(0,4); 108(25,0)	15.6

Air Samples LRL Livermore

Sampling Period	Volume Cubic Meters	Net Counts Per Minute After Sampling Terminated (Figures in parentheses are hours and minutes decay)		$\mu\text{pc}/\text{M}^3$
		Combined Beta+Gamma	Alpha	
5/1 5/2	163	127(0,6); 68(72,0)	188(0,4); 4(72,0)	10.4
5/2 5/5	489	411(0,7); 247(48,0)	366(0,5); 3(48,0)	12.5
5/5 5/7	329	608(0,5); 154(48,0)	1282(0,3); 19(48,0)	12.0
5/7 5/8	163	134(0,13); 71(96,0)	306(0,10); 1(96,0)	10.8
5/8 5/9	163	416(0,4); 46(72,0)	970(0,2); 4(72,0)	7.0
5/9 5/12	495	236(0,8); 247(48,0)	170(0,6); 22(48,0)	12.4
5/12 5/13	170	477(0,6); 69(47,0)	1170(0,4); 11(47,0)	10.1
5/13 5/14	156	572(0,6); 73(48,0)	744(0,4); 4(48,0)	11.6
5/14 5/15	163	828(0,6); 87(96,0)	1175(0,4); 0(96,0)	13.2
5/15 5/16	163	608(0,6); 117(72,0)	1279(0,4); 0(72,0)	17.8
5/16 5/19	489	376(0,6); 227(48,0)	296(0,4); 0(48,0)	11.5
5/19 5/20	163	127(0,6); 44(48,0)	89(0,4); 0(48,0)	6.7
5/20 5/21	163	136(0,6); 95(48,0)	200(0,4); 4(48,0)	14.5
5/21 5/22	163	219(0,6); 39(97,0)	539(0,4); 0(97,0)	5.9
5/22 5/23	163	315(0,6); 57(73,0)	311(0,4); 0(73,0)	8.7
5/23 5/26	489	387(0,8); 140(48,0)	520(0,6); 8(48,0)	7.1
5/26 5/27	163	282(0,6); 42(48,0)	593(0,4); 15(48,0)	6.4
5/27 5/28	163	131(0,6); 27(121,0)	105(0,4); 0(121,0)	4.1

Air Samples LRL Livermore

Sampling Period	Volume Cubic Meters	Net Count Per Minute After Sampling Terminated (Figures in parentheses are hours and minutes decay)		µpc/M <sup>3</sup>
		Combined Beta-Gamma	Alpha	
5/28 5/29	163	334(0,6); 23(96,0)	726(0,4); 0(96,0)	3.5
5/29 6/2	652	258(0,6); 114(48,0)	551(0,4); 12(48,0)	4.3
6/2 6/3	163	175(0,6); 42(48,0)	166(0,4); 0(48,0)	6.4
6/3 6/4	163	483(0,6); 28(48,0)	1098(0,4); 35(48,0)	4.3
6/4 6/5	163	214(0,6); 36(96,0)	501(0,4); 0(96,0)	5.5
6/5 6/6	163	152(0,6); 29(72,0)	186(0,4); 2(72,0)	4.4
6/6 6/9	489	188(0,6); 62(72,0)	389(0,4); 0(72,0)	3.3
6/9 6/10	163	* 31(48,0)	* 0(48,0)	4.7
6/10 6/11	163	111(0,15); 27(48,0)	351(0,10); 2(48,0)	4.1
6/11 6/12	163	72(0,6); 7(96,0)	106(0,4); 0(96,0)	1.1
6/12 6/13	163	457(0,6); 31(72,0)	760(0,4); 3(72,0)	4.7
6/13 6/16	489	393(0,6); 148(48,0)	703(0,4); 20(48,0)	7.5
6/16 6/17	163	146(0,6); 29(48,0)	491(0,4); 7(48,0)	4.4
6/17 6/18	163	152(0,6); 38(48,0)	254(0,4); 0(48,0)	5.8
6/18 6/19	163	105(0,6); 51(96,0)	209(0,4); 0(96,0)	7.8
6/19 6/20	163	48(0,6); 68(72,0)	100(0,4); 0(72,0)	10.3
6/20 6/23	489	145(0,6); 105(48,0)	120(0,4); 0(48,0)	5.3

\* Not Determined

Air Samples LRL Livermore

Sampling Period	Volume Cubic Meters	Net Count Per Minute After Sampling Terminated (Figures in parentheses are hours and minutes decay)		$\mu\text{c}/\text{M}^3$
		Combined Beta-Gamma	Alpha	
6/23 6/24	163	65(0,6); 25(50,0)	123(0,4); 0(50,0)	3.8
6/24 6/25	163	426(0,8); 27(48,0)	404(0,6); 4(48,0)	4.1
6/25 6/26	176	189(0,6); 37(94,0)	199(0,4); 0(94,0)	5.2
6/26 6/27	149	183(0,6); 55(72,0)	301(0,4); 2(72,0)	9.2
6/27 6/30	489	513(0,8); 134(48,0)	1552(0,6); 8(48,0)	6.8
6/30 7/2	329	116(0,6); 71(120,0)	123(0,4); 1(120,0)	5.3
7/2 7/3	163	246(0,12); 6(96,0)	664(0,10); 0(96,0)	0.9
7/3 7/7	652	289(0,6); 94(48,0)	371(0,4); 13(48,0)	3.6
7/7 7/8	163	278(0,6); 42(48,0)	460(0,4); 10(48,0)	6.4
7/8 7/9	163	501(0,6); 30(50,0)	653(0,4); 21(50,0)	4.6
7/9 7/10	163	649(0,6); 134(96,0)	1590(0,4); 0(96,0)	20.4
7/10 7/11	176	450(0,6); 93(70,0)	1154(0,4); 3(70,0)	13.1
7/11 7/14	475	278(0,6); 96(48,0)	467(0,4); 11(48,0)	5.0
7/14 7/15	163	69(0,6); 28(48,0)	121(0,4); 1(48,0)	4.3
7/15 7/16	163	75(0,6); 21(48,0)	107(0,4); 2(48,0)	3.2
7/16 7/17	163	100(0,6); 21(96,0)	295(0,4); 0(96,0)	3.2
7/17 7/18	163	131(0,6); 22(72,0)	215(0,4); 1(72,0)	3.3
7/18 7/21	489	248(0,6); 69(48,0)	553(0,4); 17(48,0)	3.5

Air Samples LRL Livermore

Sampling Period	Volume Cubic Meters	Net Count Per Minute After Sampling Terminated (Figures in parentheses are hours and minutes decay)		$\mu\text{c}/\text{M}^3$
		Combined Beta-Gamma	Alpha	
7/21 7/22	163	147(0,6); 6(47,0)	382(0,4); 14(47,0)	0.9
7/22 7/23	163	134(0,6); 21(47,0)	251(0,4); 7(47,0)	3.2
7/23 7/24	156	195(0,6); 28(97,0)	300(0,4); 0(97,0)	4.5
7/24 7/25	163	271(0,6); 22(73,0)	532(0,4); 4(73,0)	3.3
7/25 7/28	495	205(0,6); 58(48,0)	610(0,4); 2(48,0)	2.9
7/28 7/29	163	190(0,6); 74(49,0)	713(0,4); 2(49,0)	11.3
7/29 7/30	163	233(0,6); 23(48,0)	422(0,4); 3(48,0)	3.5
7/30 7/31	170	503(0,6); 80(97,0)	1919(0,4); 0(97,0)	11.7
7/31 8/1	156	439(0,6); 47(74,0)	1165(0,4); 1(74,0)	7.5
8/1 8/4	502	460(0,6); 153(46,0)	989(0,4); 23(46,0)	7.6
8/4 8/5	149	30(0,22); 12(53,0)	25(0,20); 0(53,0)	2.0
8/5 8/11	977	270(0,22); 79(47,0)	376(0,20); 9(47,0)	2.0
8/11 8/12	163	455(0,6); 58(48,0)	907(0,4); 4(48,0)	8.8
8/12 8/13	163	496(0,6); 55(48,0)	1731(0,4); 16(46,0)	8.4
8/13 8/14	163	416(0,6); 25(97,0)	1590(0,4); 0(97,0)	3.8
8/14 8/15	163	548(0,6); 54(73,0)	1248(0,4); 0(73,0)	8.2
8/15 8/18	495	250(0,22); 89(47,0)	513(0,20); 0(47,0)	4.5
8/18 8/19	163	235(0,7); 31(47,0)	659(0,5); 1(47,0)	4.7

Air Samples LRL Livermore

Sampling Period	Volume Cubic Meters	Net Count Per Minute After Sampling Terminated (Figures in parentheses are hours and minutes decay)		$\mu\text{c}/\text{M}^3$
		Combined Beta-Gamma	Alpha	
8/19 8/20	156	211(0,6); 20(48,0)	557(0,4); 2(48,0)	3.0
8/20 8/21	163	266(0,6); 24(72,0)	821(0,4); 0(72,0)	3.7
8/21 8/25	909	248(0,5); 52(46,0)	550(0,3); 6(46,0)	2.5
8/25 8/26	143	351(0,6); 43(48,0)	672(0,4); 9(48,0)	7.5
8/26 8/27	163	365(0,6); 56(48,0)	395(0,4); 12(48,0)	8.5
8/27 8/28	163	208(0,5); 21(120,0)	623(0,3); 0(120,0)	3.2
8/28 8/29	163	359(0,6); 10(96,0)	1328(0,4); 0(96,0)	1.5
8/29 9/2	652	495(0,6); 73(48,0)	1194(0,4); 17(48,0)	2.8
9/2 9/3	163	354(0,6); 36(48,0)	1096(0,4); 21(48,0)	5.5
9/3 9/4	163	322(0,6); 29(48,0)	1092(0,4); 15(48,0)	4.4
9/4 9/5	163	753(0,6); 41(72,0)	2176(0,4); 8(72,0)	6.2
9/5 9/6	163	858(0,6); 78(48,0)	3242(0,4); 17(48,0)	11.9
9/6 9/8	329	897(0,6); 94(48,0)	2035(0,4); 32(48,0)	7.1
9/8 9/9	170	350(0,6); 26(48,0)	1023(0,4); 8(48,0)	3.8
9/9 9/10	156	130(0,6); 7(48,0)	8(0,4); 0(48,0)	1.1
9/10 9/11	163	123(0,6); 8(96,0)	293(0,4); 13(96,0)	1.2
9/11 9/12	163	107(0,6); 46(77,0)	129(0,4); 1(77,0)	7.0
9/12 9/13	163	118(0,20); 2(53,0)	326(0,26); 2(53,0)	0.3

Air Samples LRL Livermore

Sampling Period	Volume Cubic Meters	Net Count Per Minute After Sampling Terminated (Figures in parentheses are hours and minutes decay)		$\mu\text{c}/\text{M}^3$
		Combined Beta-Gamma	Alpha	
9/13 9/15	329	301(5 hrs.); 41(48,0)	568(5 hrs.); 23(48,0)	3.1
9/15 9/16	163	1040(0,6); 70(48,0)	2807(0,4); 56(48,0)	10.6
9/16 9/17	163	750(0,6); 49(48,0)	1892(0,4); 20(48,0)	7.5
9/17 9/18	163	912(0,6); 76(53,0)	2898(0,4); 48(53,0)	11.6
9/18 9/19	163	177(0,6); 22(72,0)	619(0,4); 3(72,0)	3.3
9/19 9/20	163	245(0,6); 44(48,0)	706(0,4); 13(48,0)	6.7
9/20 9/22	329	424(0,6); 71(48,0)	903(0,4); 6(48,0)	5.4
9/22 9/23	163	273(0,6); 44(48,0)	854(0,4); 8(48,0)	6.7
9/23 9/24	163	70(0,6); 7(48,0)	18(0,4); 2(48,0)	1.1
9/24 9/25	163	679(0,6); 33(48,0)	2406(0,4); 30(48,0)	5.0
9/25 9/26	163	456(0,6); 25(72,0)	1850(0,4); 7(72,0)	3.8
9/26 9/27	163	728(0,6); 31(48,0)	3097(0,4); 35(48,0)	4.7
9/27 9/29	329	816(0,6); 40(50,0)	3434(0,4); 51(50,0)	
9/29 9/30	176	629(0,6); 23(46,0)	2185(0,4); 38(46,0)	3.2
9/30 10/1	163	628(0,6); 26(47,0)	2812(0,4); 63(47,0)	4.0
10/1 10/2	156	459(0,6); 24(48,0)	2053(0,4); 50(48,0)	3.8
10/2 10/3	163	782(0,6); 31(47,0)	3688(0,4); 12(49,0)	4.7

Air Samples IRL Livermore

Sampling Period	Volume Cubic Meters	Net Count Per Minute After Sampling Terminated (Figures in parentheses are hours and minutes decay)		$\mu\text{c}/\text{M}^3$
		Combined Beta-Gamma	Alpha	
10/3 10/4	163	838(0,6); 23(55,0)	3245(0,4); 13(55,0)	3.5
10/4 10/6	332	188(0,5); 71(48,0)	276(0,3); 0(48,0)	5.3
10/6 10/7	163	336(0,6); 33(48,0)	1300(0,4); 17(48,0)	5.0
10/7 10/8	163	954(0,6); 44(48,0)	3035(0,4); 63(48,0)	6.7
10/8 10/9	163	184(0,6); 22(48,0)	789(0,4); 16(48,0)	3.3
10/9 10/10	163	547(0,6); 26(72,0)	2969(0,4); 5(72,0)	4.0
10/10 10/11	163	682(0,6); 36(48,0)	3256(0,4); 11(48,0)	5.5
10/11 10/13	329	1164(0,6); 48(48,0)	3212(0,4); 45(48,0)	3.6
10/13 10/14	163	768(0,6); 42(48,0)	976(0,4); 41(48,0)	6.4
10/14 10/15	163	508(0,6); 23(48,0)	1262(0,4); 24(48,0)	3.5
10/15 10/16	163	544(0,6); 29(48,0)	1249(0,4); 34(48,0)	4.4
10/16 10/17	163	1349(0,6); 46(72,0)	3765(0,4); 12(72,0)	7.0
10/17 10/18	163	342(0,6); 37(48,0)	873(0,4); 17(48,0)	5.6
10/18 10/20	329	566(0,6); 276(48,0)	757(0,4); 24(48,0)	20.8
10/20 10/21	163	583(0,6); 288(48,0)	1137(0,4); 30(48,0)	44.0
10/21 10/22	163	1174(0,6); 275(48,0)	3465(0,4); 63(48,0)	41.8
10/22 10/23	156	377(0,26); 55(98,0)	665(0,24); 6(98,0)	8.8

Air Samples LRL Livermore

Sampling Period	Volume Cubic Meters	Net Count Per Minute After Sampling Terminated (Figures in parentheses are hours and minutes decay)		$\mu\text{c}/\text{M}^3$
		Combined Beta-Gamma	Alpha	
10/23 10/24	163	* 59(72,0)	* 2(72,0)	9.0
10/24 10/25	163	886(0,6); 154(48,0)	2665(0,4); 35(48,0)	23.6
10/25 10/27	329	1312(0,6); 273(48,0)	3548(0,4); 65(48,0)	20.6
10/27 10/28	163	935(0,6); 96(48,0)	2658(0,4); 42(48,0)	14.6
10/28 10/29	163	1553(0,6); 286(48,0)	5096(0,4); 75(48,0)	43.5
10/29 10/30	163	1494(0,6); 235(104,0)	4147(0,4); 0(104,0)	35.8
10/30 10/31	163	15,722(0,6); 3383(72,0)	3565(0,4); 31(72,0)	51.5
10/31 11/1	163	* 1123(75,0)	* 23(75,0)	17.1
11/1 11/3	329	1694(0,6); 618(49,0)	3712(0,4); 73(49,0)	46.5
11/3 11/4	170	395(0,7); 81(47,0)	921(0,5); 28(47,0)	11.8
11/4 11/5	156	536(0,6); 68(48,0)	1308(0,4); 27(48,0)	10.8
11/5 11/6	163	1124(0,6); 56(96,0)	3265(0,4); 2(96,0)	8.5
11/6 11/7	163	914(0,6); 32(72,0)	3046(0,4); 11(72,0)	4.9
11/7 11/10	489	173(0,6); 66(48,0)	342(0,4); 9(48,0)	3.3
11/10 11/11	163	635(0,6); 45(49,0)	2251(0,4); 34(49,0)	16.8
11/11 11/12	163	1051(0,6); 127(48,0)	2871(0,4); 45(48,0)	19.3
11/12 11/13	163	1096(0,3); 40(96,0)	2688(0,2); 4(96,0)	6.1

\* Not Determined

Air Samples LRL Livermore

Sampling Period	Volume Cubic Meters	Net Count Per Minute After Sampling Terminated (Figures in parentheses are hours and minutes decay)		$\mu\text{c}/\text{M}^3$
		Combined Beta-Gamma	Alpha	
11/13 11/14	163	55(0,6); 8(72,0)	116(0,4); 2(72,0)	1.2
11/14 11/17	489	1109(0,6); 166(50,0)	3235(0,4); 21(50,0)	8.4

## Air Samples, Off Site, LRL Livermore

(1) Location: Water Tank

Sampling Period	Volume Cubic Meters	Net Counts Per Minute After Sampling Terminated (Figures in parentheses are hours decay)		µmc/M <sup>3</sup>
		Combined Beta-Gamma	Alpha	
1140 4/1 1430 4/8	1160	359(67)	0(67)	7.7
1430 4/8 1300 4/15	1132	796(48)	10(48)	17.4
1300 4/15 1235 4/22	1140	278(51)	4(51)	6.1
1235 4/22 1250 4/29	1140	342(48)	4(48)	7.4
1250 4/29 1215 5/6	1132	565(51)	7(51)	12.4
1215 5/6 1330 5/13	1148	389(50)	3(50)	8.4
1330 5/13 1200 5/20	1132	630(51)	0(51)	13.8
1200 5/20 1300 5/27	1148	336(51)	0(51)	7.3
1300 5/27 1350 6/3	1148	144(49)	0(49)	3.1
1350 6/3 1330 6/17	2280	367(50)	0(50)	4.0
1330 6/17 1320 6/24	1140	536(26)	0(26)	11.7
1320 6/24 1330 7/1	1140	352(48)	2(48)	7.7
1330 7/1 1320 7/8	1140	130(49)	1(49)	2.8
1320 7/8 1250 7/15	1140	384(50)	2(50)	8.4
1250 7/15 1330 8/5	3425	552(48)	0(48)	4.0
1330 8/5 1320 8/12	1140	325(49)	0(49)	7.1
1320 8/12 1335 8/19	1140	271(47)	0(47)	5.9
1335 8/19 1400 8/26	1140	169(49)	17(49)	3.7

Air Samples, Off Site, LRL Livermore  
(1) Location: Water Tank

Sampling Period	Volume Cubic Meters	Net Counts Per Minute After Sampling Terminated (Figures in parentheses are hours decay)			ppc/M <sup>3</sup>
		Combined Beta-Gamma	Alpha		
1400 8/26 1255 9/3	1296	183(49)	17(49)	3.5	
1255 9/3 1300 9/9	976	227(50)	0(50)	5.8	
1300 9/9 1320 10/14	4560	999(48)	27(48)	5.4	
1320 10/14 1240 10/21	1132	815(50)	24(50)	17.9	
1240 10/21 1315 10/28	1148	1034(50)	27(50)	22.4	
1315 10/28 1415 10/31	495	5420(93)	36(93)	27.2	
1415 10/31 1010 11/1	136	720(73)	19(73)	13.1	
1010 11/1 1220 11/18	1128	479(50)	6(50)	10.5	

Air Samples, Off Site, LRL Livermore  
(2) Location: Patterson Pass(Upper)

Sampling Period	Volume Cubic Meters	Net Counts Per Minute After Sampling Terminated (Figures in parentheses are hours decay)		
		Combined Beta-Gamma	Alpha	µmc/M <sup>3</sup>
1150 4/1 1450 4/8	1160	360(67)	4(67)	7.7
1450 4/8 1315 4/15	1132	728(48)	13(48)	16.0
1315 4/15 1250 4/22	1140	344(51)	0(51)	7.5
1250 4/22 1305 4/29	1140	327(48)	2(48)	7.1
1305 4/29 1230 5/6	1132	462(50)	9(50)	10.1
1230 5/6 1340 5/13	1148	345(50)	5(50)	7.5
1340 5/13 1210 5/20	1132	494(51)	0(51)	10.8
1210 5/20 1310 5/27	1148	168(51)	0(51)	3.6
1310 5/27 1400 6/3	1148(51)	140(49)	0(49)	3.0
1400 6/3 1350 6/17	2280	363(50)	6(50)	4.0
1350 6/17 1345 6/24	1140	380(26)	4(26)	8.3
1345 6/24 1345 7/1	1140	324(49)	0(49)	7.1
1345 7/1 1340 7/8	1140	146(49)	1(49)	3.2
1340 7/8 1300 7/15	1132	580(49)	0(49)	12.7
1300 7/15 1345 7/22	1148	203(45)	10(45)	4.4
1345 7/22 1300 7/29	1132	158(50)	0(50)	3.5
1300 7/29 1345 8/5	1148	528(48)	0(48)	11.4
1345 8/5 1340 8/12	1140	401(49)	5(49)	8.7

Air Samples, Off Site, LRL Livermore  
 (2) Location: Patterson Pass(Upper)

Sampling Period	Volume Cubic Meters	Net Counts Per Minute After Sampling Terminated (Figures in parentheses are hours decay)		
		Combined Beta-Gamma	Alpha	µc/M <sup>3</sup>
1340 8/12 1350 8/19	1140	463(47)	0(47)	10.1
1350 8/19 1415 8/26	1140	205(49)	33(49)	4.9
1415 8/26 1310 9/3	1296	287(49)	25(49)	5.5
1310 9/3 1315 9/9	976	443(49)	17(49)	11.3
1315 9/9 1330 9/16	1140	211(49)	10(49)	4.6
1330 9/16 1330 9/23	1140	314(49)	8(49)	6.8
1330 9/23 1335 9/30	1140	216(49)	41(49)	4.7
1335 9/30 1340 10/7	1140	237(49)	21(49)	5.2
1340 10/7 1335 10/14	1140	226(48)	25(48)	4.9
1335 10/14 1300 10/21	1132	751(50)	33(50)	16.4
1300 10/21 1330 10/28	1140	1265(50)	29(50)	27.6
1330 10/28 1130 11/1	638	21135(52)	102(52)	82.2
1130 11/1 1410 11/4	509	601(49)	17(49)	29.3
1410 11/4 1420 11/11	1140	82(54)	2(54)	1.8
1420 11/11 1310 11/18	1132	589(50)	36(50)	14.1

## Air Samples, Off Site, LRL Livermore

(3) Location: Patterson Pass (Lower)

Sampling Period	Volume Cubic Meters	Net Counts Per Minute After Sampling Terminated (Figures in parentheses are hours decay)			µpc/M <sup>3</sup>
		Combined Beta-Gamma	Alpha		
1200 4/8 1440 4/8	1153	406(67)	4(67)	8.7	
1440 4/8 1325 4/15	1132	676(48)	17(48)	14.8	
1325 4/15 1300 4/22	1140	300(50)	0(50)	6.5	
1300 4/22 1315 4/29	1140	490(48)	0(48)	10.7	
1315 4/29 1240 5/6	1132	491(50)	15(50)	10.8	
1240 5/6 1350 5/13	1148	441(50)	5(50)	9.5	
1350 5/13 1220 5/20	1132	530(51)	0(51)	11.6	
1220 5/20 1320 5/27	1148	348(51)	0(51)	7.5	
1320 5/27 1410 6/3	1148	140(49)	0(49)	3.0	
1410 6/3 1400 6/17	2280	327(50)	2(50)	3.6	
1400 6/17 1345 6/24	1140	392(26)	0(26)	8.5	
1345 6/24 1350 7/1	1140	272(49)	0(49)	5.9	
1350 7/1 1350 7/8	1140	174(49)	3(49)	3.8	
1350 7/8 1315 7/15	1132	296(49)	2(49)	6.5	
1315 7/15 1355 7/22	1148	135(45)	0(45)	2.9	
1355 7/22 1310 7/29	1132	86(50)	0(50)	1.9	
1310 7/29 1355 8/5	1148	208(48)	0(48)	4.5	

Air Samples, Off Site, LRL Livermore  
 (3) Location: Patterson Pass(Lower)

Sampling Period	Volume Cubic Meters	Net Counts Per Minute After Sampling Terminated (Figures in parentheses are hours decay)		ppc/M <sup>3</sup>
		Combined Beta-Gamma	Alpha	
1355 8/5 1350 8/12	1140	233(49)	9(49)	5.1
1350 8/12 1345 8/19	1140	199(47)	1(47)	4.3
1345 8/19 1425 8/26	1148	209(49)	21(49)	4.5
1425 8/26 1315 9/3	1296	185(49)	21(49)	3.5
1315 9/3 1320 9/9	976	211(49)	1(49)	5.4
1320 9/9 1335 9/16	1140	158(49)	41(49)	3.4
1335 9/16 1335 9/23	1140	151(49)	12(49)	3.3
1335 9/23 1340 9/30	1140	160(49)	29(49)	3.5
1340 9/30 1330 10/7	1140	393(49)	5(49)	8.5
1330 10/7 1345 10/14	1140	145(48)	18(48)	3.2
1345 10/14 1310 10/21	1132	652(50)	19(50)	14.3
1310 10/21 1340 10/28	1140	949(50)	24(50)	20.6
1340 10/28 1140 11/1	638	698(52)	79(52)	27.2
1140 11/1 1400 11/4	502	438(49)	9(49)	21.6
1400 11/4 1430 11/11	<del>1140</del>	322(54)	2(54)	7.0
1430 11/11 1320 11/18	1132	339(49)	1(49)	7.4

Air Samples, Off Site, LRL Livermore  
(4) Location: Altamont Pass

Sampling Period	Volume Cubic Meters	Net Counts Per Minute After Sampling Terminated (Figures in parentheses are hours decay)			ppm/M <sup>3</sup>
		Combined Beta-Gamma	Alpha		
1215 4/1 1510 4/8	1160	435(67)	3(67)	9.3	
1510 4/8 1340 4/15	1132	732(48)	10(48)	16.1	
1340 4/15 1310 4/22	1140	284(50)	0(50)	6.2	
1310 4/22 1330 4/29	1140	477(48)	7(48)	10.4	
1330 4/29 1250 5/6	1132	535(50)	9(50)	11.7	
1250 5/6 1405 5/13	1148	405(49)	0(49)	8.7	
1405 5/13 1230 5/20	1128	598(50)	0(50)	13.2	
1230 5/20 1340 5/27	1148	396(51)	0(51)	8.5	
1340 5/27 1420 6/3	1148	300(49)	4(49)	6.5	
1420 6/3 1415 6/17	2280	151(50)	0(50)	1.6	
1415 6/17 1400 6/24	1140	208(25)	12(25)	4.5	
1400 6/24 1405 7/1	1140	244(49)	2(49)	5.3	
1405 7/1 1405 7/8	1140	138(48)	0(48)	3.0	
1405 7/8 1330 7/15	1132	392(49)	2(49)	8.6	
1330 7/15 1410 7/22	1148	175(45)	30(45)	3.8	
1410 7/22 1320 7/29	1132	162(50)	6(50)	3.5	
1320 7/29 1410 8/5	1148	484(48)	0(48)	10.5	

Air Samples, Off Site, LRL Livermore  
 (4) Location: Altamont Pass

Sampling Period	Volume Cubic Meters	Net Counts Per Minute After Sampling Terminated (Figures in parentheses are hours decay)		
		Combined Beta-Gamma	Alpha	ppc/M <sup>3</sup>
1410 8/5 1400 8/12	1140	285(49)	5(49)	6.2
1400 8/12 1405 8/19	1140	71(47)	0(47)	1.5
1405 8/19 1440 8/26	1148	261(48)	25(48)	5.6
1440 8/26 1330 9/3	1296	243(49)	9(49)	4.6
1330 9/3 1340 9/9	976	311(49)	25(49)	7.9
1340 9/9 1350 9/16	1140	240(49)	38(49)	5.2
1350 9/16 1345 9/23	1140	296(49)	7(49)	6.4
1345 9/23 1350 9/30	1140	176(49)	29(49)	3.8
1350 9/30 1350 10/7	1140	235(49)	12(49)	5.1
1350 10/7 1400 10/14	1140	325(48)	20(48)	7.1
1400 10/14 1330 10/21	1132	126(49)	0(49)	2.8
1330 10/21 1355 10/26	1140	2(50)	0(50)	0.0
1355 10/26 1155 11/1	638	16(52)	5(52)	0.6
1155 11/1 1420 11/4	509	1(49)	1(49)	0.0
1420 11/4 1340 11/18	1132	419(49)	31(49)	912.0

Air Samples, Off Site, LRL Livermore  
(5) Location: Vasco Road

Sampling Period	Volume Cubic Meters	Net Counts Per Minute After Sampling Terminated (Figures in parentheses are hours decay)		$\mu\text{C}/\text{M}^3$
		Combined Beta-Gamma	Alpha	
1230 4/1 1525 4/8	1160(5)	330(65)	3(65)	7.0
1525 4/8 1400 4/15	1132	774(48)	12(48)	17.0
1400 4/15 1330 4/22	1140	216(50)	0(50)	4.7
1300 4/22 1350 4/29	1140	463(48)	12(48)	8.8
1350 4/29 1310 5/6	1132	496(50)	37(50)	10.9
1310 5/6 1420 5/13	1148	685(49)	13(49)	14.8
1420 5/13 1245 5/20	1128	446(50)	4(50)	9.8
1245 5/20 1405 5/27	1148	428(51)	8(51)	9.3
1405 5/27 1440 6/3	1148	256(49)	0(49)	5.5
1440 6/3 1430 6/17	2280	363(49)	2(49)	4.0
1430 6/17 1425 6/24	1140	296(24)	0(24)	6.4
1425 6/24 1425 7/1	1140	204(49)	14(49)	4.4
1425 7/1 1420 7/8	1140	94(48)	21(48)	2.1
1420 7/8 1355 7/15	1140	340(49)	0(49)	7.4
1355 7/15 1425 7/22	1148	175(45)	6(45)	3.8
1425 7/22 1340 7/24	1132	202(50)	2(50)	4.4
1340 7/24 1420 8/5	1148	324(48)	4(48)	7.0
1420 8/5 1420 8/12	1140	245(49)	21(49)	5.3

Air Samples, Off Site, LRL Livermore  
 (5) Location: Vasco Road

Sampling Period	Volume Cubic Meters	Net Counts Per Minute After Sampling Terminated (Figures in parentheses are hours decay)		$\mu\text{Ac}/\text{M}^3$
		Combined Beta-Gamma	Alpha	
1420 8/12 1420 8/19	1140	291(47)	0(47)	6.3
1420 8/19 1455 8/26	1148	169(48)	61(48)	3.6
1455 8/26 1350 9/3	1296	231(48)	29(48)	4.4
1350 9/3 1350 9/9	976	283(49)	37(49)	7.2
1350 9/9 1405 9/16	1140	191(49)	63(49)	4.2
1405 9/16 1400 9/23	1140	252(49)	47(49)	5.5
1400 9/23 1405 9/30	1140	124(49)	33(49)	2.7
1405 9/30 1410 10/7	1140	349(49)	93(49)	7.6
1410 10/7 1410 10/14	1140	268(47)	42(268)	5.8
1410 10/14 1350 10/21	1140	835(49)	38(49)	18.2
1350 10/21 1410 10/28	1140	1229(50)	45(50)	26.7
1410 10/28 1210 11/1	<del>638</del>	3704(52)	108(52)	144.0
1210 11/1 1440 11/4	502	704(49)	24(49)	34.8
1440 11/4 1500 11/11	1140	501(54)	2(54)	10.9
1500 11/11 1355 11/18	1132	804(49)	48(49)	17.6

Air Samples, Off Site, LRL Livermore  
(6) Location: F. C. C.

Sampling Period	Volume Cubic Meters	Net Counts Per Minute After Sampling Terminated (Figures in parentheses are hours decay)			µmc/M <sup>3</sup>
		Combined Beta-Gamma	Alpha		
1330 3/25 1540 4/8	1160	399(66)	4(66)		8.5
1540 4/8 1415 4/15	1132	628(48)	47(48)		13.7
1415 4/15 1380 4/22	1140	264(50)	0(50)		5.7
1380 4/22 1400 4/29	1140	334(47)	8(47)		7.3
1400 4/29 1320 5/6	1132	486(50)	32(50)		10.6
1320 5/6 1435 5/13	1148	441(49)	41(49)		9.5
1435 5/13 1300 5/20	1128	578(50)	0(50)		12.7
1300 5/20 1420 5/27	1148	460(50)	12(50)		9.9
1420 5/27 1450 6/3	1140	232(48)	20(48)		5.0
1450 6/3 1445 6/17	2280	479(49)	10(49)		5.2
1445 6/17 1440 6/24	1140	372(25)	24(25)		8.1
1440 6/24 1440 7/1	1140	268(48)	6(48)		5.8
1440 7/1 1435 7/8	1140	142(48)	21(48)		3.1
1435 7/8 1405 7/15	1140	368(48)	6(48)		8.0
1405 7/15 1440 7/22	1148	171(45)	10(45)		3.7
1440 7/22 1350 7/29	1132	150(50)	0(50)		3.3
1350 7/29 1435 8/5	1148	404(48)	10(48)		8.7

Air Samples, Off Site, LRL Livermore  
 (6) Location: F. C. C.

Sampling Period	Volume Cubic Meters	Net Counts per Minute After Sampling Terminated (Figures in parentheses are hours decay) Combined Beta-Gamma	Alpha	$\mu\text{C}/\text{M}^3$
1435 8/5 1440 8/12	1140	313(48)	21(48)	6.8
1440 8/12 1435 8/19	1140	295(47)	29(47)	6.4
1435 8/19 1510 8/26	1148	241(48)	109(48)	5.2
1510 8/26 1400 9/3	1296	219(48)	85(48)	4.2
1400 9/3 1400 9/9	976	239(49)	41(49)	6.1
1400 9/9 1415 9/16	1140	288(49)	277(49)	6.3
1415 9/16 1410 9/23	1140	281(49)	49(49)	6.1
1410 9/23 1415 9/30	1140	212(49)	157(49)	4.6
1415 9/30 1420 10/7	1140	509(48)	149(48)	11.1
1420 10/7 1425 10/14	1140	445(47)	219(47)	9.7
1425 10/14 1405 10/21	1140	937(49)	71(49)	20.4
1405 10/21 1420 10/28	1140	1261(49)	295(49)	27.4
1420 10/28 1220 11/1	638	3519(51)	218(51)	137.0
1220 11/1 1455 11/4	502	616(48)	50(48)	30.5
1455 11/4 1510 11/11	1140	522(54)	118(54)	11.4
1510 11/11 1410 11/18	1132	657(49)	34(49)	14.8

Air Samples, Off Site, LRL Livermore  
(7) Location: City Hall, Livermore

Sampling Period	Volume Cubic Meters	Net Counts Per Minute After Sampling Terminated (Figures in parentheses are hours decay)		
		Combined Beta-Gamma	Alpha	ppm/M <sup>3</sup>
1255 4/1 1315 4/8	1140	386(67)	4(67)	8.4
1315 4/8 1430 4/15	1128	1299(48)	14(48)	28.6
1430 4/15 1400 4/22	1140	312(49)	0(49)	6.8
1400 4/22 1410 4/29	1140	467(47)	1(47)	10.2
1410 4/29 1330 5/6	1132	580(50)	13(50)	12.7
1330 5/6 1445 5/13	1148	377(49)	5(49)	8.1
1445 5/13 1215 5/20	1128	306(49)	0(49)	6.7
1215 5/20 1435 5/27	1153	432(50)	0(50)	9.3
1435 5/27 1500 6/3	1140	240(48)	0(48)	5.2
1500 6/3 1510 6/17	2280	451(48)	2(48)	4.5
1510 6/17 1455 6/24	1140	388(25)	0(25)	8.4
1455 6/24 1455 7/1	1140	356(48)	6(48)	7.7
1455 7/1 1455 7/8	1140	70(48)	5(48)	1.5
1455 7/8 1425 7/15	1140	336(48)	6(48)	7.3
1425 7/15 1450 7/22	1140	79(44)	0(44)	1.7
1450 7/22 1400 7/29	1132	118(50)	0(50)	2.5
1400 7/29 1445 8/5	1148	180(47)	10(47)	3.9

Air Samples, Off Site, LRL Livermore  
 (7) Location: City Hall, Livermore

Sampling Period	Volume Cubic Meters	Net Counts Per Minute After Sampling Terminated (Figures in parentheses are hours decay)		$\mu\text{pc}/\text{M}^3$
		Combined Beta-Gamma	Alpha	
1445 8/5 1440 8/19	2280	0(46)	0(46)	0.0
1440 8/19 1520 8/26	1148	129(48)	11(48)	2.8
1520 8/26 1420 9/3	1296	203(48)	13(48)	3.9
1420 9/3 1430 9/16	1140	512(48)	17(48)	11.1
1430 9/16 1425 9/23	1140	196(49)	21(49)	4.3
1425 9/23 1430 9/30	1140	152(48)	17(48)	3.3
1430 9/30 1435 10/7	1140	361(48)	137(48)	7.6
1435 10/7 1440 10/19	1140	113(47)	17(47)	2.5
1440 10/19 1430 10/21	1140	719(48)	31(48)	15.6
1430 10/21 1440 10/28	1140	1096(49)	41(49)	23.8
1440 10/28 1430 10/31	439	5449(73)	56(73)	276.0
1430 10/31 1240 11/1	149	746(51)	34(51)	124.0
1240 11/1 1510 11/4	502	598(48)	23(48)	29.5
1510 11/4 1420 11/8	2275	853(49)	23(49)	63.6

## Air Samples, Off Site, LRL Livermore

(8) Location: Veterans Hospital

Sampling Period	Volume Cubic Meters	Net Counts Per Minute After Sampling Terminated (Figures in parentheses are hours decay)		ppc/M <sup>3</sup>
		Combined Beta-Gamma	Alpha	
1315 4/1 1345 4/8	1140	515(68)	1(68)	11.2
1345 4/8 1500 4/15	1128	723(47)	6(47)	15.9
1500 4/15 1420 4/22	1132	352(49)	0(49)	7.7
1420 4/22 1430 4/29	1140	437(47)	7(47)	9.5
1430 4/29 1455 5/6	1140	397(48)	3(48)	8.6
1455 5/6 1515 5/13	1140	105(48)	1(48)	2.3
1515 5/13 1345 5/20	1128	518(49)	8(49)	11.4
1345 5/20 1450 5/27	1148	368(50)	0(50)	7.9
1450 5/27 1515 6/3	1140	272(48)	0(48)	5.9
1515 6/3 1525 6/17	2280	451(48)	2(48)	4.9
1525 6/17 1510 6/24	1140	308(24)	4(24)	6.7
1510 6/24 1515 7/1	1140	300(48)	2(48)	6.5
1515 7/1 1505 7/8	1140	130(48)	5(48)	2.8
1505 7/8 1445 7/15	1140	416(48)	2(48)	9.0
1445 7/15 1502 7/22	1140	211(44)	2(44)	4.6
1502 7/22 1420 7/29	1132	122(49)	0(49)	2.7
1420 7/29 1500 8/5	1140	420(47)	2(47)	9.1

Air Samples, Off Site, LRL Livermore  
 (8) Location: Veterans Hospital

Sampling Period	Volume Cubic Meters	Net Counts Per Minute After Sampling Terminated (Figures in parentheses are hours decay)		$\mu\text{pc}/\text{M}^3$
		Combined Beta-Gamma	Alpha	
1500 8/5 1510 8/12	1140	281(48)	1(48)	6.1
1510 8/12 1515 8/19	1140	267(46)	0(46)	5.8
1515 8/19 1540 8/26	1140	233(47)	9(47)	5.1
1540 8/26 1500 9/3	1296	243(47)	9(47)	4.6
1500 9/3 1440 9/9	976	259(48)	5(48)	6.6
1440 9/9 1500 9/16	1140	203(48)	12(48)	4.4
1500 9/16 1450 9/23	1140	17(48)	2(48)	0.4
1450 9/23 1500 10/7	2280	73(48)	1(48)	0.8
1500 10/7 1505 10/14	1140	6(47)	2(47)	0.1
1505 10/14 1455 10/21	1140	37(48)	0(48)	0.8
1455 10/21 1500 10/28	1140	40(49)	0(49)	0.9
1500 10/28 1300 11/1	638	526(51)	3(51)	20.4
1300 11/1 1530 11/4	502	25(48)	0(48)	1.2
1530 11/4 1535 11/11	1140	402(53)	6(53)	8.7
1535 11/11 1510 11/18	1140	522(48)	19(48)	11.4

Air Samples, Off Site, LRL Livermore  
(9) Location: Mines Road

Sampling Period.	Volume Cubic Meters	Net Counts Per Minute After Sampling Terminated (Figures in parentheses are hours decay)		
		Combined Beta-Gamma	Alpha	$\mu\text{mc}/\text{M}^3$
1420 4/12 1410 4/8	1140	360(66)	0(66)	7.8
1410 4/8 1540 4/15	1132	607(46)	1(46)	13.3
1540 4/15 1540 4/29	1140	279(47)	6(47)	6.1
1540 4/29 1520 5/6	1140	232(48)	9(48)	5.0
1520 5/6 1540 5/13	1140	313(48)	13(48)	6.8
1540 5/13 1450 5/20	1132	354(48)	0(48)	7.7
1450 5/20 1530 5/27	1148	228(49)	4(49)	4.9
1530 5/27 1610 6/3	1148	226(47)	0(47)	4.9
1610 6/3 1620 6/17	2280	391(48)	10(48)	4.3
1620 6/17 1610 6/24	1140	268(24)	4(24)	5.8
1610 6/24 1545 7/1	1140	412(47)	0(47)	9.0
1545 7/1 1610 7/8	1140	150(47)	1(47)	3.3
1610 7/8 1550 7/15	1140	476(47)	2(47)	10.4
1550 7/15 1600 7/22	1140	191(43)	2(43)	4.2
1600 7/22 1540 7/29	1140	122(48)	0(48)	2.7
1540 7/29 1545 8/5	1140	148(46)	0(46)	3.2

Air Samples, Off Site, LRL Livermore  
 (9) Location: Mines Road

Sampling Period	Volume Cubic Meters	Net Counts Per Minute After Sampling Terminated (Figures in Parentheses are hours decay)		$\mu\text{c}/\text{M}^3$
		Combined Beta-Gamma	Alpha	
1545 8/5 1600 8/12	1140	313(47)	1(47)	6.8
1600 8/12 1535 8/19	1140	315(46)	0(46)	6.8
1535 8/19 1630 8/26	1148	269(47)	17(47)	5.8
1630 8/26 1550 9/3	1296	289(47)	33(47)	5.5
1550 9/3 1550 9/9	976	199(47)	0(47)	5.0
1550 9/9 1545 9/16	1140	225(47)	10(47)	4.9
1545 9/16 1535 9/23	1140	281(48)	5(48)	6.1
1535 9/23 1610 9/30	1148	117(47)	9(47)	2.5
1610 9/30 1610 10/7	1140	319(47)	1(47)	6.9
1610 10/7 1600 10/14	1140	384(46)	16(46)	8.3
1600 10/14 1555 10/21	1140	817(47)	18(47)	17.8
1555 10/21 1555 10/28	1140	1152(48)	17(48)	25.1
1555 10/28 1345 11/1	638	12745(50)	65(50)	495.0
1345 11/1 1605 11/4	502	601(48)	11(48)	29.7
1605 11/4 1610 11/11	1140	408(53)	2(53)	8.9
1610 11/11 1610 11/18	1140	486(47)	7(47)	10.6

Air Samples, Off Site, LRL Livermore  
(10) Location: Site 300 C. P.

Sampling Period	Volume Cubic Meters	Net Counts Per Minute After Sampling Terminated (Figures in parentheses are hours decay)			$\mu\text{c}/\text{M}^3$
		Combined Beta-Gamma	Alpha		
1030 4/2 1030 4/8	1140	168(120)	0(120)		3.7
1030 4/8 1100 4/16	1140	648(51)	2(51)		14.1
1100 4/16 1100 4/23	1140	296(52)	0(52)		6.4
1100 4/23 1000 4/30	1132	308(49)	1(49)		6.8
1000 4/30 1030 5/12	1128	395(51)	17(51)		8.7
1030 5/12 1030 5/21	1140	415(53)	5(53)		9.0
1030 5/21 1045 5/28	1140	157(123)	0(123)		3.4
1045 5/28 1115 6/4	1148	159(52)	0(52)		3.4
<del>1115</del> 6/21 1130 6/25	652	478(125)	0(125)		18.2
1130 6/25 1200 6/30	814	294(50)	2(50)		9.0
1200 6/30 1115 7/9	1296	303(47)	0(47)		5.8
1115 7/9 1115 7/16	1140	549(51)	1(51)		12.0
1115 7/16 1210 7/22	984	199(47)	18(47)		5.0
1210 7/22 1000 7/30	1290	502(52)	0(52)		9.6
1000 7/30 1045 8/6	984	247(51)	3(51)		6.2
1045 8/6 1100 8/13	1140	377(51)	25(51)		8.2

Air Samples, Off Site, LRL Livermore  
 (10) Location: Site 300 C.P.

Sampling Period	Volume Cubic Meters	Net Counts Per Minute After Sampling Terminated (Figures in parentheses are hours decay)		$\mu\text{mc}/\text{M}^3$
		Combined Beta-Gamma	Alpha	
1100 8/13 1200 8/26	2124	705(51)	5(51)	8.2
1200 8/26 1100 9/3	1302	19(51)	5(51)	0.4
1100 9/3 0400 9/4	149	46(53)	6(53)	7.6
0400 9/4 1900 9/9	814	239(53)	13(53)	7.3
1900 9/9 1030 9/16	1148	173(52)	1(52)	3.7
1030 9/16 1030 9/25	1465	283(52)	6(52)	4.8
1030 9/25 1050 9/30	814	72(52)	0(52)	2.2
1050 9/30 1330 10/7	1160	193(49)	21(49)	4.1
1330 10/7 1315 10/27	4340	1860(50)	0(50)	10.6
1315 10/27 1040 11/1	1120	10032(73)	51(73)	222.0
1040 11/1 0700 11/3	311	616(57)	13(57)	49.1
1030 11/4 1040 11/18	2280	625(360)	0(360)	6.8

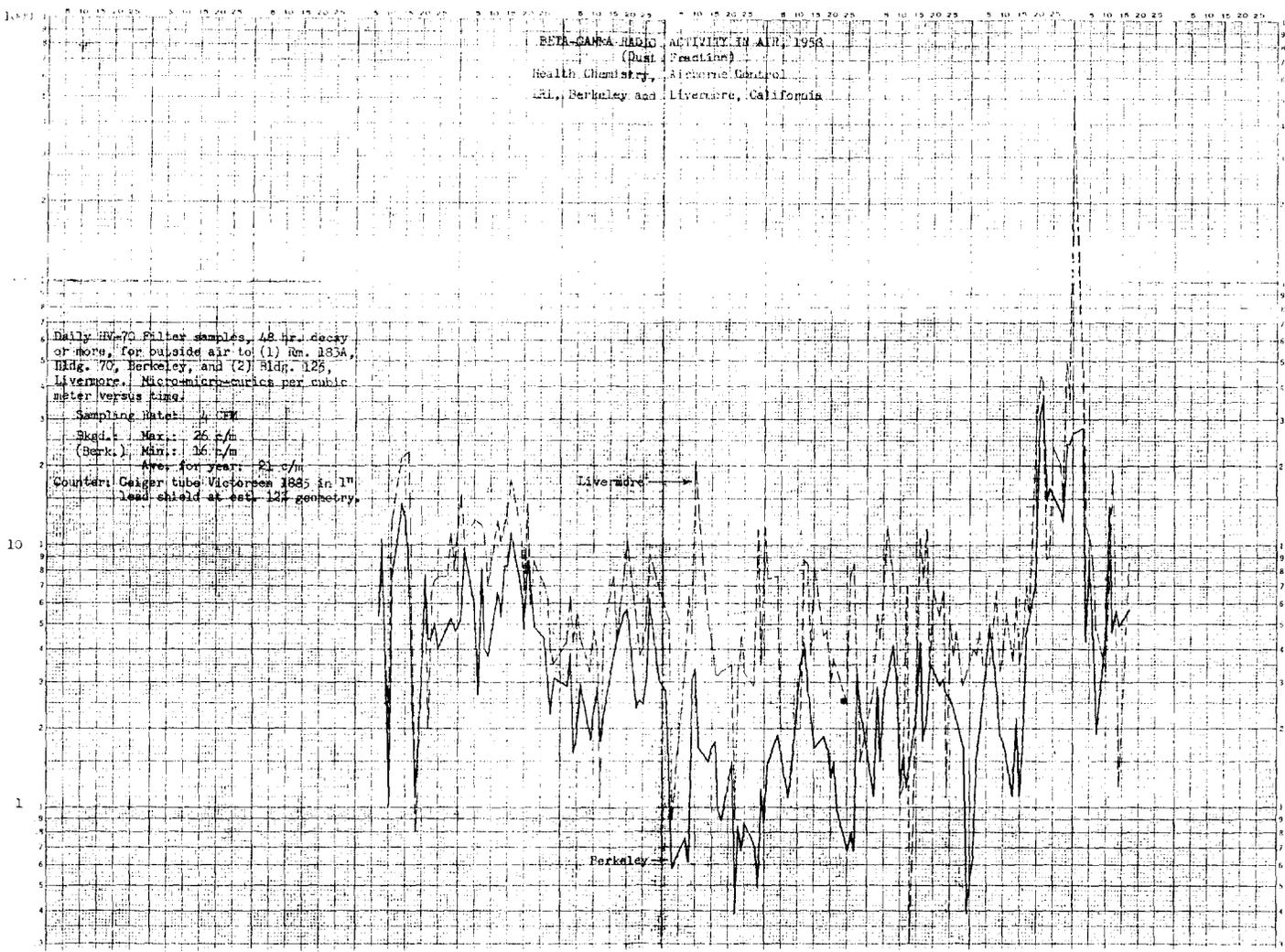
Air Samples, Off Site, ERL Livermore  
(11) Location: Butte Field

Sampling Period	Volume	Net Counts Per Minute After Sampling Terminated			$\mu\text{c}/\text{M}^3$
	Cubic Meters	(Figures in parentheses are hours decay)		Alpha	
		Combined Beta-Gamma			
0945 10/6 1215 10/7	180.1	33(50)		9(50)	4.5

BETA-GAMMA RADIO ACTIVITY IN AIR, 1958  
 (Dust Fraction)  
 Health Chemistry, Airborne Control  
 Lab., Berkeley and Livermore, California

Daily HV-70 Filter samples, 48 hr. decay  
 or more, for outside air to (1) Rm. 183A,  
 Bldg. 70, Berkeley, and (2) Bldg. 128,  
 Livermore. Micro-microcuries per cubic  
 meter versus time.  
 Sampling date: 7/17  
 Skd. Max: 26 c/m  
 (Berkeley) Min: 16 c/m  
 Ave. for year: 21 c/m  
 Counter: Geiger tube Victoreen 1885 in 1" lead shield at 45° geometry.

MICRO-MICROCURIES PER CUBIC METER



REPRODUCED FROM THE  
 REPORT OF THE  
 HEALTH, SAFETY AND ENVIRONMENTAL  
 DIVISION

Bldg. 20, Berkeley, and (2) Bldg. 12,  
Livermore. Micro-microcuries per cubic  
meter versus time.

Sampling date: 4 UEM

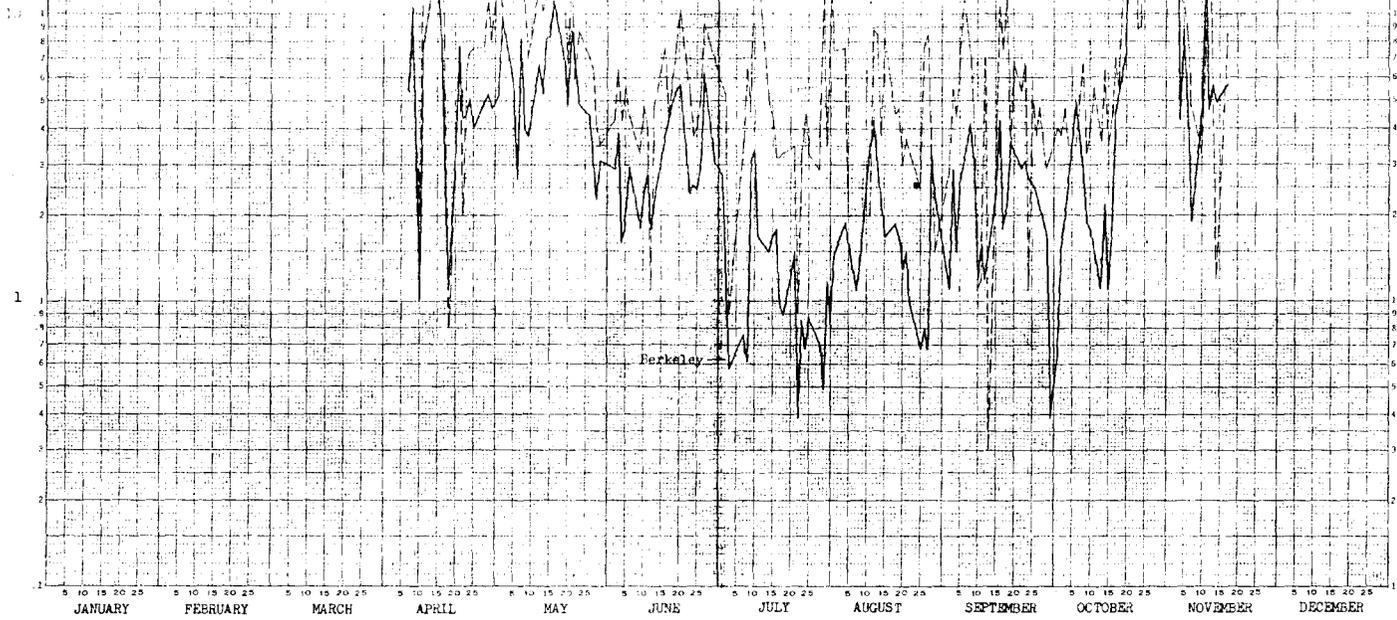
Exptl. Max.: 26 p/m

(Berkeley) Min.: 16 p/m

Ave. for year: 21 p/m

Counter: Geiger tube Victoreen 183, 50 1"

lead shield at 45°, 12" geometry.



1958

REPRODUCED FROM N. S. 100-1000  
BY THE NATIONAL ARCHIVES  
AND N. S. 100-1000

## RAIN SAMPLES, LRL BERKELEY

### Collection

From the period April 5, 1958 through October 18, 1958, rain was collected in ceramic enameled trays which were exposed outdoors for various lengths of time. Between 8 to 9 a.m. after a rainfall, the sample was collected. The trays were subsequently washed-out with tap water and reexposed outdoors.

For the period October 18 through November 15, a bag of 4 mil polyethylene was inserted into a galvanized iron drum with the edge of the bag folded over the lip of same. This presents a collection area of 1.78 sq. ft. After rainfall, the bag containing the sample was removed and replaced with a new bag. Bags were changed daily during the rainy season.

### Water Processing

The water sample is filtered through a Whatman 41H filter paper to remove the included dust and foreign debris. About 50 ml. distilled water is used to wash the filter paper\*. A drop of conc.  $\text{HNO}_3$  is added to the filtrate and the sample is then evaporated to dryness over a hot plate and/or a heat lamp. Care is taken to avoid bumping.

### $\beta$ Counting

Counting is done with a 3 mg/cm<sup>2</sup> end window GM tube placed in a 1½" lead pig. Length of time for counting is random but varies from at least ½ hr. to several hours. Background of machine is taken prior to each days counting for a similar time period.

### Data Sheet

Column headings of the table below are described as follows:

"Raw beta-gamma c/m net"--- The net counts per minute from the GM tube, followed by the decay time in hours;

"d/m/l"--- 8% counter efficiency  
95% material collection efficiency on the bottom of the beaker  
90% confidence level

$$\frac{d/m/l}{\text{volume (ml)}} \times 1.32 \times 10^4$$

" $\mu\text{c/ml}$ "---  $\mu\text{c/ml} = d/m/l \times 4.55 \times 10^{-10}$

" $\mu\text{c/sq.ft.}$ " ---  $\frac{\text{total } \mu\text{c per sample}}{\text{collection area (1.75 sq.ft.)}}$

"inches of rain: ---  $\frac{\text{total volume of collected sample}}{\text{collection area}}$

\* an average of 18% is lost to this filter

RAIN SAMPLES

<u>Sample #</u>	<u>Period of Collection</u>	<u>Total Volume Collected (ml)</u>	<u>Volume Sample Processed (ml)</u>	<u>"Raw" Beta-Gamma c/m Net (and hours decay)</u>	<u>d/m/l x 10<sup>3</sup></u>	<u>µmc/l x 10<sup>2</sup></u>	<u>mc/sq. mi.</u>	<u>inches rain</u>
1	4/4/58 to 4/7/58	*	1000	186(24), 146(103)	2.5±*	11	*	*
2	5/11/58 to 5/12/58	400	400	31(32)	1.0±*	5	3	.10
3	5/12/58 to 5/22/58	94	94	213(3), 145(121), 133 (176), 106(271), 82(482)	30. ±5	137	19	.02
4	5/22/58 to 5/23/58	2410	1000	185(8), 162(96), 155 (152), 140(248), 118 (458)	2.5±.4	11	16	.22
5	5/23/58 to 6/2/58	194	194	37(6)	2.5±.4	11	3	.05
6	6/2/58 to 6/9/58	1024	1000	75(53)	1.0±.2	5	8	.25
7	6/9/58 to 7/16/58	40	40	28(6)	9.2±2	42	3	.01
8	7/16/58 to 8/8/58	259	259	313(7)	16. ±3	73	30	.06
9	8/8/58 to 9/22/58	90	90	30(208)	4.4±1	20	3	.02
10	9/22/58 to 9/23/58	276	276	13(216)	0.6±.2	3	1	.07
11	9/23/58 to 10/18/58	1790	1350	48(96)	0.5±.2	2	6.5	.03

\* Insufficient Data

<u>Sample #</u>	<u>Period of Collection</u>	<u>Total Volume Collected (ml)</u>	<u>Volume Sample Processed (ml)</u>	<u>"Raw" Beta-Gamma c/m Net (and hours decay)</u>	<u>d/m/l x 10<sup>3</sup></u>	<u>µmc/l x 10<sup>2</sup></u>	<u>mc/sq. mi.</u>	<u>inches rain</u>
12	10/18/58 to 11/10/58	534	534	289(7)	7.1 <sup>±</sup> 1	32	30	.12
13	10/31/58 to 11/10/58	504	454	139(8)	4.0 <sup>±</sup> .6	18	14	.12
14	11/13/58 to 11/14/58	198	198	23(8)	1.6 <sup>±</sup> .6	7	7.2	.05

TAP WATER SAMPLES, LRL, BERKELEY

Samples were taken daily at 0900 from east sink tap, room 208, Building 4, after letting water run for at least ten minutes.

One liter samples were evaporated to dryness and counted at least 7 hours on 3 mg/cm<sup>2</sup> end-window GM tubes.

Wide error spread is due to relatively high background on GM counters.

Calculations are similar to those employed on rainwater samples.

TAP WATER RADIOACTIVITY			
<u>Date of Sample</u>	<i>d/m liter</i> <u>Activity</u>	<u>Date of Sample</u>	<i>d/m liter</i> <u>Activity</u>
April 5, 1958	76±20	May 26, 1958	10± 6
6	50±18	27	< 5
7	32±10	June 2	< 5
8	56±14	3	7± 5
9	86±20	4	< 6
10	13± 8	5	< 5
11	22± 8	6	< 6
12	13± 9	9	< 5
13	16± 7	10	18± 7
14	40±14	12	12± 5
15	6± 6	13	7± 5
16	22± 6	16	< 5
17	45±13	17	9± 5
18	29±13	18	13± 6
19	6± 6	19	14± 6
20	23± 9	May 14	8± 5
21	22± 9	15	< 6
22	< 5	June 20	49±11
23	< 5	30	63±13
24	8± 7	July 2	7± 5
25	12± 6	1	28± 8
29	8± 5	3	7± 5
30	< 5	7	27± 8
May 1	24± 5	15	< 9
2	< 3	16	< 6
5	< 5	22	6± 5
6	14± 6		
7	< 6		
8	< 5		
9	14± 6		
12	< 5		
13	< 6		
19	< 3		
20	< 4		
22	< 4		

Sampling Program Stopped

## TRAY AND CLOTH SAMPLES, LRL, BERKELEY

Two static-sampling devices are utilized for monitoring ambient outdoor air. These are trays and cloth screens.

A coated metal tray of 17" x 14" x 7/8" size is clamped on a plywood turntable. A vane on the table is the means of facing the same long side of the tray to the wind. No provision is made for retention or drainage of rain water. A cloth screen, open weave of fiberglass material, is mounted in an eight inch square frame underneath the turntable and just back of center. Thus the screen is always faced to the wind and is sheltered from all but driving rains.

Five sampling stations of one tray and screen each are widely spaced about the project. A sixth station is maintained for reference purposes approximately 70 miles north of San Francisco Bay at St. Helena. All samplers are mounted on five to eight foot high posts away from wind obstructions.

Periodically, the samplers are changed; the period varies with unrelated factors, such as available manpower and nuclear testing.

After 48-hour decay, processing of samples involves radioautographing the pans and screens, and in addition, instrument counting of the latter. Kodak type KK x-ray film size 16 7/8 x 13 7/8 is placed against the tray and/or screen for one-week exposure. The number of resultant "spots" on the developed film is taken as a measure of the activity. A "spot" is defined as that area bounded by the circumference of a circle (in which the darker portion just fades to the film background) which touches the four sides or overlaps the smallest square of a particular size graph paper.

The "spots" are counted on a back-illuminated glass plate covered with a graph paper. The various size graph papers used are as follows:

- 1) 10 x 10 to one-half inch, Keuffel and Esser #359-11L
- 2) 10 x 10 to inch, K & E #359-5DG
- 3) 5 x 5 to inch, K & E #359-2

A G.M. tube (see Daily Air Samples, LRL, Berkeley) is used to obtain the beta-gamma counts. A zinc-sulfide crystal is used to obtain the alpha counts.

Information prior to the reporting period is included in the data compilation below. This is done to give the reader a "feel" for the variability of the determinations; the method, after all, is considered in the exploratory stage.

For the purpose of this report much of the data has been compressed into averages, and only the total number of "spots" greater than 1/20" diameter considered.

Sampling Period	TRAYS	CLOTH	SCREENS
	Radioautograph Avg. # Spots Per Sq. Meter Per Mo. Collection	Radioautograph Avg. # Spots Per Sq. Meter Per Mo. Collection	Radioactivity by Counting c/m/m <sup>2</sup>
5/15/57 7/1/57	98	133	87
6/14/57 9/29/57	63	147	62
9/16/57 1/20/58	30	95	37
12/2/57 5/4/58	345	426	203
4/15/58 11/23/58	69	*	87

\* Not Determined

GAMMA DETERMINATIONS OUTDOORS - 1958

All readings were taken 3' above ground primarily at the author's residence employing a "Nuclear" beta-gamma portable 33 mgm/cm<sup>2</sup> Geiger Survey Meter with probe shield closed.

<u>Date</u>	<u>mr/hr.</u>		<u>Date</u>	<u>mr/hr.</u>
4/21	0.015		6/4	.01
4/22	0.015		6/5	.01
4/23	.015		6/6	.01
4/24	.010		6/7	.005
4/25	.010		6/8	.01
4/26	.010		6/9	.025
4/27	.015		6/10	.015
4/28	.012		6/11	.01
4/29	.010		6/12	.01
4/30	.015		6/13	.015
5/1	.010		6/14	.015
5/2	.010		6/15	.015
5/3	.010		6/16	.010
5/4	.015		6/17	.015
5/6	.010		6/18	.015
5/7	.010		6/19	.015
5/8	.005		6/20	.010
5/9	.012		6/21	.010
5/10	.015		6/22	.015
5/11	.010		6/23	.010
5/12	.015		6/24	.020
5/13	.010		6/25	.015
5/14	.010		6/26	.010
5/15	.010		6/27	.010
5/16	.010		6/28	.015
5/17	.015		6/29	.015
5/18	.010		6/30	.015
5/19	.010		7/1	.010
5/20	.015		7/2	.015
5/21	.015		7/3	.010
5/22	.010	Oakland	7/4	.010
5/23	.010		7/5	.010
5/24	.010		7/6	.015
5/25	.010		7/7	.010
5/26	.010		7/8	.010
5/27	.012		7/9	.015
5/28	.012		7/10	.010
5/29	.01		7/11	.015
5/30	.005		7/12	.010
5/31	.01		7/13	.010
6/1	.01		7/14	.015
6/2	.01		7/15	.005
6/3	.01		7/16	.005
			7/17	.010

<u>Date</u>	<u>mr/hr.</u>
7/18	.015
7/19	.010
7/20	.010
7/21	.010
7/22	.010
7/23	.005
7/24	.015
7/25	.010
7/26	.010
7/27	.010
7/28	.015
7/29	.010
7/30	.010
7/31	.020
8/1	.015
8/2	.010
8/3	.010
8/4	.015
8/5	.015
8/6	.010
8/7	.010
8/8	.010
8/9	.010
8/10	.010
8/11	.015
8/12	.010
8/13	.010

<u>Date</u>	<u>mr/hr.</u>
8/14	.010
8/15	.010
8/16	.010
8/17	.010
8/18	.010
8/19	.015
8/20	.010
8/21	.010
8/22	.010
8/23	.010
8/24	.010
8/25	.010
8/26	.010
8/27	.010
8/28	.010
8/29	.010
8/30	.010
8/31	.010
9/1	.010
9/2	.010
9/3	.010
9/4	.010
9/5	.010
9/6	} no determinations
9/7	
9/8	