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BIOPHYSICS SECTION
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RADIOACTIVE CONTAMINATION IN THE HANFORD ENVIRONS FOR THE PERIOD JANUARY, FEBRUARY, MARCH

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RADIOACTIVE CONTAMINATION IN THE HANFORD ENVIRONS
FOR THE PERIOD
JANUARY, FEBRUARY, MARCH
1956

By

B. V. Andersen and J. K. Soldat

Regional Monitoring Unit

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ABSTRACT

SECTION I: RADIOACTIVE CONTAMINATION IN EFFLUENT GASES

Total average I^{131} emission from S-plant, T-plant, and Semi-Works stacks this quarter was 0.24 curie per day compared to 1.0 curie per day during the previous quarter. Approximately 90 per cent of this I^{131} came from the S-plant stack where the quarterly average and maximum were 0.22 and 1.36 curies per day, respectively. A significant increase in the I^{131} emission from Semi-Works facility was noted during March when the maximum and average daily values were 0.46 and 0.039 curie per day, respectively. Shut-down of operations at T-plant this quarter reduced the average daily I^{131} emission to $<4 \times 10^{-3}$ curie per day. The ruthenium measurements obtained from S-plant revealed no detectable ruthenium emission.

Total average tritium oxide emission from all reactor stacks combined was 1.2 curies per day compared to 1.7 curies per day during the previous quarter. Quarterly average C^{14} and S^{35} emission rates from all reactor area stacks were below detection limits this quarter. This represents a reversal of the increasing trend noted during the previous quarter.

General decreases in the activity density of alpha and beta particle emitters and in the concentration of radioactive particles were noted at nearly all reactor area stacks this quarter. One unusually high emission of beta particle emitters occurred at 105-B in March when a value of 1.6×10^{-2} curie per day was obtained.

Quarterly average and maximum beta particle emitter emission rates from the 327 Building stack in 300 Area were 3×10^{-4} and 7×10^{-3} curie per day as measured by filter and scrubber samples. During the four day period from January 24 to 28, a total of 7×10^{-3} curie of beta particle emitters was discharged to the atmosphere from the 327 Building stack. The high emission correlated with work on special type slugs in E-cell during swing shift on January 27. The daily sample removed on February 2 was also unusually high and revealed an emission rate of 7×10^{-3} curie per day of beta particle emitters. With the exception of these two samples, emission from the 327 Building stack was comparable to that found during the previous quarter.

SECTION II: RADIOACTIVE CONTAMINATION ON VEGETATION

The activity density of I^{131} on vegetation remained at the same low level as the average measurements for last quarter. Significant amounts of iodine were deposited on vegetation during the latter part of March from bomb fallout. The maximum measurement of iodine on vegetation was 4.8×10^{-5} $\mu c/gm$ 10 miles south of Prosser. The deposition patterns are illustrated by months. Significant concentrations of non-volatile beta particle emitters were found throughout the quarter at all locations as a result of continuing bomb fallout.

SECTION III: RADIOACTIVE CONTAMINATION IN THE ATMOSPHERE

Dose rates measured by Victoreen Integrons remained at average values ranging from <0.1 to 7 mrad/day in and near the production areas. No significant changes were measured by detachable ionization chambers in the average dose rates present in all locations. The activity density and concentrations of beta particle emitters filtered from air remained at the same values as found during December of the previous quarter when the concentrations increased significantly as a result of nuclear detonation debris. Average values ranged from $(1.7 \text{ to } 8.0) \times 10^{-13}$ $\mu c/ml$.

SECTION IV: RADIOACTIVE CONTAMINATION IN HANFORD WASTES

The average activity of beta particle emitters discharged to the Columbia River from reactor retention basins remained at the same general level as reported last quarter in all reactor areas, except the 100-KE and 100-KW Areas. The significant increases at the 100-K Areas were caused by the higher power levels maintained at these locations. I^{131} discharged to the river from the Animal Farm averaged 9 $\mu c/day$. Particle frequency maps covering the plant and adjoining areas may be referred to in the text.

SECTION V: RADIOACTIVE CONTAMINATION IN THE COLUMBIA RIVER RELATED WATERS

Increases in the activity density of beta particle emitters in the Columbia River this quarter were related to comparable increases in the activity discharged to the river in the reactor cooling water. The most notable increases in river water activity density occurred in the region below 100-K Area. Activity density ranged from $<5 \times 10^{-8}$ μc/ml above the reactor areas to 1.9×10^{-5} μc/ml at the Hanford Ferry landing. Beta particle emitter activity density of samples collected from the Columbia River between McNary Dam and Portland ranged from $<5 \times 10^{-8}$ to 2×10^{-7} μc/ml; maximum measurements were again obtained in the Arlington-Maryhill region.

Increases in the activity density of beta particle emitters in raw water followed the increasing trend noted in the activity density of the river water from which it was derived. Maximum raw water activity density of 2×10^{-5} μc/ml was found in a sample collected from 183-F Building during March.

No significant changes were noted this quarter in the beta particle emitter activity density of river mud samples. The alpha particle emitter activity density of all river water, raw water, and river mud samples analyzed this quarter averaged below the detection limits for these types of analyses.

River flow rates this quarter were nearly identical to those noted during the previous quarter. Average and maximum flows were 5.8×10^5 and 6.5×10^5 gallons per second, respectively.

SECTION VI: RADIOACTIVE CONTAMINATION IN RAIN

The amount of precipitation during the quarter was normal, but it was twice that recorded for the same quarter last year. The activity densities of beta particle emitters in rain were highest in the vicinity of 300 Area where the maximum value of 2×10^{-5} μc/ml was detected during a period of bomb fallout.

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SECTION VII: RADIOACTIVE CONTAMINATION IN DRINKING WATER AND TEST WELLS

Average concentrations of alpha particle emitters at or above the detection limit of 5×10^{-9} μc/ml were obtained from nine drinking water supplies this quarter, Paterson Store, Benton City Store, Benton City Store, Benton City Water Company, and Richland Wells #4, #5, #12, #14, #15, and #18. All of these water sources were supplied from wells and the alpha activity was confirmed by uranium analyses. Maximum alpha particle emitter activity density of 2×10^{-8} μc/ml was measured at Richland Well #5.

Increased activity discharged into the Columbia River in the reactor cooling water (See Section V) resulted in increases in the beta particle emitter activity density of drinking water supplies derived from the Columbia River. The average values for activity density in all drinking water ranged from (<0.5 to 91) $\times 10^{-7}$ μc/ml this quarter; average values for Pasco and Kennewick water supplies were 6.5×10^{-7} and 1×10^{-6} μc/ml, respectively. The increasing trend noted last quarter in the alpha particle emitter activity density in Well 303-8 did not continue into the present quarter when the average value was 7×10^{-9} μc/ml. As in the past, uranium activity was detected in the 300 Area Wells #3 and #4. Increased beta particle emitter activity density in water samples from several test wells indicated the possibility of contaminated ground water reaching the region between 200 East Area and 300 Area near the latter part of this quarter. Notable examples were Wells 19-43, 24-33, 34-39, and 38-43 where quarterly average values were 7×10^{-8}, 1.1×10^{-7}, 1.7×10^{-7}, and 2.7×10^{-7} μc/ml, respectively.

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INTRODUCTION

This document summarizes the results obtained from monitoring the Hanford environs for radioactive contamination during the period January, February, and March 1956. Samples were collected by Regional Monitoring forces according to procedures previously outlined in documents of this series.[1, 2] These samples were analyzed by Radio-Analysis Laboratory forces according to procedures and techniques described in a previously published laboratory manual.[3]

Counting rates obtained from these analyses were corrected for geometry, backscatter, air-window absorption, source size, self-absorption, chemical yield, and collection efficiency by Radio-Analysis Laboratory forces using factors described in previous reports.[4, 5] Additional corrections for decay were applied to those samples in which significant amounts of short half-life beta particle emitters were found. The findings obtained from analyzing the direct samples were supplemented with readings obtained from portable and fixed instrumentation.

The results obtained from the described efforts are presented in Sections I through VII. These sections discuss the amounts of active material discharged from plant facilities and their effect on the contamination of vegetation, air, soil, and water.

SECTION I

RADIOACTIVE CONTAMINATION IN EFFLUENT GASES

Radioactive contaminants in the separations and reactor area effluent gases released to the Hanford environs were sampled at the stacks and the stack breechings. Daily filter and scrubber samples from the separations areas were analyzed for I^{131} and $Ru^{103-106}$ activity density. Weekly filter, tritium oxide, and C^{14}-S^{35} samples were taken at the reactor areas and analyzed radiochemically. Summaries of the results obtained from measurements in each manufacturing facility are presented below.

SEPARATIONS AREAS

200 EAST AREA - SEMI-WORKS

Filter and scrubber samples taken from the fifty foot level of the Semi-Works stack were analyzed for total beta particle emitters. The combined results of these analyses calculated as curies per day emitted from the stack are summarized in Table I.

TABLE I

BETA PARTICLE EMITTERS DISCHARGED
FROM THE SEMI-WORKS STACK
JANUARY, FEBRUARY, MARCH
1956
Units of Curies Per Day

Month	Maximum	Average
January	0.015	0.0052
February	0.0078	<0.0030
March	0.46	0.039
Quarter	0.46	0.016
Last Quarter	0.022	<0.00019

Significant increases in the emission rate of I^{131} from the Semi-Works facility were noted during March when operations were changed to a different type of separations process. Repair of the I^{131} clean-up scrubber located downstream of the dissolver is now in progress and a significant reduction in I^{131} emission is expected when the scrubber is placed in service, probably in April.

200 WEST AREA - T-PLANT

A summary of the results of I^{131} measurements at the fifty foot level of the T-plant stack is presented in Table II.

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TABLE II

IODINE-131 DISCHARGED FROM THE T-PLANT STACK

JANUARY, FEBRUARY, MARCH

1956

Units of Curies Per Day

Month	Maximum	Average
January	0.033	<0.0056
February	0.0083	<0.0030
March	0.011	<0.0036
Quarter	0.033	<0.0041
Last Quarter	3.8	0.40

The downward trend in the average daily I^{131} emission from T-plant stacks noted the previous three quarters was continued this quarter; the average I^{131} emission was <0.004 curie per day during the present quarter, compared to 0.40 curie per day during the previous quarter(6) and 0.83 curie per day during the third quarter of 1955.(7) During March, dissolving operations were completed at T-plant and I^{131} monitoring at this facility was suspended at the end of March. A filter will still be operated off the fifty foot level manifold and daily survey instrument readings of the filter will be recorded to monitor the filterable total beta activity being emitted during shut-down and clean-up work.

200 WEST AREA - S-PLANT

Table III presents a summary of the results of I^{131} monitoring at the twenty foot level of the S-plant stack.

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TABLE III

IODINE-131 DISCHARGED FROM THE S-PLANT STACK
JANUARY, FEBRUARY, MARCH
1956
Units of Curies Per Day

Month	Maximum	Average
January	0.16	<0.013
February	1.36	0.43
March	0.51	0.23
Quarter	1.36	0.22
Last Quarter	2.5	0.62

Decreases noted last quarter in the I^{131} emission from S-plant continued into the present quarter when the average daily I^{131} emission was 0.22 curie per day compared to an average value of 0.62 curie per day last quarter.

The results obtained from ruthenium monitoring at the S-plant stack are summarized in Table IV.

TABLE IV

RADIOACTIVE RUTHENIUM DISCHARGED
FROM THE S-PLANT STACK
JANUARY, FEBRUARY, MARCH
1956
Units of Curies Per Day

Month	Maximum	Average
January	<0.04	<0.01
February	<0.04	<0.01
March	<0.11	<0.01
Quarter	<0.11	<0.01
Last Quarter	0.12	<0.01

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The results in Table IV revealed that no detectable ruthenium emission occurred at S-plant this quarter; only one positive measurement has been obtained since the fourth quarter of 1954.

200 WEST AREA - U-PLANT

Table V presents a summary of the results from filter monitoring at the ten foot level of the U-plant stack.

TABLE V

RADIOACTIVE PARTICULATE MATERIALS
DISCHARGED FROM THE U-PLANT STACK
JANUARY, FEBRUARY, MARCH
1956

	Alpha Particle Emitters Units of 10^{-8} curie/day		Beta Particle Emitters Units of 10^{-5} curie/day		Radioactive Particle Concentrations Units of 10^{-5} Particles/day	
Month	Max.	Avg.	Max.	Avg.	Max.	Avg.
January	1.4	0.63	8.8	4.4	2.7	0.92
February	1.3	0.32	3.0	0.41	9.3	3.9
March	2.3	0.50	1.6	0.31	9.7	2.6
Quarter	2.3	0.50	8.8	1.9	9.7	2.4
Last Quarter	4.5	0.81	51	5.9	39	5.1

Decreases noted in the activity density of alpha and beta particle emitters and concentrations of radioactive particles in the U-plant stack effluent this quarter are of doubtful significance when compared with fluctuations in similar values noted in the past several quarters. For example, the quarter average activity density of beta particle emitters in these effluents for the second, third, and fourth quarters of 1955 were 2.7×10^{-5}, 0.26×10^{-5}, and 5.9×10^{-5} curie per day, respectively.

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REACTOR AREAS

Results of measurements at the reactor area stacks for tritium oxide, C^{14}, S^{35}, and particulate materials are summarized in Tables VI through XI.

TABLE VI

TRITIUM OXIDE DISCHARGED FROM REACTOR STACKS JANUARY, FEBRUARY, MARCH 1956

Units of Curie Per Day

Stack	January		February		March		Quarterly	
	Max.	Avg.	Max.	Avg.	Max.	Avg.	Max.	Avg.
100-B	0.13	0.10	0.11	0.09	0.61	0.29	0.61	0.17
100-C	0.21	0.10	0.12	0.08	0.41	0.17	0.41	0.12
100-KW	0.50	0.13	0.28	0.13	0.17	0.07	0.50	0.11
100-KE	0.13	0.04	0.25	0.10	0.63	0.13	0.63	0.09
100-D	0.45	0.33	0.11	0.08	1.7	0.82	1.7	0.49
100-DR	0.17	0.06	0.04	0.02	0.15	0.09	0.17	0.06
100-H	0.11	0.09	0.09	0.07	1.0	0.32	1.0	0.20
100-F	0.19	0.11	0.15	0.12	0.17	0.11	0.19	0.11

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TABLE VII

CARBON-14 DISCHARGED FROM REACTOR STACKS

JANUARY, FEBRUARY, MARCH

1956

Units of 10^{-3} Curie Per Day

Stack	January Max.	January Avg.	February Max.	February Avg.	March Max.	March Avg.	Quarterly Max.	Quarterly Avg.
100-B	<4.5	<4.5	<4.5	<4.5	<4.5	<4.5	<4.5	<4.5
100-C	8.6	<4.5	<4.5	<4.5	<4.5	<4.5	8.6	<4.5
100-KW	<4.5	<4.5	<4.5	<4.5	<4.5	<4.5	<4.5	<4.5
100-KE	<4.5	<4.5	<4.5	<4.5	<4.5	<4.5	<4.5	<4.5
100-D	6.7	<4.5	<4.5	<4.5	6.5	<4.5	6.7	<4.5
100-DR	<4.5	<4.5	<4.5	<4.5	11	<4.5	11	<4.5
100-H	<4.5	<4.5	<4.5	<4.5	<4.5	<4.5	<4.5	<4.5
100-F	<4.5	<4.5	11	<4.5	<4.5	<4.5	11	<4.5

TABLE VIII

SULFUR-35 DISCHARGED FROM REACTOR STACKS

JANUARY, FEBRUARY, MARCH

1956

Units of 10^{-4} Curie Per Day

Stack	January Max.	January Avg.	February Max.	February Avg.	March Max.	March Avg.	Quarterly Max.	Quarterly Avg.
100-B	<4.5	<4.5	<4.5	<4.5	<4.5	<4.5	<4.5	<4.5
100-C	14	5.6	<4.5	<4.5	<4.5	<4.5	14	<4.5
100-KW	7.5	<4.5	<4.5	<4.5	<4.5	<4.5	7.5	<4.5
100-KE	4.7	<4.5	<4.5	<4.5	6.7	<4.5	6.7	<4.5
100-D	<4.5	<4.5	<4.5	<4.5	34	13	34	<4.5
100-DR	14	<4.5	<4.5	<4.5	<4.5	<4.5	14	<4.5
100-H	<4.5	<4.5	<4.5	<4.5	<4.5	<4.5	<4.5	<4.5
100-F	<4.5	<4.5	4.8	<4.5	21	8.8	21	<4.5

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TABLE IX

ALPHA PARTICLE EMITTERS DISCHARGED AS PARTICULATES FROM REACTOR STACKS JANUARY, FEBRUARY, MARCH 1956

Units of 10^{-7} Curie Per Day

Stack	January		February		March		Quarterly	
	Max.	Avg.	Max.	Avg.	Max.	Avg.	Max.	Avg.
100-B	1.4	0.48	1.2	0.49	0.75	0.26	1.4	0.41
100-C	0.82	0.19	0.52	0.23	0.82	0.28	0.82	0.23
100-KW	0.94	0.40	5.1	0.83	0.60	0.29	5.1	0.51
100-KE	1.5	0.98	1.4	0.89	0.41	0.26	1.5	0.72
100-D	1.0	0.64	1.0	0.61	0.89	0.19	1.0	0.50
100-DR	1.2	0.59	0.80	0.63	0.93	0.23	1.2	0.49
100-H	1.5	0.71	1.6	0.78	0.56	0.35	1.6	0.62
100-F	1.6	0.73	1.8	0.83	0.72	0.43	1.8	0.67

TABLE X

BETA PARTICLE EMITTERS DISCHARGED AS PARTICULATES FROM REACTOR STACKS JANUARY, FEBRUARY, MARCH 1956

Units of 10^{-5} Curie Per Day

Stack	January		February		March		Quarterly	
	Max.	Avg.	Max.	Avg.	Max.	Avg.	Max.	Avg.
100-B	43	22	49	16	1600	280	1600	110
100-C	2	0.10	26	4.3	5.4	1.1	26	1.8
100-KW	1.7	0.64	1.4	0.62	0.8	0.60	1.7	0.62
100-KE	5.6	0.33	7.4	2.6	7.1	2.3	7.4	1.7
100-D	220	90	190	53	200	72	220	73
100-DR	1.3	0.46	0.26	0.21	2.4	0.5	2.4	0.39
100-H	4	1.9	2.5	1.8	7	2.5	7	2
100-F	280	120	350	160	170	70	350	110

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TABLE XI

RADIOACTIVE PARTICLES DISCHARGED
FROM REACTOR STACKS
JANUARY, FEBRUARY, MARCH
1956

Units of 10^5 Particles Per Day

	January		February		March		Quarterly	
Stack	Max.	Avg.	Max.	Avg.	Max.	Avg.	Max.	Avg.
100-B	1.6	0.22	4.0	0.60	3.6	0.94	4.0	0.49
100-C	22	6.3	94	38	2.6	1.2	94	12
100-KW	3.2	0.45	2.0	0.45	1.5	0.32	3.2	0.36
100-KE	1.8	0.48	3.7	1.3	0.9	0.17	3.7	0.54
100-D	<1.4	<0.17	6.1	1.7	1.3	0.4	6.1	1.0
100-DR	31	5.0	4.1	1.7	16	1.6	31	2.5
100-H	12	3.5	74	14	1.8	0.64	74	4.9
100-F	53	8.7	80	31	37	6	80	11

The total average tritium oxide emission from all reactor stacks was 1.2 curies per day compared to a total of 1.7 curies per day during the previous quarter.

Quarterly average C^{14} and S^{35} emission rates were below the detection limits this quarter at all reactor area stacks. These data represent a reversal of the increasing trend noted last quarter, particularly for S^{35}. Maximum C^{14} emission of 1.1×10^{-2} curie per day occurred at 100-F during February and 100-DR during March this quarter. The maximum emission rate of S^{35} of 3.4×10^{-3} curie per day was measured at 100-D during March. The maximum S^{35} emission rate last quarter was measured at 100-F during December when 1.3×10^{-2} curie per day was emitted.

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General decreases in the average alpha particle emitter activity density of the effluents emitted from all reactor area stacks were noted again this quarter. The most noticeable change occurred at 105-C where the average value this quarter was 2.3×10^{-8} compared to an average of 5.0×10^{-8} curie per day obtained last quarter.

The decreasing trend noted last quarter in the average beta particle emitter activity density in the reactor stacks effluents continued at six of the reactor areas this quarter. A slight increase of doubtful significance was observed at 105-KE when the average value for this quarter was 1.7×10^{-5} compared to 1.4×10^{-5} curie per day obtained last quarter. One unusually high measurement of 1.6×10^{-2} curie per day was obtained at 105-B in March. This one high measurement raised the quarterly average to 1.1×10^{-3} curie of beta particle emitters per day. Without this one high measurement, the quarterly average would have been close to the average of 2.6×10^{-4} curie per day noted in the previous quarter.

Concentrations of radioactive particles collected on filter samples from the reactor area stacks are summarized in Table XI. Decreases in the average radioactive particle concentrations in the reactor stack effluents were noted at all areas except 105-KW where the present quarterly average was not significantly different from that noted last quarter. These decreases are coincident with the decreases noted above in the activity density of alpha and beta particle emitters.

300 AREA

327 BUILDING

Weekly filter and scrubber samples collected from the plenum of the 327 Building stack were analyzed for gross beta particle emitters. Monthly average values for January, February, and March, were 2.0×10^{-4}, 7.0×10^{-4}, and 5.0×10^{-5} curie of beta particle emitters per day,

[redacted]

respectively. Quarterly average and maximum results were 3.0×10^{-4} and 7.0×10^{-3} curie per day.

The average values this quarter are only slightly higher than those noted for the previous quarter, although two unusually high measurements were obtained during February. The sample removed on Saturday, January 28, revealed 0.27 μc of total beta particle emitters on the filter and 2.4×10^{-2} μc in the scrubber. This corresponds to 7×10^{-3} curie for the four day period January 24 to January 28, 1956. Most of this activity was assumed to have been emitted during swing shift on January 27 while work on special type slugs was in progress in E-Cell. An unusually high E-Cell duct filter sample was collected by RMU personnel during this same period.

Isotopic analysis of the stack filter removed on January 28 revealed the following composition: 63% rare earth group, 11.8% Sr^{89}, 11.4% Ba^{140}, 1% Nb^{95}, < 1% Zr and Ru.

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SECTION II

RADIOACTIVE CONTAMINATION ON VEGETATION

Determination of the radioactive contamination of vegetation in the environs was made by the radiochemical analysis of more than 2500 vegetation samples. More than 2000 of the samples were from the immediate environs and the remainder from off-area locations in eastern and southern Washington and northern Oregon. All samples were analyzed for I^{131}; 1300 were analyzed for non-volatile beta particle emitters. Fifty samples from selected locations were analyzed for alpha particle emitters.

Averages for the present and previous quarter are compared in Table I. Tables II and III show by months the average I^{131} and non-volatile beta particle contamination measured at each general location. The concentrations of alpha particle emitters on vegetation are summarized in Table IV.

The activity density of I^{131} on vegetation remained at the same low level as the average measurements from last quarter. Significant amounts of iodine were deposited on vegetation during the latter part of March from bomb fallout. The maximum measurement of iodine on vegetation was 4.8×10^{-5} μc/gm ten miles south of Prosser on March 22. The deposition patterns are illustrated by months in Figures 1, 2, and 3.

The concentrations of non-volatile beta particle emitters remained at the high values reported for December throughout the quarter. The high concentrations were the result of continuing bomb fallout through the quarter. The high values found in and around the 200 West Area were caused by spread of contamination during burial of contaminated equipment.

The concentration of alpha particle emitters remained at the same level as reported last quarter.

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TABLE I

RADIOACTIVE CONTAMINATION ON VEGETATION
JANUARY, FEBRUARY, MARCH
1956

Units of 10^{-6} μc/gm

Location	No. Samples	Iodine-131 Max.	Iodine-131 Avg.	Iodine-131 Avg. Last Qtr.	Non-Volatile Beta Emitters Max.	Non-Volatile Beta Emitters Avg.	Non-Volatile Beta Emitters Avg. Last Qtr.
Project							
200 West Area	73	12	<3	6	13000	780	130
200 West - Redox	25	6	<3	6	960	200	43
200 West - Gate	64	6	<3	11	630	180	76
Route 3	12	4	<3	4	---	---	---
Meteorology Tower	13	3	<3	3	270	120	62
Batch Plant	14	3	<3	<3	250	130	66
200 East Area	49	7	<3	<3	330	120	52
Near the 200 Areas	309	8	<3	<3	1400	110	43
North of 200 Areas	243	4	<3	<3	380	100	39
South of 200 Areas	387	15	<3	<3	14000	150	30
PSN 50-51-61	39	7	<3	4	220	89	34
Goose Egg Hill	117	8	<3	<3	380	110	38
Rattlesnake Mountain	0	---	---	<3	---	---	22
Wahluke Slope	124	<3	<3	<3	220	86	34
Off Project							
Pasco to Ringold	113	<3	<3	<3	320	99	39
Richland	132	27	<3	<3	270	92	24
Benton City-Kiona	26	<3	<3	<3	200	82	27
Kennewick Environs	174	3	<3	<3	260	100	27
Pasco Environs	130	8	<3	<3	210	89	32
Prosser to Paterson - McNary	60	13	3	<3	340	110	30
Eastern Washington	211	<3	<3	<3	300	120	23
So. Washington and No. Oregon	190	<3	<3	<3	440	130	29

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TABLE II

RADIOACTIVE CONTAMINATION FROM IODINE-131 ON VEGETATION

JANUARY, FEBRUARY, MARCH

1956

Units of 10^{-6} μc/gm

Location	January		February		March	
	Max.	Avg.	Max.	Avg.	Max.	Avg.
Project						
200 West Area	8	<3	12	4	6	<3
200 West - Redox	4	<3	6	3	4	<3
200 West - Gate	4	<3	6	<3	4	<3
Route 3	<3	<3	4	<3	<3	<3
Meteorology Tower	3	<3	<3	<3	<3	<3
Batch Plant	<3	<3	3	<3	<3	<3
200 East Area	3	<3	7	<3	<3	<3
Near the 200 Areas	6	<3	8	<3	5	<3
North of 200 Areas	4	<3	4	<3	<3	<3
South of 200 Areas	5	<3	4	<3	15	<3
PSN 50-51-61	<3	<3	7	3	<3	<3
Goose Egg Hill	<3	<3	8	<3	<3	<3
Wahluke Slope	<3	<3	<3	<3	<3	<3
Off Project						
Pasco to Ringold	<3	<3	<3	<3	<3	<3
Richland	4	<3	3	<3	27	<3
Benton City-Kiona	<3	<3	<3	<3	<3	<3
Kennewick Environs	<3	<3	3	<3	3	<3
Pasco Environs	4	<3	<3	<3	8	<3
Prosser to Paterson - McNary	<3	<3	<3	<3	48	5
Eastern Washington	<3	<3	3	<3	<3	<3
So. Washington and No. Oregon	<3	<3	<3	<3	<3	<3

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TABLE III
RADIOACTIVE CONTAMINATION FROM NON-VOLATILE BETA PARTICLE EMITTERS ON VEGETATION
JANUARY, FEBRUARY, MARCH
1956

Units of 10^{-6} $\mu c/gm$

Location	January		February		March	
Project	Max.	Avg.	Max.	Avg.	Max.	Avg.
200 West Area	950	260	13000	1600	4300	530
200 West - Redox	270	110	320	170	960	350
200 West - Gate	300	150	630	190	580	190
Meteorology Tower	270	110	110	78	210	150
Batch Plant	230	90	250	170	190	130
200 East Area	290	120	150	89	330	140
Near the 200 Areas	360	110	320	110	1400	110
North of 200 Areas	380	94	280	110	340	110
South of 200 Areas	340	89	14000	350	200	75
PSN 50-51-61	140	83	220	130	81	54
Goose Egg Hill	380	110	210	120	250	100
Wahluke Slope	150	83	220	93	200	82
Off Project						
Pasco to Ringold	320	120	230	81	200	94
Richland	140	82	270	120	86	68
Benton City-Kiona	200	120	100	85	46	36
Kennewick Environs	260	83	220	100	140	120
Pasco Environs	210	96	150	86	99	81
Prosser to Paterson - McNary	97	57	340	120	300	150
Eastern Washington	280	110	250	120	300	120
So. Washington and No. Oregon	370	120	340	130	440	140

[redacted]

TABLE IV

RADIOACTIVE CONTAMINATION FROM ALPHA PARTICLE EMITTERS ON VEGETATION
JANUARY, FEBRUARY; MARCH
1956

Units of 10^{-8} $\mu c/gm$

Location	January Average	February Average	March Average	Quarter Maximum	Quarter Average
Near 200 Areas					
200 West Gate	270	210	250	380	240
Meteorology	150	72	110	150	100
Batch Plant	---	68	38	92	54
Route 4S, Mi. 4	34	30	32	42	32
Route 4S, Mi. 6	17	10	44	57	24
300 Area	20	--	--	20	20
Outlying					
Richland	<10	--	--	<10	<10
Pasco	<10	13	<10	15	<10
Benton City	<10	<10	<10	<10	<10

[redacted]

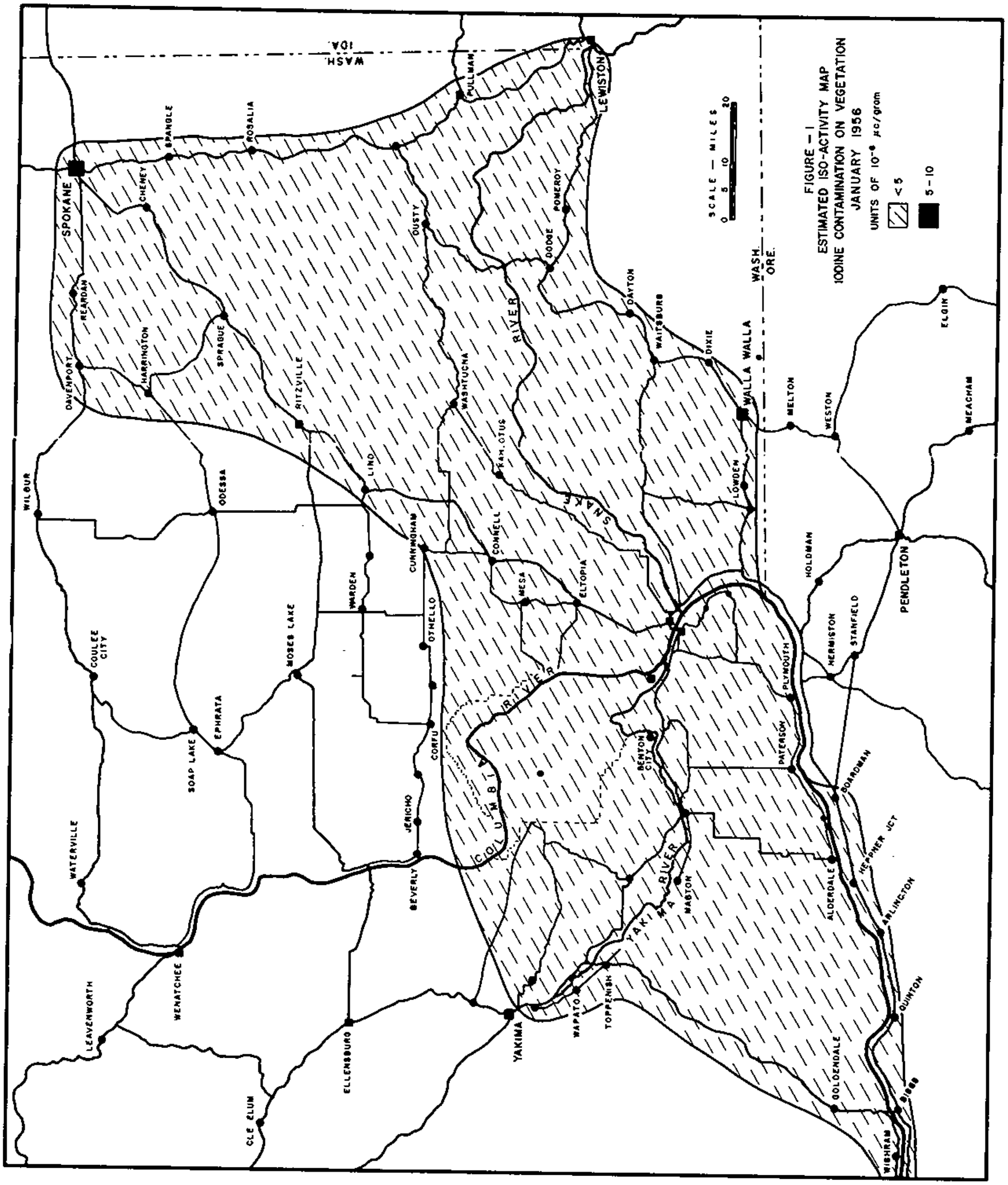
FIGURE - I
ESTIMATED ISO-ACTIVITY MAP
IODINE CONTAMINATION ON VEGETATION
JANUARY 1956
UNITS OF 10⁻⁶ µc/gram
< 5
5 - 10
SCALE — MILES
0 5 10 20
WASH.
IDA.
WASH.
ORE.
SPOKANE
CHENEY
SPANGLE
ROSALIA
PULLMAN
LEWISTON
POMEROY
DUSTY
DODGE
DAYTON
WAITSBURG
DIXIE
WALLA WALLA
MELTON
WESTON
ELGIN
MEACHAM
REARDAN
DAVENPORT
HARRINGTON
SPRAGUE
RITZVILLE
WASHTUCNA
KAHLOTUS
LOWDEN
WILBUR
ODESSA
LIND
CUNNINGHAM
CONNELL
SNAKE
RIVER
HOLDMAN
PENDLETON
WARDEN
OTHELLO
MESA
ELTOPIA
COULEE CITY
MOSES LAKE
EPHRATA
SOAP LAKE
CORFU
JERICHO
BEVERLY
COLUMBIA
RIVER
BENTON CITY
PLYMOUTH
HERMISTON
STANFIELD
PATERSON
BOARDMAN
HEPPNER JCT
ALDERDALE
ARLINGTON
QUINTON
MABTON
YAKIMA RIVER
WATERVILLE
WENATCHEE
LEAVENWORTH
CLE ELUM
ELLENSBURG
YAKIMA
WAPATO
TOPPENISH
GOLDENDALE
WISHRAM
BIGGS

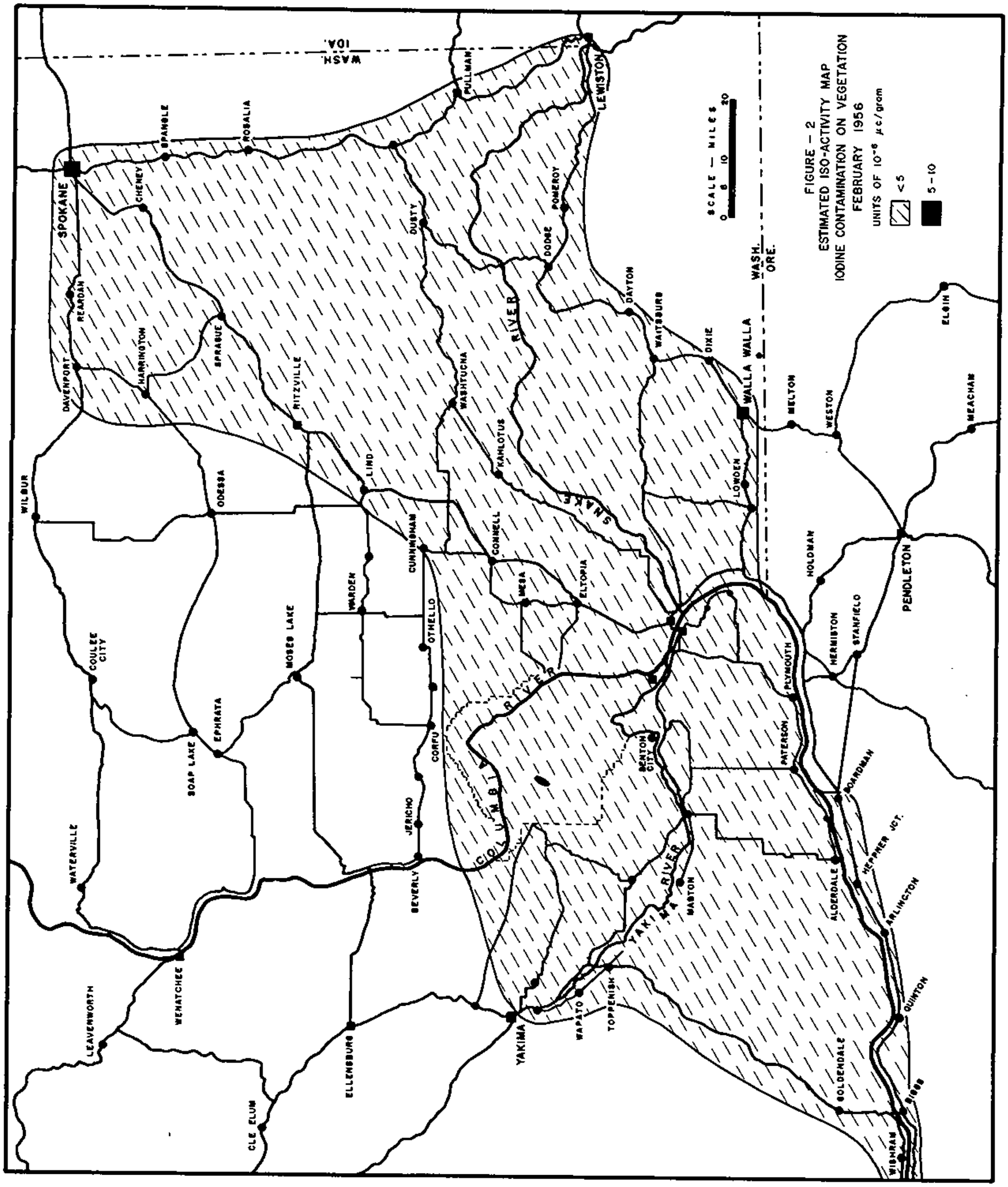

FIGURE - 2
ESTIMATED ISO-ACTIVITY MAP
IODINE CONTAMINATION ON VEGETATION
FEBRUARY 1956

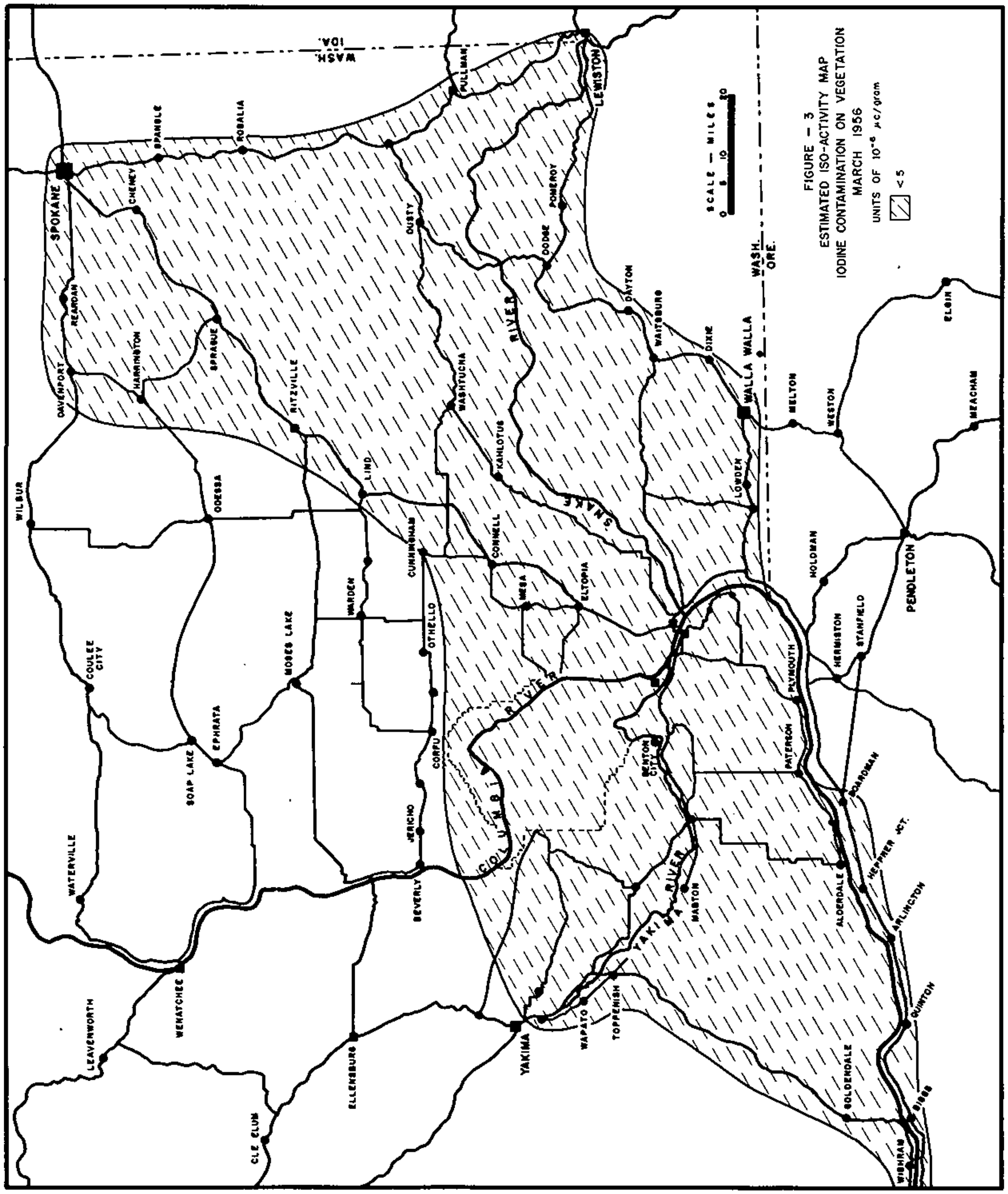

FIGURE – 3
ESTIMATED ISO-ACTIVITY MAP
IODINE CONTAMINATION ON VEGETATION
MARCH 1956
UNITS OF 10^{-6} μc/gram
<5

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SECTION III

RADIOACTIVE CONTAMINATION IN THE ATMOSPHERE

The magnitude and extent of airborne contamination in the Hanford environs were determined from analyses of filter and scrubber samples and from data recorded in the operation of Victoreen Integrons and detachable ionization chambers. The results obtained by measurements made by each of the monitoring methods during the quarter are summarized in the accompanying tables.

Victoreen Integrons were operated continuously at stations located at the perimeter of the manufacturing areas and in residential communities neighboring the plant. Accumulated dosage readings were tabulated by eight hour intervals and calculated in units of measured dosage per 24 hours. A summary of the average dosage rates for the three month period is given in Table I.

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TABLE I

AVERAGE DOSE RATES MEASURED BY VICTOREEN INTEGRONS

JANUARY, FEBRUARY, MARCH

1956

Units of mrad per 24 hours

Location	No. of Units	January	February	March	Quarterly Average
Riverland	1	0.1	1.2	0.3	0.5
100-B Area	3	<0.1	0.2	2.3	<0.9
100-K Area	3	2.1	1.3	0.6	1.3
100-D Area	3	0.1	8.8	12	7
100-H Area	3	0.4	0.3	0.3	0.3
White Bluffs	1	<0.1	<0.1	<0.1	<0.1
100-F Area	3	1.6	1.7	1.9	1.7
Hanford	1	0.9	1.7	0.4	1
200 West Area	2	5.1	3.1	2.9	3.7
Redox	1	5.8	3.4	3.6	4.3
200 East Area	3	2.5	3.2	3	2.9
200 East-Semi-Works	1	3.4	0.8	2.8	2.3
300 Area	1	0.5	0.7	1.1	0.8
1100 Area	1	0.9	1.9	4.8	2.5
Richland	1	0.9	0.6	>0.8	>0.8
Kennewick	1	8.7	5.9	10.1	8.2
Pasco	1	4.9	2.4	7.9	5.1
Benton City	1	0.7	1.4	4.1	2.1

The average dosage rates remained at the same level as the values reported for the previous quarter.

The dosage rates present at intermediate locations on the project and in residential areas around the plant perimeter were measured using detachable M and S-type ionization chambers. Readings were obtained from these instruments at frequencies ranging from daily to weekly, and dosage rates were again reported from the chamber which showed the minimum discharge at each location. A summary of these measurements is given in Table II.

TABLE II

AVERAGE DOSE RATES MEASURED WITH "M" AND "S" TYPE DETACHABLE IONIZATION CHAMBERS JANUARY, FEBRUARY, MARCH 1956

Units of mrad per 24 hours

Location	January	February	March	Quarterly Average	Group Average
100 Areas and Environs					
Route 1, Mile 8	0.7	0.7	1.7	1.0	
Route 2N, Mile 5	0.6	0.5	1.3	0.8	
Route 11-A, Mile 1	0.5	1.2	1.5	1.0	
Intersection Rt. 1 and Rt. 4N	0.4	0.6	1.3	0.8	
Military Camp, PSN 3	0.3	0.6	0.9	0.6	
Military Camp, PSN 21	>5.4 **	0.9	1.3	>2.5	>1.1
200 Areas and Environs					
Route 3, Mile 1	3.2	1.4	1.9	2.2	
Route 2S, Mile 4	0.8	0.6	1.8	1.0	
Route 4S, Mile 2.5	0.5	0.9	2.5	1.3	
Route 4S, Mile 6	>5.8 **	0.9	2.3	>3.0	
Route 4S, Mile 10	5.8	0.6	1.0	2.5	
Route 10, Mile 1	1.1	1.3	2.0	1.5	
Route 11-A, Mile 6	0.6	0.8	0.6	0.7	
Military Camp, PSN 42	2.1	1.2	1.5	1.6	
Military Camp, PSN 50	5.2	3.9	0.3	3.1	
Military Camp, PSN 51	2.4	1.2	3.9	2.5	
Military Camp, PSN 61	3.9	1.1	5.0	3.3	
Military Camp, PSN 70	1.2	1.6	3.2	2.0	>2.0
300 Area and Environs					
Route 4S, Mile 16	2.4	0.5	1.3	1.4	
Route 4S, Mile 22	1.6	0.9	0.9	1.1	
Military Camp, PSN 60	2.6	1.1	0.6	1.4	1.3

** All readings taken at these locations were greater than for the month of January 1956.

[redacted]

 [redacted]

No significant differences in average dosage rates were measured at the given grouped locations compared to values found during the previous reporting period.

The activity density of beta particle emitters in the atmosphere was measured using filters through which air was passed at flow rates of 2 to 2.5 cfm for daily or weekly periods. These samples were analyzed and counted several days after their removal from the sampling location to allow for the decay of the daughter products of the natural airborne particle emitters. A summary of the results obtained from these measurements during the quarter is given in Table III.

TABLE III

CONCENTRATIONS OF BETA PARTICLE EMITTERS FILTERED FROM AIR
SINGLE UNIT MONITORS
JANUARY, FEBRUARY, MARCH
1956
Units of 10^{-14} μc/ml

Location	January	February	March	Quarterly Average	Weekly Maximum
100 Areas and Vicinity					
100-K Area #1	15	17	18	17	21
100-K Area #2	16	10	78	69	130
100-K Area #3	49	45	46	46	79
100-D Area	46	30	40	43	63
100-H Area	40	52	48	46	70
Hanford	23	40	40	33	58
White Bluffs	34	46	36	38	93
200 Areas and Vicinity					
200 East Semi-Works	31	41	34	35	68
200 West West Center	47	440	150	78	1400
200 West - Redox	55	150	40	80	330
Gable Mountain	31	31	27	30	47
Military Camp, PSN 50	33	36	52	42	87
200 West East Center	42	110	23	54	52
300 Area	27	26	16	23	51

[redacted]

 [redacted]

TABLE III (contd.)

Units of 10^{-14} μc/ml

Location	January	February	March	Quarterly Average	Weekly Maximum
Outlying Areas					
1100 Area	42	44	40	42	62
Pasco	26	30	40	32	73
Benton City	39	33	43	38	65
Riverland	49	60	50	53	100

The increase noted in December of last quarter continued throughout the quarter. The general increases were the results of contamination from nuclear detonations with additional contamination in February, in and around the separations areas, from materials released during burial of contaminated solid wastes and equipment.

Additional evaluations of the concentrations of beta particle emitters in the atmosphere were made by analyzing the small air filters removed from dual monitors at two locations. The results of these measurements are given in Table IV.

TABLE IV

CONCENTRATIONS OF BETA PARTICLE EMITTERS FILTERED FROM AIR
DUAL UNIT MONITORS
JANUARY, FEBRUARY, MARCH
1956

Units of 10^{-14} μc/ml

Location	January	February	March	Quarterly Average	Weekly Maximum
200-ESE #1	33	40	35	36	63
200-ESE #2	33	40	43	38	67
Richland #1	25	27	32	28	47
Richland #2	24	29	17	23	38

[redacted]

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The quarterly averages shown in Table IV show the same increases as similar measurements included in Table III.

The number of radioactive particles in the atmosphere was determined by autoradiographing air filters through which air flow rates of 2.5 to 10 cfm were passed for periods ranging from daily to weekly. Monitoring stations were maintained throughout the immediate plant environs and at several remote locations in Washington, Oregon, Idaho, and Montana in order to evaluate particles originating both from Hanford and from outside sources. All filters were autoradiographed for seven days using Type K X-ray film. A summary of the results of measurements near the separations areas is given in Table V; results of similar measurements made outside the separations areas and at remote locations is given in Table VI.

[redacted]

TABLE V

SUMMARY OF PARTICLE CONCENTRATIONS NEAR THE SEPARATIONS AREAS JANUARY, FEBRUARY, MARCH 1956

Units of 10^{-3} particle/meter^3

Location	January	February	March	Quarterly Average	Last Quarterly Average
200-E Vicinity					
2704 Outside	27	74	10	35	8
BY - SE	24	77	7	35	23
"B" Gate	62	61	12	46	14
2704 Inside	52	82	14	49	5
2-EWC, 614 Building	15	39	19	23	6
2701-E Inside	42	60	11	37	9
2701-E Outside	51	26	20	35	14
200-W Vicinity					
2701 Outside	86	31	32	52	40
2722	32	110	30	56	28
"T" Gate	16	27	16	19	13
222-T Outside	73	24	26	43	140
231	16	40	6	20	31
Redox	55	95	26	57	26
2701 Inside	33	110	21	54	23
272	48	71	37	51	26
2-WWC, 614 Building	16	52	4	22	13
"U" Gate	20	51	23	30	33
222-U Lab Inside	35	74	10	41	17
Meteorology Tower					
3'	8	5	4	6	3
50'	12	1	6	6	2
100'	18	4	5	8	2
150'	19	2	8	9	2
200'	16	2	5	7	3
250'	19	1	4	6	2
300'	13	2	6	6	3
350'	7	5	3	4	2
400'	36	8	10	15	3

TABLE VI

SUMMARY OF PARTICLE CONCENTRATIONS
OUTSIDE THE SEPARATIONS AREAS
JANUARY, FEBRUARY, MARCH
1956

Units of 10^{-3} particle/meter^3

Location	January	February	March	Quarterly Average	Last Quarterly Average
Area Locations					
100-B Area	47	35	9	31	2
100-K #3 Area	19	35	8	21	3
100-D Area	26	23	13	21	3
White Bluffs	27	13	8	17	5
100-F Area	28	30	17	26	4
300 Area	7	12	3	8	0.5
Off Area Locations					
Benton City, Wn.	40	21	5	24	3
Pasco, Wn.	36	50	21	36	3
Richland, Wn.	37	30	27	32	4
Boise, Idaho	110	48	37	67	10
Klamath Falls, Ore.	50	51	24	42	8
Great Falls, Mont.	40	59	15	38	10
Walla Walla, Wn.	97	33	27	56	8
Meacham, Ore.	31	21	15	23	3
Lewiston, Idaho	12	7	4	8	2
Spokane, Wn.	56	49	44	50	14
Kennewick, Wn.	23	29	10	21	8
Yakima, Wn.	36	43	6	28	4
Seattle, Wn.	38	40	10	30	6

[redacted]

The results listed in Tables V and VI show a continuation of the increased particle deposition noted in December of the previous quarter.

These values show a continuation of fallout from nuclear detonations and verify results from other air monitoring stations as reported in previous tables in this section and in non-volatile beta particle emitter results reported in Section II of this report. The increases noted in and around the separations areas during February were caused partially by local contamination which occurred during burial of solid wastes and contaminated equipment.

The activity density of I^{131} in the atmosphere was determined from the radiochemical analysis of caustic scrubber solutions through which air was passed at rates of 2 to 2.5 cfm for periods ranging from one to seven days. The results obtained from these measurements are summarized in Table VII.

[redacted]

 [redacted]

TABLE VII

CONCENTRATIONS OF IODINE-131 DETECTED BY AIR SCRUBBERS

JANUARY, FEBRUARY, MARCH

1956

Units of 10^{-12} μc/ml

Location	January	February	March	Quarterly Average	Weekly Maximum
200 Areas and Vicinity					
Gable Mountain	<0.1	<0.1	<0.1	<0.1	<0.1
200 East South East	<0.1	<0.1	<0.1	<0.1	0.2
200 West East Center	<0.1	<0.1	<0.1	<0.1	0.1
200 West West Center	<0.1	0.2	<0.1	<0.1	0.3
200 East Semi-Works	<0.1	<0.1	0.1	<0.1	0.2
Redox Area	<0.1	0.2	0.2	0.1	0.4
Outlying Areas					
White Bluffs	<0.1	<0.1	<0.1	<0.1	0.1
100-H Area	0.1	<0.1	<0.1	<0.1	0.2
100-K #3	<0.1	<0.1	<0.1	<0.1	<0.1
300 Area	<0.1	<0.1	<0.1	<0.1	0.2
Richland	<0.1	<0.1	<0.1	<0.1	0.1
1100 Area	<0.1	<0.1	<0.1	<0.1	<0.1
Benton City	<0.1	<0.1	<0.1	<0.1	<0.1
Pasco	<0.1	<0.1	<0.1	<0.1	<0.1

The average activity densities of I^{131} in air compared favorably at all locations with those previously reported and indicate normal operations for the quarter. The concentrations measured in the surrounding residential areas remained generally below detection limits.

The concentration of alpha particle emitters in the atmosphere was determined by counting the same filters used for beta particle emitter measurements which were summarized in Table III and IV above. A summary of the alpha measurements is given in Table VIII.

[redacted]

[redacted]

TABLE VIII

CONCENTRATIONS OF ALPHA PARTICLE EMITTERS FILTERED FROM AIR
JANUARY, FEBRUARY, MARCH
1956

Units of 10^{-15} $\mu c/ml$

Location	No. of Samples	Weekly Maximum	Quarterly Average
100 Areas and Vicinity			
100-K #1	13	4	<4
100-K #2	13	15	5
100-K #3	13	6	<4
100-D	9	<4	<4
100-H	13	<4	<4
White Bluffs	13	5	<4
Hanford	13	4	
200 Areas and Vicinity			
Gable Mountain	12	<4	<4
Semi-Works	13	<4	<4
200 West West Center	13	8	<4
200 West East Center	13	5	<4
Redox Area	12	33	6
Military Camp, PSN 50	11	9	<4
300 Area	13	<4	<4
Outlying Areas			
1100 Area	13	<4	<4
Benton City	13	<4	<4
Pasco	11	6	<4
Riverland	13	<4	<4
Dual Unit Monitors			
200 East South East #1	13	5	<4
200 East South East #2	13	5	<4
Richland #1	13	5	<4
Richland #2	13	<4	<4

The average concentrations of alpha particle emitters compared favorably with previous results and are indicative of normal operations at Hanford.

[redacted]

 [redacted]

SECTION IV
RADIOACTIVE CONTAMINATION IN HANFORD WASTES

The magnitude and extent of radioactive contamination in Hanford wastes were determined from the results of over 2000 measurements. Solid and liquid samples were obtained directly from open waste areas at frequencies varying from daily to monthly; these samples were analyzed radio-chemically for the activity densities of gross alpha and beta particle emitters. Specific isotopic analyses were performed when measurements indicated unusual contamination and were carried out routinely on samples from locations which have a high probability of containing unusual quantities of certain contaminants. These measurements were supplemented with data obtained from portable instrument surveys around the perimeter of the waste storage areas and over open terrain at various locations on the plant.

The results of these measurements are summarized for each of the manufacturing areas.

100 AREA WASTE

Radioactive contamination discharged to the Columbia River from the reactor areas was determined by analyzing samples collected daily from the outlets of the effluent water retention basins. The samples were analyzed within twelve hours after collection and the measured counting rates of beta particle emitters were corrected for decay. A summary of the activity of beta particle emitters discharged to the river per unit of time is given in Table I.

[redacted]

 [redacted]

[redacted]

TABLE I

BETA PARTICLE EMITTERS DISCHARGED TO RIVER
IN REACTOR EFFLUENT WATER
JANUARY, FEBRUARY, MARCH
1956

Units of 10^3 uc/sec

Location	No. Samples	January Max.	January Avg.	February Max.	February Avg.	March Max.	March Avg.	Quarterly Max.	Quarterly Avg.
100-B	65	13	11	16	13	19	12	19	12
100-C	78	25	19	29	23	41	22	41	21
100-KW	56	15	12	30	18	28	20	30	17
100-KE	58	16	13	15	12	23	17	23	14
100-D	49	11	10	12	9	14	9	14	9
100-DR	80	17	12	15	12	19	12	19	12
100-H	66	17	13	17	14	26	16	26	14
100-F	47	24	16	18	15	24	14	24	15

A comparison of the total activity of beta particle emitters discharged to the river during this period with the results of similar measurements obtained during the previous quarter showed minor fluctuation in the activity released to the river from all of the older areas. The 100-KE and 100-KW Areas showed a significant increase as a result of rising power levels.

The average activity of alpha particle emitters in reactor effluent water entering the river was $< 1 \times 10^{-2}$ μc/sec at all areas. Individual samples showed trace alpha particle emitter discharge at various times during the quarter with values indicating contaminants in the range of 1×10^{-2} to 4×10^{-2} μc/sec.

No positive uranium or plutonium measurements were found in samples analyzed specifically for these materials.

Significant quantities of polonium were found in samples of effluent water from 100-C, 100-D, 100-DR, and 100-H Areas with values ranging

[redacted]

 [redacted]

from 0. 002 to 0. 012 μc /sec.

The activity density of I^{131} in waste discharged to the Columbia River from the Biology Farm at 100-F Area was measured by analyzing composite samples collected from the sump in the waste discharge line. An average of 9 μc/day was discharged to the river during the quarter.

200 AREA WASTES

Liquid and solid samples were collected directly from the waste sources in the separations areas and analyzed for gross alpha and beta particle emitters. A summary of the results is given in Table II.

[redacted]

[redacted]

TABLE II

RADIOACTIVE CONTAMINATION IN 200 AREA WASTE SYSTEMS

JANUARY, FEBRUARY, MARCH

1956

Liquid Samples

Location	No. Samples	Alpha Particle Emitters Units of 10^{-8} μc/ml		Beta Particle Emitters Units of 10^{-7} μc/ml	
		Max.	Avg.	Max.	Avg.
T-Ditch	13	<0.5	<0.5	39	21
T-Swamp	26	14	0.6	430	40
Laundry Ditch	23	1.4	<0.5	23	12
U-Ditch Inlet	12	1.7	<0.5	80	15
231-Ditch	24	74	4.3	16	7
234-35 Ditch	12	2.6	<0.5	8.9	4.8
U-Swamp	22	19	3.1	1400	260
B-Ditch	4	<0.5	<0.5	7	4.8
B-Swamp	10	110	12	11	5.4
Purex	6	29	7.8	8.2	7.4

Solid Samples

Location	No. Samples	Units of 10^{-6} μc/gm		Units of 10^{-5} μc/gm	
		Max.	Avg.	Max.	Avg.
T-Ditch	8	14	3	13000	2300
T-Swamp	9	8	3	970	310
Laundry Ditch	12	25	7	69	20
234-35 Ditch	12	1900	370	7	5
B-Ditch	4	9	6	10	7
B-Swamp	10	110	13	29	9

The various increases and decreases noted when comparing the measurements summarized in Table II with the data collected during the preceding period were caused by the normally wide variation of concentrations in the waste systems.

The most significant changes were a decrease in beta particle emitter activity in the T-plant and U-plant waste systems and an increase in alpha particle emitters in B-swamp and the Purex waste systems. The increase in alpha particle emitters was the result of the discharge of plutonium wastes from Purex during an unusual incident.

The results from specific analysis of 200 Area waste for uranium are reported in Table III.

[redacted]

 [redacted]

TABLE III

RADIOACTIVE CONTAMINATION IN 200 AREA WASTE SYSTEMS

JANUARY, FEBRUARY, MARCH

1956

Liquid Samples

Location	No. Samples	Uranium Units of 10^{-9} μc/ml Max.	Avg.
234-5 Ditch Pipe Outlet	12	17	2.3
U-Swamp	22	190	28
U-Ditch Inlet	12	16	2.2
Solid Samples		Units of 10^{-6} μc/gm	
200 E "B" Ditch	3	3.4	1.7
234-5 Ditch Pipe Outlet	10	9.3	3.9
Laundry Ditch	10	7.1	2.2

The values listed in Table III for uranium in liquid and solid waste appear to be normal when compared with values obtained during previous quarters.

Portable instrument surveys using GM type meters were performed at the perimeter of all open waste zones in the separations areas. Counting rates obtained over mud showed values ranging from 200 to 80,000 c/m at 200 West Area locations, while all 200 East locations showed counting rates of less than 2,000 c/m above background.

Readings obtained over the waters at the edge of the swamps and ditches ranged from 200 to 40,000 c/m at 200 West Area with background readings obtained in 200 East.

300 AREA WASTE

Radioactive contamination in waste in the 300 Area was measured in samples collected directly from the north pond inlet. Table IV summarizes the results obtained from the radiochemical analyses for alpha particle emitters, beta particle emitters, uranium, and plutonium.

[redacted]

TABLE IV

RADIOACTIVE CONTAMINATION IN 300 AREA POND INLET

JANUARY, FEBRUARY, MARCH

1956

Units of 10^{-8} μc/ml

Liquid Samples	No. Samples	Maximum	Average
Beta Particle Emitters	57	1100	150
Alpha Particle Emitters	60	4600	190
Uranium	60	1500	92
Plutonium	59	2	1

Individual samples from the 300 Area pond varied widely in activity density as was expected in this waste stream. The values are significantly lower than those obtained for the previous quarter.

ENVIRONS - GROUND CONTAMINATION

Ground surveys were completed along the side of roads on and adjacent to the project with 2,000 square feet surveyed at one-mile intervals. The patterns of particle frequencies found during these surveys in January and March are shown in Figures 4 and 5. Weather conditions during February prevented completion of sufficient grounds surveys to allow presentation on a map.

Ground surveys of selected locations in the Tri-City Area showed an average frequency of particles detectable by portable instruments of one particle per 7,000 square feet.

The Purex separations plant began operation during the quarter and survey control plots were established around the area. Surveys of these plots in February revealed from 0 to 2 particles per 400 square feet with 75 percent of the plots showing no particle deposition.

The ground contamination in and south of the 200 West Area increased significantly during the last week of January and first week of February This

 [redacted]

contamination was caused by the burial of highly contaminated material from Redox. The major contaminant was Ru^{106} with small amounts of Ru^{103} and other materials.

Several other incidents that occurred during the quarter contributed negligible amounts of contamination to the environs.

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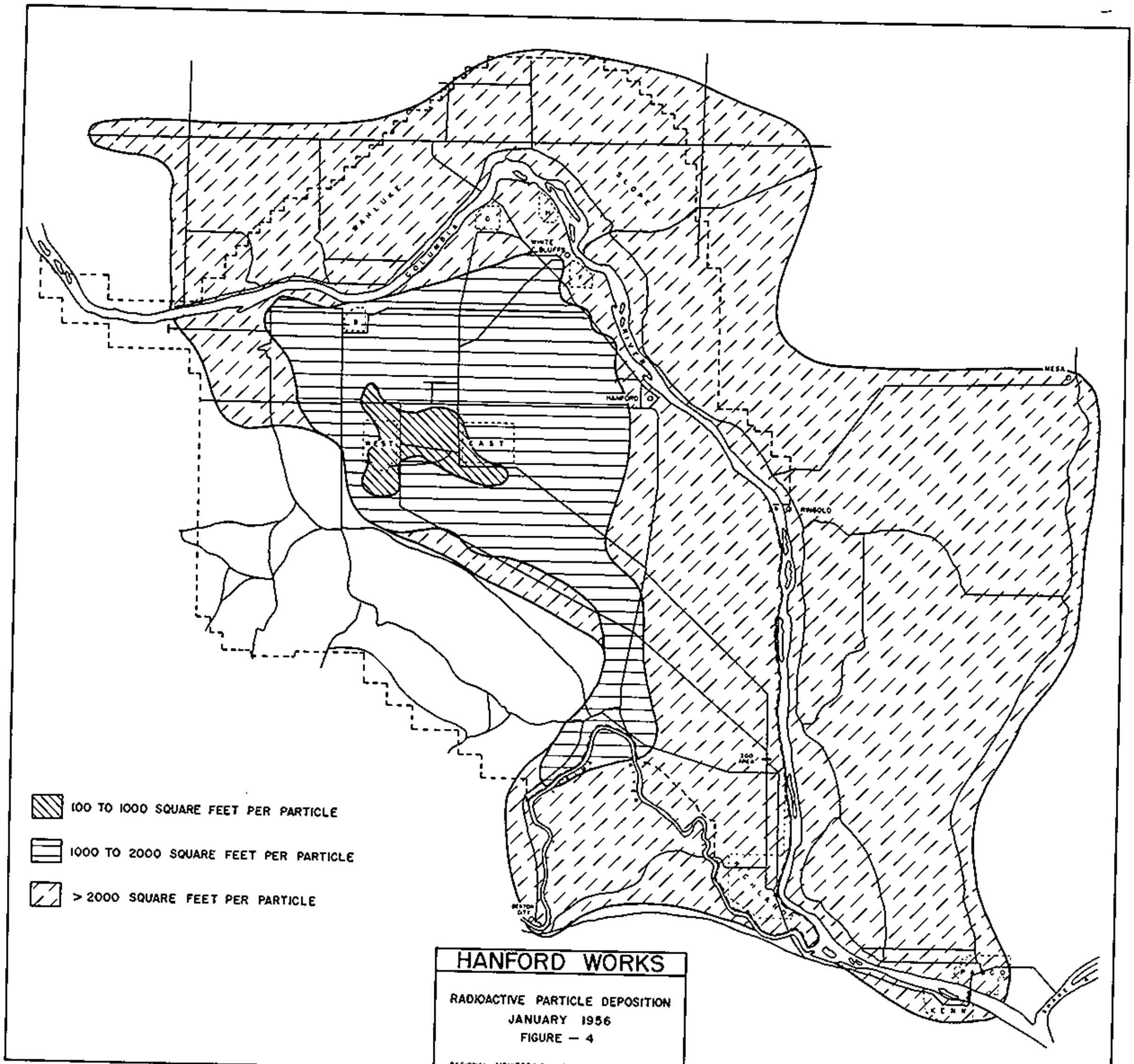

HANFORD WORKS

RADIOACTIVE PARTICLE DEPOSITION
JANUARY 1956
FIGURE — 4

REGIONAL MONITORING — RADIOLOGICAL SCIENCES

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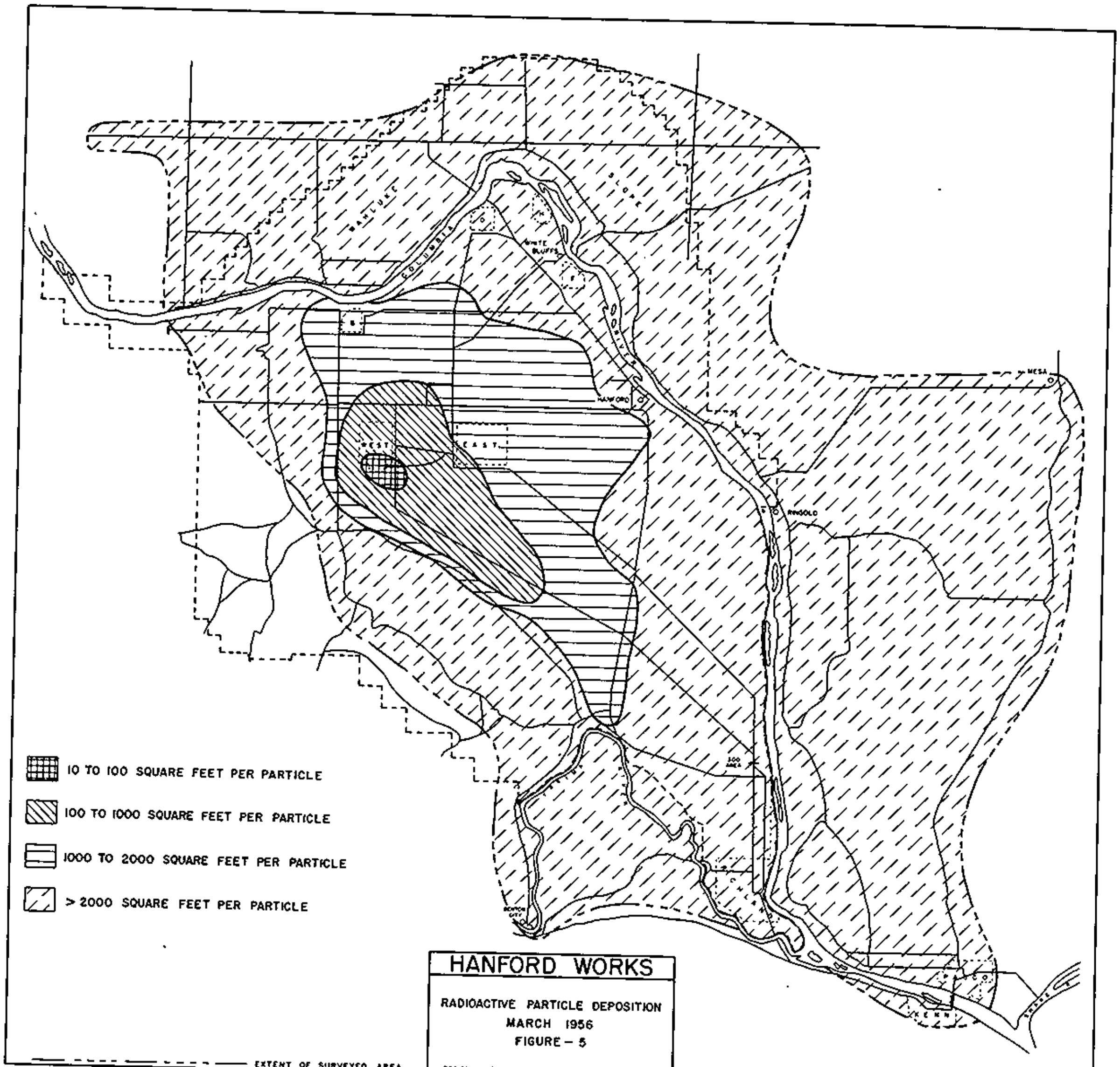

HANFORD WORKS

RADIOACTIVE PARTICLE DEPOSITION
MARCH 1956
FIGURE – 5

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SECTION V

RADIOACTIVE CONTAMINATION IN THE COLUMBIA RIVER AND RELATED WATERS

Approximately 700 samples of water were collected from the Columbia, Yakima, and Snake Rivers to determine the radioactive contamination resulting from the discharge of reactor cooling water to the Columbia River. Daily and weekly 500 ml samples were collected at the Hanford Works and downstream to McNary Dam; monthly one gallon samples were collected from the Columbia River between McNary Dam and Portland. All samples were analyzed for gross beta and alpha particle emitters. The activity density of alpha particle emitters averaged below the detection limit of 5×10^{-9} μc/ml for all river water locations sampled this quarter. Table I summarizes the activity density of beta particle emitters in these samples.

 [redacted]

TABLE I

CONCENTRATION OF BETA PARTICLE EMITTERS IN RIVER WATER

JANUARY, FEBRUARY, MARCH

1956

Units of 10^{-8} μc/ml

Location	Jan. Avg.	Feb. Avg.	Mar. Avg.	Qtr. Avg.	Last Qtr. Avg.	Max. This Qtr.
Columbia River						
Will's Ranch	<5	<5	<5	<5	<5	11
181-B	<5	<5	<5	<5	<5	8
181-C	<5	<5	<5	<5	<5	10
Allard Station	<5	12	<5	<5	8	25
181-KW	170	420	320	290	290	620
181-KE	190	---	400	320	300	480
181-D	640	800	1200	890	560	1600
181-H	1200	1400	1300	1300	710	1900
Below 100-H	1000	1100	2200	1400	930	2600
181-F	1400	1500	2400	1800	1200	3000
Below 100-F	950	1100	2600	1500	1100	3300
Hanford	1600	1700	2300	1900	1300	3500
300 Area	550	470	920	650	420	1100
Byers Landing	420	350	820	520	340	950
Richland	310	280	610	390	290	690
Kennewick Highlands Pumping Station	140	95	320	170	180	410
Pasco Bridge (Kenn. side)	180	240	230	220	140	440
Pasco Bridge (Pasco side)	280	230	440	320	180	580
Pasco Filter Plant Pumping Station	390	340	460	400	210	670
Sacajawea Park	160	150	230	180	140	270
Below McNary Dam	26	19	46	30	20	51
Paterson	22	23	32	26	18	52
Snake River						
Mouth	<5	<5	<5	<5	11	9
Yakima River						
Prosser	<5	<5	<5	<5	<5	<5
Horn	<5	<5	<5	<5	<5	<5
Mouth	<5	<5	<5	<5	<5	6

[redacted]

 [redacted]

General increases in the beta particle emitter activity density of the Columbia River water, especially in the region below 100-K Area, were noted this quarter. There were no significant changes in the river flow rates this quarter when compared to those of the previous quarter. The increased activity of the Columbia River was, therefore, due entirely to the increased activity density of beta particle emitters in the reactor cooling water discharged into the river. Comparison of the data in Table I of Section IV for this quarter with that of the previous quarter revealed that general increases in the activity density of the reactor cooling water were noted this quarter. The increases at the 100-B, 100-C, 100-KW, and 100-KE reactor areas were the most significant and were great enough to account for the increased river water activity.

Average and maximum river flow rates this quarter were 5.8×10^5 and 6.5×10^5 gallons per second, respectively; similar data for the previous quarter were 6.8×10^5 and 5.8×10^5 gallons per second, respectively. River flow rates for this and the previous quarter are shown in Figure 6.

The monthly one gallon samples collected from the Columbia River between McNary Dam and Portland revealed gross beta activity densities ranging from $<5 \times 10^{-8}$ to 2×10^{-7} uc/ml. This range is not significantly different from that found during the previous three quarters. The January and February maximum values of 2×10^{-7} μc/ml occurred at Arlington, while the March maximum of 2×10^{-7} μc/ml occurred at Maryhill. A change in the method of analyzing these one gallon samples was initiated this quarter to improve the accuracy of the activity density measurements. Duplicate one gallon samples collected from the Columbia River from the region near The Dalles, Oregon, were analyzed by the usual method of evaporating the entire one gallon as a single alequot and also by a new procedure which called for evaporating three 1 liter aliquots from each one gallon sample. The new method gave slightly higher results and eliminated the need for the large self-absorption correction factors required when the residue from the entire one gallon sample was analyzed. The new procedure also allows for

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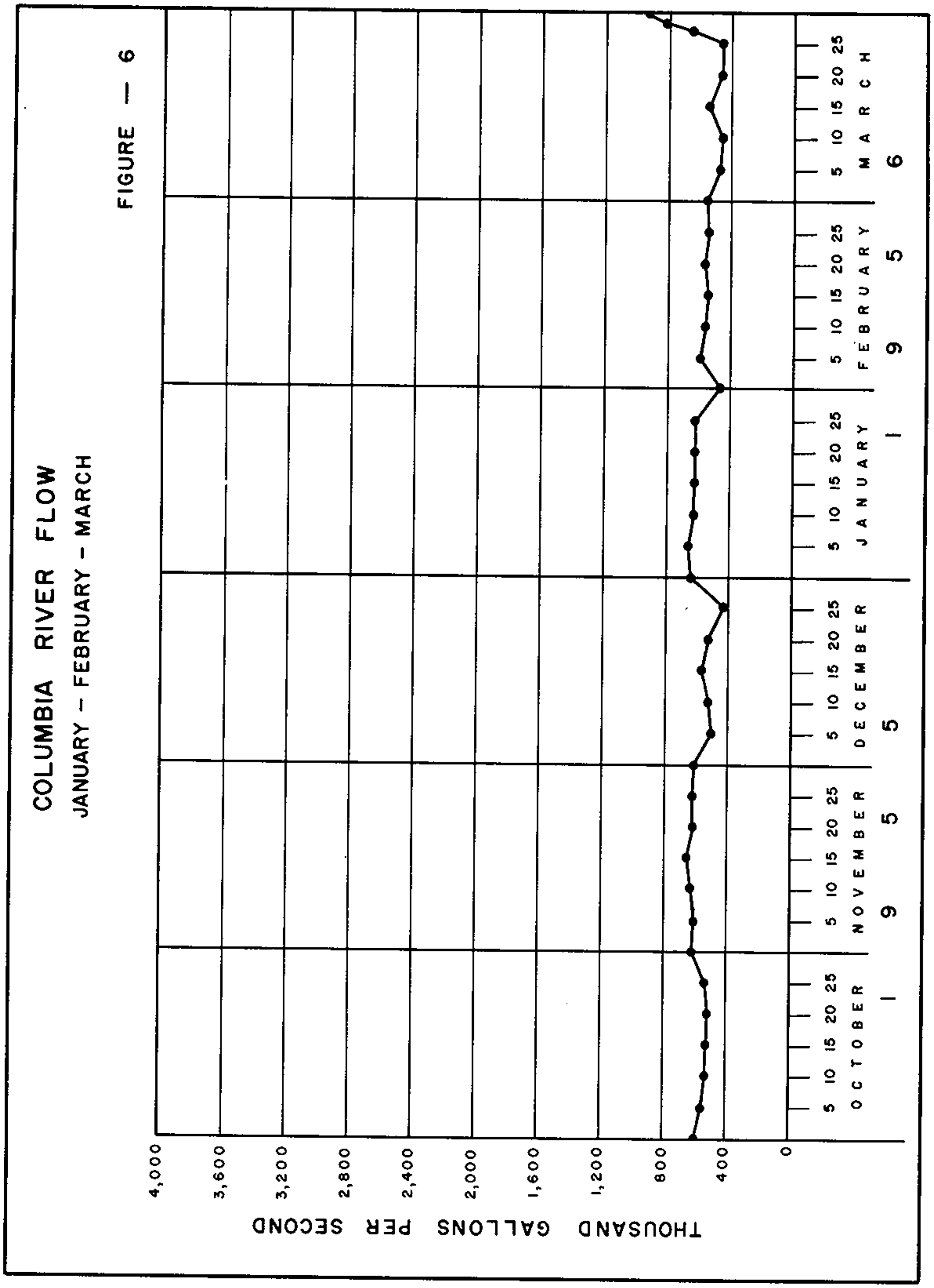
COLUMBIA RIVER FLOW
JANUARY - FEBRUARY - MARCH
THOUSAND GALLONS PER SECOND
4,000
3,600
3,200
2,800
2,400
2,000
1,600
1,200
800
400
0
5 10 15 20 25
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
1 9 5 5
1 9 5 6

FIGURE — 6

three aliquots which can be checked against one another for laboratory errors.

Thirteen water samples collected from the south bank of the Columbia River at the Hanford Ferry landing were analyzed for the activity density of I^{131}. Average and maximum results for the present quarter were 6.7×10^{-8} and 3.5×10^{-7} µc/ml, respectively, compared to values of 5.9×10^{-8} and 1.2×10^{-7} µc/ml, respectively, obtained during the previous quarter.

A total of 260 river mud samples was collected from the Columbia River and nearby tributaries for measurement of gross alpha and beta particle emitters. All alpha particle emitter concentrations were below the detection limit of 3×10^{-6} µc/gm. Table II summarizes the results of the gross beta activity density measurements.

TABLE II
CONCENTRATION OF BETA PARTICLE EMITTERS IN RIVER MUD SAMPLES
1956

Units of 10^{-6} $\mu c/gm$

Location	Jan. Avg.	Feb. Avg.	Mar. Avg.	Qtr. Avg.	Last Qtr. Avg.	Max. This Qtr.
Columbia River						
Wills Ranch						
Shore	22	24	29	26	25	39
5' Out	18	15	20	18	28	32
Allard Station						
Shore	20	20	22	20	23	28
5' Out	22	19	20	20	22	29
100-H						
Shore	68	43	65	62	120	130
5' Out	65	40	152	100	120	290
100-F						
Shore	38	75	95	68	82	180
5' Out	51	59	96	71	107	160
Hanford Ferry						
So. Shore	24	54	52	42	120	96
5' Out	74	25	141	96	74	340
300 Area						
Shore	20	32	57	40	90	75
5' Out	49	29	49	44	48	82
Byers Landing-Shore	28	27	30	29	29	45
Richland						
Shore	34	16	44	34	39	79
5' Out	38	19	105	67	42	248
Kennewick Highlands Pumping Station						
Shore	21	23	22	22	29	35
5' Out	19	24	18	21	31	32
Pasco-Kennewick Bridge (Kenn. Side)						
Shore	22	22	20	21	32	35
5' Out	19	20	21	20	34	25
Sacajawea Park						
5' Out	28	12	22	23	29	44
Below McNary Dam						
5' Out	23	25	13	18	22	29
Paterson						
5' Out	16	24	16	18	32	30

[redacted]

TABLE II (contd.)

Units of 10^{-6} μc/gm

Location	Jan. Avg.	Feb. Avg.	Mar. Avg.	Qtr. Avg.	Last Qtr. Avg.	Max. This Qtr.
Snake River						
Near Mouth						
5' Out	26	24	24	25	24	33
Yakima River						
Horn						
Shore	17	19	23	20	22	57
5' Out	20	18	17	19	19	34
Prosser						
5' Out	13	21	28	21	23	46

The data in Table II are reported in units of 10^{-6} μc/gm this quarter instead of units of 10^{-5} μc/gm as was done in the past quarterly reports. This change was made to conform with the units of the summarized data as received from the IBM 702 computer.

The results in Table II are in the range of expected values. The two unusually high results obtained from the south shore of the Hanford Ferry landing and the 300 Area shore last quarter were not repeated this quarter.

Nearly 150 samples of raw water were collected from the 183 and 283 Buildings in the reactor and separations areas for gross alpha and beta analysis. The average activity density from gross alpha emitters was below the detection limit of 5×10^{-9} μc/ml at all of these locations. Table III is a summary of the results of the gross beta particle emitter analysis.

TABLE III

CONCENTRATIONS OF BETA PARTICLE EMITTERS IN RAW WATER

RIVER EXPORT LINE

JANUARY, FEBRUARY, MARCH

1956

Units of 10^{-8} μc/ml

Location	Jan. Avg.	Feb. Avg.	Mar. Avg.	Qtr. Avg.	Last Qtr. Avg.	Max. This Qtr.
183-B	< 5	< 5	< 5	< 5	< 5	< 5
183-C	< 5	< 5	< 5	< 5	< 5	15
183-KW	150	310	330	270	250	570
183-KE	120	310	200	220	230	420
183-D	290	640	760	580	470	970
183-DR	480	810	950	750	600	1500
183-H	480	840	1200	830	740	1800
183-F	640	870	1400	950	620	2000
283-East	340	340	470	380	150	880
283-West	290	430	510	410	140	650

The raw water samples represent water just prior to purification for drinking purposes; the activity generally follows the fluctuations in the activity density of the river water from which it is derived. The increased activity density of beta particle emitters in raw water this quarter compares favorably with the increased river water activity; the most notable increases were found in the raw water drawn from the river below the 100-K reactor area and in the raw water at the 283 East and 283 West Buildings.

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SECTION VI

RADIOACTIVE CONTAMINATION IN RAIN

A total of 220 rain samples was analyzed during the quarter to determine the activity density of beta particle emitters in rain. The amount of precipitation during the quarter was normal, but it was twice that recorded for the same quarter last year. Table I summarizes the precipitation measurements made by Meteorology personnel at the Meteorology Tower near 200 West Area.

TABLE I

PRECIPITATION MEASURED AT METEOROLOGY STATION
JANUARY, FEBRUARY, MARCH
1956

Units - Inches

Year	January	February	March	Quarterly Total
1953	2.16	0.25	0.17	2.58
1954	1.48	0.28	0.59	2.35
1955	0.56	0.22	0.17	0.95
1956	1.71	0.56	0.10	2.37

The results obtained from radiochemical analysis of the rain and snow are given in Table II.

 [redacted]

 [redacted]

TABLE II

CONCENTRATION OF BETA PARTICLE EMITTERS IN RAIN

JANUARY, FEBRUARY, MARCH

1956

Units of 10^{-6} μc/ml

Location	No. Samples	Maximum	Average
200 East Area	23	4	<1
250' E of Stack	9	4	<1
2000' E of Stack	7	< 1	<1
3500' SE of Stack	7	< 1	<1
200 West Area	39	6	<1
1000' E of Stack	8	< 1	<1
7000' E of Stack	8	3	<1
4900' SE of Stack	8	1	<1
8000' SE of Stack	7	< 1	<1
Redox Area	8	6	<1
100 Area Environs	48	18	<1
100-B SE	7	<1	<1
100-D SW	7	5	<1
100-H SE	9	18	<1
100-F SW	7	<1	<1
White Bluffs	9	<1	<1
Hanford	9	3	<1
Intermediate Locations	62	20	<1
622 Bldg.	28	2	<1
Batch Plant	8	<1	<1
200 North	7	<1	<1
Gable Mountain	6	<1	<1
Route 4S, Mile 6	7	<1	<1
300	6	20	<1
Perimeter Locations	44	3	<1
1100	7	<1	<1
Riverland	8	2	<1
Richland	9	3	<1
Benton City	10	1	<1
Pasco	10	<1	<1

[redacted]

 [redacted]

The average values listed in Table II were all below the detection limit for the radiochemical analysis of rain samples for beta particle emitters. The maximum value of 2×10^{-5} µc/ml was detected at the 300 Area during a period of bomb fallout on March 23.

[redacted]

 [redacted]

SECTION VII

RADIOACTIVE CONTAMINATION IN DRINKING WATER AND TEST WELLS

Over one thousand 500 ml samples collected from drinking water supplies and test wells were analyzed this quarter to determine the radioactive contamination in these waters. A summary of the results of the analysis of 700 drinking water samples for gross alpha and beta particle emitters is presented in Table I.

[redacted]

[redacted]

TABLE I

CONCENTRATIONS OF ALPHA AND BETA PARTICLE EMITTERS IN WATER SUPPLIES JANUARY, FEBRUARY, MARCH

1956

Location	No. Samples	Alpha Particle Emitters Units of 10^{-9} μc/ml Max.	Alpha Avg.	Beta Particle Emitters Units of 10^{-8} μc/ml Max.	Beta Avg.
Midway and Vicinity	31	<5	<5	<5	<5
100-B (San)	13	<5	<5	27	<5
100-C (San)	13	<5	<5	42	6
100-K (San)	13	<5	<5	390	130
100-D (San)	12	<5	<5	580	210
100-DR (San)	13	<5	<5	330	200
100-H (San)	13	<5	<5	570	300
100-F (San)	13	<5	<5	910	350
White Bluffs Fire Hall	13	<5	<5	410	220
Pistol Range	11	<5	<5	6	<5
251 Building	13	<5	<5	63	48
200-East (San)	39	<5	<5	210	89
200-West (San)	52	<5	<5	270	110
300 Area Wells	13	<5	<5	<5	<5
No. Richland Wells	100	<5	<5	<5	<5
Byers Landing	11	<5	<5	5	<5
Larson Farm	13	7	<5	6	<5
Richland Wells	152	20	5	7	<5
Kennewick	36	<5	<5	170	59
Sacajawea	5	<5	<5	<5	<5
Pasco H and R Depot	13	<5	<5	240	59
McNary	12	<5	<5	<5	<5
Plymouth	12	<5	<5	<5	<5
Paterson Store	12	12	8	6	<5
Enterprise	13	<5	<5	5	<5
Headgate	10	<5	<5	<5	<5
Benton City	38	16	8	5	<5
Prosser	12	<5	<5	<5	<5

[redacted]

As in the past, positive measurements of beta particle emitter activity density were obtained from nearly all of the drinking water supplies sampled this quarter; quarterly averages ranged from (< 0.5 to 35) x 10^{-7} µc/ml. The range of average values noted during the previous quarter was (<0.5 to 26) x 10^{-7} µc/ml. The values reported for drinking water which originated from the Columbia River in the region immediately below 100-K Area are significantly higher than those reported for the previous quarter. These increases, and slight increases noted in drinking water supplies derived from the Columbia River at points downstream of Hanford, were due to the increased activity density of the river this quarter (Section V).

No significant changes were noted this quarter in the average alpha particle emitter activity density in any of the drinking water supplies sampled. Nine locations listed in Table I which had average values for the activity density of alpha particle emitters equal to or above the detection limit of 5 x 10^{-9} µc/ml were analyzed for uranium content. Table II is a summary of the results of these measurements. These locations were confined to well water supplies where naturally occurring uranium has been found in the past. The uranium activity accounts for the majority of the alpha particle emitter activity density in all cases.

TABLE II

CONCENTRATIONS OF ALPHA PARTICLE EMITTERS IN DRINKING WATER JANUARY, FEBRUARY, MARCH 1956

		Alpha Particle Emitters			Uranium	
		Units of 10^{-9} μc/ml			Units of 10^{-9} μc/ml	
Location	No. Samples	Max.	Avg.	No. Samples	Max.	Avg.
Richland Well No. 4	63	18	5	61	11	5
Richland Well No. 5	13	20	5	13	4	3
Richland Well No. 12	12	8	5	12	8	6
Richland Well No. 14	13	9	6	13	9	5
Richland Well No. 15	12	12	6	13	16	7
Richland Well No. 18	5	7	5	5	5	4
Benton City Store	13	16	12	13	11	8
Benton City Water Co.	12	16	12	12	11	9
Paterson Store	12	12	8	12	12	8

Supplemental samples collected from various stages of the water treatment process at the Pasco Filter Plant were analyzed for beta particle emitter activity density. A summary of the results of these measurements is presented in Table III.

TABLE III

CONCENTRATION OF BETA PARTICLE EMITTERS AT THE PASCO FILTER PLANT JANUARY, FEBRUARY, MARCH 1956

Type Sample	No. Samples	Maximum	Average
Water Entering Plant From River	34	6.7×10^{-6} μc/ml	3.3×10^{-6} μc/ml
Coal and Sand (surface of coal and sand filter)	16	1.1×10^{-4} μc/gm	4.7×10^{-5} μc/gm
First Backwash Material(Liquid)	16	1.3×10^{-5} μc/ml	1.3×10^{-6} μc/ml
First Backwash Material (Solid)	16	4.0×10^{-2} μc/gm	1.4×10^{-2} μc/gm
Water Leaving Plant	13	1.9×10^{-6} μc/ml	1.1×10^{-6} μc/ml

During the present quarter, the coal and sand filtering media used at the Pasco Filter Plant were combined so that two filter beds of mixed media are now used rather than one filter of coal and one of sand. Results of the analyses of samples of the filter media and filter backwash materials will no longer be reported separately for each filter bed, since the two filters are now essentially the same.

The average activity density of beta particle emitters in the water at the various stages of the treatment processes and of the backwash materials showed general increases this quarter reflecting increases in river water activity. Average activity density of water leaving the plant this quarter was 1.1×10^{-6} μc/ml compared to an average of 6.5×10^{-7} μc/ml last quarter. The decontamination factor of 3 determined for the treatment process this quarter is the same as that found last quarter, but represents a decrease over the factor of 8 determined for the first quarter of 1955.

Alpha particle emitters were detected in the solid material from the filter backwash water, but not in the liquid portion of the backwash water nor in the water leaving the plant. Activity density of alpha particle emitters in these backwash solids average 1.1×10^{-5} μc/ml compared to average values of 1.0×10^{-5} and 1.4×10^{-5} μc/ml obtained during the previous quarter for the sand and coal backwash solids, respectively. (These latter two values were erroneously reported as having units of 10^{-6} μc/ml last quarter and these corrections should be noted in the October, November, December, 1955 quarterly report[(6)].)

The results of the analysis of 440 test well samples from the Hanford water table for alpha and beta particle emitters are summarized in Table IV for those locations where either type of measurement yielded a positive average.

TABLE IV

CONCENTRATION OF ALPHA AND BETA PARTICLE EMITTERS IN TEST WELLS JANUARY, FEBRUARY, MARCH 1956

Location	No. Samples	Alpha Particle Emitters Units of 10^{-9} μc/ml Maximum	Alpha Average	Beta Particle Emitters Units of 10^{-8} μc/ml Maximum	Beta Average
107-B-1	4	<5	<5	510	290
107-B-2	4	<5	<5	550	420
108-B-1	4	<5	<5	120	91
108-B-2	4	<5	<5	130	95
107-D-1	1	<5	<5	640	640
107-F-1	4	<5	<5	26	21
107-F-2	2	<5	<5	9800	7000
107-F-3	4	<5	<5	190	170
108-F-1	4	<5	<5	34	29
108-F-2	4	<5	<5	77000	25000
107-H-1	4	<5	<5	150	64
361-B-7	6	<5	<5	13	6
361-9	6	16	6	<5	<5
300 Area Well No. 3	8	74	56	<5	<5
300 Area Well No. 4	7	120	65	5	<5
303-1	12	1000	640	28	8
303-2	12	940	900	10	6
303-3	12	540	400	<5	<5
303-4	12	320	220	<5	<5
303-5	11	58	50	<5	<5
303-6	12	510	390	6	<5
303-7	3	150	130	6	<5
303-8	3	8	7	7	<5
303-9	3	37	28	<5	<5
303-10	3	230	190	<5	<5
303-11	4	13	11	<5	<5
303-12	3	110	46	<5	<5
3000-7	3	26	13	<5	<5
Well 24-33	5	<5	<5	36	11
Well 19-43	4	5	<5	10	7
Well 17-5	3	9	5	<5	<5
Well 49-79	1	<5	<5	7	7
Well 32-77	2	<5	<5	9	7
Well 34-39	3	<5	<5	46	17
Well 45-69	2	<5	<5	18	10

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TABLE IV (Contd.)

Location	No. Samples	Alpha Particle Emitters, Units of 10^{-9} μc/ml: Maximum	Alpha Particle Emitters, Units of 10^{-9} μc/ml: Average	Beta Particle Emitters, Units of 10^{-8} μc/ml: Maximum	Beta Particle Emitters, Units of 10^{-8} μc/ml: Average
Well 97-48	2	<5	<5	6	5
Well 71-84	2	<5	<5	23	21
Well 38-43	3	<5	<5	66	27
321-5	5	14	8	<5	<5
321-6	6	33	26	<5	<5
321-8	5	16	13	<5	<5

Three wells which yielded positive alpha or beta particle emitter activity densities near the detection limits last quarter had averages below these limits this quarter. These wells were 361-B-1, 361-B-5, and 300 Area Well No. 1 One addition to Table IV this quarter was well 361-9 which had an average alpha particle emitter activity density just above the detection limit. Another addition this quarter was well 107-F-2 which had shown an extremely high beta particle emitter activity density of 4.3×10^{-5} uc/ml in one sample collected during the third quarter of 1955 and had an average value of $< 5 \times 10^{-6}$ uc/ml in 4 samples collected during the fourth quarter of 1955.

Test wells 49-79, 32-77, and 45-69 are located fairly close to the perimeter of 200 West Area and positive results have been noted occasionally in the past. Wells 97-48 and 71-84 are near 100-D and 100-B Areas, respectively, and positive results are not unusual for these locations. Wells 24-33, 19-43, 34-39, and 38-43 are between 200 East Area and 300 Area and the positive measurements obtained during this quarter are indications of possibly contaminated ground water reaching these wells from liquid waste disposal sites in 200 East and 200 West Areas. The frequency of sampling and the sample volumes collected from wells between 200 East and 300 Areas will be increased during the next quarter.

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The increasing trend noted last quarter in the average alpha particle emitter activity density in Well 303-8 did not continue into the present quarter. Average values for this and the previous quarter were 7×10^{-9} and 1.2×10^{-7} μc/ml, respectively. Samples from 300 Area Wells No. 3 and No. 4 were analyzed for uranium; average values were 4.9×10^{-8} and 5×10^{-8} μc/ml, respectively. The maximum measurement of 7.2×10^{-8} μc/ml was obtained at Well No. 3. These measurements were slightly lower than those obtained during the previous two quarters.

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