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ENVIRONMENTAL SURVEILLANCE
IN THE VICINITY OF HANFORD
FOR AUGUST, 1968

OCTOBER 18, 1968

AEC RESEARCH &
DEVELOPMENT REPORT

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ENVIRONMENTAL SURVEILLANCE IN THE
VICINITY OF HANFORD FOR AUGUST, 1968

By

Environmental Evaluations
Radiation Protection
TECHNICAL SERVICES DIVISION

Edited by

C. B. Wooldridge

October 18, 1968

PACIFIC NORTHWEST LABORATORY
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ENVIRONMENTAL SURVEILLANCE IN THE
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INTRODUCTION

This report contains information related to radioactive materials in the Columbia River, the atmosphere, and selected foods (Figures 1-17) for August, 1968. Measurements of the Columbia River flow rate, temperature, and chemical characteristics are also shown (Figures 5, 18-21 and Table 1). Data for the previous twelve months is included.

A comprehensive evaluation of these data is reported once per year in an annual report (see BNWL-439, "Evaluation of Radiological Conditions in the Vicinity of Hanford for 1966"). The data are updated at midyear and are published in a semi-annual report (see BNWL-665, "Evaluation of Radiological Conditions in the Vicinity of Hanford, January-June, 1967").

The radiochemical data presented in this report were supplied by the U. S. Testing Co., Inc., which performed the routine radioassays of environmental samples. The "analytical limit", as used on some of the figures in this report, is defined as the concentration at which the laboratory can measure a radionuclide with an accuracy of ± 100 per cent at the 90 per cent confidence level. The detection limit for a specific radionuclide varies with sample type, sample size, counting time, and the amounts of interfering radionuclides present. The "analytical limits" were chosen to represent upper bounds to these fluctuating detection limits. Many of the graphs do not show the "analytical limit" because, for certain analyses, these limits are below the range of values shown on the graphs.

SUMMARY

The concentrations of most radionuclides measured in the Hanford environs were within the expected ranges of variation.

Figure 1
Air Sampling Locations

Figure 2

Beta activity in the atmosphere was determined from off-plant air filter samples from near-by locations in the direction of the prevailing wind (Southeast Quadrant), and from other more distant locations (Perimeter Communities). These are shown on Figure 2. The continued higher concentrations compared to 1967 were attributed to fallout.

Figure 3

Radioiodine in the atmosphere was determined from caustic scrubbers operated at off-plant sampling locations (Southeast Quadrant). During August, ¹³¹I concentrations were below the analytical limit (0.02 pCi/m³).

¹³¹I IN LOCALLY PURCHASED MILK

Figure 4

Milk is sampled from individual farms near the Hanford project, from a local creamery that collects milk from several producers near the Hanford perimeter, and from local stores. Radioiodine concentrations in all milk samples collected in August were below the analytical limit (3 pCi¹³¹I/l). (Data for other radionuclides in milk are presented in Figures 14-15).

COLUMBIA RIVER FLOW RATE AT PRIEST RAPIDS

Figure 5

River flow rates continued to be below the long-term average during most of August. The average river flow rate during August, 1968, was 113,000 cubic feet per second, according to U. S. Geological Survey Reports for the Priest Rapids Gauge Station. The peak mean daily flow rate for the month was 147,000 cubic feet per second on August 9. For comparison, the average river flow rate during August, 1967, was 125,000 cubic feet per second.

Figure 6

Figure 7

Transport rates for several radionuclides are calculated from concentrations at Richland and Columbia River flow rates at the Priest Rapids Gauge Station. The average ^{51}Cr and ^{65}Zn transport rates for August, 1968, were about one-third of those for the comparable period a year ago. The average transport rates for the other measured radionuclides were at or below the comparable values for a year ago.

Figure 8

The concentrations of ^{32}P , ^{65}Zn , and ^{131}I in August samples of Richland drinking water were at or below the comparable values of last year. Well water constituted the entire water supply for Richland during that period of August for which no radionuclide concentrations are shown.

Figure 9

Figure 10

Data for the third week of August reflect the use of well water for the entire water supply during the period August 13 to August 23. The cumulative 12-month dose to the GI tract from Richland drinking water was estimated to be 21 mrem through August, 1968, compared to 31 mrem through August, 1967. Estimates were based on an assumed intake rate of 1.2 l/day.

Figure 11

Through August, 1968, the cumulative 12-month GI tract dose from Pasco drinking water was 12 mrem compared to 15 mrem through August, 1967. Estimates were based on an assumed intake of 1.2 l/day.

Figure 12

Columbia River whitefish are collected twice monthly from the stretch of the river above Richland. During August, 1968, average ^{65}Zn concentrations were similar to 1967 values. Concentrations of ^{32}P were significantly below comparable 1967 values.

Figure 13

^{65}Zn concentrations in Willapa Bay oysters were slightly lower than those observed a year ago. The expected seasonal decrease in ^{32}P concentrations was observed.

Figure 14

Figure 15

Seasonal use of Columbia River water (drawn from below the Hanford project) for irrigation of pasture land results in the presence of ^{32}P and ^{65}Zn in some local farm milk. The analyses of milk samples from farms in the Riverview district (above Pasco) are designated as "Farms Irrigated with Columbia River Water" in Figures 14 and 15. During August, ^{32}P and ^{65}Zn concentrations were generally at levels typical of the irrigation season.

Figure 16

Gamma radiation exposure rates at the Columbia River shoreline are measured with a 40-liter ionization chamber, calibrated in $\mu\text{R}/\text{hour}$ (radium-gamma calibration). The measurements are made 3 feet above ground, approximating the dose rate to the gonads of a person standing on the riverbank. The Ringold location is near the closest point of public access to the river below the reactors. The average exposure rate was $50 \mu\text{R}/\text{hr}$ during August, 1968.

Figure 17

External gamma exposure rates in the city of Richland are measured with small ionization chambers. The average for August, 1968, was $0.28 \text{ mR}/\text{day}$. The measured exposure rates over the twelve months ending with August averaged $0.28 \text{ mR}/\text{day}$, the same as the comparable average for a year ago. The occasional higher than usual results could not be related to other environmental measurements or plant releases.

Figure 18

The temperatures plotted in Figure 18 are measured at the Priest Rapids Gauge Station.

Figure 19

The temperatures plotted in Figure 19 are measured at the Richland Water Plant intake.

Figure 20

Figure 21

Concentrations of hexavalent chromium ion and nitrate ion were determined from grab samples at the Priest Rapids Gauge Station (upstream from Hanford) and from cumulative samples at the Richland Water Plant intake. Dichromate ion is added during the treatment process for reactor cooling water. Some nitrate ion from chemical wastes discharged to the ground may enter the river with underground water. For drinking water, the Public Health Service standards (1962) include concentration limits of 50 parts per billion as hexavalent chromium and 45,000 parts per billion as nitrate ion.

TABLE 1

CHEMICAL CHARACTERISTICS OF COLUMBIA RIVER WATER

Results for August, 1968, of analyses of river water collected at Vernita Bridge and the 100-F Area (above and below the production reactors) as reported by Douglas-United Nuclear.

(Results in ppm)

<u>Vernita</u>	<u>Mg</u>	<u>Fe</u>	<u>Cu</u>	<u>Ca</u>	<u>SO₄</u>	<u>PO₄</u>	<u>Cl</u>	<u>Diss. O₂</u>	<u>Phth. Alk.</u>	<u>M.O. Alk.</u>	<u>Hardness</u>	<u>Solids</u>
8-6-68	2	.03	.004	25	8	.001	.15	10.6	2	54	73	85
8-20-68	2	.02	.002	25	8	.01	.15	9.5	2	53	71	80
<u>100-F Area</u>												
8-6-68	3	.03	.007	27	7	.002	.20	9.6	2	58	79	86
8-20-68	3	.03	.002	27	10	.006	.27	9.9	3	59	79	78

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