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ENVIRONMENTAL SURVEILLANCE IN THE VICINITY OF HANFORD FOR JANUARY, 1968

APRIL 1968

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AEC RESEARCH & DEVELOPMENT REPORT

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BATTELLE MEMORIAL INSTITUTE
for the
UNITED STATES ATOMIC ENERGY COMMISSION UNDER CONTRACT AT(45-1)-1830

Printed in the United States of America
Available from
National Technical Information Service
U.S. Department of Commerce
5285 Port Royal Road
Springfield, Virginia 22151
Price: Printed Copy $3.00; Microfiche $0.65

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ENVIRONMENTAL SURVEILLANCE IN THE VICINITY OF HANFORD FOR JANUARY, 1968

By

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Environmental Studies Section
ENVIRONMENTAL HEALTH DEPARTMENT

Edited by

C. B. Wooldridge

April 15, 1968

PACIFIC NORTHWEST LABORATORY
RICHLAND, WASHINGTON

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ENVIRONMENTAL SURVEILLANCE IN THE VICINITY OF HANFORD FOR JANUARY, 1968

Introduction

This is the first report for 1968 in a continuing series of monthly reports of radiological and other measurements in the vicinity of the Hanford plant. The preceeding report in this series was BNWL-420-12, "Radiological Status of the Hanford Environs for December, 1967." The change in title has been made to reflect more accurately the data included.

The monthly report series for 1968 will be similar to the 1967 series in content i.e., information related to radioactive materials in the Columbia River, the atmosphere, and selected foods (Figures 1-17) is presented. Measurements of the Columbia River flow rate, temperature, and chemical characteristics are also shown (Figures 5, 18-21 and Table 1). However, a change in format has been made in order to facilitate comparisons by showing both data for the current month and the previous twelve months.

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 $\pm$ 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 in the vicinity of Hanford during January, 1968 were below comparable measurements for a year ago. Slightly increased concentrations of I-131 in Richland drinking water were observed during the last two weeks of the month. Radioiodine detected in several milk samples (maximum 25 pCi/ℓ) was attributed to fallout from an announced nuclear weapons test of December 24, 1967. Increased beta activities on air filters were also attributed to fallout.

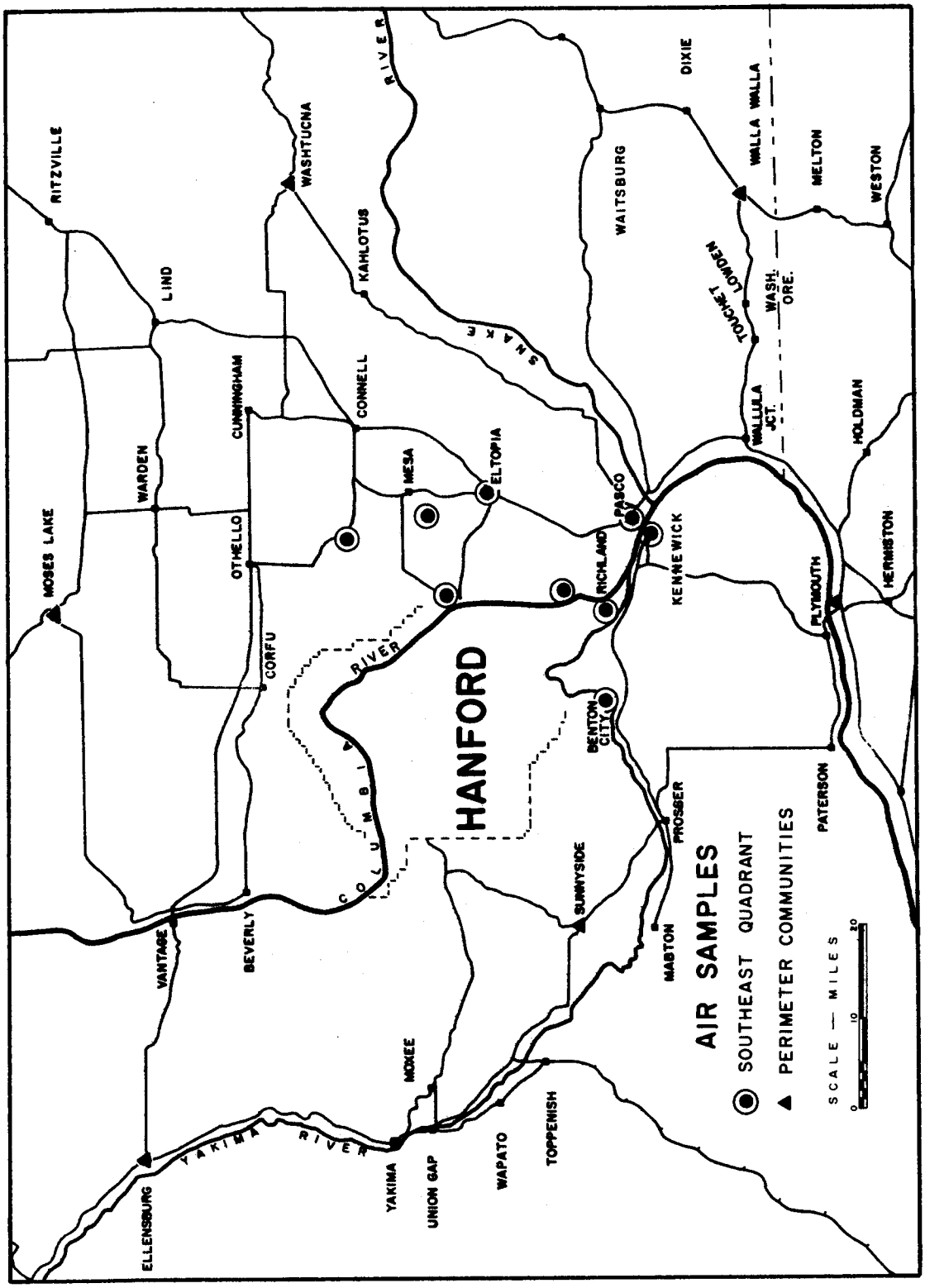

Figure 1

Air Sampling Locations

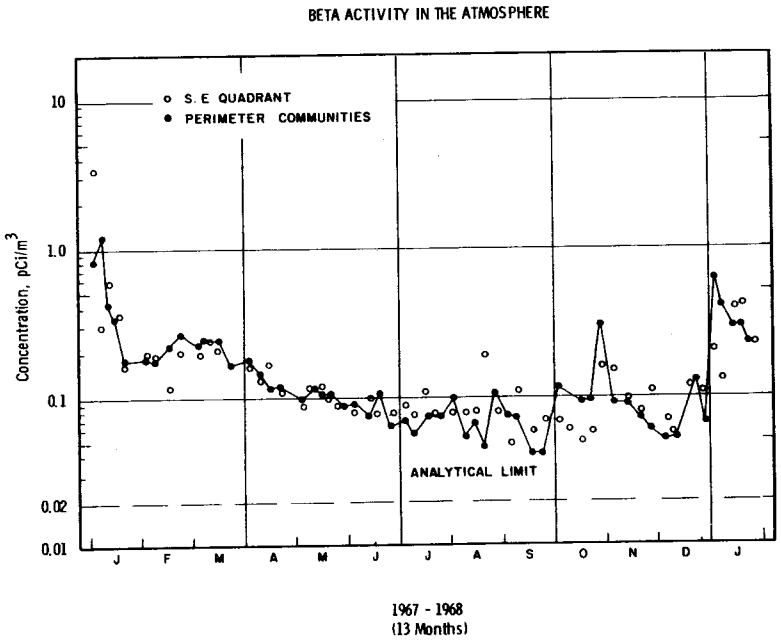

Figure 2

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 1. Slightly increased atmospheric beta activity during January was attributed to fallout following an announced nuclear weapons test.

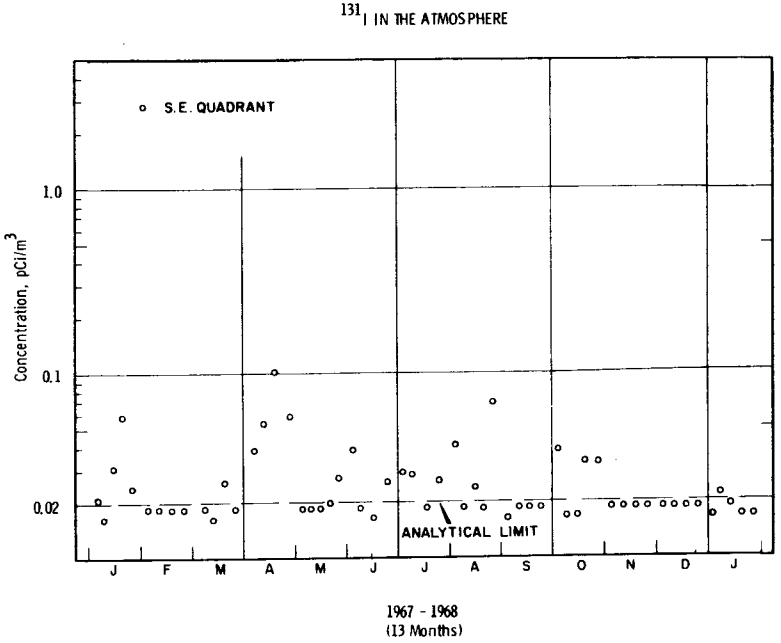

Figure 3

Radioiodine concentrations at several locations were attributed primarily to fallout from an announced nuclear weapons test.

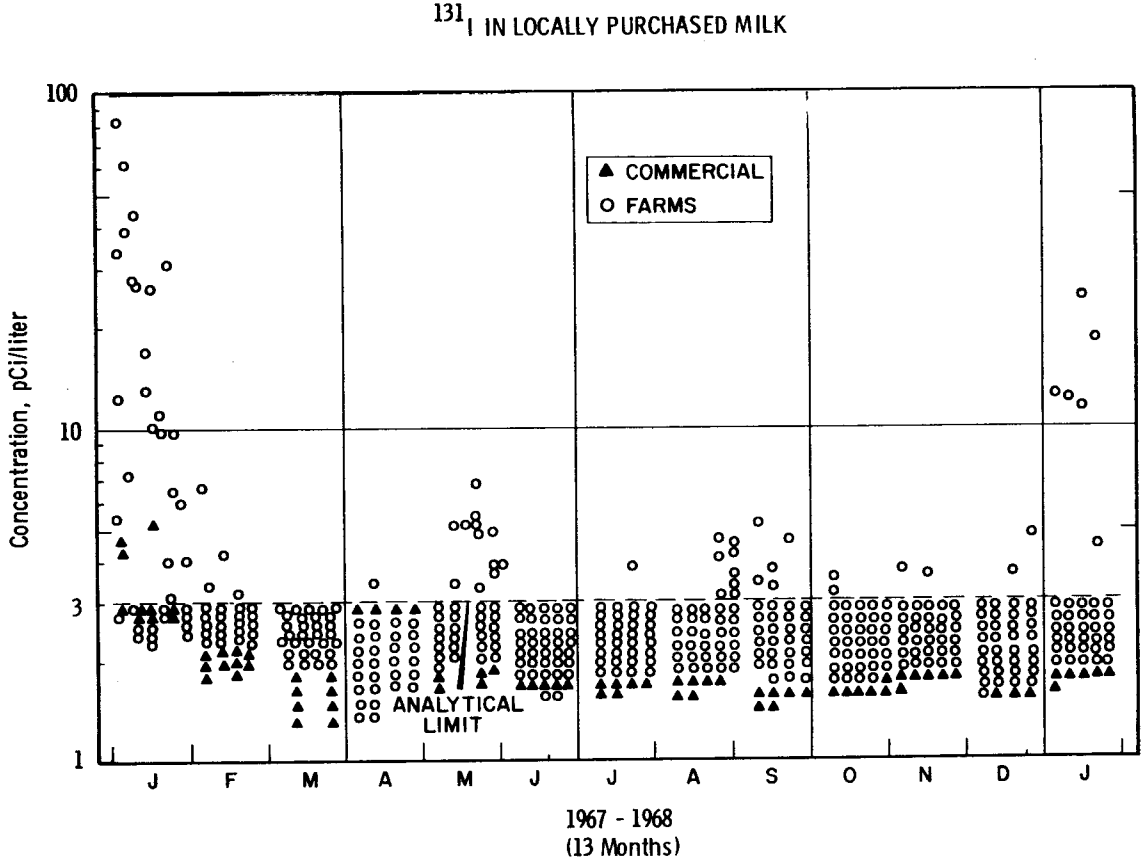

Figure 4

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. The maximum concentration in milk of ^{131}I following the reported nuclear weapons test of December, 1967, was 25 pCi/ℓ. For comparison, the peak concentration following the announced weapons test of December, 1966 was 83 pCi/ℓ.

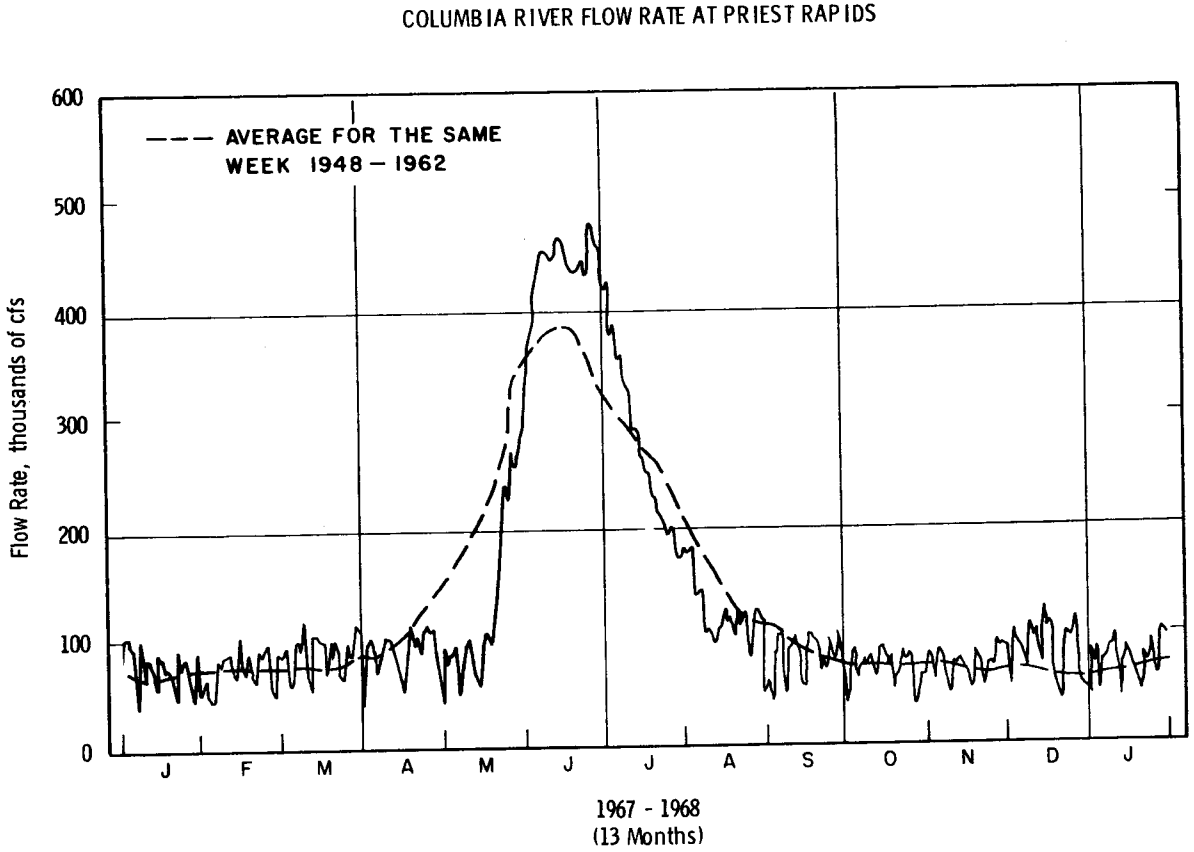

Figure 5

The average river flow rate during January, 1968 was 77,900 cubic feet per second, according to the U. S. Geological Survey Reports for the Priest Rapids Gauge Station. The peak mean daily flow rate for the month was 106,000 cubic feet per second on January 29. For comparison, the average river flow rate during January, 1967 was 75,300 cubic feet per second.

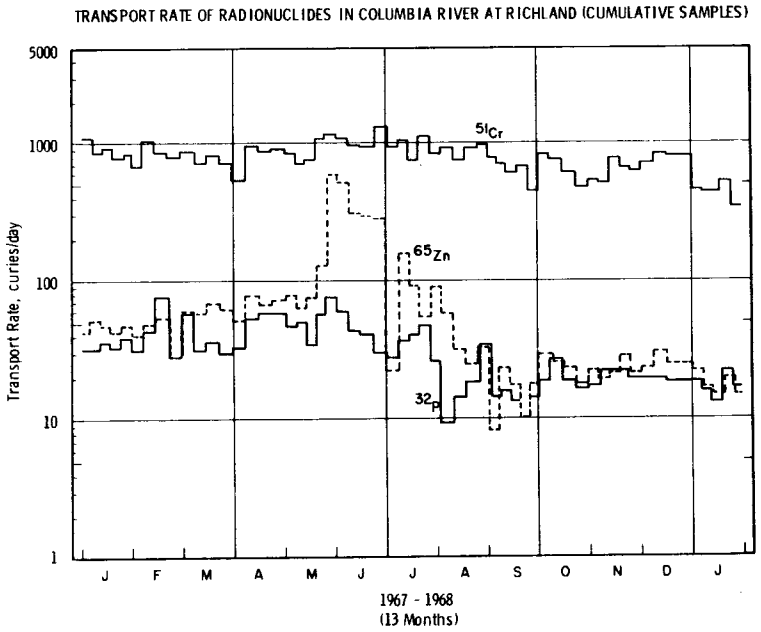

Figure 6

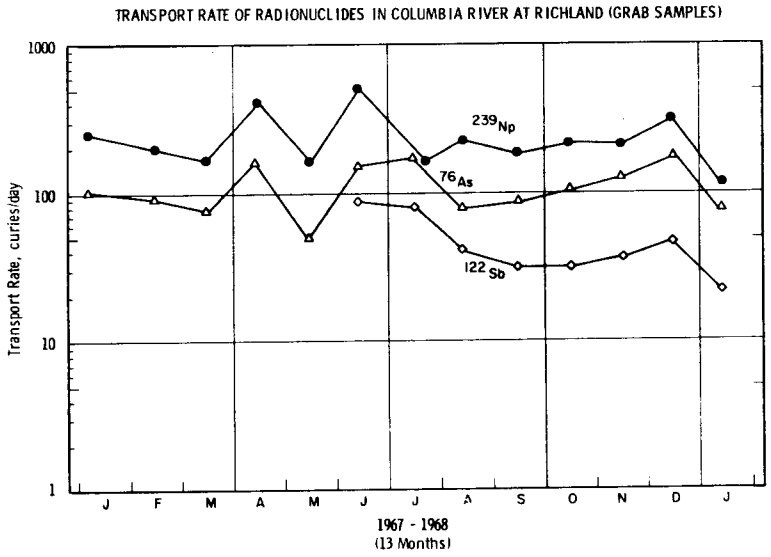

Figure 7

The transport rates of ^{32}P, ^{51}Cr, ^{65}Zn, ^{76}As, ^{122}Sb, and ^{239}Np during January, 1968, were below comparable values for 1967.

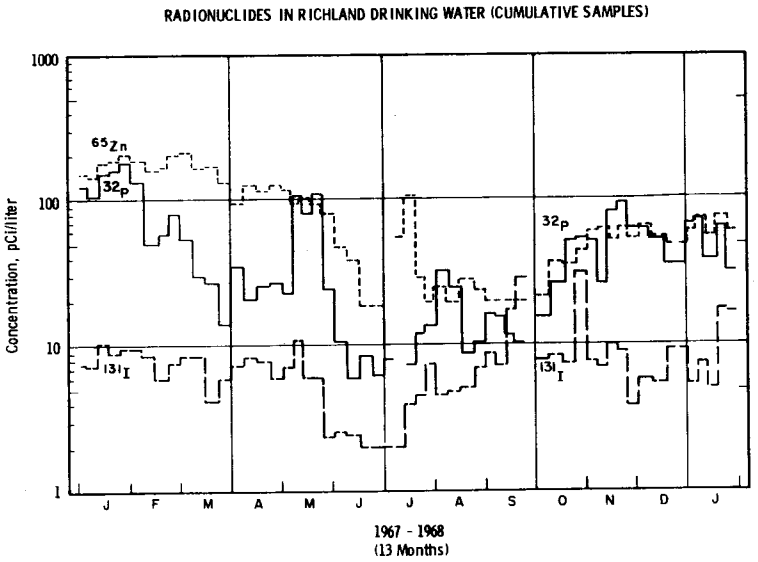

Figure 8

During January, concentrations of ^{32}P and ^{65}Zn were at expected levels. ^{131}I concentrations in Richland drinking water increased during the last two weeks of the month due to a slightly increased ^{131}I release rate.

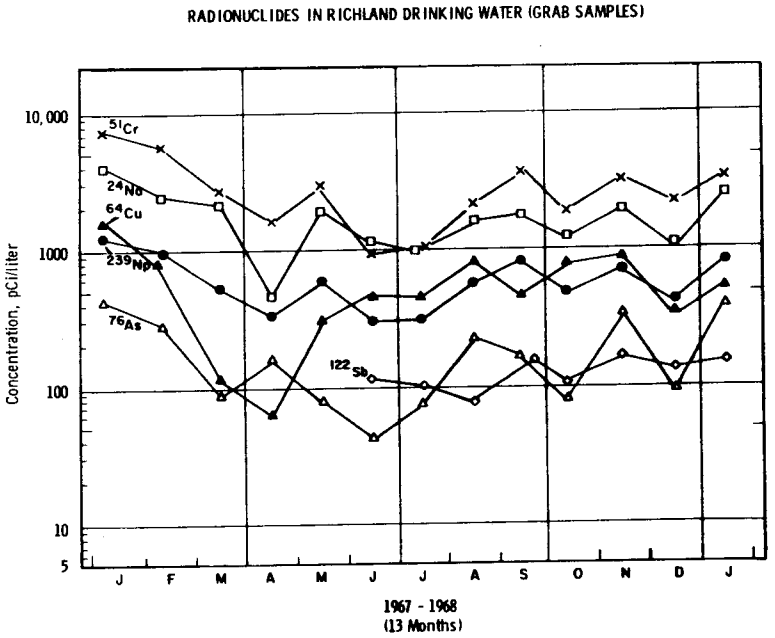

Figure 9

The concentrations of the several radionuclides measured in spot samples of Richland drinking water were consistent with expected levels.

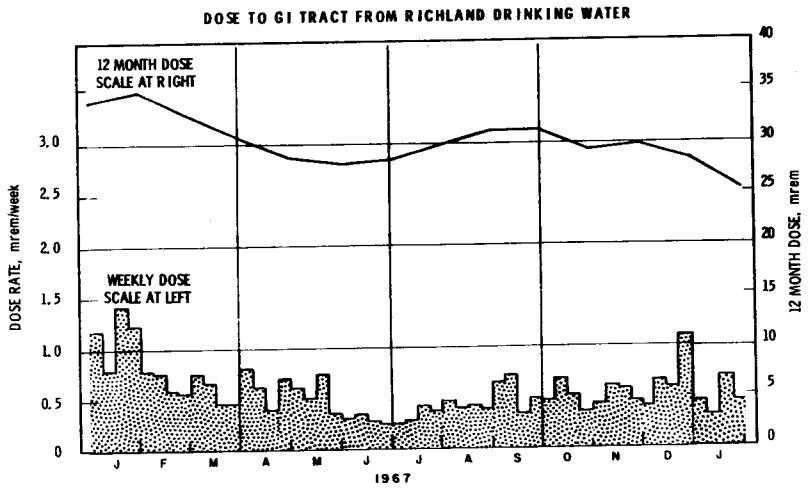

Figure 10

The cumulative 12 month dose to the GI tract from Richland drinking water was 25 mrem through January, 1968, compared to 35 mrem through January, 1967.

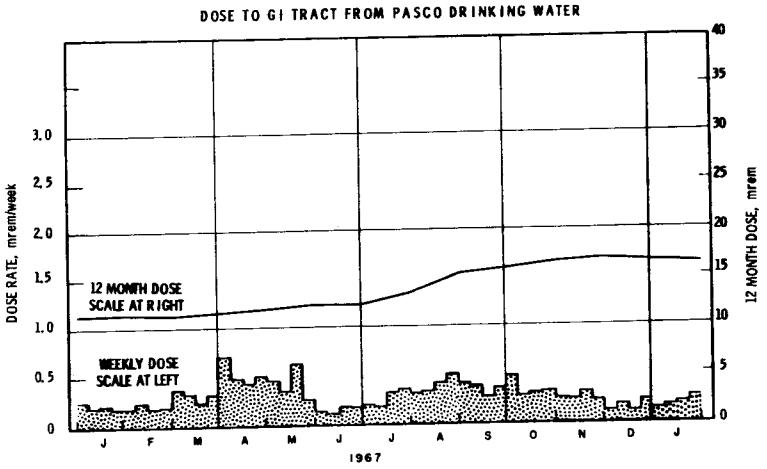

Figure 11

For January, 1968, the average dose rate to the GI tract from drinking Pasco water was 0.16 mrem per week, compared to 0.23 mrem per week for January, 1967.

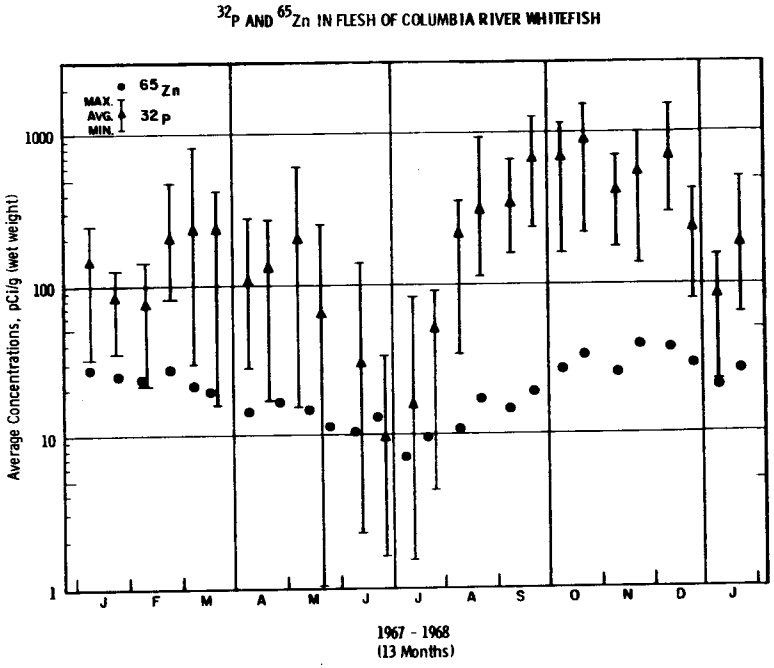

Figure 12

During January, concentrations of ^{32}P and ^{65}Zn in Columbia River whitefish were consistent with expected values.

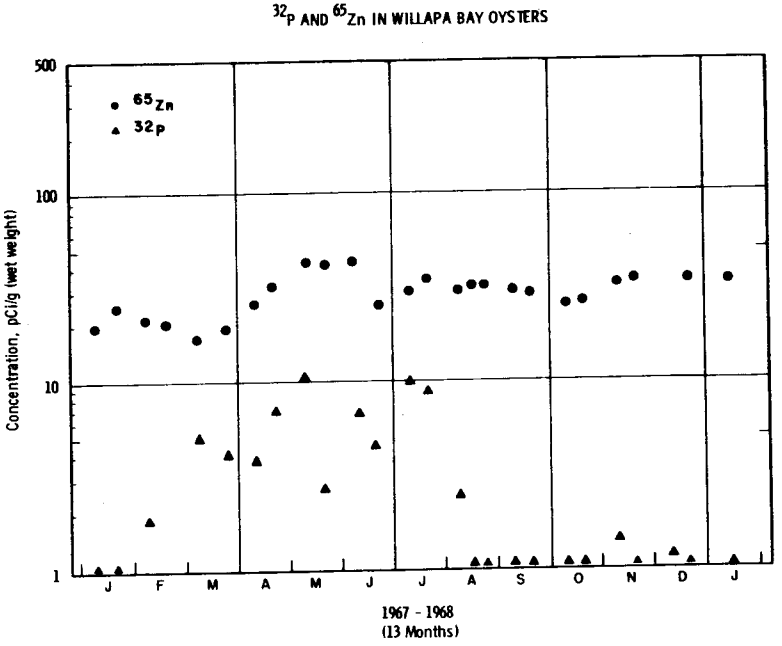

Figure 13

During January, the concentrations of ^{65}Zn in Willapa Bay oysters were somewhat higher than expected. Concentrations of ^{32}P remained near the analytical limit (1 pCi/g) for the sixth consecutive month.

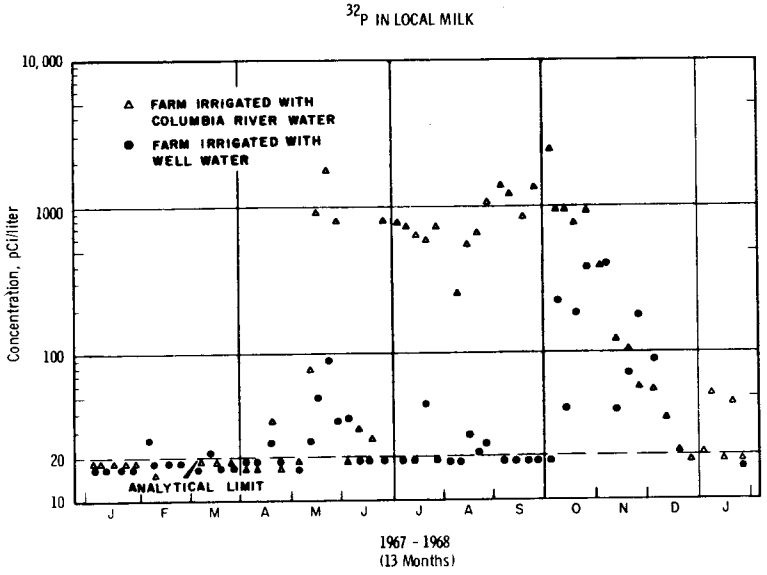

Figure 14

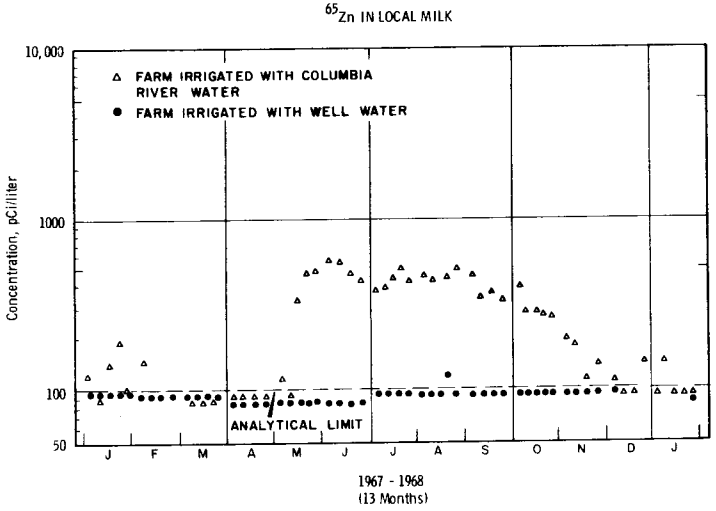

Figure 15

Seasonal use of Columbia River water 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 one farm in the Riverview district are designated as "Farm irrigated with Columbia River water" in Figures 14 and 15. Concentrations of ^{32}P and ^{65}Zn were at normally expected levels during January.

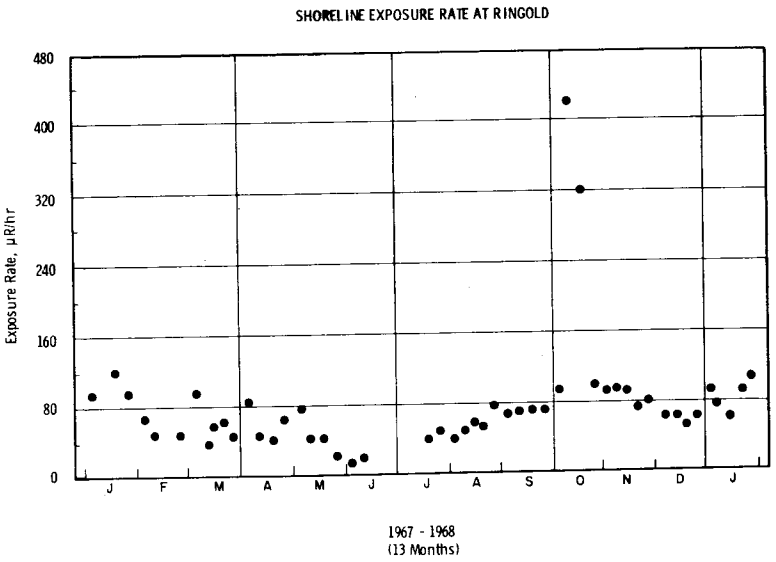

Figure 16

External gamma radiation exposure rates at the Columbia River shoreline are measured with a 40-liter ionization chamber, whose response is interpreted in terms of µR/hour (radium-gamma calibration). The measurements are made 3 feet above ground, thus approximating the dose rate to the gonads of a person standing on the riverbank. The shoreline exposure rates measured at Ringold during January, 1968, were similar to those measured during January, 1967.

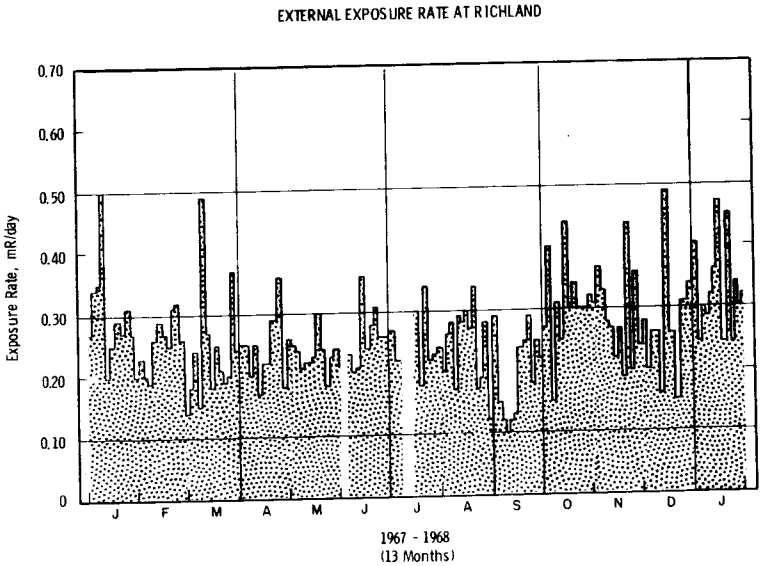

Figure 17

Measurements of the external gamma exposure rates in the city of Richland are made with small ionization chambers. For January, 1968, the average exposure rate was 0.33 mR/day and included the effects of fallout from a reported nuclear weapons test of December 24, 1967. For comparison, the average exposure rate for January, 1967, was 0.30 mR/day and included the effects of fallout from an announced nuclear weapons test of December 27, 1966.

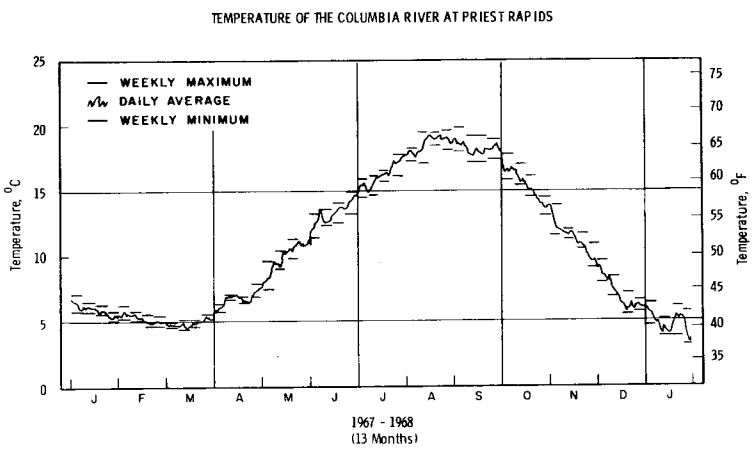

Figure 18

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

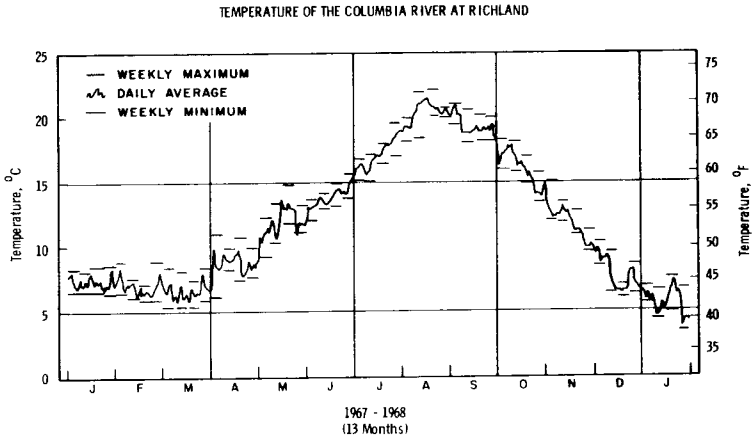

Figure 19

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

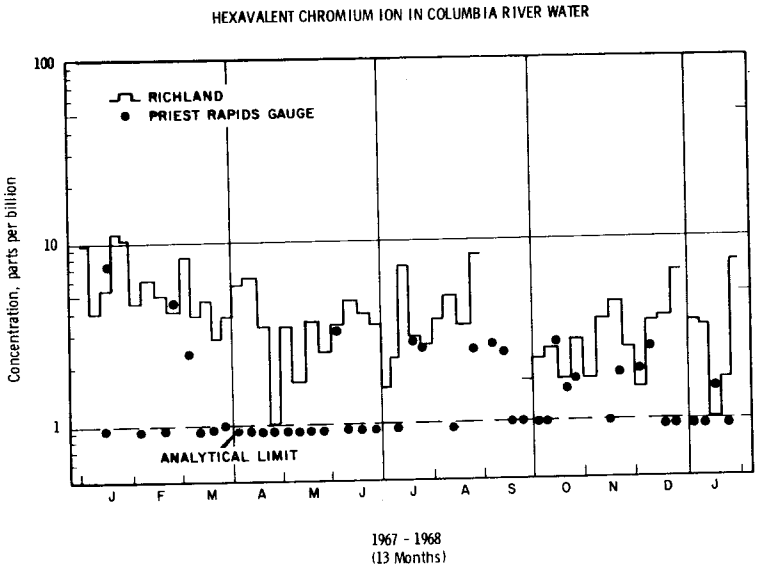

Figure 20

Concentrations of hexavalent chromium ion in Columbia River water 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 water treatment process for reactor cooling water. For drinking water, the Public Health Service standards (1962) permit 50 parts per billion as hexavalent chromium ion.

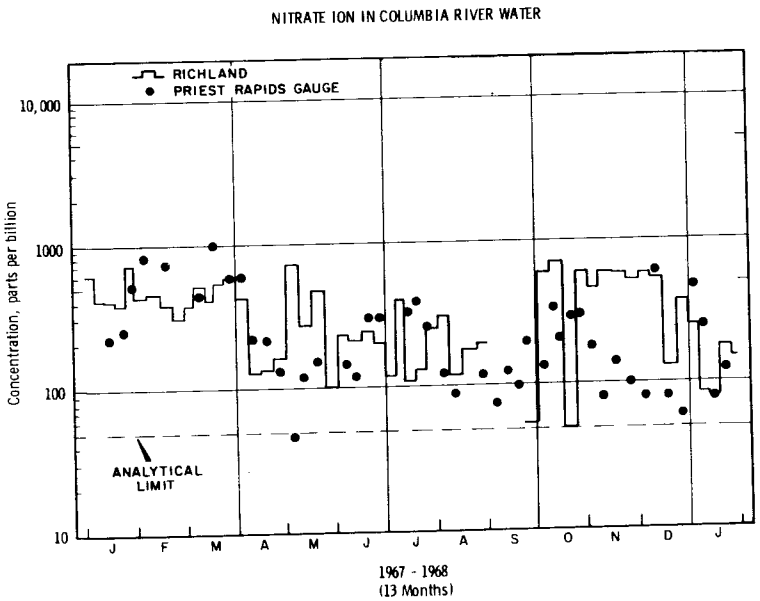

Figure 21

Concentrations of nitrate ion in Columbia River water were determined from "grab" samples at the Priest Rapids Gauge Station (upstream from Hanford) and from cumulative samples at the Richland Water Plant. Some nitrate ion from chemical wastes discharged to the ground may enter the river with underground water. For comparison, the Public Health Service standards (1962) for drinking water permit 45,000 parts per billion as nitrate ion.

TABLE 1

CHEMICAL CHARACTERISTICS OF COLUMBIA RIVER WATER

Results for January, 1968, of analyses of river water collected at Vernita Bridge and the old Hanford townsite (above and below the production reactors) as reported by Douglas-United Nuclear.

(results in ppm)

Vernita	Mg	Fe	Cu	Ca	SO_4	PO_4	Cl	Diss. O_2	Phth. Alk.	M.O. Alk.	Hardness	Solids
1-2-68	4	.03	.001	23	12	.10	.20	11.8	2	55	75	99
1-16-68	4	.02	.006	25	13	.08	.15	9.3	2	58	78	72
Hanford												
1-2-68	4	.04	(1)	26	15	.06	.35	12.2	4	59	83	95
1-16-68	4	.01	.001	25	15	.06	.25	11.5	2	55	79	84

(1) - Defective Sample

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