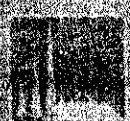
UNCLASSIFIED

BNWL-420-4

25 4/

DECLASSIFIED by CG [redacted] 9/00 and
Approved for Public Release
Name/Date Burt Hamilton
Name/Date W.F. Nicaise 5-14-03
ORG: PNNL NSAT
at Stivelys 2003



BATTELLE MEMORIAL INSTITUTE / PACIFIC NORTHWEST LABORATORY

[redacted]

UNCLASSIFIED

UNCLASSIFIED

PACIFIC NORTHWEST LABORATORY
RICHLAND, WASHINGTON 99352

UNITED STATES ATOMIC ENERGY COMMISSION UNDER CONTRACT AT(45-1)-1830

[redacted]

BNWL 420 4
UC-41
Health and Safety
(Special Distribution)

RADIOLOGICAL STATUS OF THE HANFORD ENVIRONS FOR APRIL, 1967

By

The Evaluations and Measurements Unit Staff
Environmental Studies Section

ENVIRONMENTAL HEALTH DEPARTMENT

edited by J. R. Bovingdon
T. H. Essig

June 12, 1967

PACIFIC NORTHWEST LABORATORY
RICHLAND, WASHINGTON
operated by
BATTELLE MEMORIAL INSTITUTE
for the
UNITED STATES ATOMIC ENERGY COMMISSION UNDER CONTRACT AT(45-1)-1830

[redacted]

84-1100-057 (6-65)
AEC-RLOO RICHLAND, WASH.

RADIOLOGICAL STATUS OF THE HANFORD ENVIRONS FOR APRIL, 1967

This report contains information related to radioactive materials in the Columbia River, the atmosphere, and selected foods (Figures 1-20). Measurements of the Columbia River flow rate, temperature, and chemical characteristics are also shown (Figures 21-25 and Table 1). The data are summarized in graphic form with the latest available data added each month to update the previous month's report.

A comprehensive evaluation of these data is reported once per year in an annual report (see BNWL-316, "Evaluation of Radiological Conditions in the Vicinity of Hanford for 1965"). The data are updated at mid-year and are published in a semi-annual report. (See BNWL-391, "Evaluation of Radiological Conditions in the Vicinity of Hanford, January-June, 1966.)

The radiochemical data presented in this report were supplied by the U. S. Testing Co., Inc., who 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 percent at the 90 percent 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 data collected during April was within the normal range of variation. A slight increase in ^{131}I concentration detected in the atmosphere was attributed to normal plant releases.

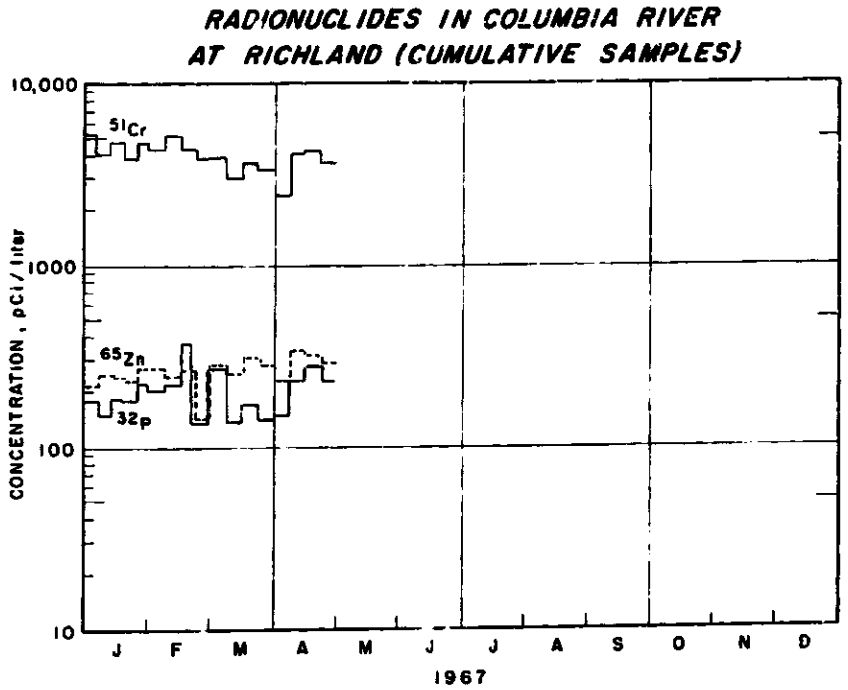


Figure 1

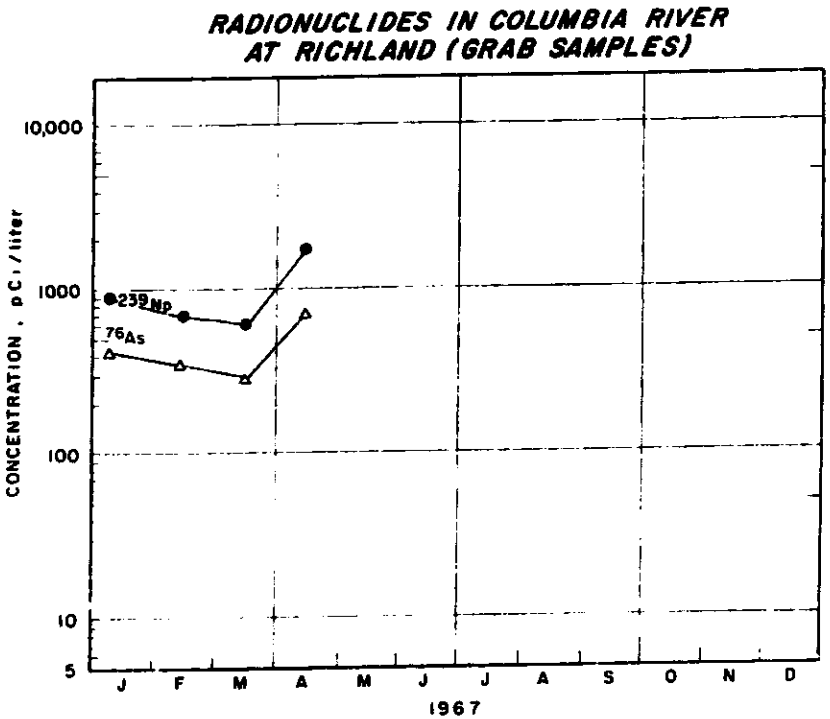


Figure 2

The concentrations of the radionuclides in the Columbia River were consistent with concentrations measured during April, 1966.

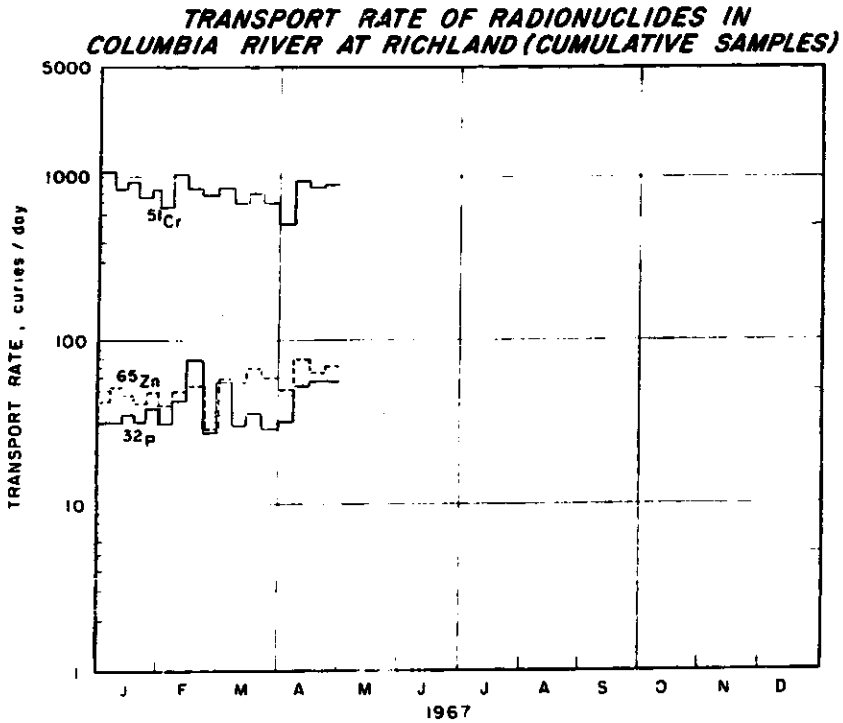


Figure 3

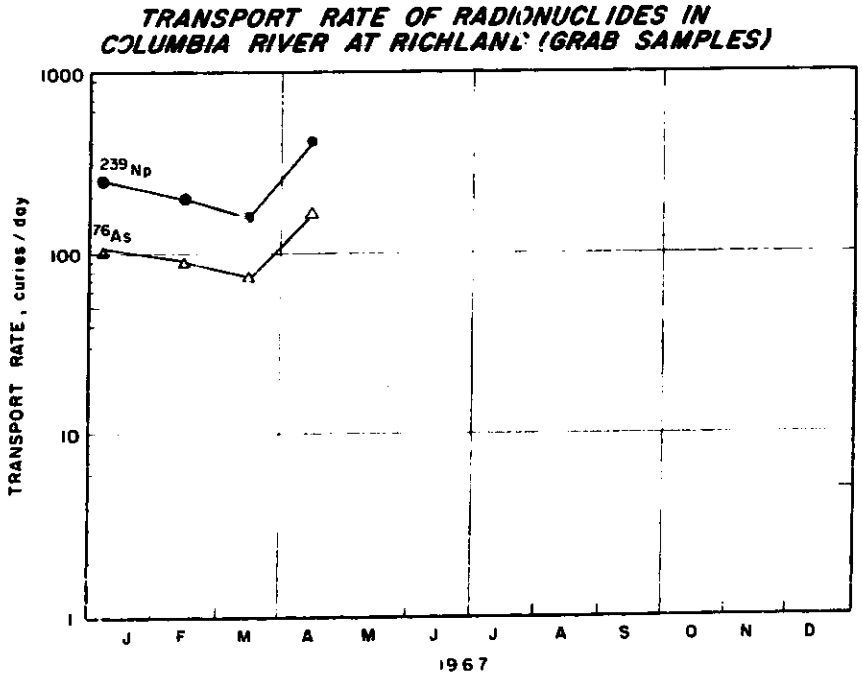


Figure 4

Ra lionuclide transport rates are calculated from the concentrations shown in Figures 1 and 2 and daily river flow rates measured at the Priest Rapids Gauge (Figure 21). The transport rates of all measured radionuclides were consistent with transport rates during April, 1966, reflecting the concentrations discussed under Figures 1 and 2.

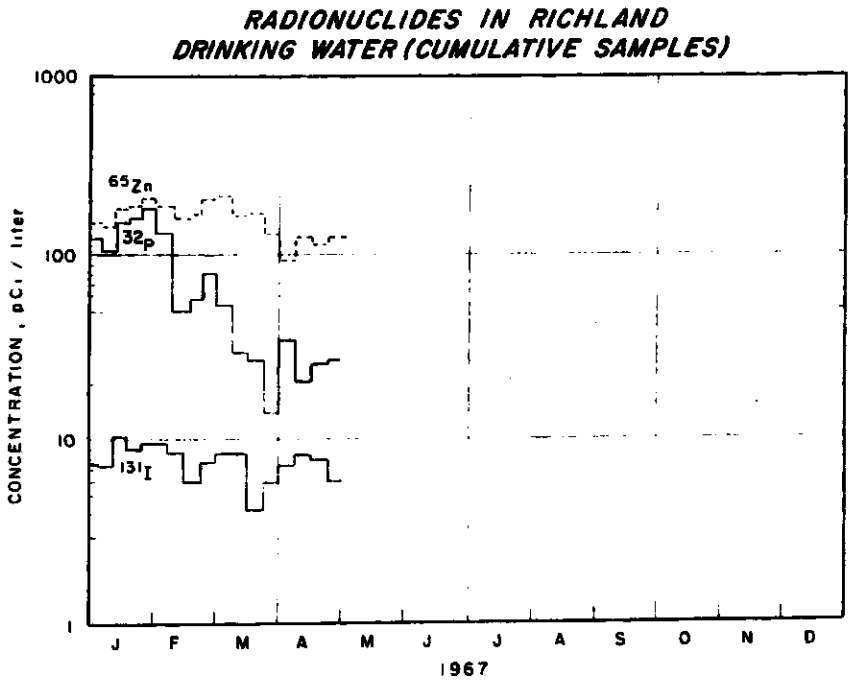


Figure 5

The concentrations of ^{32}P and ^{131}I in Richland drinking water were at normally expected levels. The concentration of ^{65}Zn was slightly higher than the concentration measured one year ago.

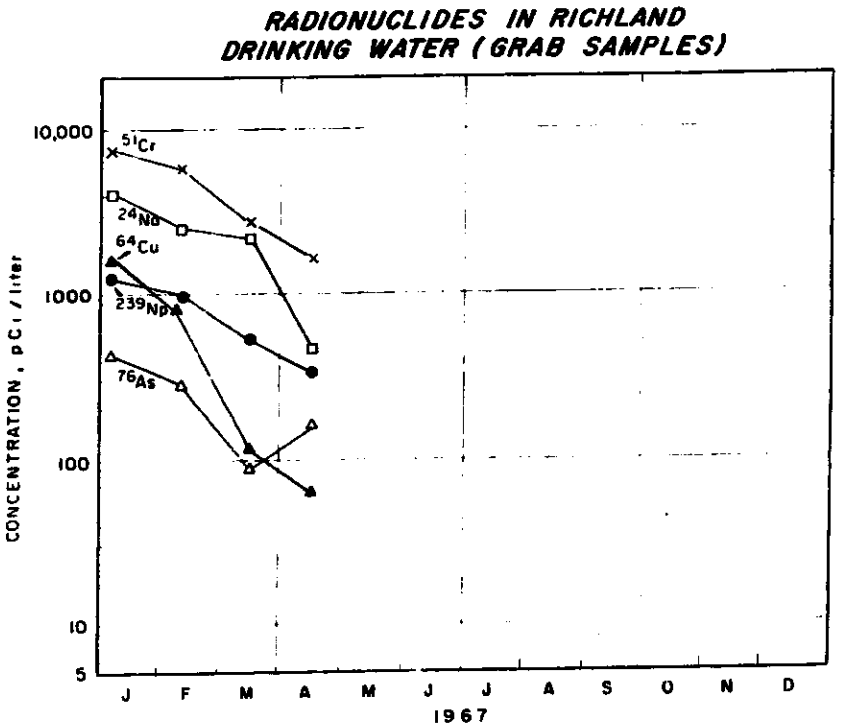


Figure 6

The concentration of ^{76}As in the Richland drinking water was consistent with the concentrations measured during April, 1966. The concentrations of ^{51}Cr, ^{24}Na, ^{239}Np, and ^{64}Cu were lower.

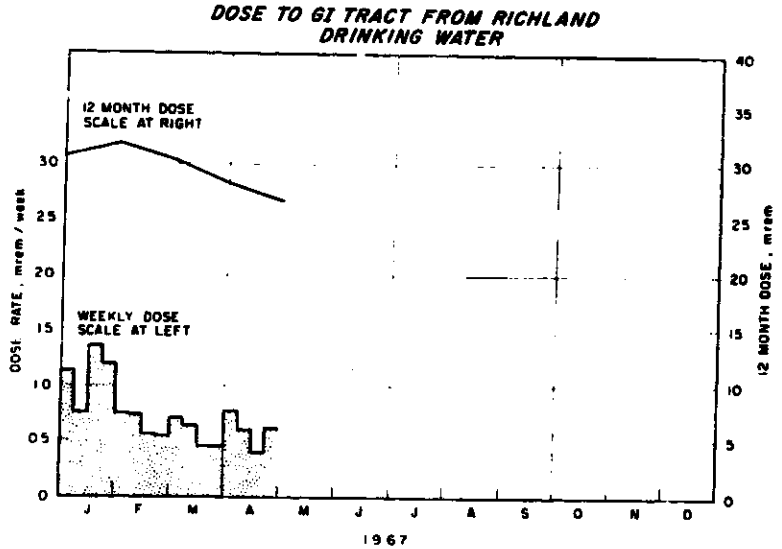


Figure 7

The GI tract dose from Richland drinking water integrated over the 52-week period ending April 30, 1967 was 27 mrem, as compared with 34 mrem one year ago. At least part of this reduction reflects the extended reactor outage of 1966.

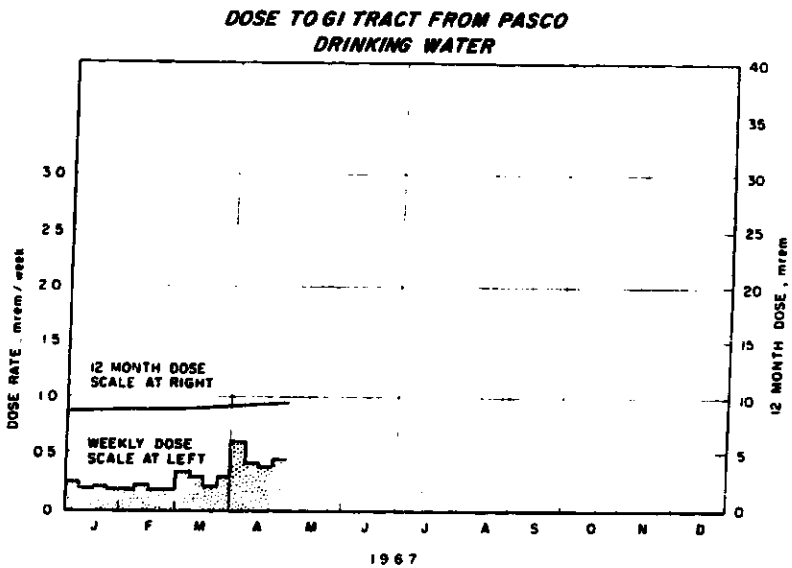


Figure 8

The GI tract dose from Pasco drinking water integrated over the 52-week period ending April 30, 1967 was 10 mrem, as compared with 11 mrem one year ago.

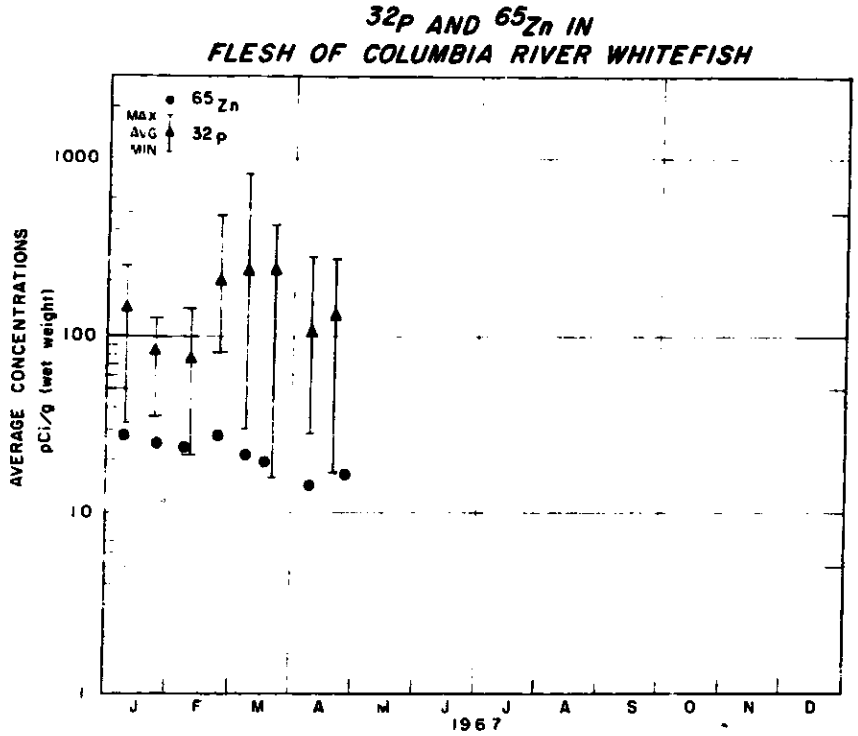


Figure 9

The average concentrations of ^{32}P in whitefish were 110 and 130 pCi/g, as compared with an average of 247 pCi/g for April, 1966. Concentrations of ^{65}Zn were about 15 pCi/g, as compared with 30 pCi/g one year ago.

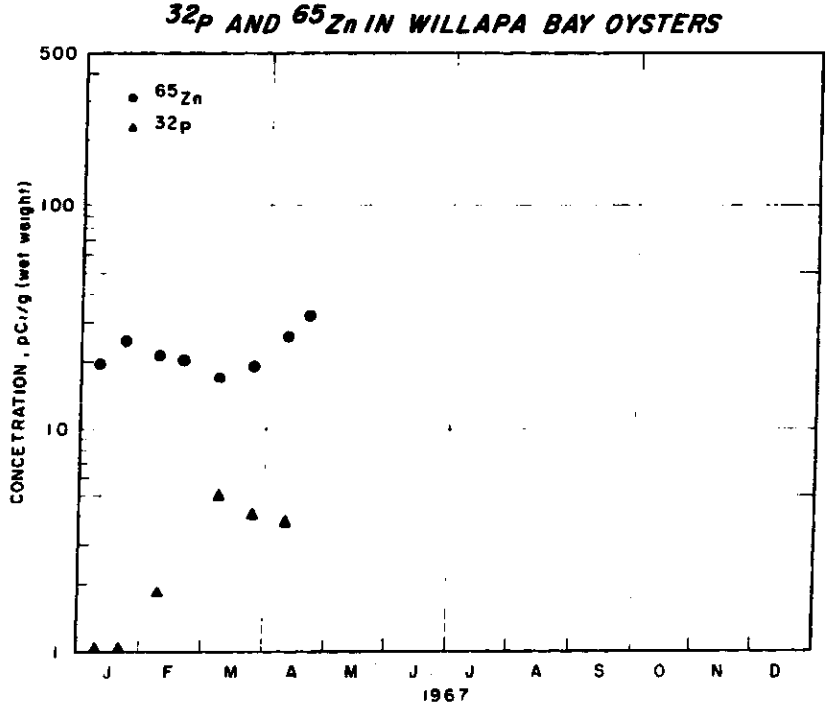


Figure 10

Concentrations of ^{65}Zn and ^{32}P in Willapa Bay Oysters during April, 1967 were about the same as the concentrations measured one year ago.

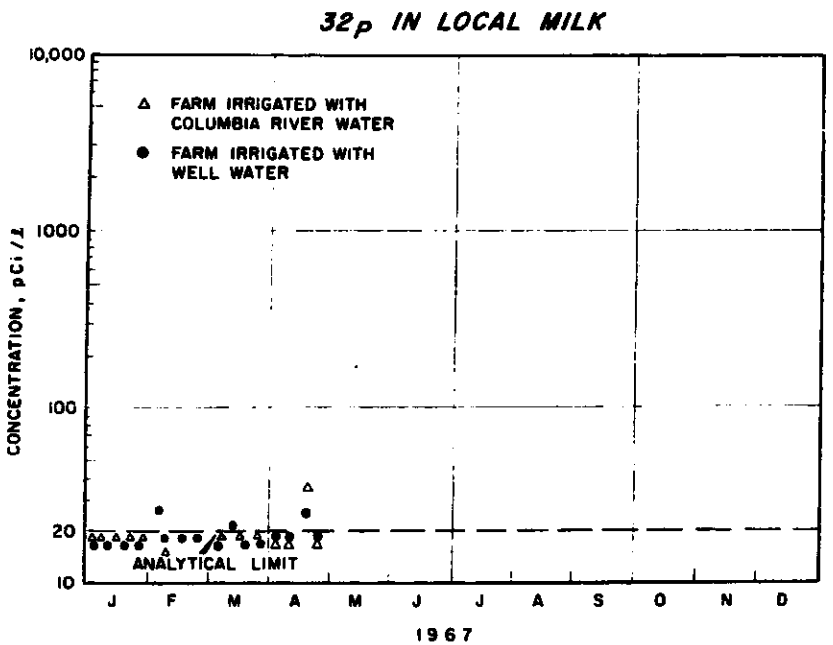


Figure 11

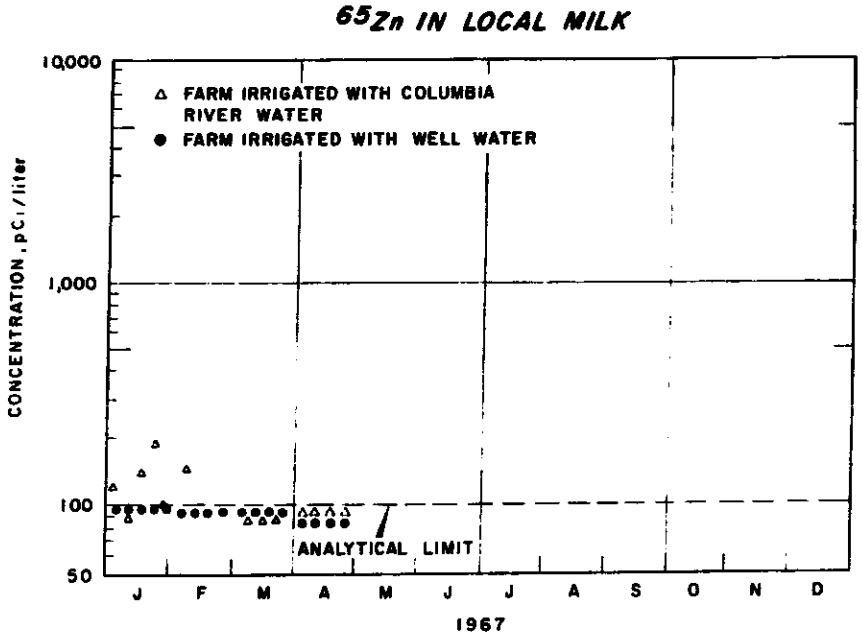


Figure 12

Use of Columbia River water for irrigation of pasture land results in the presence of ^{32}P and ^{65}Zn in milk. The analyses of milk samples from one farm in the Riverview district are designated as "Farm irrigated with Columbia River water" in Figures 11 and 12. Analyses of milk from a nearby farm irrigated with well water are also shown in Figures 11 and 12 for comparison. The concentrations of ^{32}P and ^{65}Zn in local milk were similar to those observed one year ago.

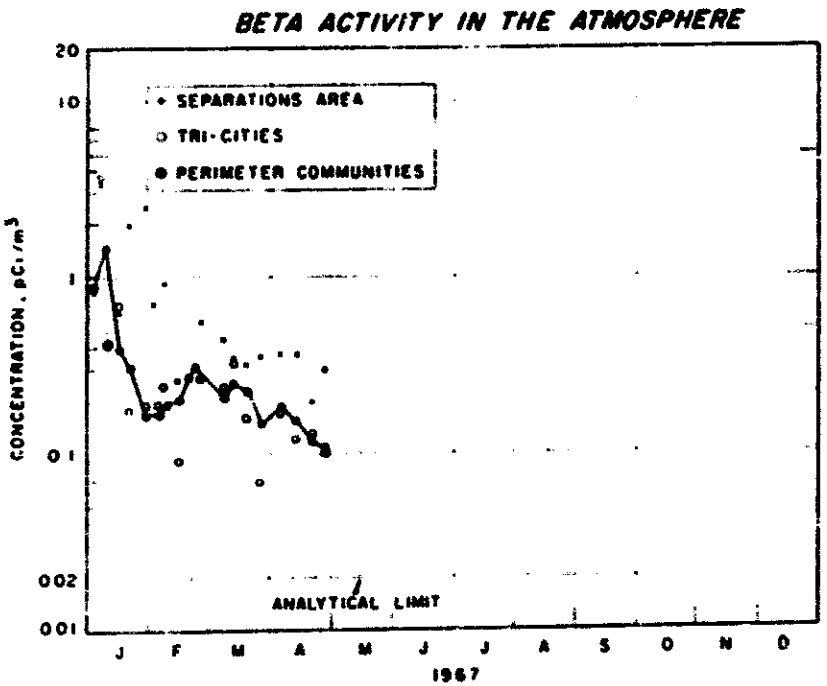


Figure 13

Beta activity in the atmosphere was determined from air filter samples collected within the Hanford project, Tri-Cities, and perimeter communities. Except for the sample collected in the separations areas, these samples show a continued decrease in activity from the December, 1966 Chinese weapons test. The spring influx of debris normally detected in these samples is notable by its absence.

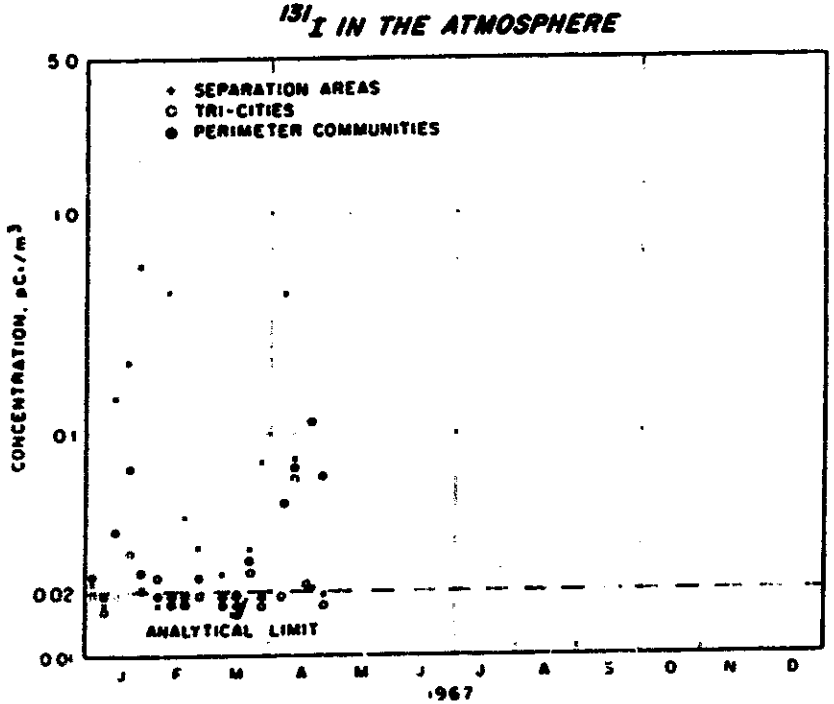


Figure 14

^{131}I concentrations in the atmosphere were determined from caustic scrubbers operated within the Hanford project, Tri-Cities, and perimeter communities. The increase in ^{131}I concentrations were caused by an increase in the emission rate of ^{131}I from a chemical separations facility during the first week of the month and laboratory area facilities during the remainder of the month. All releases were within Hanford release guidelines.

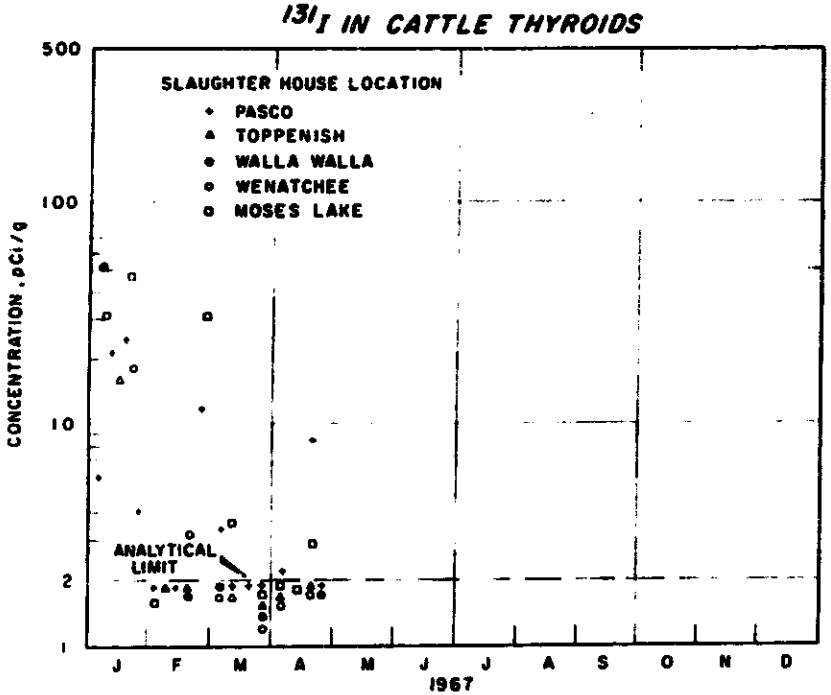


Figure 15

Cattle thyroids are collected in batches of 3 to 5 every two or three weeks at each of five slaughterhouses. The concentration of ^{131}I in these thyroids are plotted on a "batch average" basis. The increase in concentration observed in the samples collected at Pasco appear to be related to plant emissions.

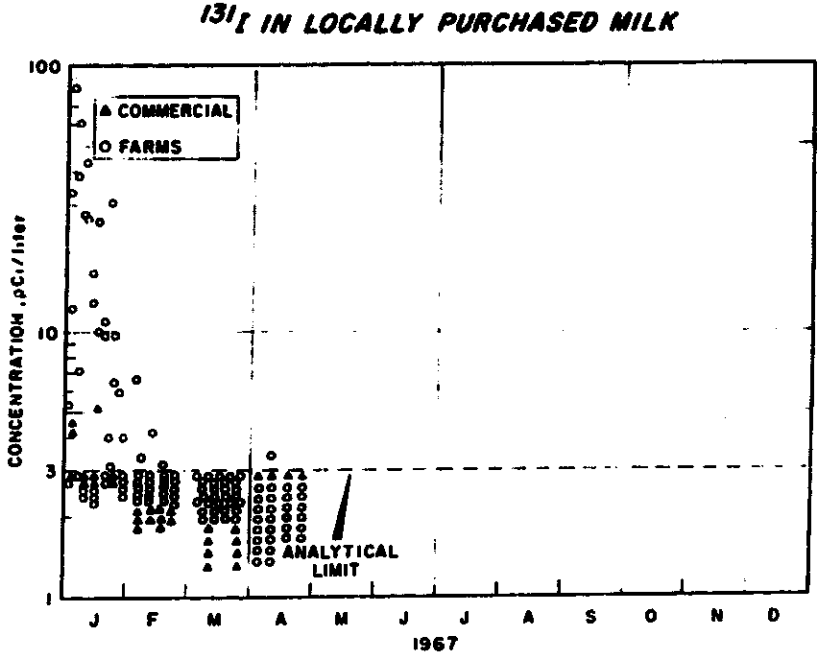


Figure 16

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. ^{131}I concentrations in local milk samples during April were generally below detection levels.

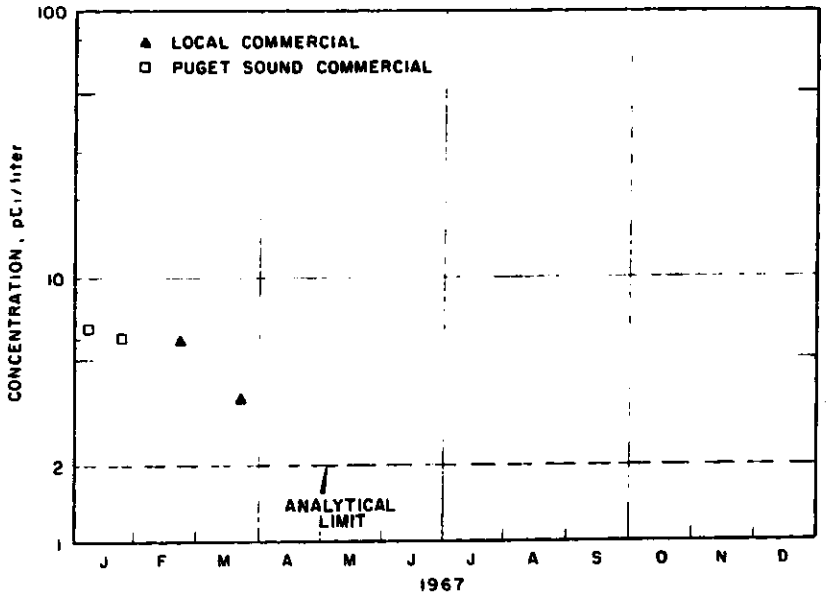


Figure 17

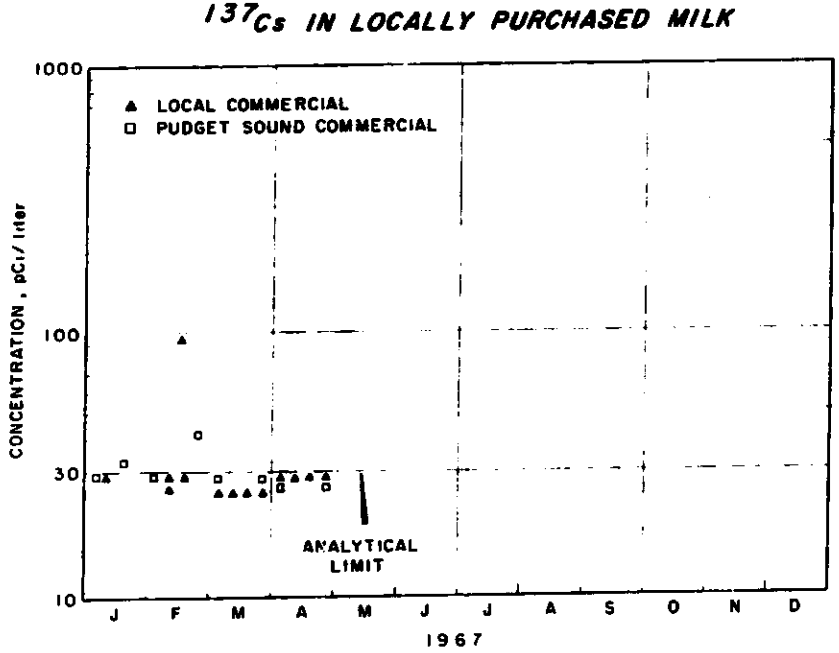


Figure 18

The source of ^{90}Sr and ^{137}Cs in locally purchased milk is world-wide fallout. In general, milk from the Pacific Coast has higher concentrations of these radionuclides than does locally produced milk. During April, the ^{137}Cs concentrations were below the analytical limit of 30 pCi/ℓ. The ^{90}Sr results were unavailable at report time.

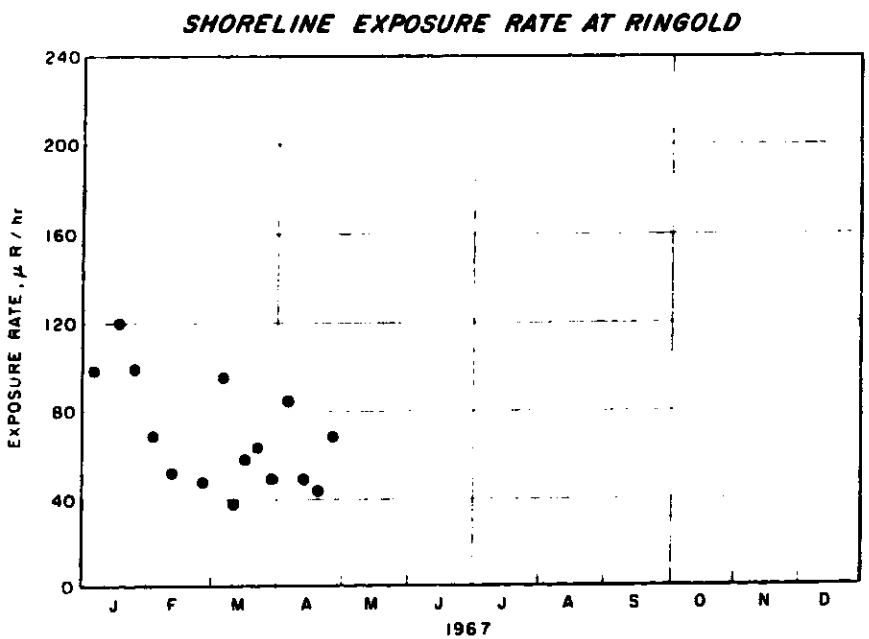


Figure 19

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 river-bank. The April data were about the same as those collected one year ago.

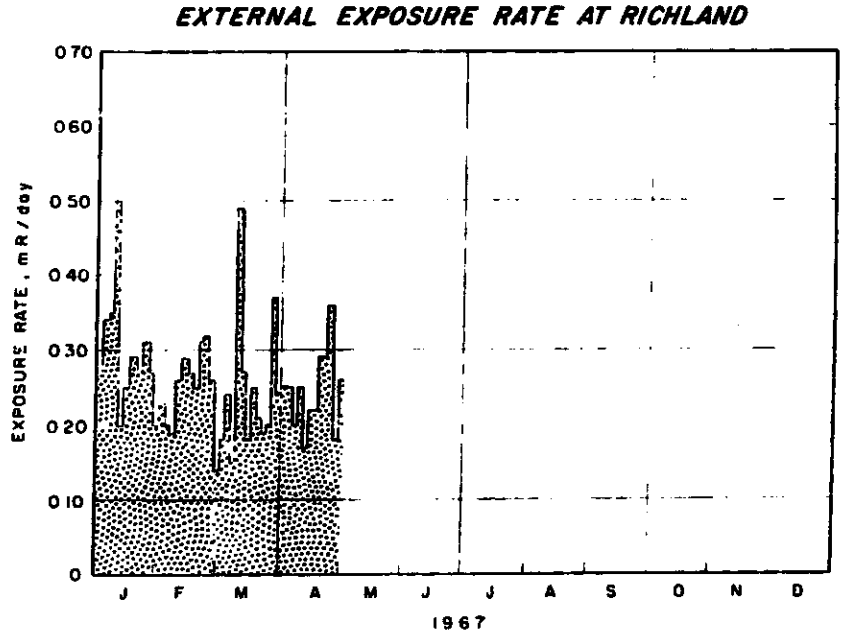


Figure 20

Measurements of the external gamma exposure rates in the city of Richland are made with small ionization chambers (Victoreen Stray Radiation Chamber Model No. 239) located near the Whole Body Counter Facility (747-A Building). The average exposure rate for April, 1967 was 0.25 mR/day, which is comparable to the 0.24 mR/day measured in April, 1966.

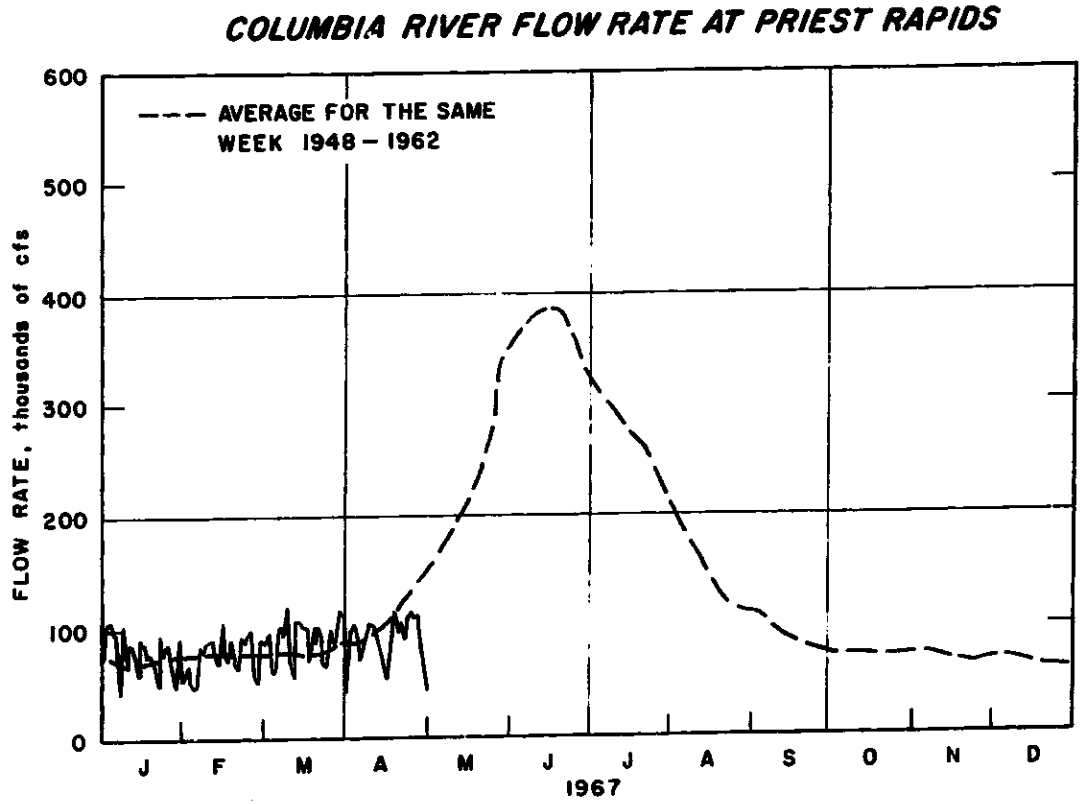


Figure 21

The average river flow rate during April, 1967 was 90,000 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 116,000 cubic feet per second on April 19. The average river flow rate for April, 1966 was 83,000 cubic feet per second.

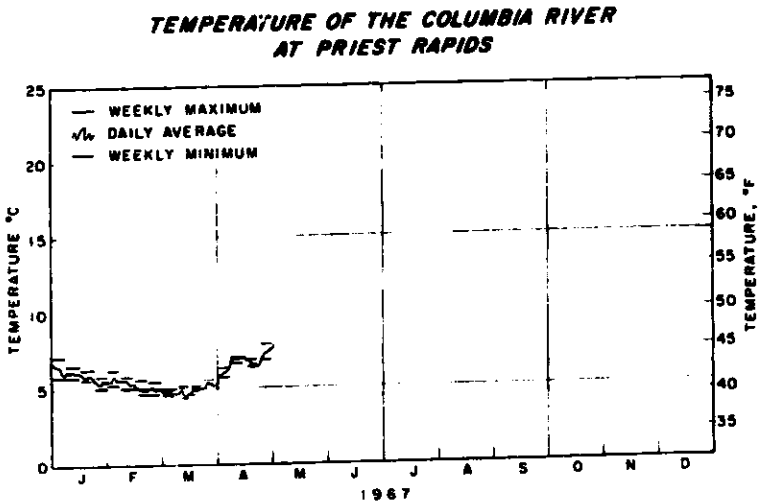


Figure 22

The temperatures plotted in Figure 22 are measured at the Priest Rapids Gauge Station.

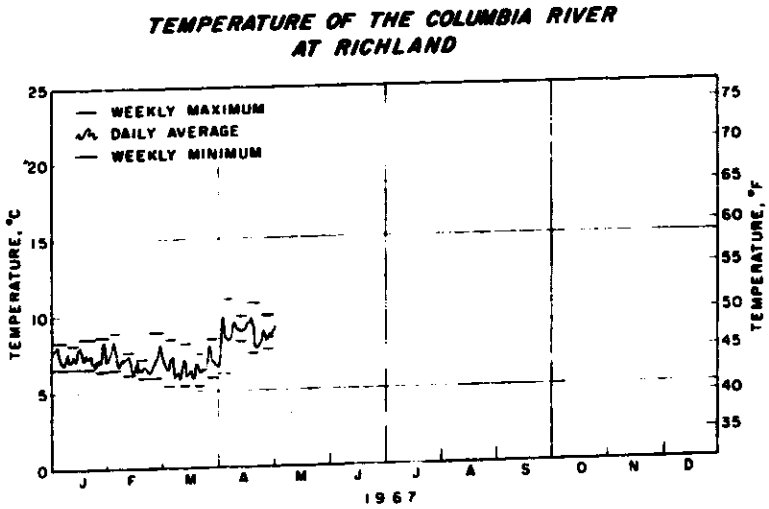


Figure 23

The temperatures plotted in Figure 23 are measured at the Richland Water Plant intake.

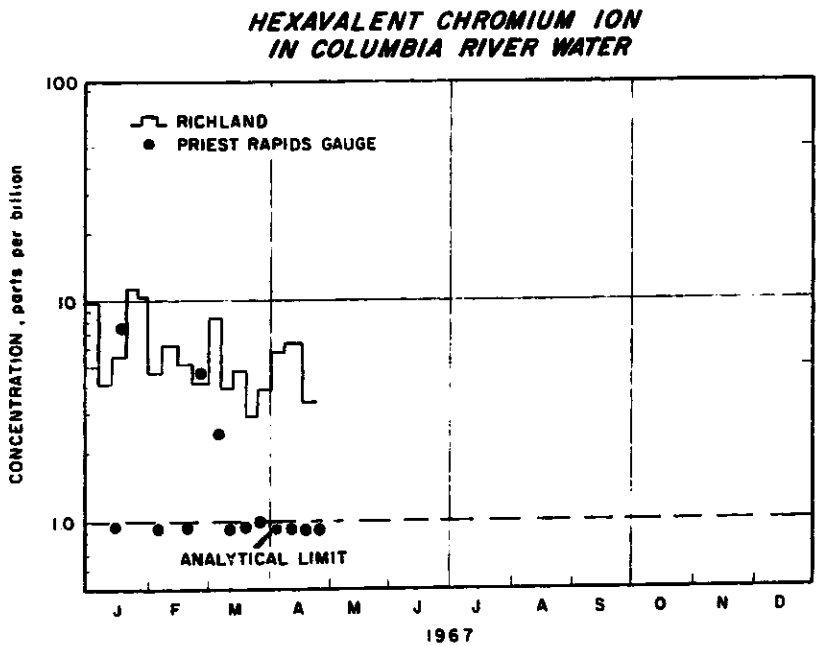


Figure 24

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. Dichromate ion is added during the water treatment process for reactor cooling water. The Public Health Service recommended limit for drinking water is 50 parts per billion.

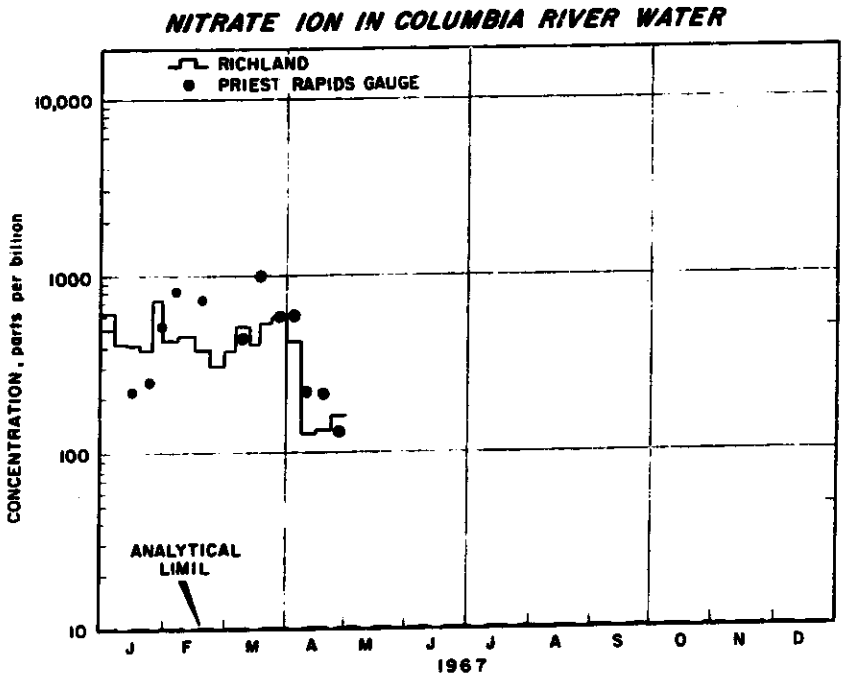


Figure 25

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 recommended limit for drinking water is 45,000 parts per billion.

TABLE 1

CHEMICAL CHARACTERISTICS OF COLUMBIA RIVER WATER

Results for April, 1967, reported by Douglas-United Nuclear on samples of river water collected above (Vernita Bridge) and below (Hanford) the reactors.

(results in ppm)

	Mg	Fe	Cu	Ca	SO_4	PO_4	Cl	O_2	Phth. Alk.	M.O. Alk.	Hardness	Solids
Hanford												
4-12-67	4	.03	.002	25	15	.04	.35	-*	0	57	77	99
4-25-67	5	.02	.007	24	14	.01	.40	11.8	0	57	78	84
Vernita												
4-12-67	4	.03	-**	25	15	.14	.27	-*	0	60	78	96
4-25-67	4	.04	.002	24	15	.10	.30	12.8	0	62	77	89

* Defective sample
** Not detected