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HW-71999

EVALUATION OF RADIOLOGICAL CONDITIONS IN THE VICINITY OF HANFORD FOR 1961

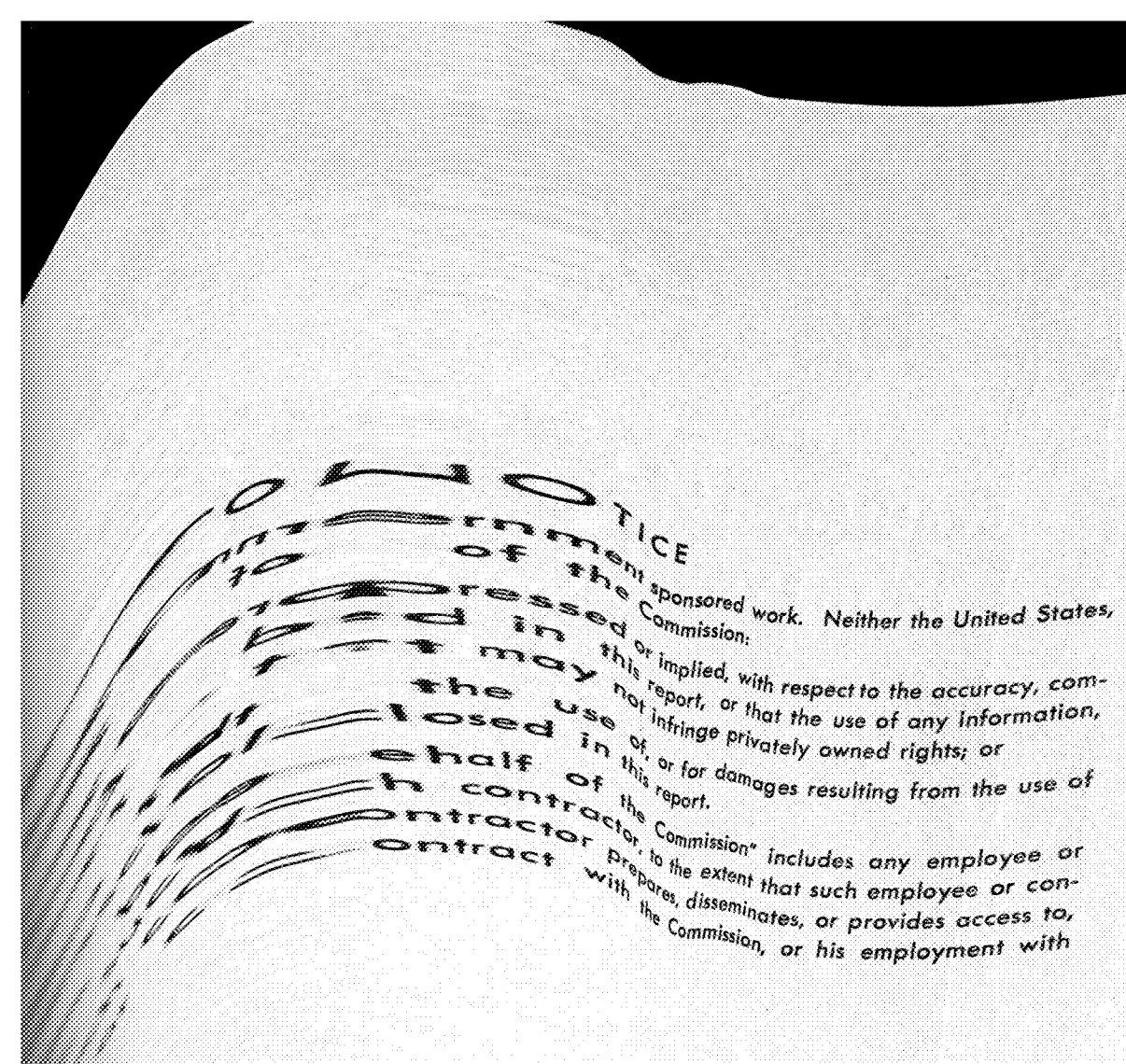
THE ENVIRONMENTAL STUDIES AND EVALUATION STAFF

MARCH 1, 1962

HANFORD LABORATORIES

HANFORD ATOMIC PRODUCTS OPERATION
RICHLAND, WASHINGTON

GENERAL ELECTRIC



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EVALUATION OF RADIOLOGICAL CONDITIONS IN THE VICINITY OF HANFORD FOR 1961

By

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Radiation Protection Operation
Hanford Laboratories

March 1, 1962

HANFORD ATOMIC PRODUCTS OPERATION
RICHLAND, WASHINGTON

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SUMMARY STATEMENT

An evaluation of results obtained from the Hanford environmental surveillance program for 1961 indicates that most of the environmental radiation exposure for the majority of persons in the neighborhood of Hanford project was due to natural sources and world-wide fallout rather than to Hanford operations.

The principal Hanford source of environmental exposure continues to be identified with the neutron-induced radionuclides present in reactor cooling water discharged to the Columbia River. The primary mechanisms of exposure from this source are the drinking of sanitary water derived from the river and the consumption of fish and waterfowl which inhabit the river.

For the residents of Pasco and Kennewick, a potential exposure from municipal drinking water was estimated as about 5 per cent and 1 per cent, respectively, of the nationally recommended limit for the gastrointestinal tract as the limiting body organ. For the ardent fisherman who consumed 10 pounds of local fish in 1961, a potential exposure from bone-seeking radionuclides was estimated to be about 25 per cent of the appropriate limit. Samples of 1500 ducks bagged by hunters in southeastern Washington were analyzed. The bird having the largest amount of radioactive material of Hanford origin would have provided, when ingested, approximately 10 per cent of the recommended limit for bone. The average bird would have provided less than 0.5 per cent of the limit.

The dose to the thyroid gland from ingestion of I^{131} in milk (exclusive of fallout), consumed at a rate of one quart per day, was within applicable limits.

The composite annual exposures, exclusive of those contributed by recent fallout, were similar to those reported for 1960, but trends in several Hanford sources were downward late in the year. Additional pretreatment of the reactor cooling water is credited with these reductions in exposure sources.

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EVALUATION OF RADIOLOGICAL CONDITIONS IN THE VICINITY OF HANFORD FOR 1961

I. INTRODUCTION

The Hanford project is a complex of nuclear reactors, fuel fabrication plants, chemical separation facilities and research and development laboratories*. The project is located in southeastern Washington as shown in Figure 1. This part of Washington is a semiarid region having an average annual rainfall of about 8 inches. Natural vegetation in the area is sparce, primarily suited for grazing although considerable areas have been put under irrigation. The plant site, shown in Figure 2, comprises an area of about five hundred square miles. The Columbia River flows throught the area and forms part of the eastern boundary. The meteorology of the region is typical of a desert area with frequent strong inversions occurring at night and breaking during the day to provide unstable and turbulent conditions. The prevailing winds are from the northwest in the plant areas with strong drainage and cross winds causing distorted flow patterns.

The populated areas of primary interest are Richland, Pasco, and Kennewick. Other communities in the vicinity are Benton City, Mesa, and Othello. Altogether, about 80,000 people live in the vicinity of the project.

During the course of its operation, the Hanford plant generates various radioactive wastes. High level wastes are concentrated and retained in storage within the project area. Low level wastes, for which concentration and retention are not presently feasible, are admitted to the atmosphere, the Columbia River and to ground through controlled releases. The Hanford philosophy governing radioactive waste disposal is described in the Hearings on Industrial Radioactive Waste Disposal held by the Joint Congressional Committee on Atomic Energy in 1959.[1]

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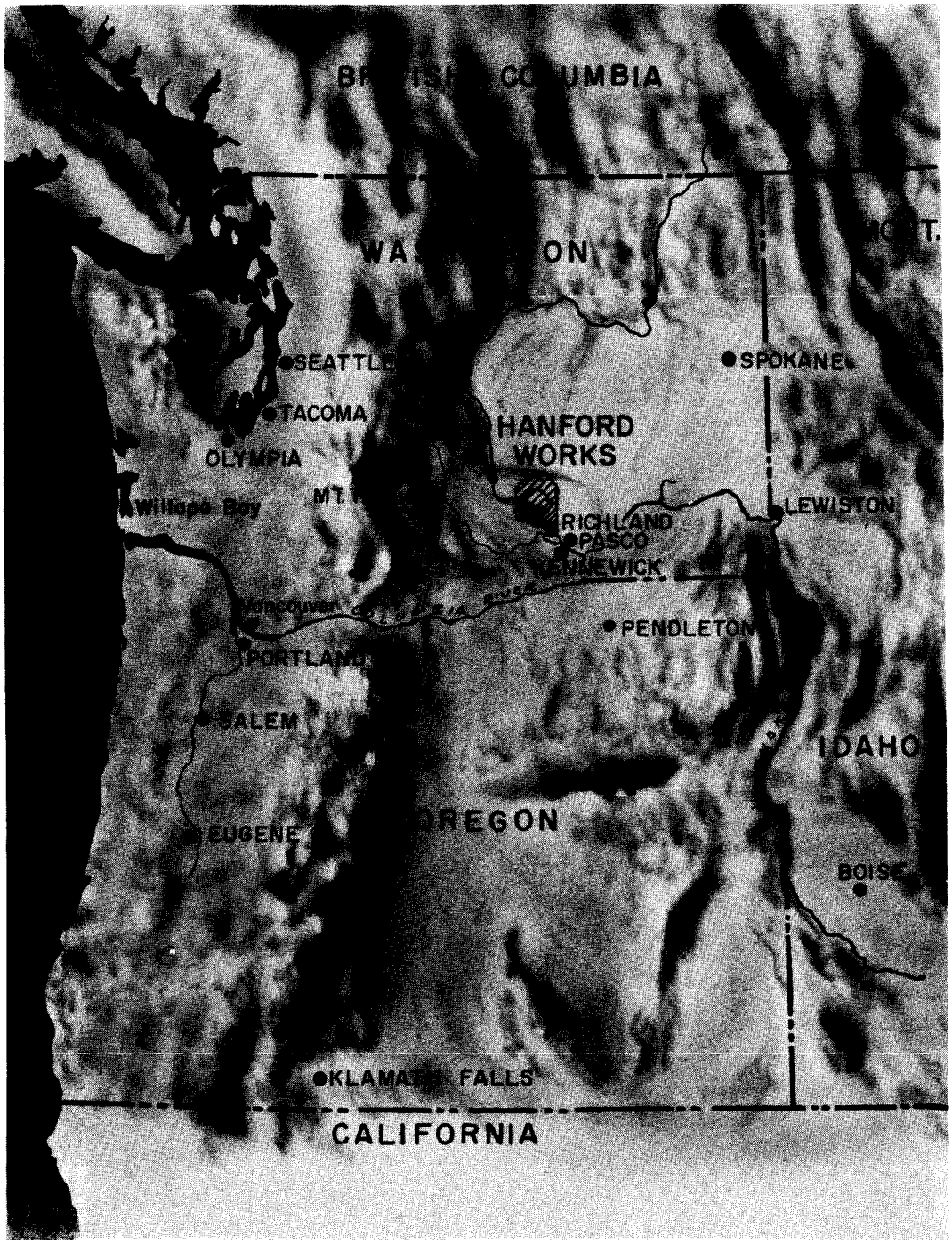

FIGURE 1

Geographical Relationship
of Hanford Works to Pacific Northwest

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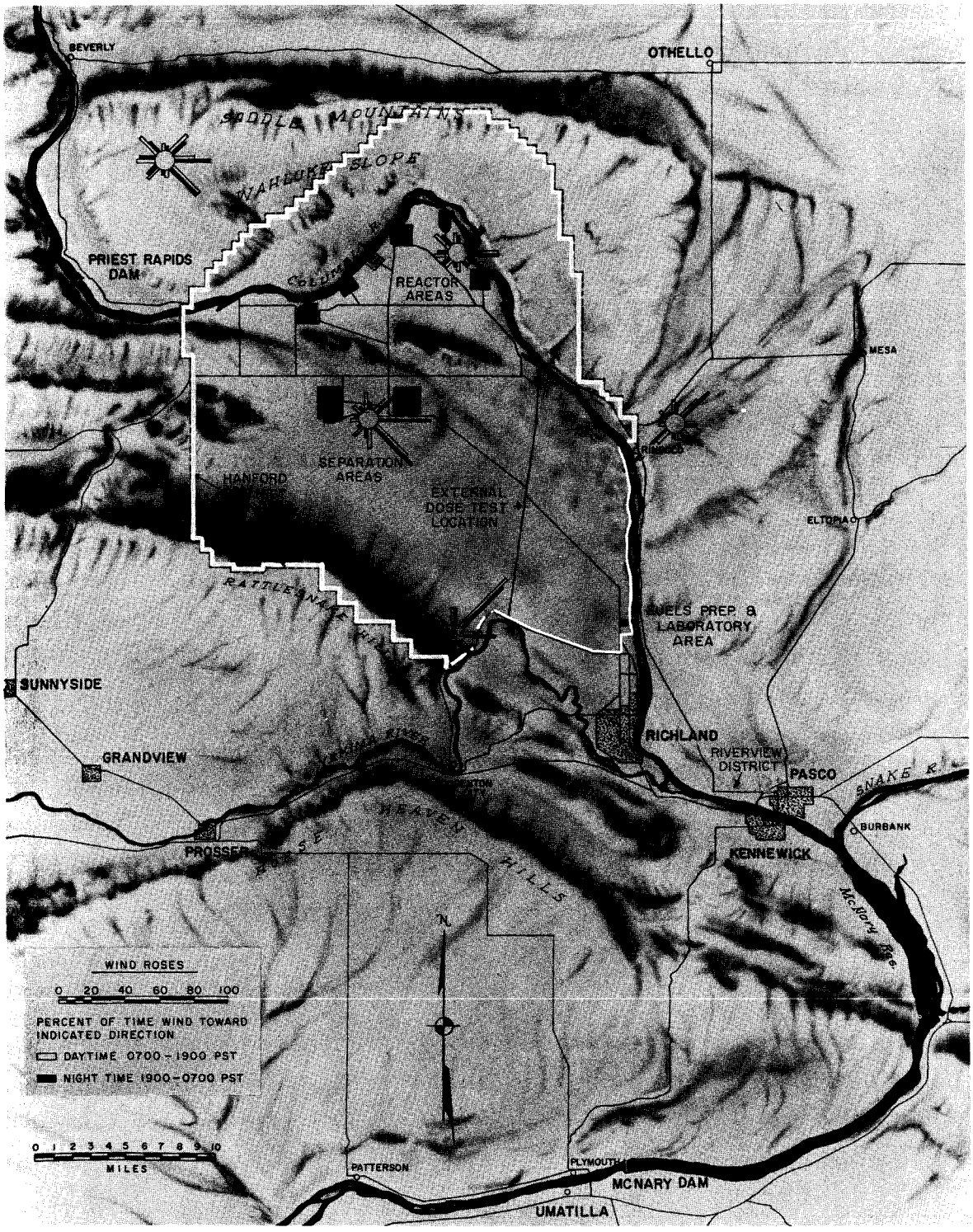

FIGURE 2

Features of Hanford Project and Vicinity

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AEC-GE RICHLAND, WASH.

Radioactive wastes dispersed to the atmosphere and to the Columbia River may contribute to the radiation exposures of persons living in the neighborhood of the plant or along the Columbia River downstream from the plant. The protection of these persons from undue radiation exposure attributable to Hanford sources is one of the attendant responsibilities in the operation of the Hanford facilities.

The AEC Manual Chapters[2] and the recommendations of the National Committee on Radiation Protection and Measurement (NCRP)[3], the International Commission on Radiological Protection (ICRP)[4], The Federal Radiation Council (FRC)[5], and the results of Hanford research programs form the basis of radiation protection practices at Hanford. The recommendations of these organizations in the form of permissible limits and guides for radiation exposure constitute criteria against which radiation exposures estimated from the findings of the Hanford environmental surveillance program are compared. The results of this comparison indicate the effectiveness of Hanford waste control and radiation protection practices and point out conditions requiring attention.

In this report, estimates of the continuous exposure of individuals in the neighborhood of the controlled area are compared with the recommendations of the NCRP. These recommendations, in the form of maximum permissible limits to individuals are 1500 mrems per year to the GI tract, 500 mrems per year to the total body, 3000 mrems to the thyroid, and 100 per cent of the maximum permissible rate of intake in the case of bone seekers*.

The exposures estimates can also be compared with recently published FRC guides. This guidance, in the form of annual exposures averaged for suitable samples of an exposed population and continued throughout life, is 170 mrems per year to the total body, 500 mrems per year to the thyroid,

---

* The maximum permissible rate of intake (MPRI) is taken as the maximum permissible concentration in water for a given radionuclide, as recommended by the NCRP for persons in the neighborhood of controlled areas, multiplied by the rate of water intake as defined for the standard man. This amounts to one-tenth of the MPC's for continuous exposure of occupational workers multiplied by 2,200 cc per day, or by 800 liters per year in the case of annual estimates.

and 500 mrems per year to bone. In the case of P^{32}, the major bone seeker of interest at Hanford, the historical approach to the maximum permissible quantity in bone precludes direct comparison of the MPRI to the FRC bone dose guide.

The presentation and evaluation of the results of the environmental surveillance program for the year 1961 is the subject of this report. Similar evaluations for previous years have been reported.[1, 6, 7]

II. SUMMARY

Natural background and world-wide fallout are the primary sources of environmental radiation exposure for most persons in the neighborhood of the Hanford controlled area. The principal Hanford source of environmental exposure is identified with the neutron induced radionuclides present in reactor cooling water discharged to the Columbia River. The primary mechanisms of exposure from this source are the drinking of sanitary water derived from the river and the consumption of fish and water fowl which inhabit the river. Hanford's contribution to environmental exposure through atmospheric paths is generally small.

Because of uncertainties in multiple sources, paths of intake, individual radiation exposures cannot be stated precisely. However, useful exposure estimates may be made assuming different exposure parameters.

The composite annual exposure for a hypothetical individual whose habits include consumption of locally caught fish at a rate of 10 pounds per year, consumption of products from farms irrigated with Columbia River water, consumption of water from the Pasco sanitary system and swimming and boating on the river is estimated at 180 mrems to the GI tract, 70 mrems to the total body and 30 per cent of the NCRP maximum permissible rate of intake for bone seeking radionuclides.

The resident of Pasco of average dietary habits who drank water from the municipal water system and consumed milk and other foods obtained from local stores would likely have recieved an annual exposure on the order of 80 mrems to the GI tract, 10 mrems to the total body and 3 per cent of the NCRP MPRI for bone. In this case the GI tract is the organ of major interest and the exposure amounts to about 5 per cent of the NCRP limit for individuals.

The residents of Richland and other communities who made no use of the Columbia River or products derived therefrom would have likely received an annual exposure of about 5 mrems to the GI tract and total body and less than one per cent of the MPRI for bone. The primary source of exposure for these individuals was from world-wide fallout.

Persons consuming one liter of local milk per day would have likely taken in (exclusive of fallout) from 10 to 75 per cent of the quantity of I^{131} recommended by the FRC in their report of September 1961[5] as a guide for average rates of intake by a suitable sample of an exposed population group. This guidance is for normal peacetime operations and was established with the assumption that infants would be ingesting the radioiodine.

While trends in several exposure modes were downward late in the year, the composite exposures, exclusive of that contributed by recent fallout, as outlined above are essentially the same as reported for 1960.

III. ENVIRONMENTAL MONITORING PROGRAM RESULTS AND INTERPRETATION

Discussion and interpretation of the results of the various Hanford environmental sampling programs follow. Data for many of the programs are presented in the appendices, as are brief descriptions of several of the analytical methods used in determining the amounts of radionuclides in various samples.

A. Reactor Effluent Released to the Columbia River

Cooling water for each of Hanford's eight production reactors is pumped from the Columbia River. This water goes through water purification processes and then passes once through the reactors as coolant. Although the coolant water is treated to remove suspended impurities, a fraction of the impurities remaining are transformed into radioactive elements during passage through the reactor and during retention in films which form on the surface of the fuel channels and elements. Very small quantities of uranium in the cooling water undergo fission during passage

through the reactor and form small amounts of fission product radionuclides. Occasionally fuel element jackets will fail releasing small amounts of fission products to the cooling water. After it has passed through the reactor the cooling water (reactor effluent water) is returned to the Columbia River.

Twenty radionuclides, formed principally by neutron activation, make up 98 per cent of the radioactive material present in reactor effluent. Over forty others, which have been measured with some confidence, make up the remaining two per cent of the activity. The relative abundance of these radionuclides, as adjusted to four hours postirradiation, is shown in Table I.

TABLE I

RELATIVE ABUNDANCE OF REACTOR EFFLUENT RADIONUCLIDES

Reference Time - 4 Hours Postirradiation

Major, 90 Per Cent	Minor, 8 Per Cent	Trace, 2 Per Cent		
Mn^{56}	Zn^{69}	Eu^{152}	I^{131}	Pr^{145}
Cu^{64}	Ga^{72}	Sm^{153}	Ce^{141}	Pm^{151}
Na^{24}	Sr^{92}	W^{187}	Pr^{142}	Co^{60}
Cr^{51}	U^{239}	La^{141}	C^{14}	Pr^{143}
Np^{239}	I^{133}	Nd^{149}	Nd^{147}	Ru^{103}
As^{76}	Y^{92}	La^{140}	Ca^{45}	Sc^{47}
Si^{31}	Nb^{97}	I^{132}	Ag^{111}	Sr^{90}
	Sr^{91}	Eu^{157}	Y^{91}	Cs^{137}
	Zn^{65}	Ba^{140}	Fe^{59}	Sr^{85}
	P^{32}	Mo^{99}	Sr^{89}	U^{238}
	Y^{90}	Sm^{156}	Mn^{54}	Pu^{239}
	I^{135}	Sc^{46}	Zr^{95}	Ac^{227}
	Y^{93}	Cd^{115}	Pm^{149}	Po^{210}
		Ce^{143}	Eu^{156}	Tb^{160}
		Pm^{147}	$Ce\text{-}Pr^{144}$	

There are several ways by which radionuclides in the Columbia River water may result in radiation exposure to humans. Among these paths of exposure are ingestion of Columbia River water, ingestion of sanitary water derived from the river, ingestion of fish and waterfowl which inhabit the river, consumption of agricultural and dairy products derived from land irrigated with water drawn from the river, consumption of certain marine organisms, and external exposure from swimming, boating, etc. on the river.

B. Radionuclides in the Columbia River

Samples of river water were obtained weekly from the inlet of the Pasco municipal water pumping plant, and fortnightly at the Hanford Ferry and Vancouver monitoring stations. These samples were analyzed for several radionuclides and the results of the analyses are presented in Appendix A, Tables 1, 2, and 3.

Many of the radionuclides formed in reactor cooling water are short-lived and decay rapidly after formation in the reactors. In addition to radioactive decay, a significant fraction of the radionuclides is removed from the water by such mechanisms as silting and uptake by river biota.

The relative abundance of the significant radionuclides at Hanford Ferry, Pasco and Vancouver is illustrated in Figure 3. The areas of the circles are proportional to the total measured at the three locations. The average concentrations of radionuclides measured routinely at the three river sampling stations are shown in Table II.

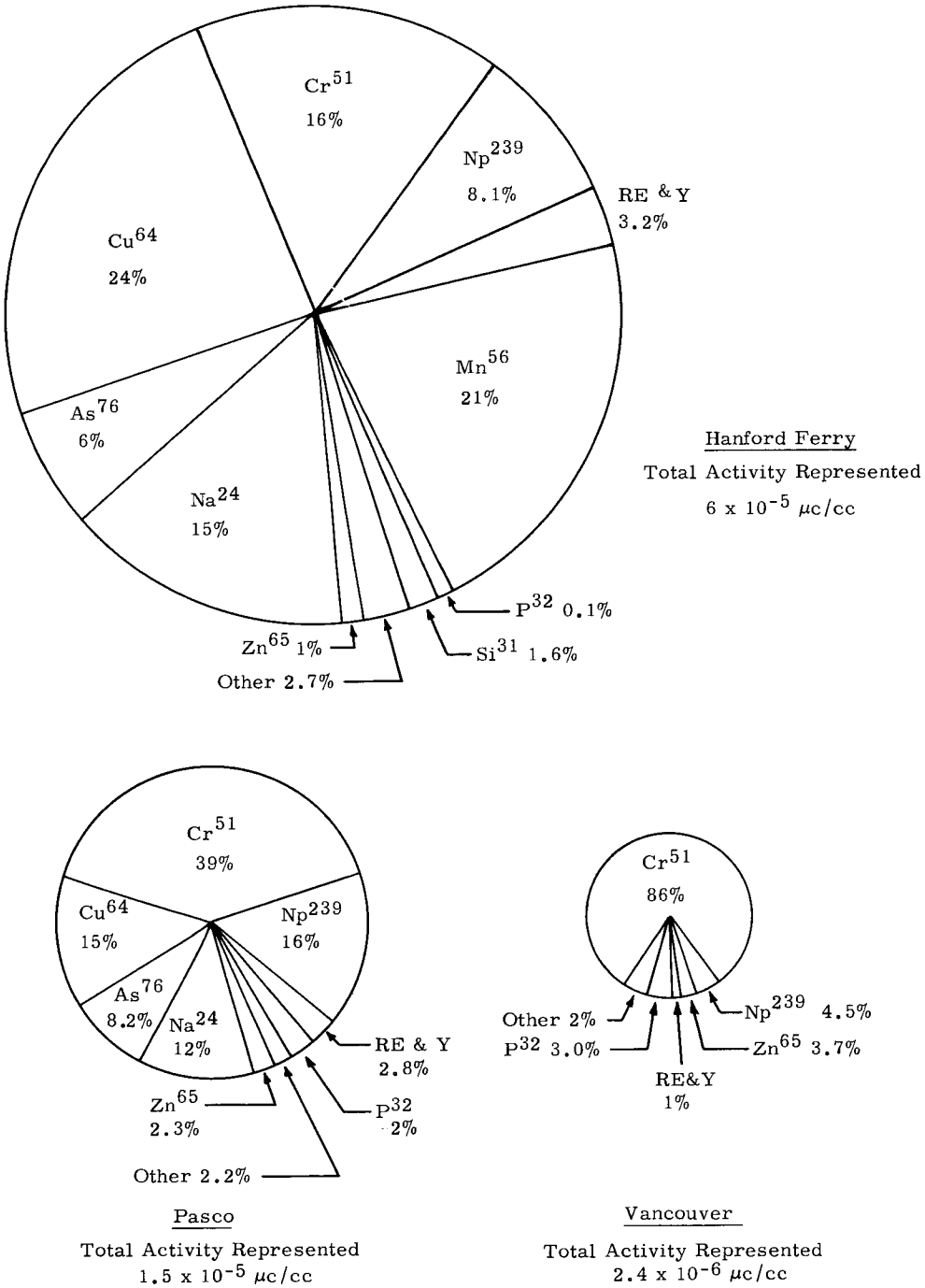

FIGURE 3

Relative Abundance of Radionuclides in Columbia River Water at Several Locations. Annual Averages 1961

AEC-GE RICHLAND, WASH.

TABLE II

ANNUAL AVERAGE CONCENTRATION OF
SEVERAL RADIONUCLIDES IN COLUMBIA RIVER WATER - 1961

Units of 10^{-9} μc/cc

Radionuclide	Hanford Ferry	Pasco	Vancouver
Total Beta	56,000	11,000	520
RE+Y	2,000	390	24
Na^{24}	9,500	1,800	ND*
Si^{31}	1,000	ND	ND
P^{32}	410	260	68
Sc^{46}	57	33	24
Cr^{51}	9,800	5,700	2,100
Mn^{56}	13,000	ND	ND
Cu^{64}	15,000	2,200	ND
Zn^{65}	600	340	90
As^{76}	3,700	1,200	ND
Sr^{89-90}	7.0	5.0	2.7
Sr^{90}	0.5	0.4	0.4
I^{131}	18	10	ND
Np^{239}	5,000	2,400	110
Zn^{69m}	790	130	ND
Ga^{72}	840	150	ND

*Not detected

The Hanford Ferry monitoring station is about seven miles downstream from the closest production reactor and about six miles upstream from the point where the project boundary crosses the Columbia River. Effluent from the reactors is not uniformly distributed across the river at this location and measurement results vary both across the river and with depth.

The Pasco water plant monitoring station is at the point of first municipal usage of the Columbia River and is about 40 miles downstream from the reactors. The distribution of radioactive material in the river is not uniform at Pasco due, in part, to the entry of the Yakima River some 10 miles upstream from Pasco. The Yakima influent tends to make concentrations of radionuclides lower on the Kennewick side of the river.

Vancouver is the farthest downstream location where river water was routinely samples and is about 260 miles from the reactors. Further downstream the intrusion of sea water complicates quantitative measurement of the radionuclides because of the salt content and tidal movement increases variability of results.

The seasonal variation in flow rate of the Columbia River markedly affects the dilution of the reactor effluent. Also affected is the time taken for a given volume of water to move from one location to another which in turn affects depletion. The flow rate of the Columbia River at Pasco and Vancouver for 1958 through 1961 is shown in Figure 4. The variation in concentration of several radionuclides in the Columbia River water at Pasco, Washington for 1958 through 1961 is illustrated in Figure 5. The rate of transport of these same radionuclides past Pasco is shown in Figure 6.

Although there is no known routine human consumption of untreated river water, the potential radiation exposure from such a source may be of interest. The calculated annual dose to the gastrointestinal tract and total body and the combined percentages of maximum permissible (MPRI) rate of intake for bone seekers are presented in Table III.

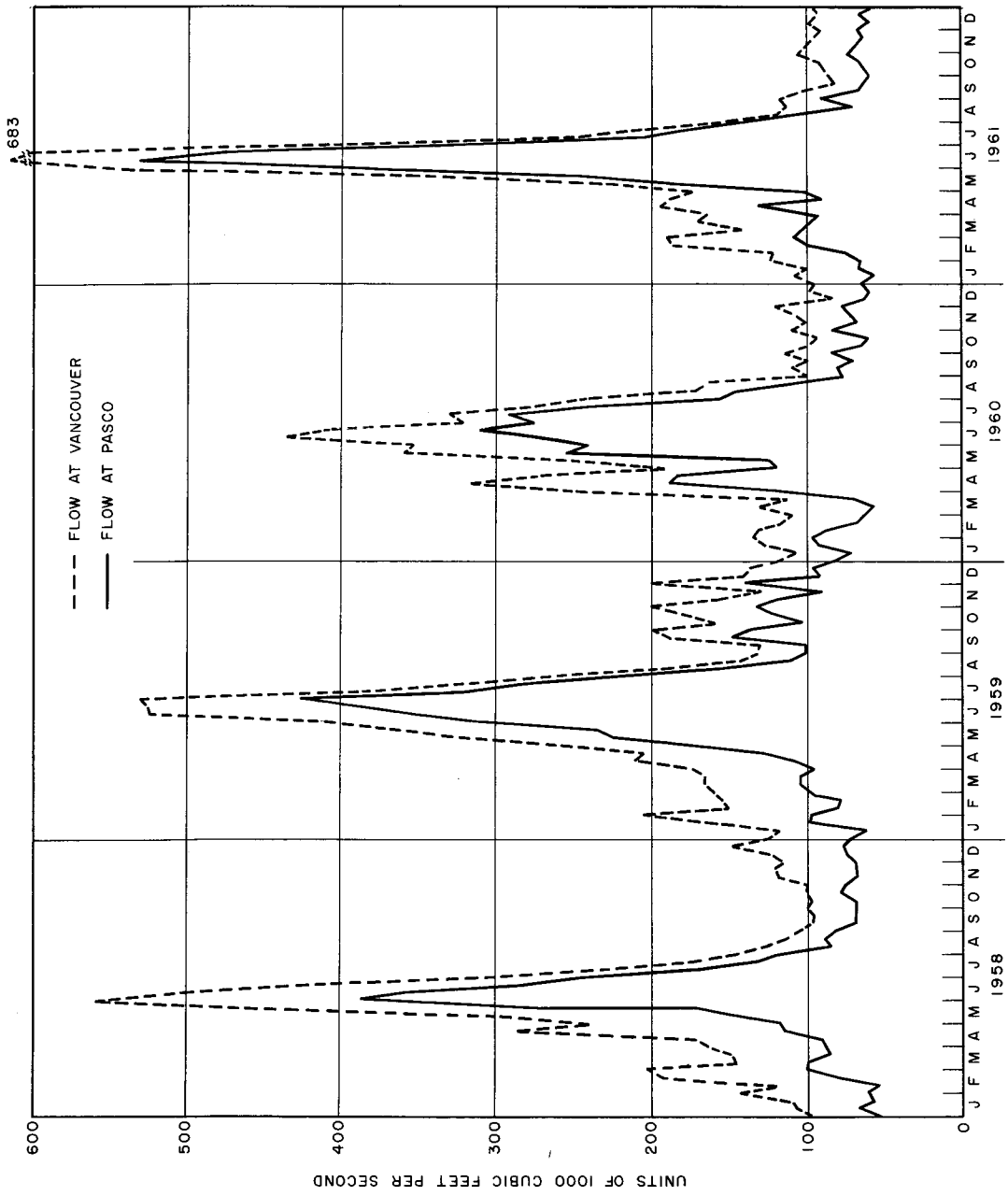

FIGURE 4

Columbia River Flow at Pasco and Vancouver
(Data Furnished by the U. S. Geological Survey)

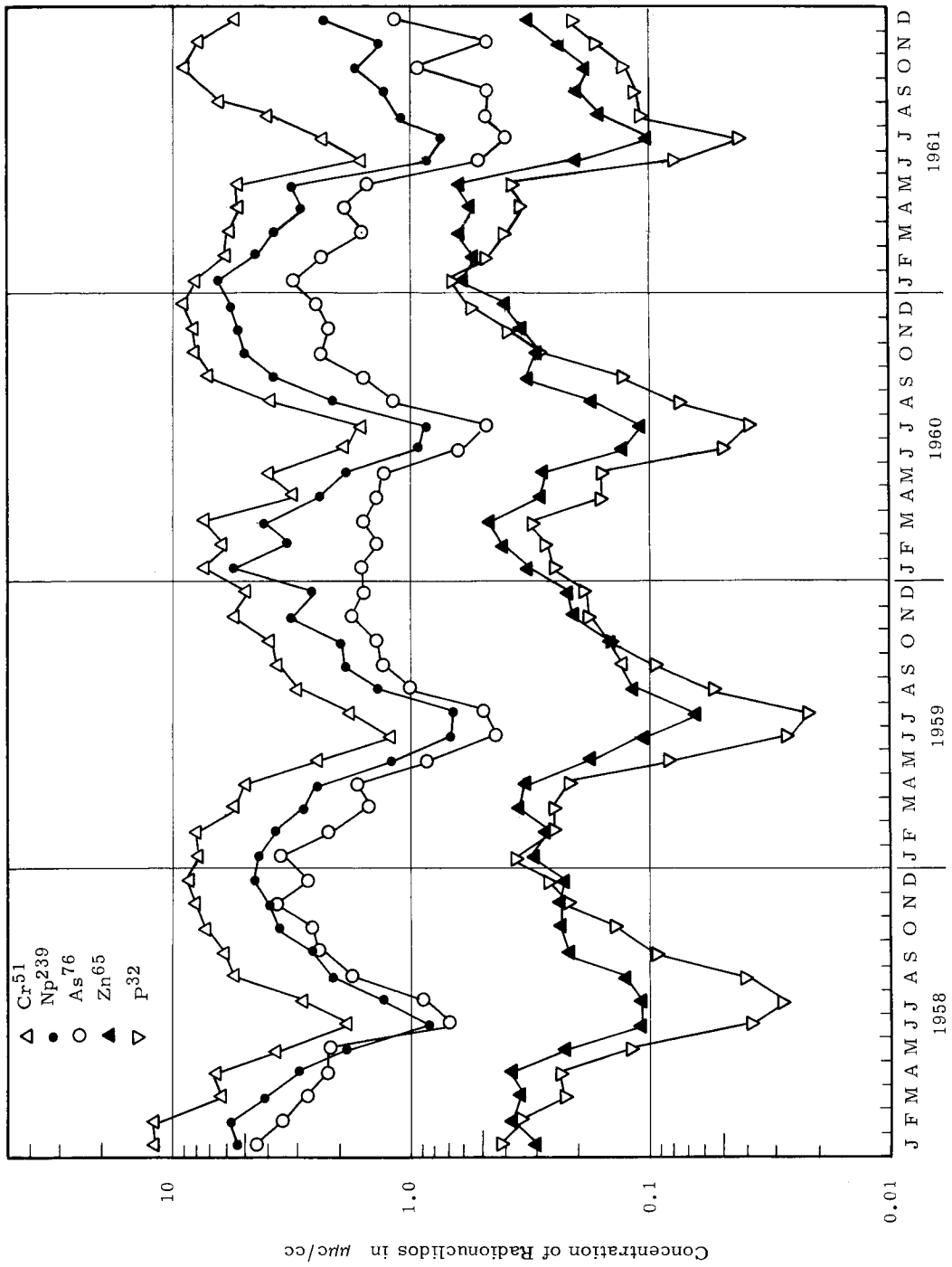

FIGURE 5

Concentrations of Several Radionuclides in Columbia River Water at Pasco, Washington

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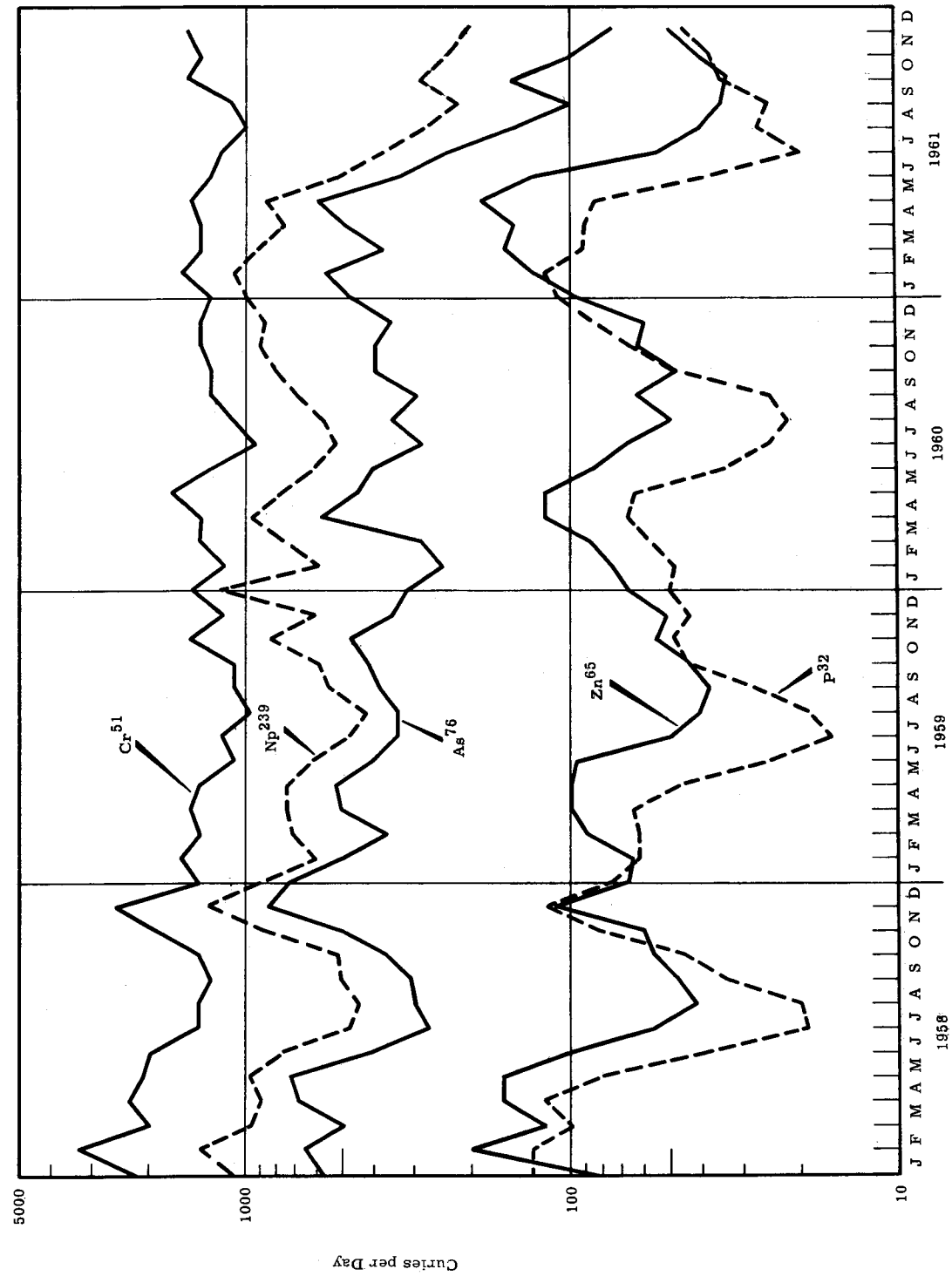

FIGURE 6

Rate of Transport of Several Radionuclides, Pasco, Washington

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TABLE III

POTENTIAL DOSE TO SELECTED ORGANS FROM ROUTINE INGESTION OF COLUMBIA RIVER WATER AT SEVERAL LOCATIONS - 1961*

	Total Body, mrems/yr	GI-Tract, mrems/yr	Bone, Per Cent MPRI
Columbia River Water at Hanford Ferry	19	640	2.7
Columbia River Water at Pasco	7	180	1.8
Columbia River Water at Vancouver	1.4	6	0.8

*Here and elsewhere in this report where the dose to particular body organs is expressed in rem units the determination starts with a calculation of the fraction of maximum permissible rate of intake. One hundred per cent of the maximum permissible rate of intake for the total body is considered to result in 0.5 rem per year to the total body. One hundred per cent of the maximum permissible rate of intake for the GI Tract is considered to expose the GI Tract to 1.5 rem per year. The derived fraction of MPRI of one or more modes of exposure are compared to these equivalent rem exposures to estimate the organ dose.

C. Radionuclides in Sanitary Water

Pasco and Kennewick are the nearest of the few cities downstream from the plant which treat Columbia River water for use as domestic water. Domestic water from each of the water treatment plants was sampled weekly and analyzed for several radionuclides. The results of radioanalysis of water from these plants are presented in Appendix A, Tables 4 and 5, and are summarized in Table IV.

TABLE IV

ANNUAL AVERAGE CONCENTRATION OF SEVERAL RADIONUCLIDES MEASURED IN SANITARY WATER - 1961

Units of 10^{-9} μc/cc

Radionuclide	Pasco Sanitary	Kennewick Sanitary
Total Beta	5,100	780
RE+Y	55	14
Na^{24}	920	140
Si^{31}	ND *	ND
P^{32}	52	12
Sc^{46}	ND	ND
Cr^{51}	4,700	2,500
Mn^{56}	ND	ND
Cu^{64}	470	130
Zn^{65}	130	14
As^{76}	380	100
Sr^{89-90}	4.0	1.2
Sr^{90}	0.3	0.3
I^{131}	7.0	6.0
Np^{239}	1,600	130
Zn^{69m}	20	21
Ga^{72}	50	20

*Not detected

In both cities, the sanitary water samples were collected near the water treatment plants. Because there is a significant flow time between the point of sampling and most consumers, the concentrations of short-lived nuclides in the water at the time it is consumed is less than that shown. The decay time available varies from hours to days depending upon water usage rates, particular location of the consumer, etc.

Table V shows the apparent efficiency of the water treatment plant at Pasco for the removal of various radionuclides.

TABLE V

DEPLETION OF SEVERAL RADIONUCLIDES IN COLUMBIA RIVER WATER FROM TREATMENT AT THE PASCO WATER PLANT (1961 AVERAGES)

	Per Cent Depletion
RE+Y	86
Cu^{64}	79
As^{76}	68
P^{32}	80
Zn^{65}	62
Na^{24}	49
Np^{239}	33
Cr^{51}	18

These data include the radioactive decay of the radionuclides during travel through the water treatment plant. The calculated annual average dose to the GI-tract and total body and the percentage MPRI for bone from sustained consumption of sanitary water at Pasco and Kenneiwck is presented in Table VI.

TABLE VI

CALCULATED ANNUAL DOSE FOR SELECTED ORGANS FROM ROUTINE INGESTION OF SANITARY WATER

	Total Body	GI-Tract, mrems	Bone, Per Cent MPRI
Pasco	3	75	0.6
Kennewick	1	15	0.4

The relative contribution of several radionuclides in Pasco sanitary water to the calculated annual dose to the GI-tract is illustrated in Figure 7. Short term variations and long term trends in GI-tract dose at Pasco are shown in Figure 8.

The sharp decline in the dose rate to the GI-tract at Pasco late in 1961 was due to a decrease in the concentrations of As^{76} and Np^{239} which resulted when additional treatment was given the reactor influent water. This treatment consisted mainly of increased addition of alum in the clarifying process which reduces the amount of parent materials from which the As^{76} and Np^{239} are formed. Phosphorus-32 and Zn^{65} were also reduced to a smaller degree. The reduced output is expected to prevail as long as the high alum feed is continued and reactor operating practices remain unchanged.

D. Radionuclides in Fish and Waterfowl

Species of fish which feed in the Columbia River downstream from the reactors acquire some of the radionuclides present in reactor effluent water. Except for suckers, whitefish usually have the greatest concentration of radioactive materials. The bulk of this material is P^{32} which deposits principally in the bone but some is found in the flesh. The concentrations of several radionuclides in different kinds of fish from different localities are reported in Appendix A, Table 9. The concentrations of P^{32} in whitefish caught between Ringold and Richland are shown in Figure 9. The seasonal variation is affected by the amount of P^{32} released from the reactor, the feeding habits and metabolism of the fish and flow rate of the river which determines the effective dilution of the reactor effluent. Assuming a constant release of P^{32} in reactor effluent water, the level for whitefish starts to decrease late in the year and due to cold water and limited feeding, decreases until spring at which time increased feeding on contaminated food organisms starts to increase the P^{32} content. The trend is reversed in mid-spring by the high flow rates of the Columbia which affords greater dilution of effluent. As the high flows recede in early summer the P^{32} content again increases and a maximum is reached in late fall.

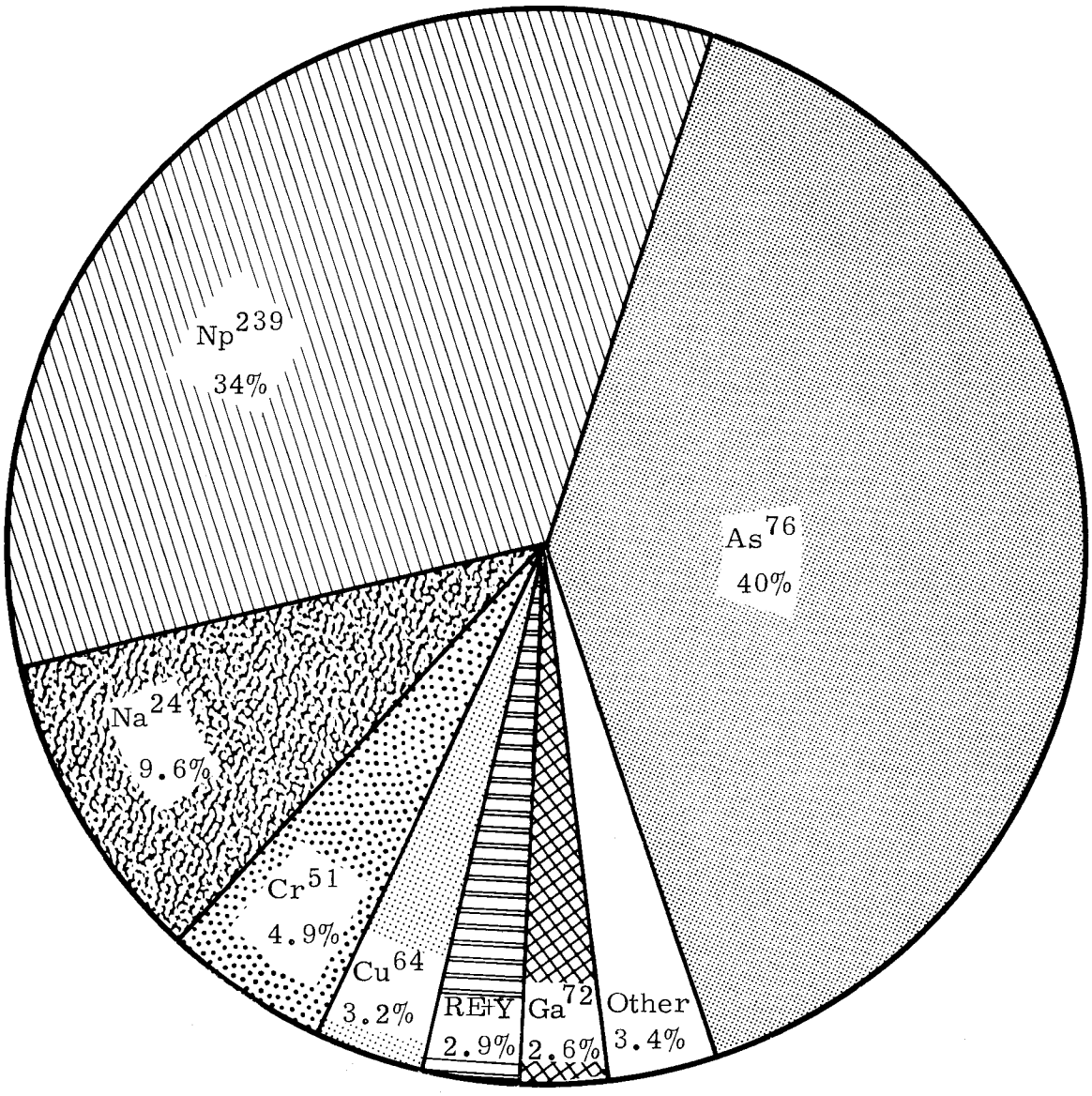

FIGURE 7

Relative Contribution of Several Radionuclides to GI Tract Dose
Pasco Sanitary Water - 1961

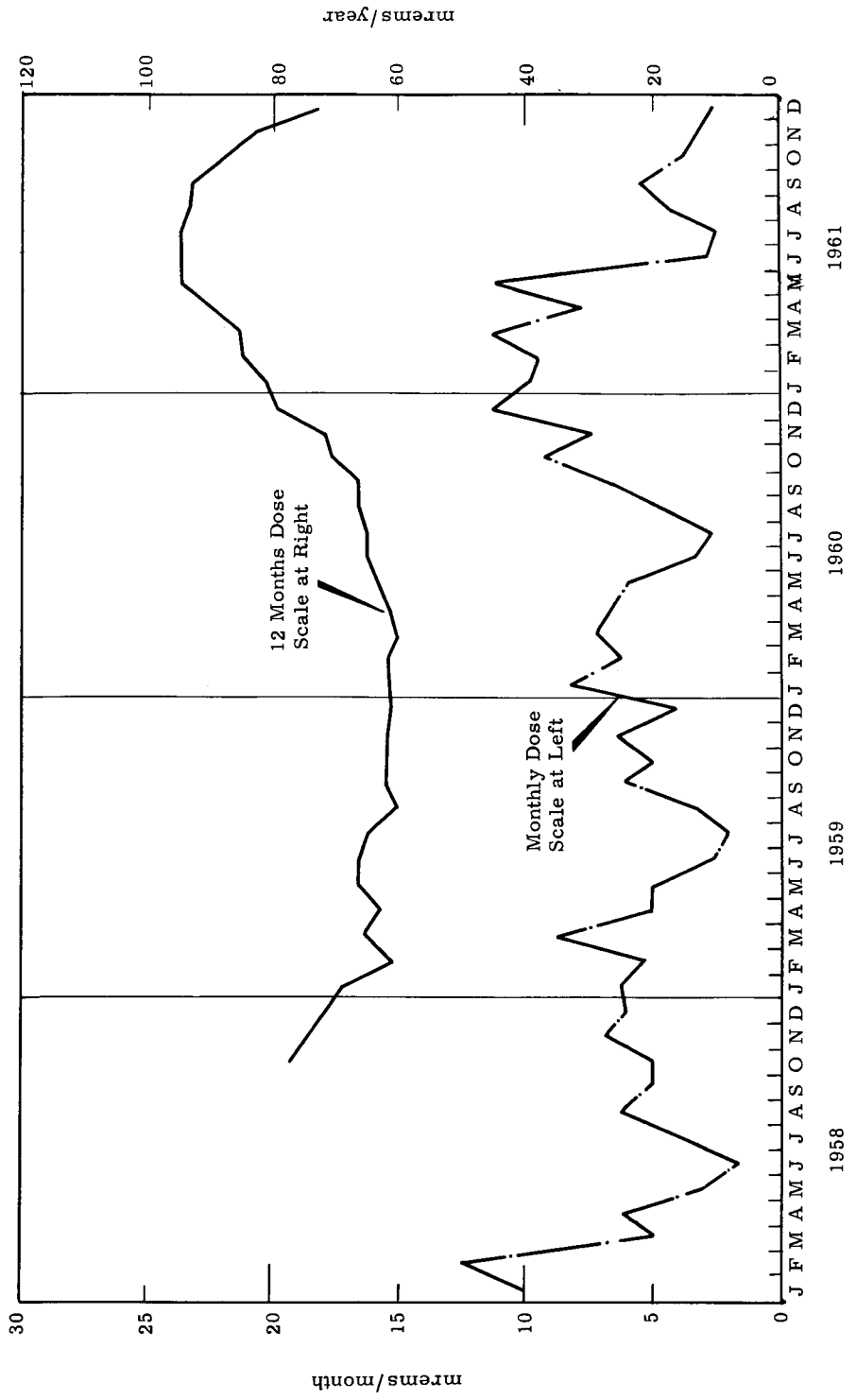

FIGURE 8

Calculated Dose to GI Tract Pasco Sanitary Water

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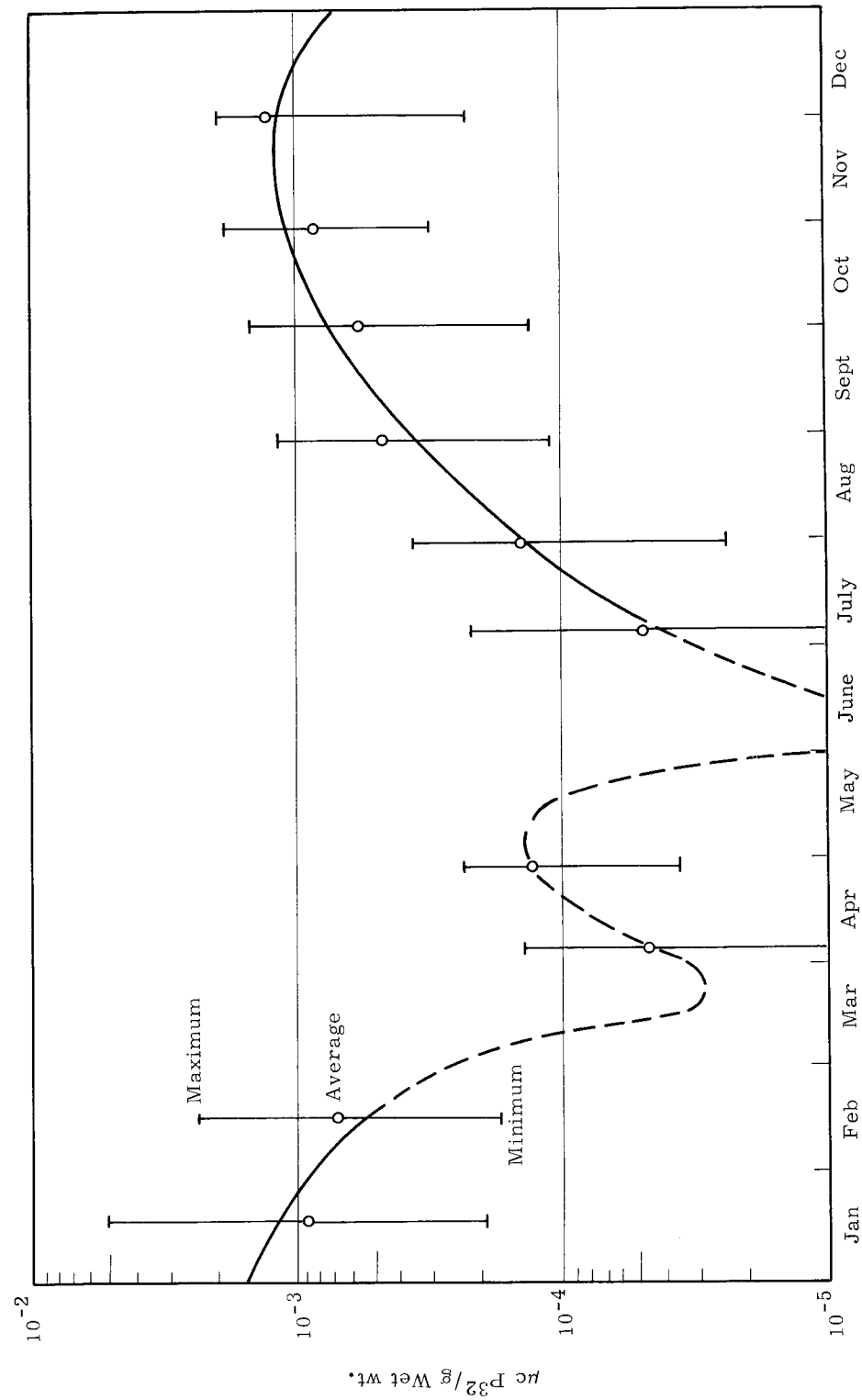

FIGURE 9

Phosphorus-32 in Whitefish Caught in Columbia River Between Ringold and Richland - 1961

AEC-GE RICHLAND, WASH.

The season for most successful whitefish fishing is from September through February. The average seasonal concentration of P^{32} in the flesh of whitefish caught between Ringold and Richland was 8×10^{-4} μc P^{32} per gram. Ringold is the closest fishing area available to the public downstream from the reactors. Consumption of 10 pounds of whitefish containing an average of 8×10^{-4} μc P^{32} per gram would result in an intake of about 4 μc P^{32}. This would provide and exposure of about 80 mrems to the GI tract and 25 mrems to the total body and about 25 per cent of the MPRI for bone. The average concentration of Zn^{65} in whitefish from the same localities was 8×10^{-5} μc per gram. The presence of Zn^{65} in this concentration would add 2 to 3 mrems to the total body (critical organ) exposure.

Migratory waterfowl such as mallard ducks, Canada geese, etc., which have utilized the Hanford section of the river may contain radionuclides and may be harvested by hunters at a number of places. During the 1961 waterfowl season, samples from about 3400 ducks bagged by hunters from Washington, Idaho, Oregon and California were submitted for radioassay. Analyses have been completed on 1500 duck samples provided by southeastern Washington hunters. Individual data obtained from radioassay of waterfowl samples are included in Appendix A, Tables 10 and 11. The data show that about one out of every 13 ducks contained concentrations of P^{32} greater than the detectable level of 5×10^{-5} μc per gram wet weight. Only one out of 250 ducks contained P^{32} in concentration greater than 5×10^{-4} μc per gram. The maximum concnetration observered was 2.6×10^{-3} μc P^{32} per gram. Though the chances were about 1 in 1500 of obtaining such a duck, the person consuming 750 grams of duck containing P^{32} in this amount would have consumed about 2 μc P^{32}. This amounts to about 12 per cent of the MPRI for bone seeking radionuclides.

E. Radionuclides Entering the Pacific Ocean

The rate of transport of radionuclides past Vancouver may be used as an index of the quantities of certain radionuclides entering the Pacific Ocean from the Columbia River. The annual average rate of transport of selected radionuclides is given in Table VII.

TABLE VII

ANNUAL AVERAGE RATE OF TRANSPORT
OF SELECTED RADIONUCLIDES PAST VANCOUVER
curies per day

Radionuclides	1961	1960
P^{32}	29	17
Cr^{51}	840	850
Zn^{65}	44	38
Np^{239}	67	72

An equilibrium exists in the ocean for these radionuclides in the sense that the rate of addition through the river system corresponds to the rate of decay of the radionuclides which have previously entered the ocean. If a constant rate of entry into the ocean equivalent to that indicated by the 1961 Vancouver data is assumed, then the equilibrium values amount to about 600 curies of P^{32}, 220 curies of Np^{239}, 33,000 curies of Cr^{51}, and 14,000 curies of Zn^{65}.

F. Radiozinc in Marine Organisms

Zinc-65 is the only radionuclide of reactor effluent origin which has been found in sufficient abundance beyond the mouth of the Columbia to be of radiological interest. The oyster has been found to contain more Zn^{65} than other sea food organisms.[6] Oysters grown in Willapa Bay were regularly sampled and analyzed for Zn^{65} and other radionuclides. Individual results of oyster sampling are tabulated in Appendix C, Table 4. The average concentration of 17 samples involving 34 pints of oysters taken throughout the year was 8×10^{-5} μc Zn^{65} per gram. Consumption of oysters containing this amount of Zn^{65} at a sustained rate of one pound each week would lead to an exposure to the total body of about 12 mrems per year.

G. Radioactive Wastes Released to the Atmosphere

Air-borne radionuclides at Hanford are primarily associated with process vessel off-gases and building ventilation air from the chemical separations facilities. This gaseous waste is released to the atmosphere through 200 foot high stacks after removal of some 99 per cent of the radioactive materials present. Under normal operating conditions the ventilation air from reactor and laboratory buildings contain comparatively minor amounts of radioactive materials.

Air-borne radioactive material can contribute to human exposure through such pathways as inhalation, ingestion of leafy vegetables upon which the material has deposited, and milk from cows which have grazed on affected pasture.

The radionuclide of principal interest in process off-gases is I^{131}. Continuous measurements of the release of I^{131} from the separations facilities are made. Results of such measurements are presented in Appendix B, Table 11. The average daily emission rates of I^{131} and several other radionuclides for the year are shown in Table VIII.

TABLE VIII

AVERAGE EMISSION RATES OF SEVERAL RADIONUCLIDES FROM SEPARATIONS PLANT STACKS - 1961

Radionuclide	Average Emission, c/day
I^{131}	0.7
$Zr\text{-}Nb^{95}$	0.005
Ru^{103}	0.003
Ru^{106}	0.005
Ce^{141}	0.006
Ce^{144}	<0.01

Earlier measurements have shown that emission rates of the rare earth and yttrium group are about 0.02 curies per day; Sr^{89} about 0.004 curies per day, and Sr^{90} about 0.0005 curies per day.

The rate of release of I^{131} in units of curies per seven days is illustrated for 1961 in Figure 10. Local operational guides for stack releases are developed from the anticipated contamination levels in foodstuffs, and, in response to increased emphasis on lower rates of intake of I^{131} for humans, the local operational guide was reduced from 10 curies per week to 2 curies per week averaged over a year's time. The lower limit hopefully will be such that I^{131} from Hanford sources in locally produced milk will not exceed an annual average concentration of 10 μμc per liter.

H. Radioactive Particulates in the Atmosphere

Air sampling stations maintained by the Hanford project include those located at Benton City, Kennewick, Pasco, Richland, Seattle, Spokane, Walla Walla, and Yakima in Washington; Meacham and Klamath Falls, Oregon; Boise and Lewiston, Idaho; and Great Falls, Montana. The sample filters are changed weekly by cooperating agencies and sent to Hanford where they are analyzed for the number of radioactive particles and for total beta activity. Individual measurement results are presented in Appendix B, Tables 1 and 2. The concentration of beta emitters in filtered air from several locations are shown in Figure 11 for the past few years. The geographical location of these sampling stations are also shown.

For the first eight months of 1961 the activity in off-site air samples continued to be from old world-wide fallout which had depleted to a level of about 0.06 μμc β per cubic meter of air. The measurements made at the Hanford station had continued to indicate a level of about 0.3 μμc β per cubic meter of air since fall of 1959. With the resumption of nuclear testing by the USSR in September 1961, the activities on air samples increased sharply. The average value observed for the period September through December 1961 was 6 μμc β per cubic meter of filtered air for all sampling locations including Hanford. This amount is quite similar to values observed at the peak of fallout from nuclear testing in late 1958.

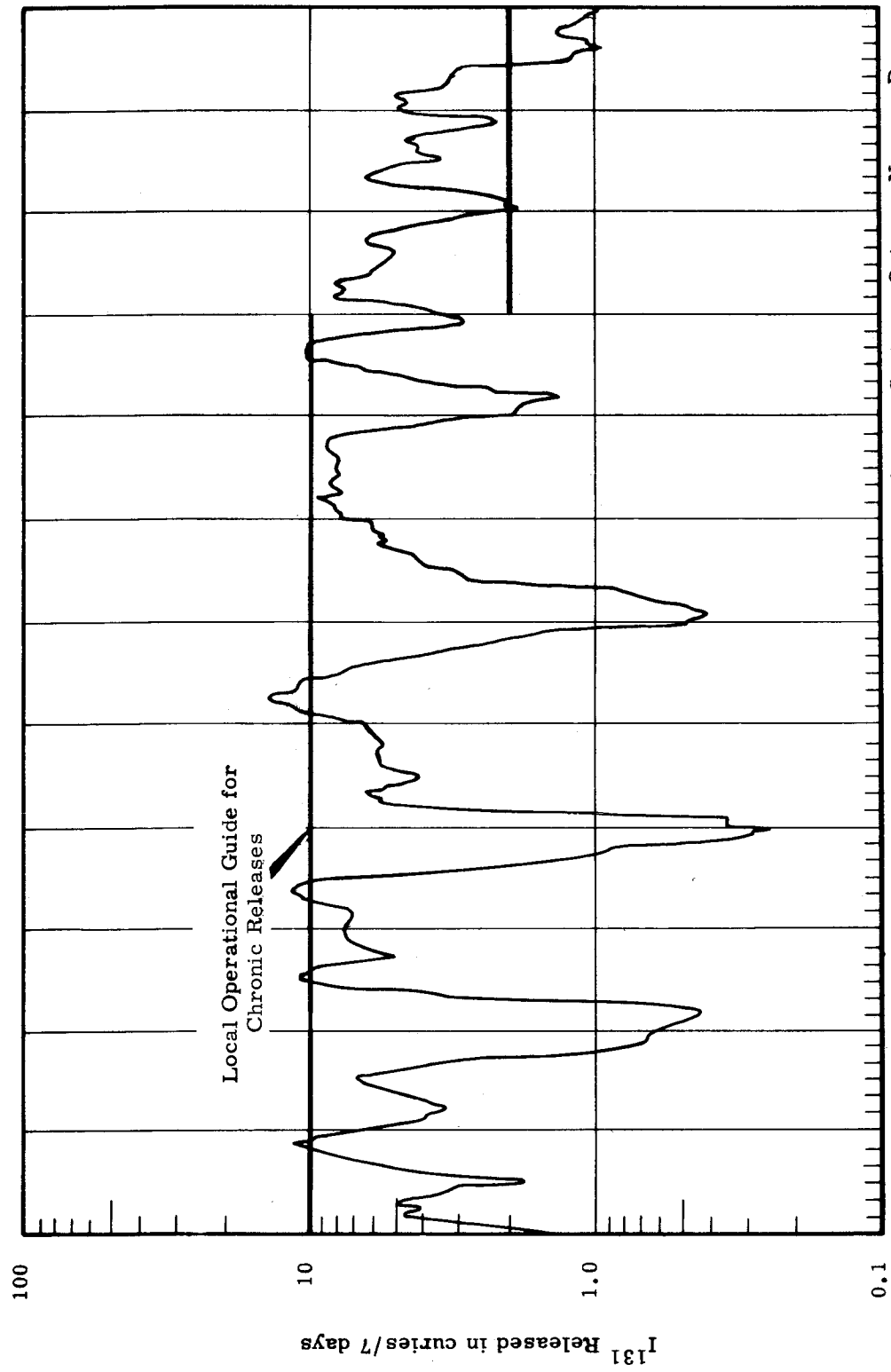

FIGURE 10

Release of I^{131} to the Atmosphere, 1961

AEC-GE RICHLAND, WASH

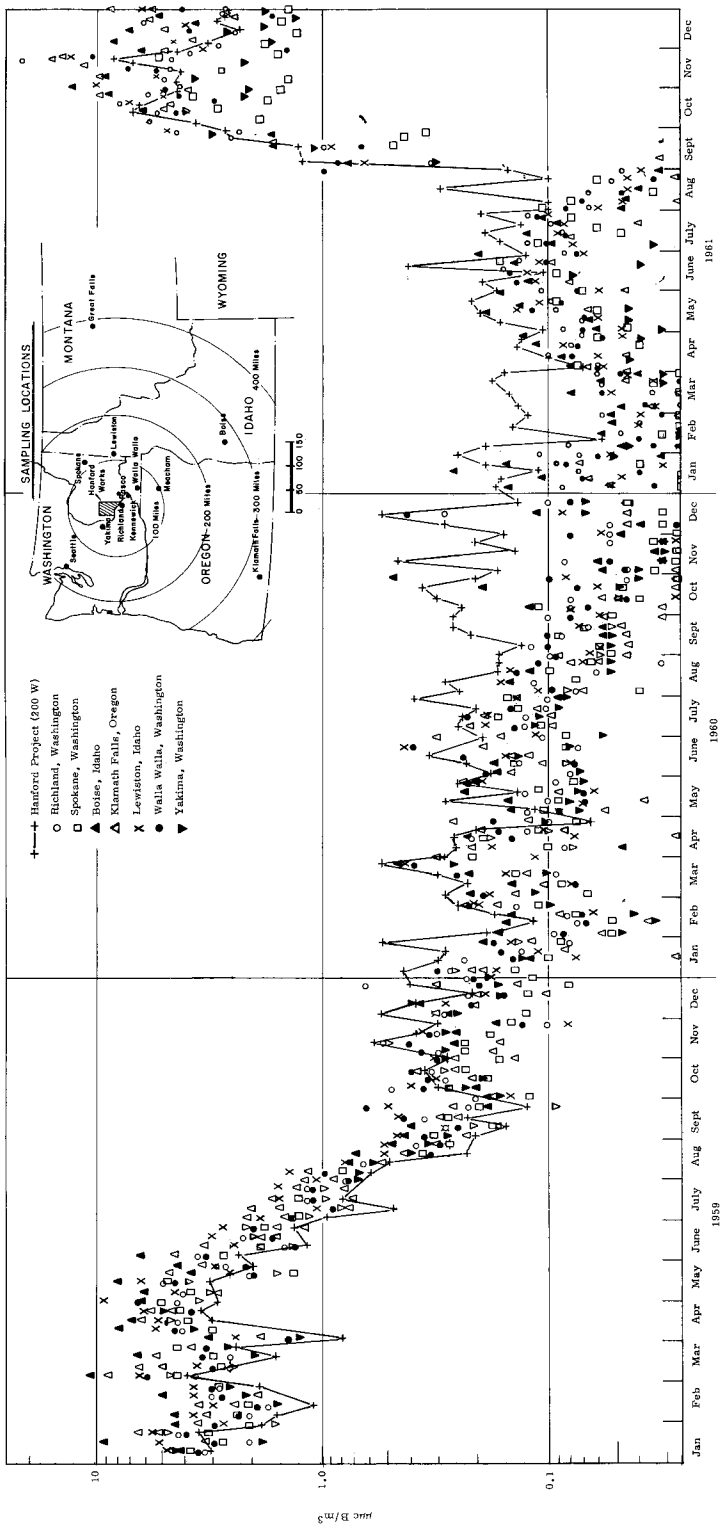

FIGURE 11

Activity on Filters from Selected Northwestern United States Sampling Locations

While the activity on air filter samples are not used in exposure determination, these samples serve very well in illustrating the trends in atmospheric contamination.

I. Radionuclides in Native Vegetation

Some of the radioactive material released to the atmosphere is deposited on the ground or on vegetation as local fallout. Radioiodine, in particular, can contribute to human exposure through ingestion of leafy vegetables upon which it has deposited and ingestion of milk from cows which have grazed on affected pasture. Grazing animals can also receive radiation exposure through similar paths. Usually a program appropriately oriented in terms of human exposure will insure against harmful exposure of animals.

In the past, considerable sampling and radioassay of native vegetation was done both locally and as far away as Spokane and Portland. This survey established contamination levels for native vegetation and was also used as a gross indicator of concentrations of radionuclides to be expected in milk and leafy vegetables. Emphasis has been changing toward separate sampling and radioassay of milk and other foodstuffs with the result that the monitoring of native vegetation has been considerably reduced both in extent and frequency of sampling. The remaining program is primarily for the study of deposition patterns of radioactive contaminants close to the plant facilities.

Detailed data obtained in 1961 on radionuclides in native vegetation are presented in Appendix B, Tables 4 through 10.

The I^{131} associated with fallout from USSR Nuclear Testing was the only significant deposition on vegetation in 1961. The peak concentrations occurred in late October to early November and amounted to about 4×10^{-5} μc I^{131} per gram. By early December the I^{131} had decayed at most locations to less than 1.5×10^{-6} μc per gram. Other radionuclides of fallout origin such as Ba-La^{140}, Zr-Nb^{95}, $Ru^{103-106}$, and $Ce^{141-144}$ were on the order of 10^{-4} to 10^{-3} μc per gram at peak concentrations and are decaying slowly.

J. Concentrations of I^{131} in Beef Cattle Thyroids

Late in 1960 assay of thyroids of cattle slaughtered for beef at Pasco, Washington was initiated. Since the concentration of I^{131} in the thyroids is expected to be several orders of magnitude higher than in the pasture grass or in milk, it may become advantageous to estimate concentrations of I^{131} in milk and on leafy vegetables from the thyroid samples when the levels in the milk and vegetables are otherwise too low for practical measurement. Additionally, knowledge of cattle thyroid exposure may be developed from the thyroid data.

Data obtained from the cattle thyroid program for 1961 are presented in Appendix B, Table 12. The measurement results are illustrated in Figure 12. Thyroid burdens vary widely due to differences in feeding habits, location of residency, etc., prior to slaughter. The increase in concentrations of I^{131} in the thyroids in late 1961 was again the result of fallout from nuclear testing.

K. Radioiodine in Air

Measurements of I^{131} concentrations in air were made routinely at several communities adjacent to the plant. Results of these measurements for 1961 are presented in Appendix B, Table 3 and results for the past few years are summarized in Table IX.

TABLE IX

AVERAGE IODINE-131 CONCENTRATIONS IN ATMOSPHERE

Location	Distance from Separation Stacks	Concentrations in Units of 10^{-14} μc/cc 1959	1960	1961
Benton City	20 miles	15	5.4	2.2
North Richland	21 miles	6.4	4.3	4.5
Richland	23 miles	7.9	3.0	2.3
Pasco	32 miles	13	2.3	3.6

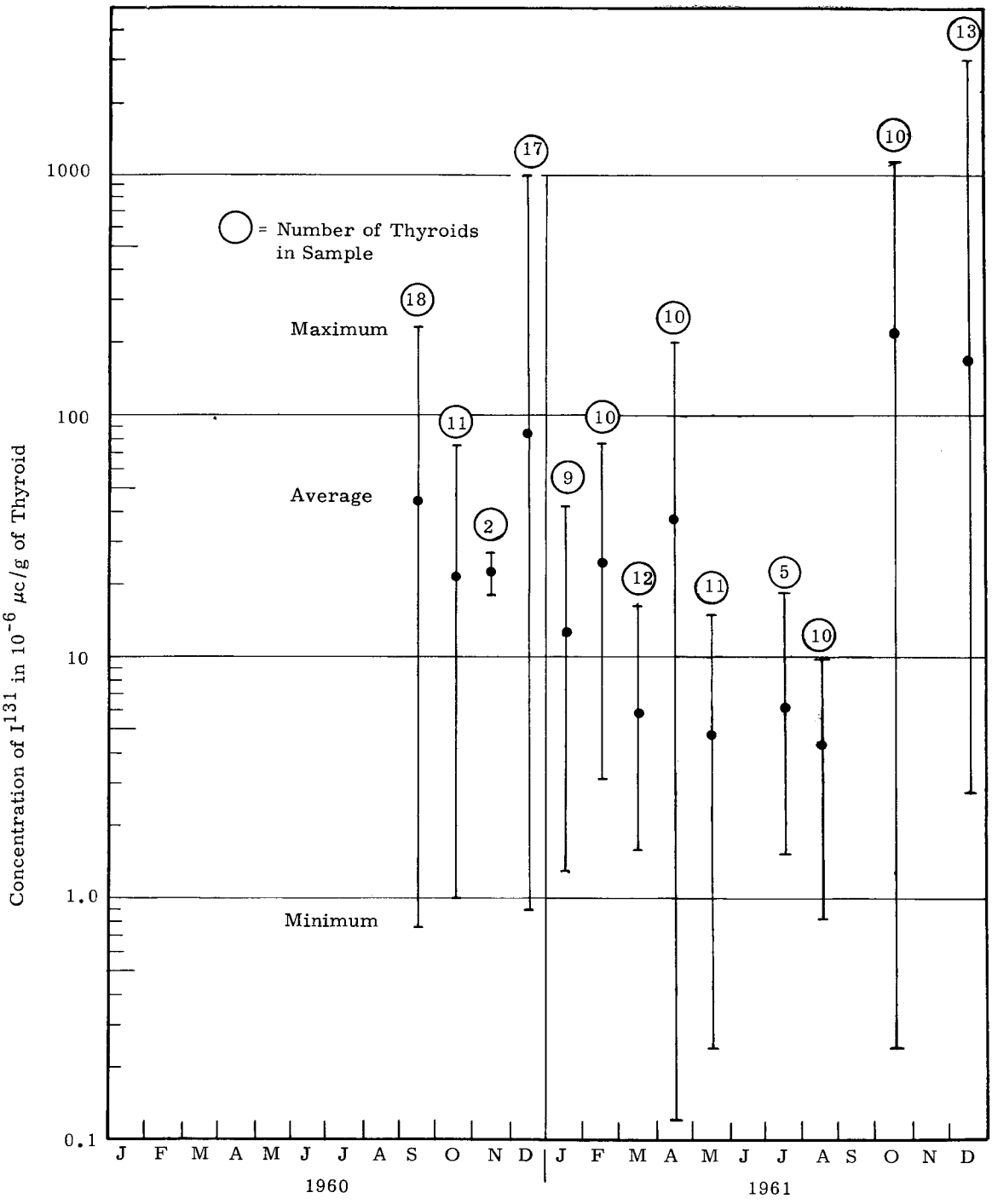

FIGURE 12

Average Concentrations of I^{131} in Beef Cattle Thyroids
(From Pasco Slaughter House)

AEC-GE RICHLAND, WASH.

The communites listed in Table IX lie within a 45 degree sector southeast to south of the separations centers.

The radioiodine present in the fallout from recent USSR nuclear testing contributed little to the small amounts of I^{131} measured in air at the aforementioned locations. Under usual circumstances the amount of I^{131} in inspired air is small and the thyroid dose to man from this source is of marginal significance. The annual dose to the thyroid estimated from this source was less than one millirem.

L. Radionuclides in Milk and Agricultural Produce

The radioactivity of local agricultural produce can be influenced by deposition of air-borne radionuclides on the ground or vegetation or by irrigation of food and forage crops with water containing reactor effluent radionuclides. Generally, the local source of air-borne radio-nuclides is considered to be the chemical separations facilities; however, under certain conditions the ventilation stacks of the reactors or laboratory areas could become the source of interest.

There is no farming within about a 20-mile radius of the separations facilities and under most meteorological conditions this distance affords good dilution before the radioactive effluents reach farming areas. Most of the irrigated land in the vicinity of the Hanford plant is irrigated from the Yakima River, or with water taken out of the Columbia above the project.

The Ringold farms and the Riverview District of Pasco, which are about 15 and 30 miles downstream from the reactors, respectively, take water from the river and some of the reactor effluent radionuclides are traced through the irrigation processes to milk and produce. The Ringold farms involve about a dozen people working about 500 acres of land. Fruit and milk are the principal products of these farms with only limited production of vegetables or meat. The Riverview farming area is composed of less than 3000 acres and has 20 to 30 families. Most of the farms are small, with milk, fruit and some vegatables as principal items of produce.

These areas are about 20 miles east and 30 miles southeast, respectively, of the chemical separations facilities, (see Figure 2). Another area frequently samples is the Benton City area on the Yakima River, about 20 miles south of the separations facilities.

With the exception of milk obtained from local farms which are irrigated with Columbia River water, the radionuclide content of milk available in the Tri-City area appears typical of that reported by the US Public Health Service in their Radiological Health Data Quarterly Reports for sections of the country with similar rain fall. Data concerning radionuclides in milk analyzed locally are contained in Appendix C, Table 1.

Hanford analysis of milk known to be of local origin showed Sr^{90} concentrations ranging from less than 2 to 6 μμc Sr^{90} per liter. The average concentration measured in 50 samples was 3 μμc Sr^{90} per liter of milk, which ranks among the lowest in the Nation. The Sr^{90} content of milk analyzed is illustrated in Figure 13. The concentration of Sr^{89} and Cs^{137} in milk analyzed at Hanford was usually below the detection level of 4 μμc Sr^{89} per liter and 30 μμc Cs^{137} per liter. World-wide fallout is the principal source of these radionuclides in milk. No significant increases of the above radionuclides in milk are expected before Spring 1962.

Irrigation water pumped from the Columbia River is the source of P^{32} and Zn^{65} in the milk of cows which had grazed on irrigated pasture. For dairy farms in the Ringold and in the Pasco areas the average concentrations of Zn^{65} in milk were 0.7 μμc per gram and 0.5 μμc per gram, respectively, and the average concentrations of P^{32} were 0.7 μμc per gram and 0.6 μμc per gram, respectively. The concentration of Zn^{65} and P^{32} measured in local milk are illustrated in Figures 14 and 15, respectively. Neither Zn^{65} nor P^{32} was positively detected in milk distributed through commercial outlets in the Tri-City Area.

At a consumption rate of one liter of milk per day the "fallout" nuclides would contribute an average annual dose of about 1 mrem to the GI tract, 2 mrems to the total body and about 2 per cent of the MPRI for bone. The

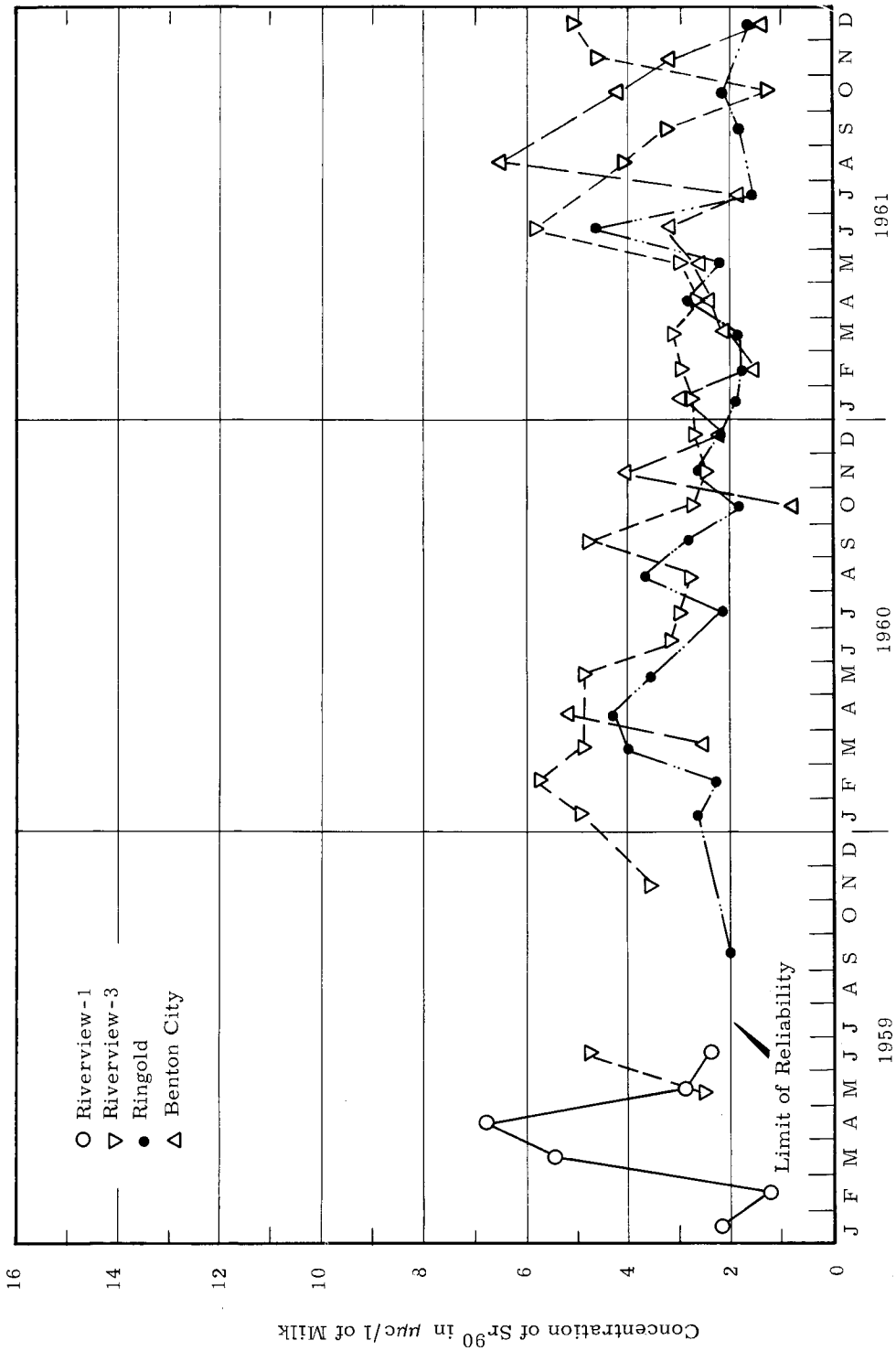

FIGURE 13

Strontium-90 in Locally Produced Milk

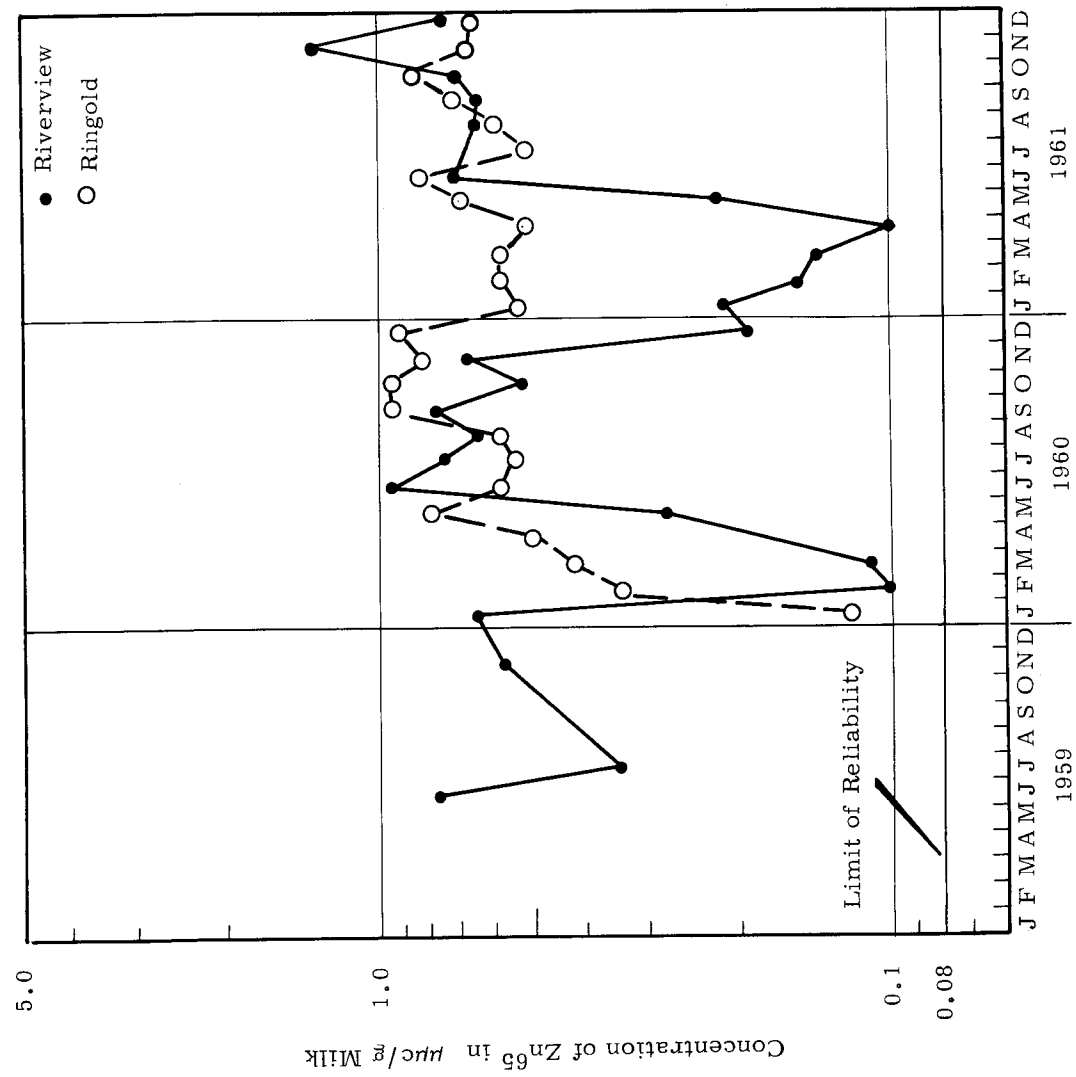

FIGURE 14

Zinc-65 in Local Milk

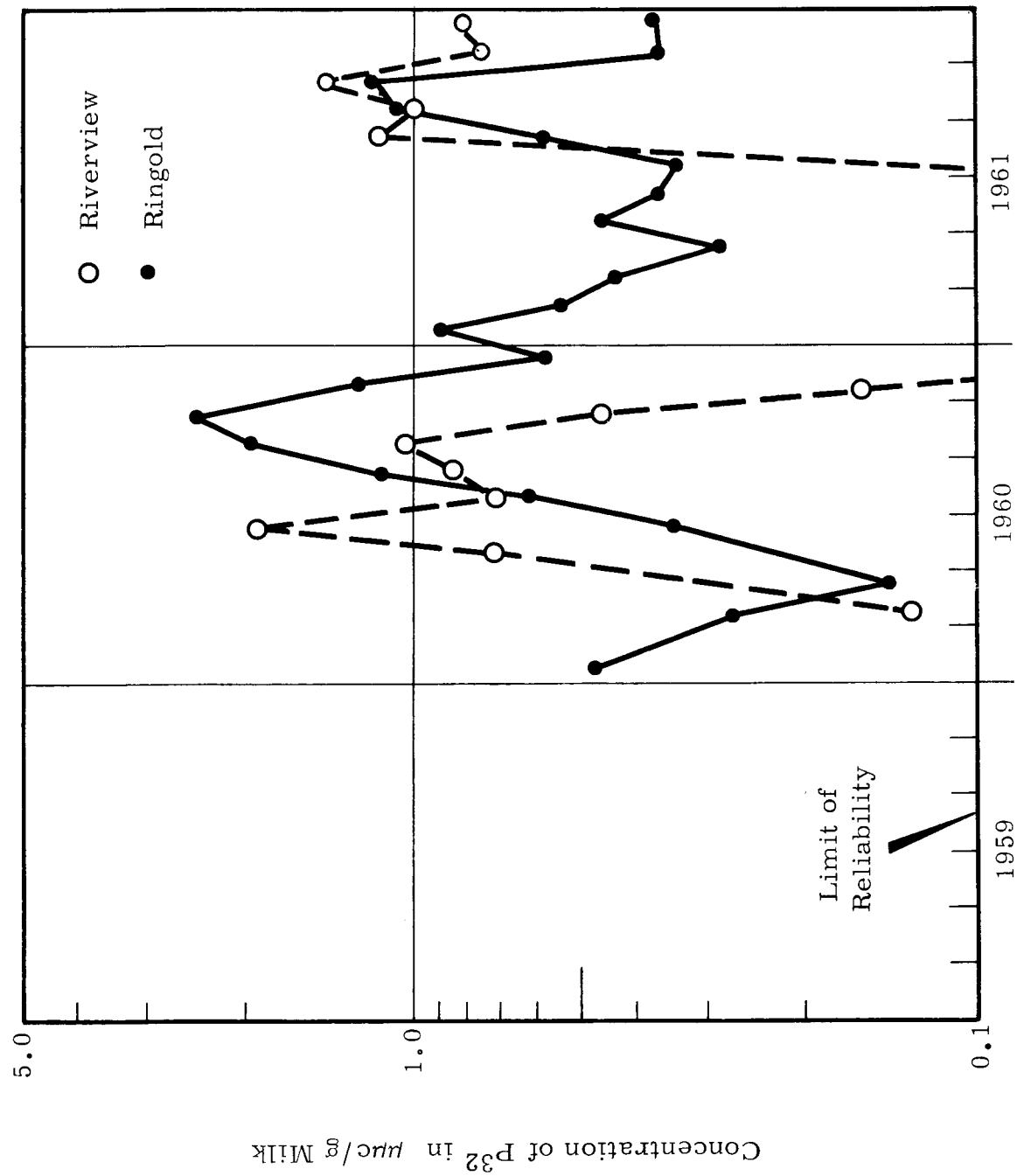

FIGURE 15

Phosphorus-32 in Local Milk

additional exposure to the few individuals drinking milk from the Ringold area is calculated as about 10 mrems to the GI tract, 4 mrems to the total body and about 2 per cent of the MPRI for bone.

In addition to the above nuclides, measurements for I^{131} were made in all milk samples. Measurements results obtained in 1961 on I^{131} in milk are illustrated in Figure 16. Before the USSR nuclear tests the concentration of I^{131} in milk from local farms was usually below the reporting level of 50 μμc I^{131} per liter. There were, however, a few samples which contained measurable amounts and because of these the pretest average was probably no less than 10 nor more than 60 μμc I^{131} per liter. Consumption of this milk at a rate of one liter per day for one year would imply an exposure of from 7 to 40 mrems per year to the 20 gram thyroid of the standard man. At one liter per day, an exposure of from 70 to 400 mrems per year to the 2 gram thyroid of an infant is implied.

An improved technique for the measurement of I^{131} in milk was employed beginning in early October. This technique, using about 3 gallons of milk and a resin column exchange technique, resulted in a new detection capability of about 1 μμc I^{131} per liter of milk.

Fallout from the USSR testing caused the concentrations of I^{131} in milk to increase sharply for a short time. The maximum concentration observed locally was on November 2 and amounted to 1500 μμc I^{131} per liter of milk. Because of radioactive decay of the I^{131} in the fallout and because of the onset of winter and increased dry feed for the cows, the concentration of I^{131} in milk from local farms had decreased to about 2 μμc I^{131} per liter by late December.

Experience of the past few years indicated that under normal plant operating conditions local produce contains very small quantities of radionuclides. This was again substantiated by a minor amount of sampling of foodstuffs in 1961. The fallout from USSR testing in the fall of 1961 was late enough in the year as to be of little importance in terms of produce contamination other than milk.

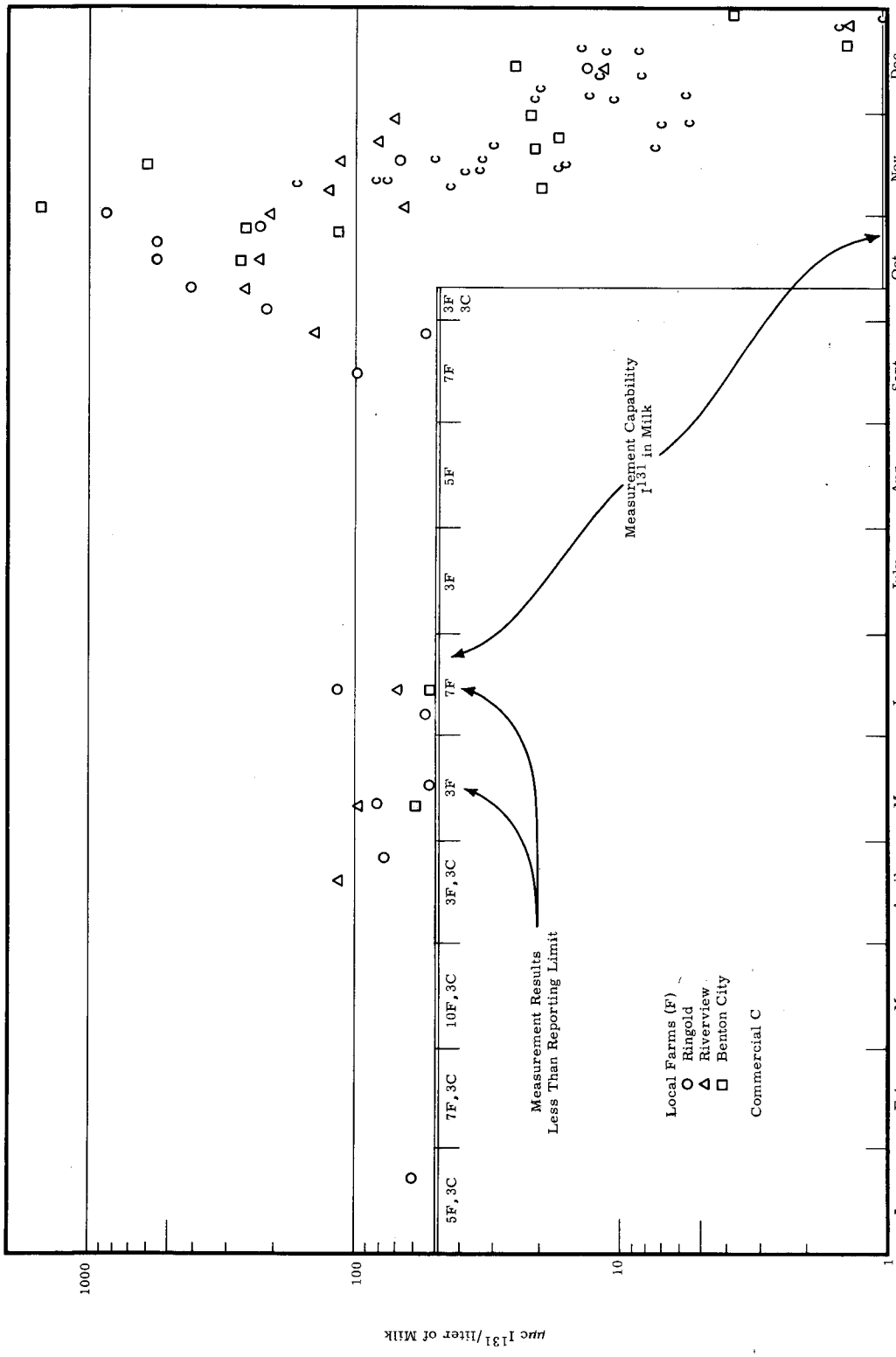

FIGURE 16

Iodine-131 in Milk - 1961

As a means of estimating dose from ingestion of local produce a comparison with milk is expedient. The dose to different body organs is developed assuming a consumption rate of 1 liter of milk per day containing the annual average concentrations of the important radionuclides. A dose of equal magnitude is then taken as the assumed exposure from produce. This approximation is adequate in times of little fallout on plant emissions because the dose involved is small and the associated error does not appreciably alter the estimate of total exposure received from all sources. This approach also appears consistent with estimates made by others for various parts of the country.(8)

As an estimate of intake of I^{131} from leafy vegetables, the concentrations on pasture grass were taken as representative. The average concentration of I^{131} on pasture grass prior to fresh fallout was about 2×10^{-7} μc per gram. Assuming a consumption rate of 60 grams of leafy vegetables per day during the assumed four month growing season, the average annual daily intake would amount to about 4 μμc I^{131}. This implies an annual exposure of about 3 mrems to the thyroid of a "standard man".

A small amount of local produce was sampled and radioassayed during the 1961 growing season. Results of these measurements are presented in Appendix C, Table 3.

M. External Radiation

Estimates of the combined exposure from external sources in the vicinity of the Hanford project were made from measurements with ionization chambers stationed above the ground surface and in the Columbia River. Measurements over the ground indicated that the annual exposure for 1961 was about 130 mr, which is essentially the same as that reported for 1960. Virtually all of this radiation originates from natural background and any addition from Hanford sources is not readily discernible. Measurements of external radiation in 1960 and 1961 are illustrated in Figure 17.

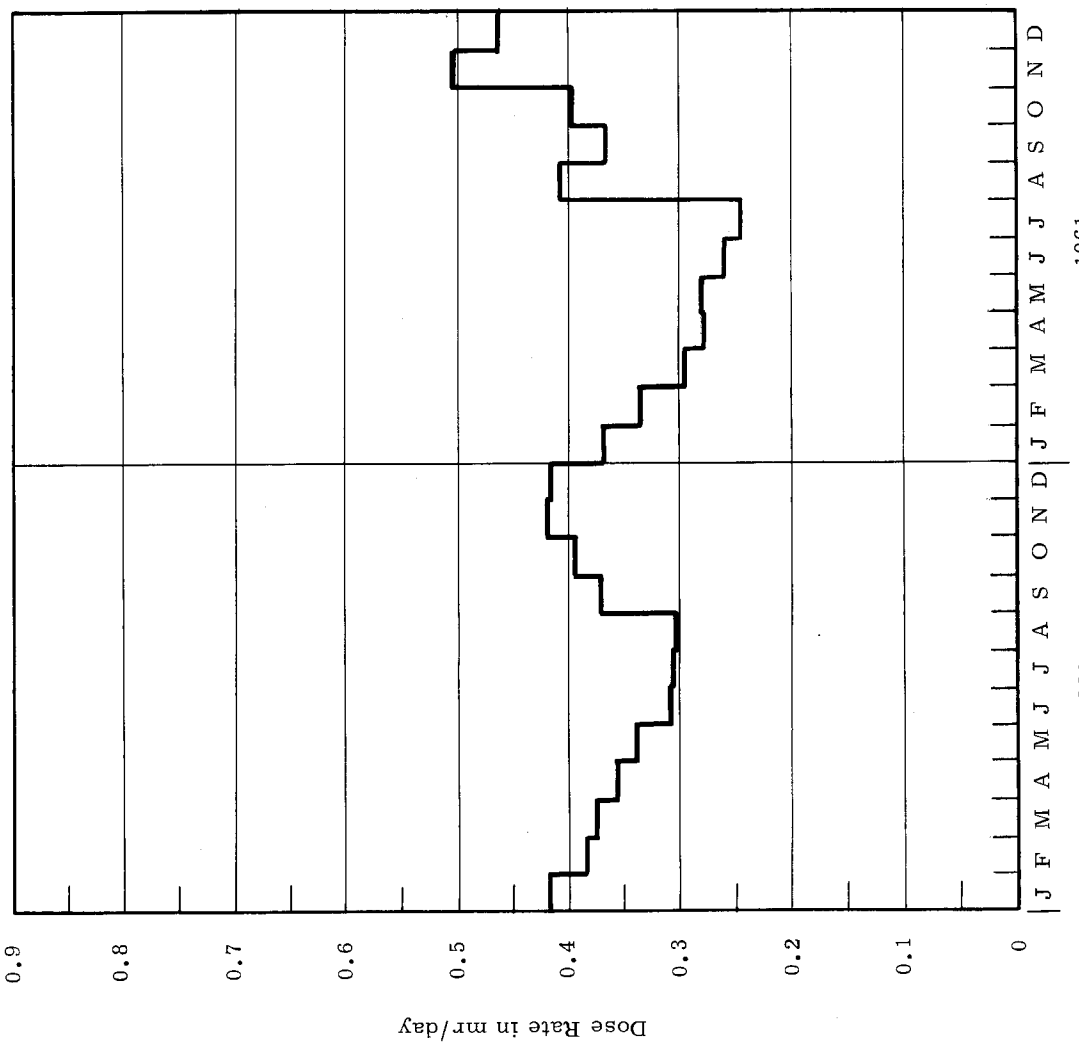

FIGURE 17

External Dose Rate As Measured at Hanford External Dose Test Location

AEC-GE RICHLAND, WASH.

The exposure rate in the river is higher, however, because of the presence of gamma emitters, especially Na^{24}, in the reactor effluent. In the vicinity of Richland, the average dose rate measured in the river during the months of April through October was about 2.5 mr per day; upstream near the Laboratories and Fuel Preparation Area 2.8 mr per day, and near Kennewick about 0.9 mr per day. For a person swimming or boating in the river in the vicinity of Richland for as much as 240 hours during the year, exposure from the river as a source would amount to about 25 mr.

N. Radioactive Wastes Released to Ground

Chemical separations processes account for nearly all of the liquid and solid radioactive waste sent to ground.

Solid wastes involving small quantities of radionuclides are packaged, placed in trenches and buried. At these arid burial locations, moisture from rain or snow is retained in the upper several inches of the soil and is absorbed by plants. It evaporates by capillary action and rarely, if ever, reaches the ground water. Hence, there is no mechanism available for transporting the contaminants to the water table.

The liquid wastes are disposed of by various means depending on the radioactive contents. "High level wastes", normally containing activity of 100 μc per cc or more, are neutralized and stored in concrete tanks lined with steel. "Intermediate level wastes", containing activity of approximately 5×10^{-5} μc per cc to 100 μc per cc, are sent to underground cribs from which waste can percolate into the soil. "Low level wastes", usually containing less than 5×10^{-5} μc per cc, are sent to depressions in the ground where they have formed surface ponds. The areas selected for liquid waste disposal have soil with good capacity for storage for depths of 150 to 350 feet above ground water.

The prevention of significant quantities of radiologically important radionuclides from reaching ground water and ultimately the Columbia River is an important objective in local waste disposal practice. For this reason wells have been drilled in and around crib and tank storage areas to detect

leaks in the tanks and any radionuclides which have reached the ground water. The radionuclides present in ground water have historically been associated with liquid waste sent to cribs. Figure 18 shows the probable extent and concentration of radioactive materials in the ground water. (9)

The total quantity of radioactive materials sent to ground (storage tank contents excluded) since plant start-up is estimated as 2.5×10^6 curies. Because of radioactive decay, the current total in the ground is estimated as 2.1×10^5 curies. In order of abundance the bulk of this material is Cs^{137}, Sr^{90}, and Ru^{106}. Only minor amounts of other radionuclides are present.

About two years ago, research work performed at the Savannah River Plant identified tritium as a product of U^{235} fission. The yield was established as about one tritium atom per 10^4 fission events. In 1961 a program was initiated at Hanford to determine the tritium content of the ground water in the vicinity of the Chemical Processing Areas. The contamination pattern in the ground water was found to be very similar to that of other beta emitters which is illustrated in Figure 18. Concentrations in the ground water ranged from 5×10^{-2} μc per cc near the crib disposal sites to 2×10^{-5} μc per cc several miles from the sites.

IV. AGGREGATE EXPOSURE FROM ENVIRONMENTAL SOURCES

Because individual dietary habits, periods of occupancy and so forth are rarely known, individual exposures cannot be stated precisely. However, by assuming ingestion rates for various foodstuffs, and making other assumptions a useful assessment of radiological conditions may be made. This assessment is also useful for identifying waste disposal practices which warrant particular attention.

Several modes of radiation exposure are illustrated for different groups of the local population in Figures 19, 20, and 21 for the GI tract, bone and total body, respectively.

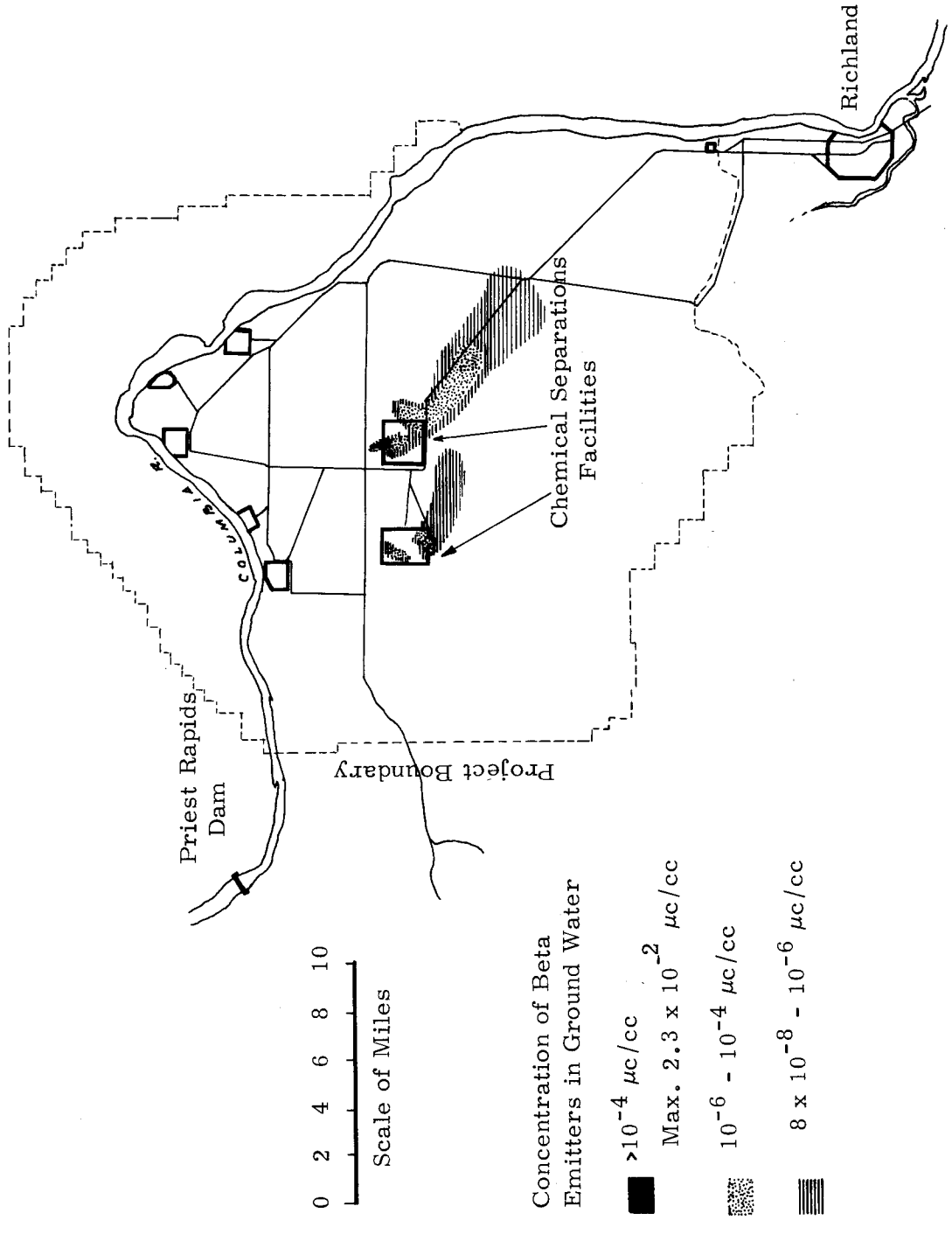

FIGURE 18

Probable Extent of Beta Emitters in Ground Water

AEC-GE RICHLAND, WASH.

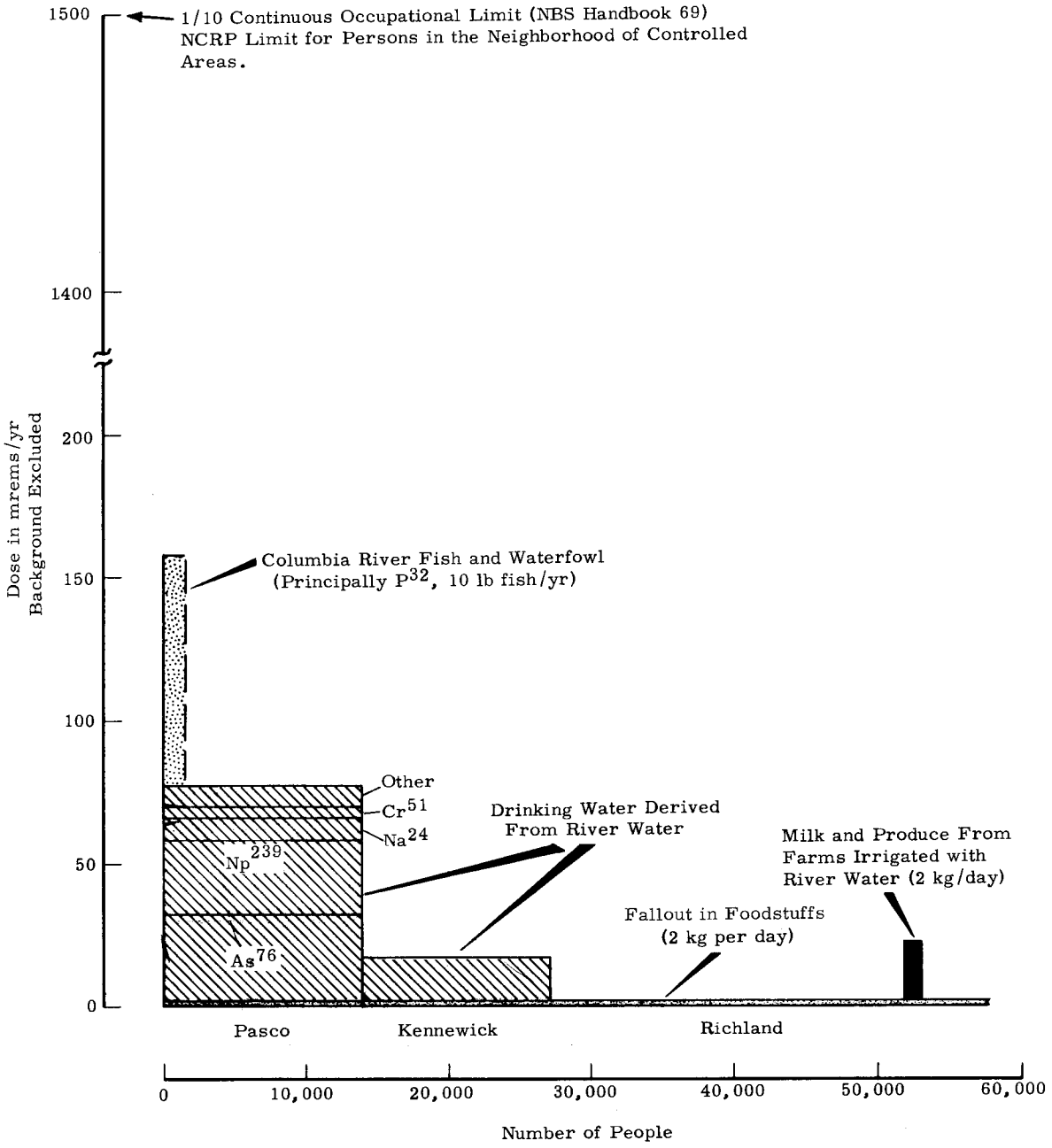

FIGURE 19

Calculated Dose to the GI Tract, 1961

AEC-GE RICHLAND, WASH.

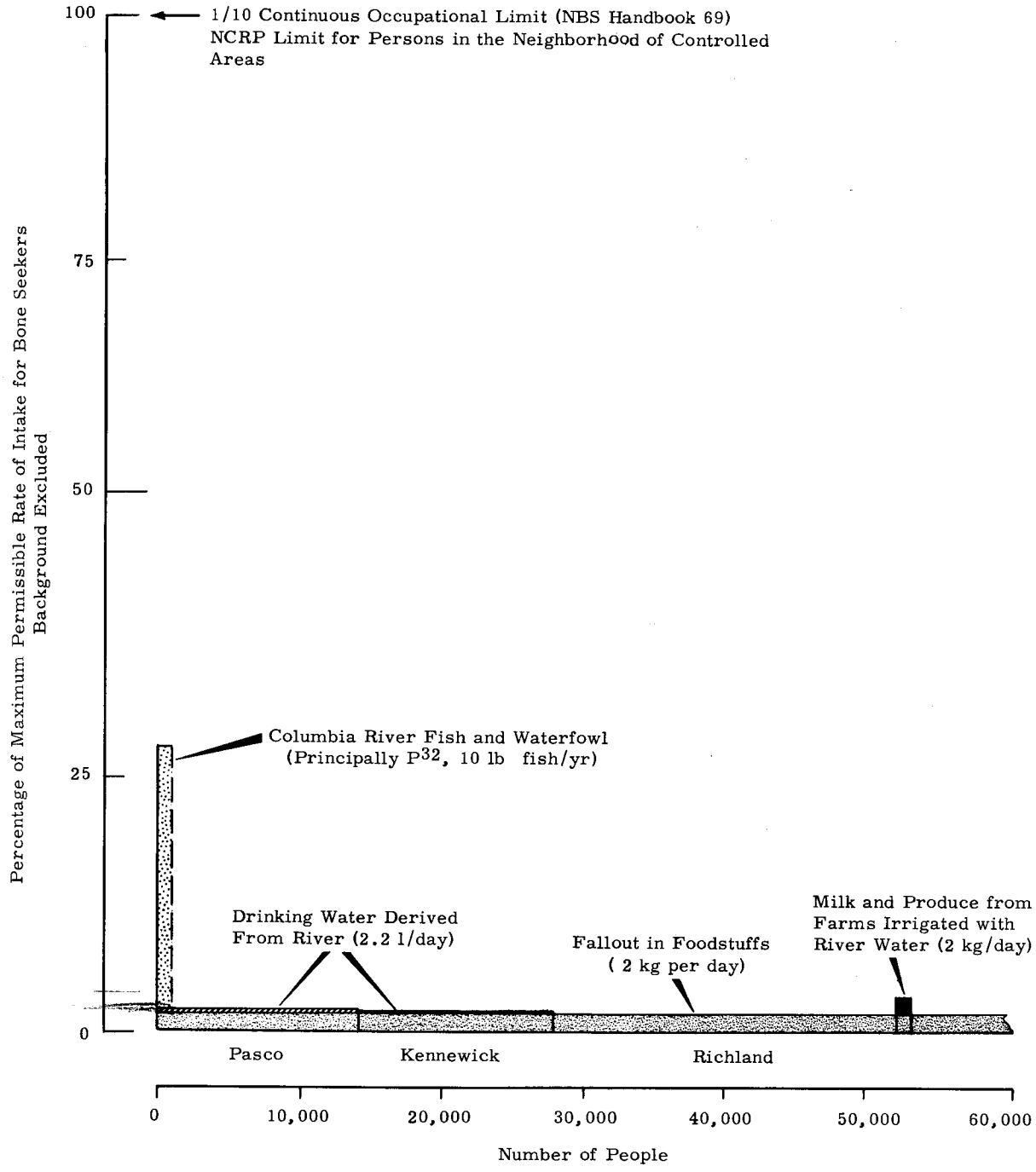

FIGURE 20

Calculated Dose to Bone, 1961

AEC-GE RICHLAND, WASH.

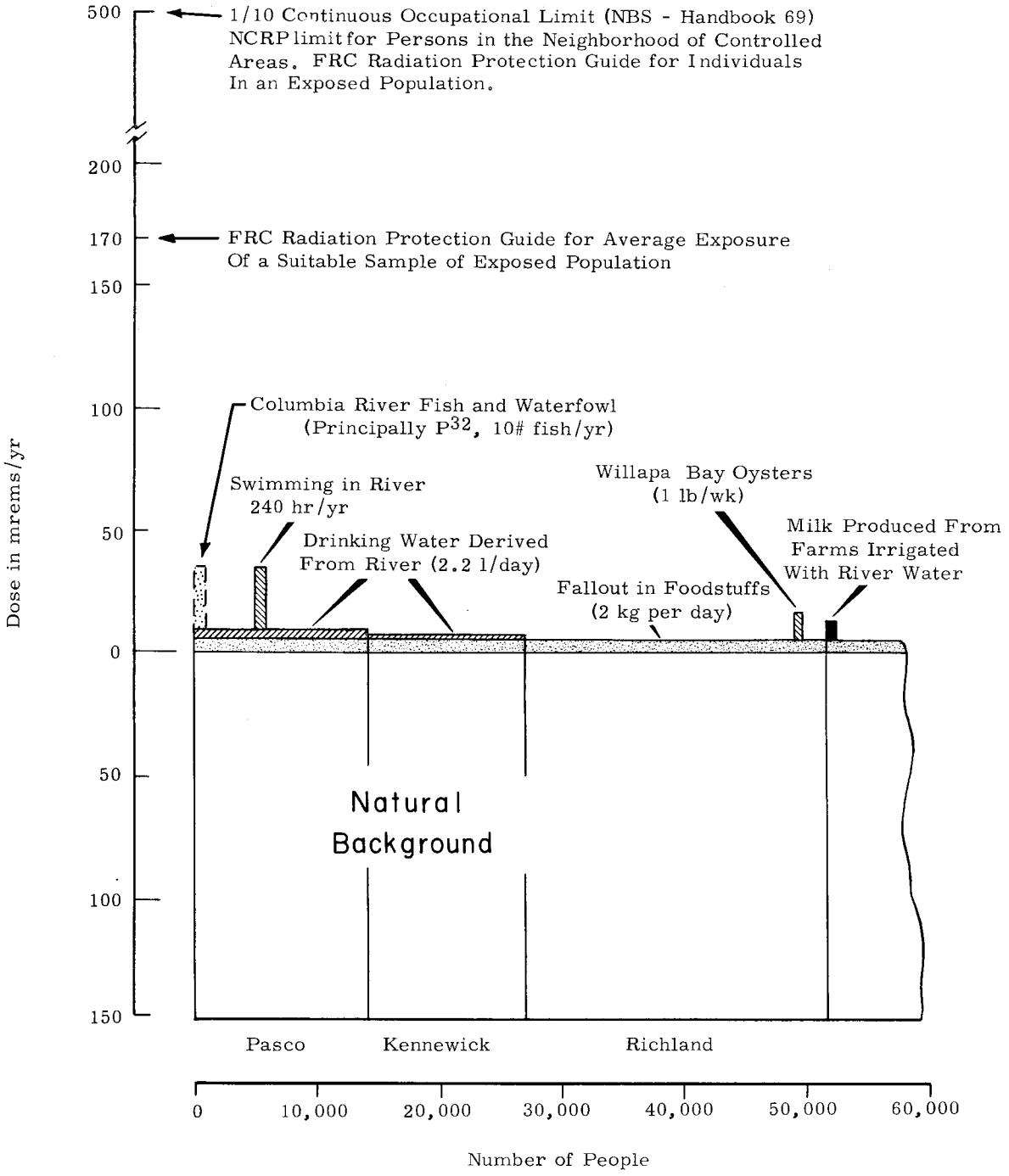

FIGURE 21

Calculated Dose to Total Body, 1961

AEC-GE RICHLAND, WASH.

The exposure postulated for different groups is represented by blocks whose height is an indication of the dose received and whose width is an approximation to the number of people so exposed. In the case of exposure through drinking water it is assumed that each resident of the city consumes 2.2 liters per day of water taken at the treatment plant. Some reduction in exposure could be expected at different points in the city due to radioactive decay during transit time in the water mains. The water intake of 2.2 liters per day is the intake of "standard man" and is convenient in terms of comparison against MPC. It is doubtful that the whole population of either Pasco or Kennewick consumes this much water a day. This consumption may, however, be normal for a few individuals since it can be acquired in 8 to 10 cups of coffee per day.

In the case of exposure from consumption of fish the individual catches and consumption rates are unknown. For purposes of this illustration, 1,000 persons are assumed to be the more ardent and successful fishermen each of whom consumes 10 pounds of local fish per year. A creel survey to provide data on fishing pressure and the catch and disposition of fish for individual fishermen was initiated with the Washington State Game Department in mid 1961. About 500 fishermen had been contacted by the end of 1961 and had given the game protectors their estimates of annual catch and consumption. Survey returns covering at least one year are considered necessary before an adequate assessment of the local fishing harvest can be made.

The exposure from eating farm produce and milk from land irrigated with river water is also assumed to involve about 1,000 people. The ingestion rate is assumed to be one liter of milk and one kilogram of fresh farm produce per day. The amounts of radionuclides in farm produce and milk, other than I^{131}, generally are considered to be of less significance than the fish or drinking water.

Exposure from consumption of Pacific Coast sea food is illustrated on the basis of ingestion of one pound of Willapa Bay oysters per week, since oysters contain more Zn^{65} than other common sea foods.

If the exposures are summed in a manner which would tend to maximize the total dose, estimates for the year of about 180 mrems to the GI tract, 70 mrems to total body and 30 per cent of the NCRP maximum permissible rate of intake for bone seeking radionuclides are obtained. For the majority of Pasco residents neither consumption of fish nor recreational use of the river would be a significant source of exposure. The annual exposure for this group would be about 80 mrems to the GI tract, 10 mrems to the total body and 3 per cent of the NCRP MPRI for bone. In this case the GI tract is the organ of major interest and the dose amounts to about 5 per cent of the NCRP limit for persons in the neighborhood of controlled areas.

The residents of Richland and other communities who made no use of the Columbia River or products derived therefrom would likely have received an annual exposure of about 5 mrems to the GI tract and total body and less than one per cent of the MPRI for bone.

V. CONCLUSIONS

Evaluation of results obtained from the radiological surveillance program for the Hanford environs for 1961 showed no unusual conditions attributable to Hanford operations. The results indicate that (1) releases of radioactive wastes to the atmosphere and to the Columbia River were adequately controlled, and (2) most of the exposure received by the vast majority of people in the Hanford environs was from natural sources or world-wide fallout rather than from Hanford operations. However, P^{32} concentrated by edible fish from the Columbia River can be a significant source of exposure for people who eat them in quantity. Studies are in progress both to better define the importance of P^{32} in fish and to arrive at ways to reduce the discharge of this and certain other radionuclides to the Columbia River.

VI. ACKNOWLEDGEMENTS

The cooperation of many General Electric Company personnel who gathered samples, performed the radioassays, prepared and provided data, and reviewed this document is gratefully acknowledged.

The cooperation and contribution of information by the United States Geological Survey Records Center, Portland, Oregon; the Pasco, Washington, City Water Department and the members of several state and federal agencies listed below who operated air filter sample stations contributed substantially to the report.

Federal Aviation Agency

Walla Walla, Washington
Spokane, Washington
Boise, Idaho
Great Falls, Montana

Washington State Patrol
Yakima, Washington

Civil Aeronautics Administration
Seattle, Washington

U. S. Weather Bureau

Meacham, Oregon
Lewiston, Idaho

USAF 408th Fighter Group Air Defense
Klamath Falls, Oregon

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VIII. APPENDIX A

RIVER AND RELATED SAMPLE RESULTS

APPENDIX A
TABLE 1

CONCENTRATIONS OF SEVERAL RADIONUCLIDES IN COLUMBIA RIVER WATER AT HANFORD FERRY - 1961

Units of 10^{-9} μc/cc of Water

Date	RE+Y	Na^{24}	P^{32}	Cr^{51}	Cu^{64}	Zn^{65}	Zn^{69m}	As^{76}	Sr^{89} +Sr^{90}	Sr^{90}	Np^{239}
1-3	3,900	13,000	1,300	17,000	22,000	1,100	960	14,000	13	0.46	17,000
1-16	1,700	7,400	950	11,000	10,000	980	500	8,900	16	0.93	9,500
2-6	5,200	12,000	950	14,000	19,000	1,200	1,500	13,000	14	0.55	13,000
2-20	2,900	8,600	590	7,500	10,000	770	840	4,700	6.0	0.26	9,100
3-6	4,100	11,000	633	7,600	18,000	920	1,800	6,300	7.4	< 0.15	9,400
3-20	2,300	9,400	670	11,000	12,000	950	1,300	3,400	9.3	< 0.33	8,000
4-3	5,500	16,000	750	8,600	30,000	1,300	3,600	Lost	7.8	< 0.36	8,700
4-17	5,300	15,000	650	13,000	31,000	1,300	300	6,900	5.9	< 0.25	11,000
5-1	3,900	8,700	480	8,700	14,000	1,000	1,800	4,700	6.6	< 0.31	5,100
5-15	1,900	7,600	390	5,300	12,000	510	1,200	2,300	3.1	< 0.41	3,300
5-29	750	2,500	74	2,100	4,000	200	370	380	1.4	< 0.38	870
6-12	1,200	3,800	88	3,400	7,200	190	400	990	1.7	0.45	1,100
6-19	630	2,300	51	2,600	4,500	150	420	460	5.4	< 0.43	700
6-26	1,100	3,700	80	3,700	6,200	170	390	940	3.7	< 0.40	1,600
7-10			110	3,500	8,600	290		1,500	4.1	0.20	1,400
7-24	890	6,400	96	5,700	9,900	180	200	1,500	2.0	< 0.52	1,800
8-7	790	6,300	< 12	6,700	12,000	300	320	1,100	2.6	< 0.48	1,600
8-21	1,200	12,000	290	12,000	18,000	450	370	3,800			3,500
8-23	1,100	11,000	280	12,000	17,000	420	430	2,300			2,700
9-5	820	9,800	230	10,000	16,000	380	330	1,800			2,700
9-18	790	9,300	280	11,000	14,000	430	380	2,300	15	< 0.44	3,400
10-2	940	14,000	380	17,000	24,000	590	550	3,500	7.7	0.77	4,500
10-16	740	12,000	380	16,000	16,000	600	290	2,200	9.3	< 0.74	3,300
10-30	430	6,400	230	9,400	9,100	300	220	1,500	9.7	< 0.48	2,600
11-13	1,100	16,000	520	18,000	20,000	570	650	2,700	8.1	< 0.58	4,700
11-27	1,000	12,000	44	15,000	17,000	430	450	2,300	6.7	< 0.77	3,300
12-18	700	9,900	420	12,000	15,000	510	770	2,100	< 1.4	< 0.30	2,600

No entry indicates no analysis made.

APPENDIX A
TABLE 2

CONCENTRATIONS OF SEVERAL RADIONUCLIDES IN COLUMBIA RIVER WATER AT PASCO, WASHINGTON - 1961

Units of 10^{-9} μc/cc of water

Date	RE+Y	Na^{24}	P^{32}	Cr^{51}	Cu^{64}	Zn^{65}	Zn^{69m}	As^{76}	Sr^{89} +Sr^{90}	Sr^{90}	Np^{239}
1-4	810	2,600	890	13,000	3,600	800	140	5,100	11	0.49	9,800
1-10	890	2,300	670	8,600	3,000	670	130	4,500	8.2	0.91	7,500
1-17	390	620	560	6,200	650	560	20	1,600	8.0	0.51	4,100
1-24	710	2,100	710	7,900	2,100	550	110	2,400	8.9	0.33	6,900
1-31	370	910	560	5,000	1,100	510	29	1,800	9.1	0.45	5,000
2-7	630	2,400	580	7,300	3,400	540	140	3,400	5.4	0.82	5,900
2-14	740	2,000	540	7,400	2,400	590	96	2,300	9.4	0.40	5,300
2-21	830	2,400	410	6,000	2,700	550	190	2,100	5.4	0.35	2,600
2-28	660	2,900	430	5,600	3,600	520	250	1,800	5.3	0.23	4,200
3-7	530	1,800	350	4,700	2,200	570	310	1,700	4.5	0.24	3,900
3-14	550	2,100	400	5,900	2,400	600	270	1,800	8.1	Lost	4,200
3-21	950	2,800	490	7,500	2,700	760	330	1,800	15	< 0.05	4,500
3-28	490	1,800	340	5,400	1,900	730	260	1,100	5.8	< 0.33	3,000
4-4	600	2,000	430	4,800	2,100	520	250	1,500	6.1	< 0.29	2,700
4-11	610	2,500	260	4,200	3,200	590	360	1,500	5.6	< 0.17	2,400
4-18	580	2,500	310	5,400	3,600	540	360	2,000	5.8	< 0.25	2,800
4-25	870	3,000	410	7,100	4,100	660	400	2,500	5.7	< 0.72	3,800
5-2	960	3,200	300	5,100	3,800	680	450	2,600	7.2	0.29	3,000
5-9	770	2,700	300	4,300	3,800	460	240	2,000	6.4	< 0.41	2,800
5-16	790	2,100	170	2,700	3,100	370	180	690	2.3	< 0.46	1,600
5-23	400	1,600	100	2,400	2,500	320	240	740	1.8	< 0.31	1,100
5-31	250	1,300	57	980	1,700	130	110	550	1.3	< 0.81	660
6-6	260	1,100	44	1,300	1,800	140	130	370	< 1.1	< 0.48	520
6-13	190	690	24	810	1,100	63	58	250	< 1.6	< 0.42	360
6-20	220	940	36	1,400	1,800	170	120	300	1.2	< 0.55	440
6-27	220	950	34	1,200	1,700	76	84	300	1.1	< 0.38	560
7-5	260	1,400	42	2,100	2,300	130	93	480	1.5	0.16	820
7-11	280	1,600	43	2,500	2,400	110	< 35	520	1.2	< 0.19	850
7-18	120	1,100	36	2,600	1,800	100	6.8	430	1.4	< 0.18	570
7-25	200	1,600	42	2,400	2,000	100	34	570	0.7	< 0.49	760

APPENDIX A
TABLE 2 (Continued)

CONCENTRATIONS OF SEVERAL RADIONUCLIDES IN COLUMBIA RIVER WATER AT PASCO, WASHINGTON - 1961

Units of 10^{-9} µc/cc of water

Date	RE+Y	Na^{24}	P^{32}	Cr^{51}	Cu^{64}	Zn^{65}	Zn^{69m}	As^{76}	Sr^{89} +Sr^{90}	Sr^{90}	Np^{239}
8-1	190	1,700	51	2,900	2,100	140	58	420	1.6	0.25	890
8-8	180	1,700	81	3,000	1,900	140	26	510	1.1	< 0.18	900
8-15	170	2,200	77	4,900	2,500	150	51	630	1.3	< 0.51	1,000
8-22	200	2,500	150	5,300	2,600	200	52	840	3.8	< 0.78	1,700
8-28	160	1,900	190	3,800	940	170	24	550	2.6	< 0.70	1,000
9-5	280	2,000	110	6,600	2,400	190	32	650	2.9	< 0.64	1,200
9-12	140	1,800	140	5,100	2,000	190	31	620	2.9	< 0.45	1,100
9-19	180	1,900	190	7,100	2,100	290	56	640	6.0	< 0.35	1,600
9-26	72	1,400	140	6,600	1,100	150	< 15	420	4.0	< 0.70	1,300
10-3	110	1,100	170	7,800	1,400	190	34	860	3.5	< 0.66	1,500
10-10	270	2,500	250	11,000	2,600	240	48	1,400	3.5	< 0.43	2,200
10-16	230	2,600	250	11,000	3,000	220	50	930	7.4	< 0.63	1,900
10-24	250	2,800	210	8,700	3,300	250	53	840	13	< 0.56	1,700
10-31	140	1,700	170	6,900	1,800	74	42	630	< 2.8	< 0.56	1,400
11-7	210	2,400	240	8,000	2,600	220	79	710	5.8	< 0.61	1,500
11-14	270	2,600	290	11,000	2,400	280	140	1,000	4.4	< 0.39	2,200
11-20	120	640	150	5,900	500	210	16	210	3.1	< 0.76	790
11-28	130	1,000	200	7,300	990	230	19	420	3.6	< 0.50	1,300
12-5	210	1,400	290	8,400	850	300	49	610	3.7	< 0.49	1,500
12-12	140	820	250	8,600	700	290	45	310	3.4	< 0.32	1,200
12-19	140	930	200	5,000	540	200		420	5.1	0.72	850
12-26	200	1,100	380	12,000	920	400		1,100	7.9	0.55	1,600

No entry indicates no analysis made.

APPENDIX A
TABLE 3

CONCENTRATIONS OF SEVERAL RADIONUCLIDES IN COLUMBIA RIVER WATER AT VANCOUVER, WASHINGTON - 1961

Units of 10^{-9} μc/cc of Water

Date	RE+Y	P^{32}	Cr^{51}	Zn^{65}	Np^{239}
1-10	23	100	3,100	37	52
1-24		190	3,100	170	70
2-7	25	140	2,900	100	110
2-21	14	110	1,800	100	130
3-14	16	91	1,400	130	110
3-28	40	160	2,000	150	190
4-17	77	180	2,500	160	230
4-25	13	87	2,300	130	130
5-9	23	65	2,000	120	180
5-23	21	48	1,300	96	330
6-6	18	24	760	35	140
6-20	28	28	1,400	110	150
7-12	11	23	1,400	110	120
7-28	26	20	1,200	100	76
8-8	< 2.7	11	1,200	37	39
8-29	74	18	1,400	160	28
9-19	< 2.8	18	2,300	26	55
10-3	4.8	22	2,500	17	36
10-17	< 2.8	21	Lost	< 11	Lost
10-31	< 7.9	43	2,800	< 28	60
11-14	< 11	38	2,400	< 20	
11-29	12	51	3,300	27	30
12-13	Lost	76	3,400	43	43

No entry indicates no analysis made.

APPENDIX A
TABLE 4

CONCENTRATIONS OF SEVERAL RADIONUCLIDES IN SANITARY WATER AT PASCO, WASHINGTON - 1961

Units of 10^{-9} μc/cc of Water

Date	RE+Y	Na^{24}	P^{32}	Cr^{51}	Cu^{64}	Zn^{65}	Zn^{69m}	As^{76}	Sr^{89} +Sr^{90}	Sr^{90}	Np^{239}
1-4	5.8	< 21	< 5.9	130	12	< 12	< 15	< 93	0.63	0.24	27
1-10	160	480	150	7,400	280	350	< 29	920	8.2	< 0.64	3,700
1-17	120	280	290	6,000	150	270	< 18	820	11	0.51	3,300
1-24	220	740	240	6,700	340	330	12	690	7.6	0.24	3,700
1-31	110	260	140	5,500	150	200	< 15	450	9.5	0.40	2,800
2-7	43	1,100	41	6,400	480	230	< 14	190	6.7	1.0	3,800
2-14	72	1,800	35	7,100	740	220	< 15	290	8.3	0.39	4,200
2-21	120	1,300	39	4,700	580	160	< 26	< 70	5.3	0.46	3,500
2-28	59	2,000	18	4,600	790	250	< 21	370	5.5	0.26	4,100
3-7	120	46	160	5,400	370	340	48	2,500	4.6	0.30	3,000
3-14	68	1,300	30	5,000	430	320	< 25	270	9.0	0.18	3,000
3-21	62	1,500	35	7,000	550	280	45	450	5.4	< 0.32	3,600
3-28	34	1,000	16	5,200	390	320	39	180	3.3	0.74	2,900
4-4	60	1,400	28	4,700	610	260	< 60	450	5.3	< 0.24	2,500
4-11	43	1,400	25	4,500	830	280	67	Lost	4.9	0.27	2,000
4-18	96	1,600	48	4,500	1,100	330	92	580	4.7	< 0.53	2,500
4-25	140	1,600	100	4,400	1,000	290	36	1,100	5.5	< 0.22	3,200
5-2	110	2,000	60	4,000	1,000	300	44	790	5.2	< 1.1	2,100
5-9	95	1,500	53	4,000	890	180	18	670	5.9	< 0.48	2,100
5-16	50	1,300	18	2,400	800	140	36	310	2.4	< 0.38	1,300
5-23	37		12	1,600	680	110	26	220	2.3	< 0.34	1,000
5-31	15	490	< 3.1	1,100	180	71	< 24	< 75	0.75	< 0.40	380
6-6	18	820	< 4.6	1,200	320	30	< 16	< 80	< 0.73	< 0.45	420
6-13	21	390	< 4.3	840	150	12	< 15	44	< 1.3	< 0.42	270
6-20	19	660	< 4.2	920	440	24	< 14	65	1.2	< 0.37	370
6-27	28	750	9.5	1,100	490	27	< 34	53	< 0.76	< 0.36	450
7-5	19	910	< 8.4	1,800	560	33	< 19	140	1.3	< 0.16	630
7-11	33	1,200	10	2,500	660	25	< 51	73	1.4	< 0.19	700
7-18	28	1,000	13	2,200	700	42	14	140	1.2	< 0.15	660
7-25	54	1,100	13	2,100	730	26	15	250	0.8	< 0.48	600

APPENDIX A
TABLE 4 (Continued)

CONCENTRATIONS OF SEVERAL RADIONUCLIDES IN SANITARY WATER AT PASCO, WASHINGTON - 1961

Units of 10^{-9} μc/cc of Water

Date	RE+Y	Na^{24}	P^{32}	Cr^{51}	Cu^{64}	Zn^{65}	Zn^{69m}	As^{76}	Sr^{89} +Sr^{90}	Sr^{90}	Np^{239}
8-1	44	1,200	16	3,100	630	33	20	360	1.0	< 0.15	560
8-8	56	1,100	41	3,700	650	44	< 12	130	1.0	< 0.48	700
8-15	66	1,600	47	3,800	870	63	< 26	390	1.8	< 0.46	1,000
8-22	60	1,800	64	6,400	860	36	< 7.4	340	3.0	< 0.79	1,100
8-29	55	1,400	54	3,900	790	81	19	270	2.1	< 0.66	620
9-5	53	1,400	53	6,400	680	73	< 24	380	3.3	< 0.58	1,000
9-12	39	1,000	64	4,300	600	75	< 20	360	2.4	< 0.41	760
9-19	37	980	42	5,900	350	59	< 17	200	4.8	< 0.36	1,100
9-26	19	720	38	5,300	260	50	< 26	170	3.2	< 0.64	740
10-3	34	640	78	7,100	380	77	< 56	320	2.9	< 0.58	1,200
10-10	26	250	61	6,100	91	59	< 19	150	3.3	< 0.36	710
10-16	31	650	64	8,800	250	69	< 23	240	7.7	< 0.55	1,400
10-24	41	490	46	6,900	120	58	< 15	170	6.4	< 0.55	870
10-31	< 2.9	14	11	4,900	4.5	< 29	< 15	< 16	< 2.9	< 0.35	
11-7	59	690	64	6,700	300	67	< 23	180	5.7	0.43	810
11-14	< 19	19	32	6,200	2.2	26	< 14	190	3.5	< 0.41	190
11-20	5.7	< 13	12	5,300	4.3	< 11	< 29	74	3.1	< 0.46	70
11-28	21	530	74	7,600	200	84	< 26	210	3.8	< 0.50	970
12-5	28	750	65	6,500	190	71	< 29	140	3.5	< 1.5	770
12-12	10	45	57	5,800	26	59	< 14	< 150	3.2	< 0.60	280
12-19	35	380	72	8,500	150	110		280	4.6	0.36	1,100

No entry indicates no analysis made.

APPENDIX A
TABLE 5

CONCENTRATIONS OF SEVERAL RADIONUCLIDES IN SANITARY WATER AT KENNEWICK, WASHINGTON - 1961

Units of 10^{-9} μc/cc of Water

Date	RE+Y	Na^{24}	P^{32}	Cr^{51}	Cu^{64}	Zn^{65}	Zn^{69m}	As^{76}	Sr^{89} +Sr^{90}	Sr^{90}	Np^{239}
1-4	14	73	17	4,700	67	< 12	< 15	< 93	< 0.93	< 0.49	300
1-10	12	56	16	4,600	68	< 27	< 20	< 94	< 1.0	< 0.59	210
1-17	9.2	26	15	3,600	26	< 13	< 17	< 76	< 1.0	< 0.35	200
1-24	13	83	16	3,800	73	< 11	< 21	< 78	0.58	0.25	200
1-31	10	75	15	3,400	64	28	< 17	75	7.5	0.09	200
2-7	29	150	36	2,900	170	20	< 17	120	0.92	0.25	410
2-14	33	110	32	2,900	88	13	< 15	100	0.68	0.25	300
2-21	16	77	11	2,300	88	< 12	< 18	< 77	0.61	0.25	200
2-28	8.6	74	8.0	1,800	59	11	< 17	170	0.32	0.28	150
3-7	7.1	< 15	9.0	1,900	61	12	< 19	< 78	0.33	< 0.13	99
3-14	8.8	60	9.1	1,400	43	< 12	< 17	< 84	< 0.84	0.13	120
3-21	11	77	11	1,800	70	16	< 16	< 100	< 0.47	< 0.13	140
3-28	11	91	11	2,000	80	< 12	< 16	< 84	< 0.13	< 0.09	100
4-4	12	120	7.7	1,800	84	14	< 42	< 89	< 0.51	< 0.09	140
4-11	7.3	100	< 3.4	1,900	68	15	< 20	260	0.43	< 0.14	100
4-18	18	120	12	2,200	130	19	< 16	< 79	< 0.60	< 0.19	140
4-25	9.4	62	9.5	2,000	65	< 12	21	< 81	< 1.0	< 0.13	110
5-2	5.8	79	< 3.2	1,800	54	< 8.1	< 16	< 76	< 0.43	< 0.19	78
5-9	6.0	87	< 5.0	1,400	72	15	< 20	< 73	< 0.43	< 0.42	72
5-16	29	190	14	1,300	220	< 11	< 14	63	< 1.1	< 0.38	150
5-23	24	170	10	1,200	170	< 13	< 15	< 82	< 0.69	< 0.43	110
5-30		51	3.1	690	48	< 11	< 16	< 74	< 0.58	< 0.39	25
6-6	34	210	8	800	290	11	< 15	< 76	< 0.35	< 0.46	110
6-13	28	110	< 4.6	640	140	38	< 18	< 68	< 0.71	< 0.35	32
6-20	24	200	< 4.4	980	250	5.9	< 35	< 73	< 0.67	< 0.46	84
6-27	32	250	8.2	1,100	310	11	< 39	< 74	< 0.68	< 0.37	140
7-5	17	270	< 5.4	1,400	250	17	< 37	< 92	< 0.85	< 0.09	160
7-11	27	450	12	1,900	390	18	< 37	< 73	< 0.75	< 0.18	220
7-18	13	320	8.2	2,100	250	11	< 40	< 79	< 0.74	< 0.16	140
7-25	14	340	11	1,600	300	< 16	< 4.0	< 98	< 0.75	< 0.09	150

APPENDIX A
TABLE 5 (Continued)

CONCENTRATIONS OF SEVERAL RADIONUCLIDES IN SANITARY WATER
AT KENNEWICK, WASHINGTON - 1961

Units of 10^{-9} μc/cc of Water

Date	RE+Y	Na^{24}	P^{32}	Cr^{51}	Cu^{64}	Zn^{65}	Zn^{69m}	As^{76}	Sr^{89} +Sr^{90}	Sr^{90}	Np^{239}
8-1	8.8	340	7.8	2,100	340	10	< 20	< 77	< 0.75	0.13	120
8-8	10	300	21	1,900	240	7.5		160	< 0.75	< 0.48	160
8-15	7.3	410	11	2,900	310	11	< 5.3	56	< 0.8	< 0.48	220
8-22	7.2	370	15	3,300	250	< 11	< 10	< 86	< 1.1	< 0.78	220
8-29	4.2	270	9.5	2,400	190	13	5.1	< 85	< 0.98	< 0.66	140
9-12	< 3.0	36	< 5.9	2,800	36	< 11	< 4.5	< 77	< 1.3	< 0.51	8.8
9-19	< 2.8	55	< 5.2	3,100	41	12	< 23	< 78	< 0.89	< 0.30	76
9-26	8.4	230	16	3,700	170	< 11	< 18	< 77	< 1.1	< 0.76	180
10-3	< 2.9	51	< 6.0	3,900	50	8.8	< 41	< 73	< 0.99	< 0.63	160
10-10	< 2.9	78	< 5.8	3,900	60	< 11	< 20		< 0.60	< 0.23	78
10-16	< 2.9	92	< 3.2	4,400	66	< 11	< 23	< 89	< 0.90	< 0.23	80
10-24	< 2.9	47	< 5.8	3,800	64	< 11	< 26	< 78	< 1.1	< 0.67	75
10-30	< 2.9	90	< 3.1	3,200	55	< 32	< 29	< 81	< 1.1	< 0.55	53
11-7	13	150	< 9.0	4,000	130	< 29	< 27	< 87	< 0.89	< 0.52	140
11-14	< 9.6	24	< 6.4	190	10	< 19	< 29		< 0.78	< 0.22	8.5
11-28	< 3.2	90	< 6.1	3,900	67	< 11	< 25	< 150	< 1.2	< 1.1	67
12-5	< 3.1	125	< 6.9	3,800	61	< 11	< 26	< 150	< 0.84	< 1.3	72
12-12	< 3.3	83	< 5.9	4,000	56	< 11	< 23	< 160	< 0.93	< 0.48	73
12-19	< 3.0	65	< 6.0	3,100	42	< 20		< 120	< 0.49	< 0.22	56

No entry indicates no analysis made.

APPENDIX A
TABLE 6

ESTIMATED RATE OF TRANSPORT FOR SEVERAL RADIONUCLIDES IN COLUMBIA RIVER WATER AT PASCO, WASHINGTON - 1961

Units of curies/day

Date	P^{32}	Cr^{51}	Zn^{65}	As^{76}	Np^{239}	RE+Y	Na^{24}	Cu^{64}	Zn^{69m}	Sr^{89} +Sr^{90}	Sr^{90}
1-4	130	1,900	120	750	1,400	120	380	530	21	1.6	0.07
1-10	95	1,200	95	640	1,100	130	320	420	18	1.2	0.13
1-17	82	900	82	230	600	57	90	95	2.9	1.2	0.07
1-24	130	1,400	99	430	1,200	130	380	380	20	1.6	0.06
1-31	110	940	96	340	940	70	170	210	5.5	1.7	0.08
2-7	130	1,700	120	770	1,300	140	540	770	32	1.2	0.18
2-14	120	1,700	130	520	1,200	170	450	540	22	2.1	0.09
2-21	90	1,300	120	460	570	180	530	590	42	1.2	0.08
2-28	120	1,600	150	510	1,200	190	820	1,020	71	1.5	0.07
3-7	88	1,200	140	430	980	130	450	550	78	1.1	0.06
3-14	81	1,200	120	360	850	110	420	480	54	1.6	Lost
3-21	120	1,800	180	430	1,100	230	670	650	79	3.6	< 0.01
3-28	88	1,400	190	280	770	130	470	490	67	1.5	< 0.08
4-4	98	1,100	120	340	620	140	460	480	57	1.4	< 0.07
4-11	64	1,000	150	370	590	150	620	790	89	1.4	< 0.04
4-18	86	1,500	150	550	780	160	690	1,000	100	1.6	< 0.07
4-25	120	2,000	190	720	1,100	250	860	1,180	110	1.6	< 0.21
5-2	88	1,500	200	760	880	280	940	1,110	130	2.1	0.08
5-9	110	1,600	170	750	1,100	290	1,020	1,430	90	2.4	< 0.15
5-16	98	1,600	210	400	920	460	1,210	1,790	100	1.3	< 0.26
5-23	71	1,700	230	530	780	280	1,130	1,770	170	1.3	< 0.22
5-31	56	970	130	550	650	250	1,290	1,680	110	1.3	< 0.80
6-6	53	1,600	170	440	620	310	1,320	2,160	160	< 1.3	< 0.58
6-13	30	1,000	79	310	450	240	860	1,370	72	< 2.0	< 0.52
6-20	42	1,600	200	350	510	260	1,100	2,100	140	1.4	< 0.64
6-27	32	1,100	71	280	530	210	890	1,600	79	1.0	< 0.36
7-5	26	1,320	82	301	515	160	880	1,450	59	0.94	0.10
7-11	21	1,225	54	255	416	140	790	1,180	< 17	0.59	< 0.09
7-18	17	1,200	44	190	250	53	490	800	3.0	0.62	< 0.08
7-25	20	980	41	230	310	82	650	820	14	0.29	< 0.20

APPENDIX A
TABLE 6 (Continued)

ESTIMATED RATE OF TRANSPORT FOR SEVERAL RADIONUCLIDES IN COLUMBIA RIVER WATER AT PASCO, WASHINGTON - 1961

Units of curies/day

Date	P^{32}	Cr^{51}	Zn^{65}	As^{76}	Np^{239}	RE+Y	Na^{24}	Cu^{64}	Zn^{69m}	Sr^{89} +Sr^{90}	Sr^{90}
8-1	16	930	45	140	290	61	550	930	19	0.51	0.08
8-8	20	740	35	130	220	45	420	740	6.4	0.27	< 0.04
8-15	23	1,500	45	190	300	51	650	740	15	0.39	< 0.15
8-22	30	1,100	40	170	340	40	500	520	10	0.76	< 0.16
8-28	46	920	41	130	240	39	460	230	5.8	0.63	< 0.17
9-5	23	1,400	39	130	250	57	410	490	6.5	0.59	< 0.13
9-12	27	1,000	37	120	220	27	350	390	6.1	0.57	< 0.09
9-19	29	1,100	44	100	240	27	290	320	8.4	0.91	< 0.05
9-26	19	880	20	56	170	9.6	190	330	< 2.0	0.53	< 0.09
10-3	28	1,300	31	140	250	18	180	230	5.6	0.58	< 0.11
10-10	40	1,800	39	230	360	44	400	420	7.7	0.56	< 0.07
10-16	39	1,700	34	140	300	36	400	470	7.8	1.2	< 0.10
10-24	38	1,600	46	150	310	46	510	600	9.7	2.4	< 0.10
10-31	30	1,200	13	110	240	24	300	310	7.3	< 0.49	< 0.10
11-7	38	1,300	34	110	230	33	380	410	12	0.91	< 0.10
11-14	52	2,000	50	180	390	48	460	430	25	0.78	< 0.07
11-20	27	1,100	37	37	140	21	110	89	2.9	0.55	< 0.14
11-28	33	1,200	38	69	210	21	160	160	3.1	0.59	< 0.08
12-5	47	1,400	49	99	240	34	230	140	8.0	0.60	< 0.08
12-12	43	1,500	50	53	210	24	140	120	7.7	0.58	< 0.05
12-19	32	800	32	68	140	23	150	87		0.82	0.12
12-26	54	1,700	60	150	230	28	150	130		1.1	0.08

No entry indicates no analysis made.

APPENDIX A
TABLE 7

ESTIMATED RATE OF TRANSPORT FOR SEVERAL RADIONUCLIDES IN COLUMBIA RIVER WATER AT VANCOUVER, WASHINGTON - 1961

Units of curies/day

Date	P^{32}	Cr^{51}	Zn^{65}	Np^{239}
1-10	29	900	11	15
1-24	50	820	45	19
2-7	52	1,100	37	41
2-21	50	810	45	59
3-14	36	550	51	43
3-28	79	990	75	94
4-17	78	1,100	70	100
4-25	36	940	53	53
5-9	35	1,100	65	98
5-23	47	1,300	94	320
6-6	38	1,200	56	220
6-20	33	1,600	130	170
7-12	13	790	62	68
7-28	10	580	49	37
8-8	3.5	380	12	12
8-29	5.3	410	47	8.3
9-19	3.7	480	5.4	11
10-3	4.8	540	3.7	7.8
10-17	4.6	Lost	< 2.4	Lost
10-31	12	810	< 8.1	17
11-14	8.7	550	< 4.6	
11-29	11	740	6.1	6.7
12-13	18	790	10	10

No entry indicates no analysis made.

APPENDIX A
TABLE 8

BETA EMITTERS IN COLUMBIA RIVER WATER - 1961
Units of d/s per cc of Water

Location	January	February	March	April	May	June	July	August	September	October	November	December
Hanford Ferry	2.7	2.8	2.2	4.0	2.0	0.71	0.92	0.97	1.6	1.9	1.6	2.3
Byers Landing	1.8	1.4	1.0	0.80	0.82	0.17	0.20	0.28	0.40	0.48	0.64	1.8
Below 300 Area (Downstream from Project)	2.0	1.8	1.2	1.4	0.88	0.38	0.30	0.36	0.56	0.83	0.79	1.1
Richland, Washington	2.0	1.5	1.2	1.2	0.87	0.32	0.27	0.32	0.52	0.84	0.84	0.81
Yakima River (Near Mouth)	0.0003	0.006	0.0006	0.0003	0.0007	0.0005	0.0004	0.0003	0.0003	0.0004	0.0006	0.0003
Sacajawea Park	0.79	0.57	0.59	0.47	0.47	0.15	0.13	0.19	0.23	0.33	0.38	0.39
Irrigation Pumping Plant	0.012	0.014	0.0064	0.0019	0.005	0.0007	0.004	0.003	0.007	0.017	0.015	0.013
Backwater - Highway 410	0.024	0.025	0.012	0.0056	0.003	0.0007	0.0002	0.004	0.011	0.017	0.038	0.018
Boise Cascade Pump Plant	0.21	0.17	0.061	0.012	0.006	0.006	0.050	0.017	0.032	0.12	0.10	0.067

APPENDIX A
TABLE 9

CONCENTRATIONS OF SEVERAL RADIONUCLIDES IN MUSCLE OF WHITEFISH TAKEN FROM THE COLUMBIA RIVER AT VARIOUS LOCATIONS - 1961

Units of μμc/g

Date	Total Beta	P^{32}	Zn^{65}	Sc^{46}	As^{76}	Cr^{51}	Np^{239}
Reporting Limits*		2	5	5	100	10	10
Priest Rapids							
3-29	38	29	15	-			
3-30	8.2	-	-	-			
3-30	6.8	2.5	-	-			
3-30	32	5.8	87	8.1	340		
4-18	5.6	-	-	-		-	-
6-26	-	-	-	-	-	-	-
6-26	-	-	-	-		-	-
6-26	-	-	-	-	-	-	-
6-26	-	-	-	-	-	13	-
6-26	-	-	31	-	-	11	-
6-26	-	-	-	-	-	21	-
6-27	-	-	-	-	-	-	-
6-27	-	-	-	-	-	-	-
6-27	-	-	-	-	-	-	-
6-27	-	-	-	-	-	-	-
6-27	-	2.3	-	-	-	-	-
6-27	-	-	60	-	-	-	-
6-27	-	-	-	-	-	15	-
6-27	-	100	-	56	-	10	-
6-27	-	110	110	-	-	-	-
7-27	-	-	-	-	-	-	-
7-27	-	-	-	-	-	-	-
7-27	-	11	35	-	-	-	-
7-27	-	-	-	-	-	-	-
8-15	Total Beta	-		-			-
8-15	Discontinued	-		-			-
8-15		-		-	-		
8-15		-		-			-
8-15		-		-	-	-	-
8-15		-		-			-
8-15		2.1	14	-	-		-
8-15		-		-			-
8-15		< 6.9	-				-
8-15		14	12	-	-	-	-

* Results less than the reporting limit are indicated by a (-). No entry indicates no analysis made.

APPENDIX A
TABLE 9 (Continued)

CONCENTRATIONS OF SEVERAL RADIONUCLIDES IN MUSCLE OF WHITEFISH TAKEN FROM THE COLUMBIA RIVER AT VARIOUS LOCATIONS - 1961

Units of μμc/g

Date	Total Beta	P^{32}	Zn^{65}	Sc^{46}	As^{76}	Cr^{51}	Np^{239}
Reporting Limits*		2	5	5	100	10	10
Priest Rapids (Continued)							
8-16		-		-	-	-	-
8-16		-		-			
8-16		-		-	-	-	-
8-16		-	-	-	-		-
8-16		-		-			-
8-16		-	-	-	-		-
8-18		16	-		260	-	18
8-18		11	-		300		160
8-18		180	21	-	220	-	44
8-18		1,000	86	-	540	29	
8-18		9.5	14	-	350	-	40
8-18		14	-		370	-	31
8-18		9.4	-	-	330	-	36
9-19		6.1	13	-	-	10	
9-21		2.2	29	-	-	-	-
9-21		-	-	-	-	-	
9-21		-	-		-		
9-21		-	-	-	-		-
11-20		< 2.8	9.0	-	-	-	-
11-20		340	58	-	-	-	31
11-20		< 4.6	16	-	-	-	-
11-20		400	45	-	120	-	38
11-20		880	90	-	360	14	89
11-20		1,800	150	-	190		150
11-20		160	58	-	-		41
11-20		75	64		-		11
Entire Fish							
12-11		-	8.1		-	-	-
12-11		-	-	-	-	-	-
12-11		-	7.5		-		-
12-11		-	6.4		-	-	-

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX A
TABLE 9 (Continued)

CONCENTRATIONS OF SEVERAL RADIONUCLIDES IN MUSCLE OF WHITEFISH TAKEN FROM THE COLUMBIA RIVER AT VARIOUS LOCATIONS - 1961

Units of μμc/g

Date	Total Beta	P^{32}	Zn^{65}	Sc^{46}	As^{76}	Cr^{51}	Np^{239}
Reporting Limits*		2	5	5	100	10	10
Priest Rapids (Continued)							
Entire Fish							
12-12		30	49		-	-	-
12-12		2.1	7.1	-	-	11	-
12-12		-	72	-	-	-	-
12-12		82	170	-	-	12	-
12-12		-					
12-12		-	-	-	-	-	-
12-12		-	58	-		10	-
Hanford							
4-4	37	8.6	69	6.0	-	-	
4-4	44	26	43	-	380	-	
4-4	110	73	100	11	1,000	-	
4-4	97	74	28	-	-	-	
4-4	19	11	26	-	-	-	
4-4	340	290	52	5.1	-	-	22
4-4	160	110	95	8.5	270	-	-
5-4	2.6	14	37	-	140	-	-
5-4	51	37	35	-	150	-	-
5-4	96	51	61	7.5	330	-	-
5-4	56	34	45	-	-	-	10
5-4	3.0	20	40	-	230	-	-
6-16	11	2.1	40	-	-	-	-
6-16	64	51	56	-	-	15	-
6-16	44	29	42	-	-	-	-
7-11	70	61	54	-	-	10	-
7-11	39	37	10	-	-	-	-
7-11	180	180	11	-	-	-	-
7-11	110	110	62	-	-	-	-
7-11	56	36	50	-	-	-	-
7-11	140	130	85	-	-	13	-
7-11	100	94	65	-	-	-	-

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX A
TABLE 9 (Continued)

CONCENTRATIONS OF SEVERAL RADIONUCLIDES IN MUSCLE OF WHITEFISH TAKEN FROM THE COLUMBIA RIVER AT VARIOUS LOCATIONS - 1961

Units of μμc/g

Date	Total Beta	P^{32}	Zn^{65}	Sc^{46}	As^{76}	Cr^{51}	Np^{239}
Reporting Limits*		2	5	5	100	10	10
Hanford (Continued)							
8-2	160	150	43	-	-	-	-
8-2	21	19	7.1	-	-	-	-
8-2	27	15	68	-	-	-	-
8-2	15	9.6	5.0	-	-	-	-
8-2	55	55	5.5	-	-	-	-
8-2	280	300	65	-	-		11
8-3	110	110	32	-	-	-	-
8-3	17	6.2	-	-	-	-	-
8-3	150	130	78	10	-	-	-
8-3	210	180	24	-	-	-	-
8-3	81	63	42	-	-	19	-
8-3	53	44	42	-	-	-	-
8-3	250	230	63	-			-
8-3	600	680	70	-			23
8-24	150	150	30	6.5	-		19
8-24	290	290	45	10	-		33
8-24	240	240	45	-	-		45
8-24	390	360	51	7.5	-		53
9-7	180	180	48	7.3	-	17	35
9-7	270	330	56	6.5	-	-	14
9-7	270	210	13	-	-	-	-
9-7	180	200	39	5.0	-	-	-
9-7	650	640	62	6.1	-	-	21
9-7	370	350	54	10	-	-	14
9-7	200	130	10	-	-	-	-
9-7	310	280	50	-	-		10
10-10	840	860	63	-	410	13	130
10-10	410	400	48	-	330	10	71
10-10	500	460	81	-	580	15	91
10-11	120	110	47	-	190	11	45
10-11	460	470	65	-	240	11	56
11-6	610	Analysis	59	-	-		48
11-6	67	discon-	18	-	-	-	-
11-6	580	tinued	54	-	-		44

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX A
TABLE 9 (Continued)

CONCENTRATIONS OF SEVERAL RADIONUCLIDES IN MUSCLE OF WHITEFISH TAKEN FROM THE COLUMBIA RIVER AT VARIOUS LOCATIONS - 1961

Units of μμc/g

Date	Total Beta	P^{32}	Zn^{65}	Sc^{46}	As^{76}	Cr^{51}	Np^{239}
Reporting Limits*		2	5	5	100	10	10
Hanford (Continued)							
11-6	1,100	Analysis	89	-	-		80
11-6	560	discon-	59	-	-		45
11-6	1,600	tinued	78	-	-		91
11-6	700		72	-	-		56
11-6	510		64	-	-	-	48
11-6	340		65	-	-	-	29
11-6	1,100		78	-	-		66
12-5	590		69	-	200	20	43
12-5	210		88	-	240	10	28
12-5	830		110	5.6	570	10	94
12-5	650		170	5.4	640	24	89
12-5	780		210	-	820	16	100
12-5	410		100	7.4	290	22	58
12-5	1,200		450	19	1,500	140	190
12-5	150		460	12	1,200	93	220
12-5	1,400		370	27	2,000	190	230
12-5	1,800		450	23	2,100	160	250
12-5	2,100		380	13	920	110	260
12-5	1,200		340	11	890	100	170
12-5	1,500		730	14	1,100	150	220
12-5	1,300		450	8.1	470	40	18
12-5	2,000		450	7.2	730	72	230
12-6	600		130	-	220	32	61
Richland							
6-13	9.1	4.0	-	-	-	-	-
8-1	290	330	48	12	-	-	11
8-1	26	23	-	-	-	-	-
8-1	170	170	18	5.8	-	-	-
8-1	51	40	58	18		-	-
8-1	70	63					
8-1	170	160	15	8.3	-	-	-
8-1	90	92	13	-	-	-	-

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX A
TABLE 9 (Continued)

CONCENTRATIONS OF SEVERAL RADIONUCLIDES IN MUSCLE OF WHITEFISH TAKEN FROM THE COLUMBIA RIVER AT VARIOUS LOCATIONS - 1961

Units of μμc/g

Date	Total Beta	P^{32}	Zn^{65}	Sc^{46}	As^{76}	Cr^{51}	Np^{239}
Reporting Limits*		2	5	5	100	10	10
Richland (Continued)							
8-1	300	270	85	8.6	-		-
8-1	62	62	5.0	-	-	-	-
8-1	77	66	12	-	-	-	-
8-1	97	100	11	-	-	-	-
8-1	380	360	32	-	-	-	13
10-2	230	240	63	-	-		-
10-2	290	290	54	-	-	-	-
10-2	1,200	1,200	110	-	-		32
10-2	960	920	85	-	-		25
10-2	1,700	1,500	93	-	-	-	46
10-2	29	15	42	-	-	19	-
10-3	330	320	74	9.6	-	24	-
10-3	140	130	53	8.7	-	16	-
11-29	380	380	90	-	11,000	36	97
11-29	1,400	1,400	220	5.6	9,100		720
11-30	620	600	84	-	8,100	19	200
11-30	290	260	130	-	7,200	1,100	150
11-30	1,200	1,200	240	7.3	10,000	20	500
11-30	1,300	1,300	210	-	9,000	22	550
11-30	2,000	1,900	200	5.9	7,900	34	580
11-30	1,400	1,500	220	-	5,100	12	490
11-30	1,600	1,500	210	-	12,000	29	540
11-30	1,600	1,600	200	-	10,000	22	540
11-30	1,800	2,000	200	-	8,700	22	550
11-30	1,300	1,400	210	-	3,800	22	410
11-30	1,800	1,900	230	7.7	16,000	27	660
11-30	1,700	1,900	220	-	19,000	21	810
11-30	1,800	770	190	7.3	28,000	22	810
Ringold							
4-6	170	140	87	16	540	15	17
4-6	8.7	-	7.5	-	-	-	-
4-6	21	16	25	-	-	-	-

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX A
TABLE 9 (Continued)

CONCENTRATIONS OF SEVERAL RADIONUCLIDES IN MUSCLE OF WHITEFISH TAKEN FROM THE COLUMBIA RIVER AT VARIOUS LOCATIONS - 1961

Units of μμc/g

Date	Total Beta	P^{32}	Zn^{65}	Sc^{46}	As^{76}	Cr^{51}	Np^{239}
Reporting Limits*		2	5	5	100	10	10
Ringold (Continued)							
4-6	85	65	48	19	-	-	
4-7	170	14	110	13	-	16	11
4-28	87	78		-	14,000	19	60
4-28	200	190	56	6.2	1,600		38
4-28	220	210	67	9.4	8,700	12	51
4-28	180	160	70	8.1	9,500	12	63
4-28	370	34	70	8.0	12,000	-	120
7-5	17	5.0	42	-	-	-	
7-5	21	14	52	-	-	-	-
7-5	38	220	57	-	-		15
7-5	29	14	60	-	-		14
7-5	9.4	6.5	-	-	-		-
7-5	23	7.5	20	-	-		10
7-6	9.0	2.9	-	-	-	-	-
7-6	34	25	17	-	-		
7-6	38	25	40	-	-	-	-
7-6	23	12	12	-			21
8-28	720	670	98	-	-		51
8-29	410	410	63	7.8	-		67
8-29	420	410	56	-	-		110
8-29	580	590	87	-		11	
8-29	230	290	27	-	-	-	
8-31	110	110	67	11	-		120
8-31	1,200	1,200	7.1	-	-		60
8-31	14	180	14	7.2	-		41
10-30	530	430	60	6.4	-	-	23
10-30	670	600	78	7.6	-		170
10-30	660	540	100	-	-	-	45
10-30	920	750	93	-	-	-	60
10-30	2,500	1,900	110	-	140		160
10-30	600	470	76	-	-	-	43
10-31	1,100	1,100	83	-	-		56
10-31	400	320	56	-	-	-	20
10-31	1,100	900	93	5.9	-	-	51

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX A
TABLE 9 (Continued)

CONCENTRATIONS OF SEVERAL RADIONUCLIDES IN MUSCLE OF WHITEFISH TAKEN FROM THE COLUMBIA RIVER AT VARIOUS LOCATIONS - 1961

Units of μμc/g

Date	Total Beta	P^{32}	Zn^{65}	Sc^{46}	As^{76}	Cr^{51}	Np^{239}
Reporting Limits*		2	5	5	100	10	10
Burbank							
4-20	40	30	65	7.3			-
10-5	150	150	26	-		-	-
10-5	220	210	53	-	-	-	-

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX A
TABLE 9 (Continued)

CONCENTRATIONS OF SEVERAL RADIONUCLIDES IN MUSCLE OF SUCKERS TAKEN FROM THE COLUMBIA RIVER AT VARIOUS LOCATIONS - 1961

Units of μμc/g

Date	Total Beta	P^{32}	Zn^{65}	Sc^{46}	As^{76}	Cr^{51}	Np^{239}
Reporting Limits*		2	5	5	100	10	10
Priest Rapids (Coarse Scale)							
3-29	7.8	-	6.6	-	440		
3-29	8.7	-		-			
3-29	14	-		-			
3-30	7.8	2.5	8.0	-			
3-30	12	3.6	14	-			
5-1	-	-	-	-	-	-	-
5-1	-	19	70	-		-	-
5-2	-	12	42	-	-	-	-
5-2	-	-	-	-		-	
6-27	-	-	16	-	-	19	-
8-16	-	3.0	29	-			-
9-18	-	-	5.2		-	-	
9-19	-	-	31		-		
9-21	-	9.8	-		-		
10-18	-	680	77	-	440	20	74
10-18	-	27	-	-	290	20	73
10-18	-	4,300	310	-	1,100		760
10-18	-	1,000	100	-	250		190
11-21	-	< 3.5	-		-	-	-
11-21	-	< 2.2	-	-	-	-	-
12-12	-	-	64	-	-	-	-
12-12	-	-	44	-	-	-	-
Hanford (Coarse Scale)							
4-4	13	7.0	-			-	
4-4	38	40	25	-	220	-	
4-4	93	77	58	-		-	
5-4	36	24	26	-			
5-4	240	180	20	-	590	-	47

* Results less than the reporting limit are indicated by a (-). No entry indicates no analysis made.

APPENDIX A
TABLE 9 (Continued)

CONCENTRATIONS OF SEVERAL RADIONUCLIDES IN MUSCLE OF SUCKERS TAKEN FROM THE COLUMBIA RIVER AT VARIOUS LOCATIONS - 1961

Units of μμc/g

Date	Total Beta	P^{32}	Zn^{65}	Sc^{46}	As^{76}	Cr^{51}	Np^{239}
Reporting Limits*		2	5	5	100	10	10
Hanford (Continued)							
5-4	120	92	19	-	210	-	30
5-4	33	19	48	-		-	-
5-4	110	87	43	-	210	-	24
6-16	16	7.8	36	-	-	-	
6-16	140	150	44	-	-	-	-
6-16	11	6.1	-	-	-	15	-
6-16	270	270	42	-	-	12	15
6-16	530	500	340	-			21
6-16	310	410	150	-	-	-	20
7-11	190	170	56	-	-	-	-
7-11	140	130	50	-	-	-	-
7-11	150	140	94	-	-	16	-
7-11	1,300	1,200	43	-	-		33
7-11	53	47	9.9	-	-	16	-
9-5	2,400	2,400	78	21	-	12	54
9-7	2,600	2,400	79	7.3	-		81
10-11	1,900	1,700	80	9.2	-	10	45
10-11	1,200	1,200	37	6.5	-	-	29
10-11	1,200	1,000	45	7.8	-	20	30
11-7	990		89	-	-		61
11-7	510		52	-	-		31
11-7	570		53	-	-		33
12-6	370		160	-	150	-	35
12-6	570		110	-	150	12	49
Richland (Coarse Scale)							
4-6	17	6.2	68	6.9			-
4-7	53	42	11	-	-	-	-
4-7	81	65	100	9.7		-	-
4-7	56	40	82	6.8			

* Results less than the reporting limit are indicated by a (-). No entry indicates no analysis made.

APPENDIX A
TABLE 9 (Continued)

CONCENTRATIONS OF SEVERAL RADIONUCLIDES IN MUSCLE OF SUCKERS TAKEN FROM THE COLUMBIA RIVER AT VARIOUS LOCATIONS - 1961

Units of μμc/g

Date	Total Beta	P^{32}	Zn^{65}	Sc^{46}	As^{76}	Cr^{51}	Np^{239}
Reporting Limits*		2	5	5	100	10	10
Richland (Continued)							
4-7	140	120	74	6.3	-	-	-
6-13	35	24	56	-	-	-	-
6-13	210	190	79	-	-	-	-
6-13	110	100	83	-	-	13	-
6-13	350	320	78	-	-	11	-
8-1	1,000	980	77	-	-	60	23
10-2	730	680	55	-	-		20
Ringold (Coarse Scale)							
5-8	240	230	36	6.3	6,400	16	130
5-9	15	2.4	74	5.2		< 25	
5-9	1,100	960	35	8.0	4,900	13	240
7-5	87	81	29	-	-	-	11
7-6	68	2.2	-	-	-		-
8-23	-	3.0	29	-			-
8-28	1,500	1,500	68	-	-		79
8-29	970	810	63	-	-		230
8-31	670	670	41	-	-		22
8-31	890	900	38	-	-		29
8-31	1,400	1,300	53	-	-		130
10-30	450	370	66	-	-	-	22
Burbank (Coarse Scale)							
4-20	7.7	-	15	-			
4-20	11	-	16	-		-	-
4-20	21	140	54	-			
4-20	8.4	-	17	-	-		
4-20	40	270	58	-			

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX A
TABLE 9 (Continued)

CONCENTRATIONS OF SEVERAL RADIONUCLIDES IN MUSCLE OF SUCKERS TAKEN FROM THE COLUMBIA RIVER AT VARIOUS LOCATIONS - 1961

Units of μμc/g

Date	Total Beta	P^{32}	Zn^{65}	Sc^{46}	As^{76}	Cr^{51}	Np^{239}
Reporting Limits*		2	5	5	100	10	10
Burbank (Continued)							
5-12	140	120	110	8.1		-	
5-12	8.4	-	45	6.0	280	-	11
5-12	13	4.5	31	-		-	
6-22	70	46	100	-		-	-
8-8	79	69	26	-			-
8-9	61	94	49	-			-
9-12	120	150	22	-	-	-	-
9-12	88	110	26	-		-	-
9-12	63	88	6.6	-	-	-	-
9-12	580	720	34	-	-		27
10-5	130	120	28	-	-		-
10-5	290	270	43		-		-
11-13	65	61	24		1,600	-	39
11-13	180	170	44		2,400	-	71
11-13	82	85	38		2,300	-	39
11-13	120	98	40		2,100		47
11-13	100	88	30		1,900		36
Priest Rapids (Fine Scale)							
7-27	-	-	-				18
9-19	-	530	44		-		18
9-21	-	2,600	57		-		110
9-21	-	2.3	-	-	-	-	-
10-18	-	410	80		310		300
11-21	-	11	18	-	-	-	-
11-21	-	< 2.2	-		-	-	-

* Results less than the reporting limit are indicated by a (-). No entry indicates no analysis made.

APPENDIX A
TABLE 9 (Continued)

CONCENTRATIONS OF SEVERAL RADIONUCLIDES IN MUSCLE OF SUCKERS TAKEN FROM THE COLUMBIA RIVER AT VARIOUS LOCATIONS - 1961

Units of μμc/g

Date	Total Beta	P^{32}	Zn^{65}	Sc^{46}	As^{76}	Cr^{51}	Np^{239}
Reporting Limits*		2	5	5	100	10	10
Hanford (Fine Scale)							
4-4	450	510	100	6.2	-	-	59
4-4	150	140	94	8.8	760		
4-4	440	380	210	13		14	47
4-4	420	450	280	9.9	1,600	-	36
4-4	410	400	130	8.2	1,200	34	13
6-16	310	320	150	-	-	-	15
8-3	920	970	70	-	-		29
9-7	6,900	6,800	84	16	-		220
9-7	100	3,900	86	-	-		110
9-7	3,300	3,200	61	15	-		130
10-11	2,400	2,400	160	13	-	28	70
10-11	2,400	2,300	110	13	-	10	61
11-7	2,800		85	-	-		160
11-7	2,300		120	-	-		130
Richland (Fine Scale)							
6-13	130	120	58	-	-	-	-
8-1	2,400	2,400	17	5.5	-	29	68
10-2	900	880	93	-	-		24
10-3	1,100	1,200	70	-	-	-	29
10-3	720	720	40	8.0	-	13	17
10-3	1,200	1,100	75	8.7	-	13	26
Ringold (Fine Scale)							
7-6	97	86	-	-	-	-	-
7-6	460	590	94	-	-		22

* Results less than the reporting limit are indicated by a (-). No entry indicates no analysis made.

APPENDIX A
TABLE 9 (Continued)

CONCENTRATIONS OF SEVERAL RADIONUCLIDES IN MUSCLE OF SUCKERS TAKEN FROM THE COLUMBIA RIVER AT VARIOUS LOCATIONS - 1961

Units of μμc/g

Date	Total Beta	P^{32}	Zn^{65}	Sc^{46}	As^{76}	Cr^{51}	Np^{239}
Reporting Limits*		2	5	5	100	10	10
Ringold (Continued)							
7-6	260	230	87	-	-	-	15
8-31	580	580	97	5.3	-		160
Burbank (Fine Scale)							
8-8	290	390	63				24
8-8	590	600	62				79
9-12	370	400	48	-	-		24
9-12	250	340	57		-		24
9-12	580	680	47	-	-		38
9-12	350	550	34	-	-		23
10-5	730	750	88		-		15
10-5	390	370	37		-		-
10-5	510	500	41	-	-		10
11-5	1,300	1,400	96		1,400	-	260

*Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX A
TABLE 9 (Continued)

CONCENTRATIONS OF SEVERAL RADIONUCLIDES IN SHINERS (ENTIRE) TAKEN FROM THE COLUMBIA RIVER AT VARIOUS LOCATIONS - 1961

Units of μμc/g

Date	Total Beta	P^{32}	Zn^{65}	Sc^{46}	As^{76}	Cr^{51}	Np^{239}
Reporting Limits*		2	5	5	100	10	10
Priest Rapids							
6-26	6.3						
8-14	0.054						
9-21	30						
10-16	1,800						
Hanford							
4-3	1,100	830	1,300	120	-	140	510
4-3	1,200	1,100	1,400	120	-	100	580
5-4	1,300						
6-16	110						
8-3	16,000						
10-10	11,000						
10-10	12,000						
11-3	4,000						
11-3	6,200						
Richland							
4-7	800	-	1,500	130	< 3000	71	87
9-29	12,000						
12-1	3,400						
Ringold							
5-9	2,400						
7-6	630		820	33	150	43	810
10-30	7,600						
10-30	6,900						

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX A
TABLE 9 (Continued)

CONCENTRATIONS OF SEVERAL RADIONUCLIDES IN SQUAWFISH (MUSCLE AND/OR ENTIRE FISH) TAKEN FROM THE COLUMBIA RIVER AT VARIOUS LOCATIONS - 1961

Units of μμc/g

Date	Total Beta	P^{32}	Zn^{65}	Sc^{46}	As^{76}	Cr^{51}	Np^{239}
Reporting Limits*		2	5	5	100	10	10
Priest Rapids							
3-30	7.5	-	-	-			
3-30	18	-	-				
3-30	4.6	3.7	-	-		-	
3-30	18	-	-			-	
3-30	31	-	-	-	110		
5-1	-	3.8	-	-	330	-	-
5-1	-	3.8	-	-		-	
5-2	-	2	5.6	-	-	10	
6-27	-	-			-	14	-
6-27	-	5.6	6.6	-	-	13	-
6-27	-	-	8.2	-	-	17	-
7-27	-	-	-	-	-	-	-
7-27	-	-		-			11
7-27	-	-	-				15
7-27	-	35	36				21
7-27	-	-	-				25
8-14	0.15						
8-15		96	34	-	-		29
9-18	-	3.5	-		-	-	
9-18	-	5.7	-		-	-	
9-18	-	7.2	-	-	-	-	
9-18	-	-	-		-	13	
9-19	-	2.7	8		-	-	
11-20	-	< 2.7	-		-	-	-
12-12	-	-	-	-	-	-	-
Hanford							
4-3	29	15	63	-	570	-	
4-3	45	13	52	-	440		
4-3	22	5.8	64	-		-	

* Results less than the reporting limit are indicated by a (-). No entry indicates no analysis made.

APPENDIX A
TABLE 9 (Continued)

CONCENTRATIONS OF SEVERAL RADIONUCLIDES IN SQUAWFISH (MUSCLE AND/OR ENTIRE FISH) TAKEN FROM THE COLUMBIA RIVER AT VARIOUS LOCATIONS - 1961

Units of μμc/g

Date	Total Beta	P^{32}	Zn^{65}	Sc^{46}	As^{76}	Cr^{51}	Np^{239}
Reporting Limits*		2	5	5	100	10	10
Hanford (Continued)							
4-3	29	11	62	-	-		
4-3	11	-	6.9	-	300	-	
5-4	9.6	2.7	27	-		-	-
5-4	15	6.3	36	-	450	-	-
5-4	28	13	68	-			22
6-15	44	39	37	-	-	17	-
6-15	19	55	64	-	120	35	-
6-15	52	33	150	-	-	21	-
7-11	52	37	27	-	-	-	-
7-11	100	70	32	-	-	13	-
8-3	120	110	39	-	-	-	-
8-3	32	25	37	-	-	-	-
8-3	130	470	76		-		-
8-3	59	51	25	-	-		-
8-3	34	26	33	-		-	-
8-24	310	300	50	-	-		44
8-24	240	250	43	7.6	-	-	11
9-5	10,000						
9-7	1,600	1,400	100	9.3	-		51
10-10	9,800						
10-10	180	190	49	-	280	13	34
10-10	93	100	24	-	100	-	18
10-10	160	170	47	-	350	23	42
10-10	290	270	70	-	340	18	54
10-10	550	480	97	-	700	28	110
11-7	100		53	-	-	-	-
11-7	220		64	-	-	-	15
12-5	79		80			-	17
12-6	16		20		-	-	-
12-6	150		120	-	120	-	17
12-27	< 4.2						

* Results less than the reporting limit are indicated by a (-). No entry indicates no analysis made.

APPENDIX A
TABLE 9 (Continued)

CONCENTRATIONS OF SEVERAL RADIONUCLIDES IN SQUAWFISH (MUSCLE AND/OR ENTIRE FISH) TAKEN FROM THE COLUMBIA RIVER AT VARIOUS LOCATIONS - 1961

Units of μμc/g

Date	Total Beta	P^{32}	Zn^{65}	Sc^{46}	As^{76}	Cr^{51}	Np^{239}
Reporting Limits*		2	5	5	100	10	10
Richland							
6-13	33	22	40	-	-	-	-
6-13	37	28	33	-	-	13	-
6-13	8.7	2.2	29	-	-	-	-
6-13	73	Lost	55	-	-	17	-
8-1	49	45	42	-	-	-	-
8-1	37	33	19	-	-	-	-
9-29	9,200						
9-29	930	980	36	-			
9-29	340	330	17	-			
9-29	260	250	14	-			
10-2	210	200	15	-			
10-2	220	210	14	-			
Ringold							
4-6	38	15	170	12			
4-7	15	3.6	57	-			
4-7	21	9.3	90	7.1			
4-7	48	27	51	-			-
4-7	23	4.9	120	11			
5-8	17	3.5	52	8.9	8,600	20	1,200
5-8	10	4.4	8.6	-		-	
5-8	19	14	12	-	620	15	
5-9	2,800						
7-5	34	21	22	-	-		20
7-5	20	11	41	-	-		20
7-5	16	13	-	-	-		28
7-6	16	11	24	-	-		11
7-6	34	25	31	-	-		17
8-23	240	190	42	-	-		110
8-23	270	230	57	-	-		86
8-23	190	180	33	-	-		96

* Results less than the reporting limit are indicated by a (-). No entry indicates no analysis made.

APPENDIX A
TABLE 9 (Continued)

CONCENTRATIONS OF SEVERAL RADIONUCLIDES IN SQUAWFISH (MUSCLE AND/OR ENTIRE FISH) TAKEN FROM THE COLUMBIA RIVER AT VARIOUS LOCATIONS - 1961

Units of μμc/g

Date	Total Beta	P^{32}	Zn^{65}	Sc^{46}	As^{76}	Cr^{51}	Np^{239}
Reporting Limits*		2	5	5	100	10	10
Ringold (Continued)							
8-23	270	240	29	-	-		99
8-28	1,200	1,300	68	-	-		160
10-30	160	120	39	-	-	-	-
Burbank							
5-12	7.8	-	14	-		11	
5-12	4.8	-	12	-			
5-12	5.3	-	11	-		-	
6-22	140	7.5	36	-	-	10	
6-22	33	17	31	-	-	11	-
6-22	11	2.9	23	-	-	-	
6-22	12	5.3	25	-	-	19	-
6-22	15	2.7	36		-	-	-
7-25	2.4	14	-				-
7-25	3.0	63	-		-	-	-
7-25	0.51	7.5	5.8		-	-	-
7-25	3.5	73	46			-	-
7-25	0.34	3.5	29		-	-	-
8-8	66	3.3	37				-
8-8	51		20		-	-	-
8-8	140		38				16
9-12	160	160	42	-			19
10-4	6,000						
10-5	7.9	6.6	-	-			
11-14	1,700						

* Results less than the reporting limit are indicated by a (-). No entry indicates no analysis made.

APPENDIX A
TABLE 9 (Continued)

CONCENTRATIONS OF SEVERAL RADIONUCLIDES IN CRAPPIE (MUSCLE AND/OR ENTIRE FISH) TAKEN FROM THE COLUMBIA RIVER AT VARIOUS LOCATIONS - 1961

Units of μμc/g

Date	Total Beta	P^{32}	Zn^{65}	Sc^{46}	As^{76}	Cr^{51}	Np^{239}
Reporting Limits*		2	5	5	100	10	10
Burbank							
5-11	8.5	2.5	20	-		-	
5-12	8.5	-	18	-		-	
5-12	3.9	-	-	-		-	
5-12	6.1	-	19	-		-	
5-12	7.0	-	14	-		-	
6-21	16	3.7	27	-	-	20	-
6-21	13	3.6	29	-	-	-	
6-21	17	4.2	26	-	-	-	-
6-21	11	3.0	31				-
6-21	16	-	27	-		-	
6-21	11	2.1	20	-	-	13	-
6-21	Lost	Lost	19	-	-	27	
7-25	4.6	110	22	-			25
7-25	5.3	120	6.3				-
8-8	140	4.3	28	-			20
8-8	260	10	29				51
10-5	140	130	27	-			-

* Results less than the reporting limit are indicated by a (-). No entry indicates no analysis made.

APPENDIX A
TABLE 9 (Continued)

CONCENTRATIONS OF SEVERAL RADIONUCLIDES IN PERCH (MUSCLE AND/OR ENTIRE FISH) TAKEN FROM THE COLUMBIA RIVER AT VARIOUS LOCATIONS - 1961

Units of μμc/g

Date	Total Beta	P^{32}	Zn^{65}	Sc^{46}	As^{76}	Cr^{51}	Np^{239}
Reporting Limits*		2	5	5	100	10	10
Burbank							
4-19	7.3	-	40	-	-		-
4-19	16	-	23	-			
4-19	8.9	-	46	-	-		
4-19	8.4	-	28	-			
4-20	14	4.0	54	-		-	
6-21	82	48	89		-	-	-
6-21	29	17	37	-	-	15	-
7-25	4.5	100	37		-		-
8-8	150	130	24	-			29
8-9	150	160	32	-			-
9-12	280	290	65		-		11
9-12	460	530	120	-			-

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX A
TABLE 9 (Continued)

CONCENTRATIONS OF SEVERAL RADIONUCLIDES IN MUSCLE OF CHUB TAKEN FROM THE COLUMBIA RIVER AT VARIOUS LOCATIONS - 1961

Units of μμc/g

Date	Total Beta	P^{32}	Zn^{65}	Sc^{46}	As^{76}	Cr^{51}	Np^{239}
Reporting Limits*		2	5	5	100	10	10
Priest Rapids							
3-30	14	15	11	-	570	-	22
3-30	6.4	5.9		-	560		
9-18	-	3.9	7.3	-	-	-	-
9-18	-	8.2	-	-	-	-	-
9-18	-	5.1	-	-	-	-	
9-19	-	6.9	-		-	50	
9-19	-	740	69	-	-	-	31
Richland							
6-13	66	48	25	-	-	-	-
6-13	37	23	110	-	-	-	
6-13	93	73	99	-	-	-	-
6-13	71	55	81	-	-	-	-
Ringold							
7-6	19	12	14	-	-		

* Results less than the reporting limit are indicated by a (-). No entry indicates no analysis made.

APPENDIX A
TABLE 9 (Continued)

CONCENTRATIONS OF SEVERAL RADIONUCLIDES IN MUSCLE OF CHISELMOUTH TAKEN FROM THE COLUMBIA RIVER AT VARIOUS LOCATIONS - 1961

Units of μμc/g

Date	Total Beta	P^{32}	Zn^{65}	Sc^{46}	As^{76}	Cr^{51}	Np^{239}
Reporting Limits*		2	5	5	100	10	10
Priest Rapids							
3-30	23	4.2	110	9.5	9,100		
3-30	17	3.5	55	-			
3-30	38	-	100	8.0	130		
3-30	27	9.2	100	7.3			
3-30	58	4.2	25	-	460		
5-2	-	82	43	-			
5-2	-	6.1	29	-		-	-
7-27	-	-	18				13
7-27	-	35	100				20
7-27	-	150	52				20
7-27	-	-	-	-	-	-	-
9-19	-	3,600	70		-		160
9-19	-	2,900	130		-		230
9-21	-	1,500	48		-		36
10-18	-	450	73	-	380		140
10-18	-	140	34	-	260	-	45
10-18	-	820	130		600		230
10-18	-	14,000	1,000	-	4,400		4,800
10-18	-	730	110	-	430		210
Hanford							
4-4	280	260	110	7.6	1,100	-	22
4-4	57	39	110	7.8		-	
4-4	51	31	140	7.9		-	
4-4	51	18	160	12		-	
4-4	200	180	100	7.5		-	
5-4	540	440	70	-	920	-	100
5-4	660	560	140	11	450	-	140
6-16	180	150	120	-		-	-
7-11	75	58	68	-	-	-	-
7-11	220	200	75	-	-	-	-

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX A
TABLE 9 (Continued)

CONCENTRATIONS OF SEVERAL RADIONUCLIDES IN MUSCLE OF CHISELMOUTH TAKEN FROM THE COLUMBIA RIVER AT VARIOUS LOCATIONS - 1961

Units of μμc/g

Date	Total Beta	P^{32}	Zn^{65}	Sc^{46}	As^{76}	Cr^{51}	Np^{239}
Reporting Limits*		2	5	5	100	10	10
Hanford (Continued)							
8-3	1,700	1,700	200	5.7	-		530
10-11	2,600	2,700	110	12	-	12	63
10-11	2,500	2,400	120	610	-		58
10-11	1,700	1,700	100	130	-	21	43
10-11	2,200	2,100	93	-	340	-	230
10-11	3,300	3,100	270	-	380	13	340
Richland							
4-7	2,300		1,700	140		280	200
4-7	140	110	210	15			
4-7	210	190	170	14		-	
8-1	1,400	1,300	81	-	-		47
8-1	400	330	61	-	-	-	14
8-1	1,300	2,000	94	-	-		68
8-1	2,600	2,200	96	-	-		82
8-1	870	720	110	-	-	43	24
10-3	2,300	2,200	120	-	-	11	52
10-3	2,500	2,500	140	9.8	-		59
10-3	2,900	2,800	78	-	-		29
10-3	2,600	2,800	42	5.2	-		26
10-3	1,600	1,600	59	-			16
Ringold							
4-7	140	96	3,000	22			
4-7	320	240	180	14			-
4-7	190	150	190	15		12	-
7-6	39	29	70	-			11
7-6	53	52	24	-	-		-
7-6	270	260	69	-	-		19
7-6	500	570	51	-	-	28	32

* Results less than the reporting limit are indicated by a (-). No entry indicates no analysis made.

APPENDIX A
TABLE 9 (Continued)

CONCENTRATIONS OF SEVERAL RADIONUCLIDES IN MUSCLE OF CHISELMOUTH TAKEN FROM THE COLUMBIA RIVER AT VARIOUS LOCATIONS - 1961

Units of μμc/g

Date	Total Beta	P^{32}	Zn^{65}	Sc^{46}	As^{76}	Cr^{51}	Np^{239}
Reporting Limits*		2	5	5	100	10	10
Ringold (Continued)							
8-28	4,500	4,300	130	-	-		630
8-28	6,100	5,200	160	7.2	-		480
8-28	4,600	4,600	110	5.3	-		260
8-28	2,500	2,300	100	-	-		160
8-28	3,700	3,900	90	6.5	-		490
Burbank							
4-20	28	38	140	13			-
4-20	29	11	140	9.7			
4-20	23	64	180	15			-
4-20	64	36	190	13			
4-20	92	62	18	-		-	-
5-12	22	6.1	130	9.0	1,300	-	
5-12	15	-	89	6.3			
6-22	100	81	90	-	-	30	-
6-22	22	9.4	32		-	14	
6-22	11	-	23	-	-	17	-
6-22	150	110	140	-		-	-
9-12	390	460	74	-			68
10-5	3,800	3,400	130	-	-		87
10-5	1,300	1,300	91	-	-	-	53
10-5	1,700	1,600	110	-	-		66
10-5	2,400	2,500	130	-	-	-	98
11-14	150	200	110	-	2,600	-	160
11-14	150	150	26	-	1,300	-	53
11-15	110	88	61	-	400	-	25
11-15	710	760	110		1,100	-	130
11-15	580	600	75		860	-	99
11-15	750	760	110		970	-	140
11-15	770	790	120	-	270		160
11-15	510	550	120	-	520		99

* Results less than the reporting limit are indicated by a (-). No entry indicates no analysis made.

APPENDIX A
TABLE 9 (Continued)

CONCENTRATIONS OF SEVERAL RADIONUCLIDES IN MUSCLE OF CARP TAKEN FROM THE COLUMBIA RIVER AT VARIOUS LOCATIONS - 1961

Units of μμc/g

Date	Total Beta	P^{32}	Zn^{65}	Sc^{46}	As^{76}	Cr^{51}	Np^{239}
Reporting Limits*		2	5	5	100	10	10
Priest Rapids							
3-29	8.4	2.4	-	-			
5-2	-	18	130	9.1			-
Hanford							
4-4	46	41	300	17		-	
4-4	26	10	81	6.6	360	-	
5-4	37	19	150	8.0		-	
5-4	9.2	3.9	150	-			-
6-16	32	13	140		-	-	
6-16	26	15	55	-	-	11	-
7-10	18	10	71	-	-	-	-
7-10	260	230	17	-	-	-	13
8-3	360	340	62	-			13
9-5	400	300	81	20	-	22	12
Richland							
6-13	17	4.8	120	-		-	
Ringold							
8-28	190	210	60		-		61
8-28	1,500	1,400	160	-	-		290
Burbank							
4-19	24	11	140	12		-	-
4-20	8.0	2.0	45	-			
4-20	25	6.0	120	10			
4-20	25	8.5	220	16			
4-20	34	2.9	360	29			16

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX A
TABLE 9 (Continued)

CONCENTRATIONS OF SEVERAL RADIONUCLIDES IN MUSCLE OF CARP TAKEN FROM THE COLUMBIA RIVER AT VARIOUS LOCATIONS - 1961

Units of μμc/g

Date	Total Beta	P^{32}	Zn^{65}	Sc^{46}	As^{76}	Cr^{51}	Np^{239}
Reporting Limits*		2	5	5	100	10	10
Burbank							
5-12	18	-	150	10			
5-12	7.8	2.8	12	-	-	-	
6-21	6.4	-	-	-	-	-	-
7-25	0.97	22	19	-			-
7-25	1.2	25	63				-
7-25	3.5	72	170				-
7-25	2.2	52	150				-
8-8	58	40	230				-
8-8	110	91	60				50
8-9	60	2.0	53	-			-
8-9	28	-	130		-		73
8-9	150	6.4	40	-			130
McNary							
8-21	1,500						
9-12	30	40	62	-	-		12
9-12	230	380	100		-		14
9-12	50	54	110				-
9-12	150	240	150				27
10-5	53	46	51	-		-	-
10-5	32	17	120		-	-	-

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX A
TABLE 9 (Continued)

CONCENTRATIONS OF SEVERAL RADIONUCLIDES IN MUSCLE OF SMALL MOUTH BASS TAKEN FROM THE COLUMBIA RIVER AT VARIOUS LOCATIONS - 1961

Units of μμc/g

Date	Total Beta	P^{32}	Zn^{65}	Sc^{46}	As^{76}	Cr^{51}	Np^{239}
Reporting Limits*		2	5	5	100	10	10
Hanford							
4-4	11	4.1	22	9.4			
7-11	13	6.1	26	-	-	-	-
7-11	14	9.2	25	-	-	-	-
7-11	370	390	57	-	-	-	15
7-11	100	100	35	-	-	-	-
9-26	650	710	60	-	-		24
9-26	1,500	1,500	84	-	-		38
Richland							
4-7	11	2.4	22	-			
4-7	14	3.1	23	-	-	-	-
4-7	12	2.7	33	-		-	
9-29	8,300						
Ringold							
4-28	11	4.4	16	-	1,500		20
4-28	20	12	23	-	1,900	-	
4-28	16	8.0	21	-	1,800	-	-
4-28	14	8.1	19	-		-	-
4-28	19	9.2	31	-	1,900	-	-
Burbank							
6-22	10	2.6	12	-	-	-	-
6-22	16	4.5	31	-	-	-	-
6-22	34	22	35	-		-	-
7-25	5.4	140	37		-		-
10-5	290	290	15	-	-		-

* Results less than the reporting limit are indicated by a (-). No entry indicates no analysis made.

APPENDIX A
TABLE 9 (Continued)

CONCENTRATIONS OF SEVERAL RADIONUCLIDES IN MISCELLANEOUS FISH TAKEN FROM THE COLUMBIA RIVER AT VARIOUS LOCATIONS - 1961

Units of μμc/g

Date	Total Beta	P^{32}	Zn^{65}	Sc^{46}	As^{76}	Cr^{51}	Np^{239}	Species
Reporting Limits*		2	5	5	100	10	10	
Priest Rapids								
3-30	5.4	-	5.6	-				Brown Trout
5-2	-	-	18	-				Brown Trout
5-2	-	-	-	-				Sturgeon
8-15	26							Salmon
8-16	21							Salmon
9-26	5.3	-	-	-	-	-	-	Steelhead
9-26	5.5	2.3	-	-	-	-	-	Steelhead
9-26	3,000	2,800	110	5.9	-		77	Steelhead
11-20	-	< 5.0	-	-	100	-	-	Steelhead
Hanford								
4-4	36	26	53	-	570	-		Brown Trout
4-4	20	19	18	-	120	-		Sturgeon
4-4	26	19	20	-		12		Sturgeon
5-4	6.2	-	19	-		-		Sturgeon
6-16	12	75	12	-	-	-	-	Sturgeon
6-16	20	19	16	-	-	11	-	Sturgeon
6-16	23	Lost	13	-	-	-	-	Sturgeon
6-16	47	79	24	-	-	13	-	Sturgeon

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX A
TABLE 9 (Continued)

CONCENTRATIONS OF SEVERAL RADIONUCLIDES IN MISCELLANEOUS FISH TAKEN FROM THE COLUMBIA RIVER AT VARIOUS LOCATIONS - 1961

Units of μμc/g

Date	Total Beta	P^{32}	Zn^{65}	Sc^{46}	As^{76}	Cr^{51}	Np^{239}	Species
Reporting Limits*		2	5	5	100	10	10	
Hanford (Continued)								
7-11	28	25	28	-	-	-	-	Sturgeon
7-11	69	25	32	-		15	-	Sturgeon
7-11	19	17	34	-	-	13	-	Sturgeon
7-11	37	26	31	-	-	-	-	Sturgeon
8-3	19	13	27	-	-	-	-	Sturgeon
9-7	5,300							Crawfish
11-3	34	25	-	-	-	-	-	Steelhead
Richland								
11-29	1,000	1,000	200		9,900	16	460	Rainbow Trout
11-30	2,800	2,600	350		3,100	48	900	Rainbow Trout
Ringold								
10-30	2,000	1,600	160	-	-		89	Steelhead
11-3	4.4	-	-	13	-	42	-	Salmon

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX A
TABLE 9 (Continued)

CONCENTRATIONS OF SEVERAL RADIONUCLIDES IN MISCELLANEOUS FISH TAKEN FROM THE COLUMBIA RIVER AT VARIOUS LOCATIONS - 1961

Units of μμc/g

Date	Total Beta	P^{32}	Zn^{65}	Sc^{46}	As^{76}	Cr^{51}	Np^{239}	Species
Reporting Limits*		2	5	5	100	10	10	
Burbank								
4-20	7.3	-	11	11	-		-	Channel Cat
4-20	6.4	-	11	-	-		-	Channel Cat
4-20	11	6.5	8.6	-		-	-	Sturgeon
6-22	19	10	55		-	-	-	Sturgeon
6-22	13	4.6	24	-	-	-	-	Sturgeon
6-22	52	45	29	-	-	-	-	Sturgeon
6-22	16	7.9	32		-	-	-	Sturgeon
7-25	1.9	3.7	31				-	Sturgeon
7-25	1.3	26	33		-	-	-	Sturgeon
7-25	0.69	12	20	-			-	Channel Cat
7-25	0.36	5.5	17	-	-		-	Channel Cat
7-25	0.78	13	21	-	-		-	Channel Cat
7-25	0.58	4.9	24	-	-	.16	-	Channel Cat
8-9	26	22	15	11			-	Channel Cat
8-9	46	340	23	-			-	Channel Cat
8-9	130	130	30	-			-	Channel Cat
8-9	62	65	27		-		99	Channel Cat
8-8	61	52	27				47	Channel Cat
8-9	16	58	25	-	-		27	Sturgeon
9-12	51	72	30	-		-	-	Channel Cat

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX A
TABLE 9 (Continued)

CONCENTRATIONS OF SEVERAL RADIONUCLIDES IN MISCELLANEOUS FISH TAKEN FROM THE COLUMBIA RIVER AT VARIOUS LOCATIONS - 1961

Units of μμc/g

Date	Total Beta	P^{32}	Zn^{65}	Sc^{46}	As^{76}	Cr^{51}	Np^{239}	Species
Reporting Limits*		2	5	5	100	10	10	
Burbank (Continued)								
9-12	77	77	35	-		-	-	Channel Cat
9-12	610	670	89				22	Bluegill
9-12	920	920	210				45	Bluegill
10-5	77	70	35	-	-	-	-	Channel Cat
10-5	81	74	31	-		-	-	Channel Cat

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX A
TABLE 10

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Benton City			
10-15	Widgeon	-	-
10-14	"	-	-
10-14	"	-	-
10-28	"	-	-
11-4	"	-	
11-4	"		
11-4	"	-	
11-4	"	-	
10-15	Teal	-	-
10-15	"	-	-
10-28	"	-	
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-23	"	-	
11-4	Shoveler	-	-
11-4	Scaup	-	-
11-4	Pintail	-	-
10-15	Mallard	-	-
10-14	"	110	110
10-14	"	-	-
10-14	"	-	-
10-14	"	18	17
10-14	"	-	-
10-15	"		
10-15	"	20	21
10-15	"		
10-15	"	-	-
10-15	"	-	-
10-15	"	6.4	-
10-15	"	-	-
10-15	"	-	-
10-15	"	-	-
10-15	"	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 (Continued)

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Benton City (Continued)			
11-4	Mallard	-	-
11-4	"	-	-
11-4	"	-	
11-4	"	-	
11-4	"	-	-
11-4	"	-	
11-4	"	-	
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	
11-13	"	-	
11-13	"	-	
11-13	"	-	
11-13	"	-	
11-13	"	-	
11-13	"	-	
11-23	"	-	-
11-23	"	-	
11-23	"	-	
11-23	"	-	
11-23	"	12	
11-23	"	12	
12-1	"	-	-
11-5	Golden Eye, American	-	
11-5	" " "	-	
11-5	Golden Eye, Barrow	-	
11-5	" " "	15	
10-15	Gadwall	-	
10-15	"	-	
11-4	Bufflehead	-	-
Bepo North Pond			
10-14	Teal	< 45	-

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 (Continued)

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Burbank			
10-15	Wood Duck	14	
10-15	Widgeon		
10-15	"	-	
10-15	"	-	
10-15	"	-	-
10-15	"	-	-
10-28	"	-	
11-15	"	5.1	
11-15	"	-	-
11-15	"	-	
12-10	"	-	-
12-10	"		
10-15	Teal	-	
10-15	"	-	
10-23	"	7.3	
10-15	"	-	-
10-15	"	-	-
10-15	"	-	-
10-15	"	-	-
10-28	"	-	
11-15	Shoveler	-	
10-24	"	-	-
10-15	"	-	-
10-24	Scaup	16	
10-15	"	< 5.8	
10-15	"	-	-
11-18	"	-	-
11-18	"	-	-
10-28	Ruddy Duck	-	
10-28	" "	-	
10-28	" "	-	
10-28	" "	-	-
10-28	" "	-	-
10-28	" "	-	-
10-24	Pintail	-	-
10-28	"	-	-
10-28	"	-	
10-28	Old Squaw	-	
10-28	" "	-	

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 (Continued)

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Burbank (Continued)			
10-15	Mallard	-	
10-15	"		
10-15	"	-	
10-15	"	-	
10-23	"	-	-
10-28	"	-	-
10-28	"	-	
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-15	"	-	-
10-15	"	-	
10-15	"	-	-
10-15	"	-	-
10-15	"	-	-
10-15	"	-	-
10-15	"	-	-
10-15	"	-	-
10-28	"	-	
11-18	"	-	-
12-10	"		
12-10	"		
12-16	"		
12-16	"		
12-16	"	-	-
12-16	"		
12-16	"		
12-16	"		
12-16	"	-	-
12-21	"		

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 (Continued)

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Burbank (Continued)			
10-24	Golden Eye, American		
10-24	Golden Eye, Barrow		
11-18	" " "	88	
11-18	" " "	-	-
10-15	Canvas Back	-	-
10-15	Bufflehead	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
11-18	"	-	-
Byron Pond			
11-5	Pintail	-	-
10-14	Mallard	-	-
11-5	"	-	-
11-28	"	-	-
11-28	"		
11-28	"	-	-
11-28	"		
12-21	"		
12-21	"	-	-
12-21	"	-	-
12-21	"		
12-21	"		
12-21	"		
12-5	"		
12-5	"		
12-5	"	-	-
11-5	Bufflehead	-	-
Columbia River			
11-8	Widgeon	5.6	

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 (Continued)

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Connell			
10-22	Mallard	-	-
10-22	"	-	-
10-22	"	-	-
10-22	"	-	
10-22	"	-	-
10-22	"	-	
Eureka			
10-28	Widgeon	-	-
10-28	"	-	-
10-28	"	-	-
11-4	"	-	-
11-2	"	-	-
11-2	"	-	-
11-2	"	-	-
11-25	"	-	
11-25	"	-	-
11-25	"		
10-28	Pintail	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-12	"	-	-
10-28	Mallard	-	-
10-28	"	-	
10-28	"	-	
10-28	"	-	
10-28	"	-	
10-28	"	-	
10-28	"	-	
11-4	"	-	
11-4	"	-	
11-4	"	-	
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 (Continued)

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961
Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Eureka (Continued)			
11-4	Mallard	-	-
11-4	"	-	
11-4	"	-	
11-4	"	-	
11-4	"	-	
11-12	"	-	
11-12	"	-	-
11-12	"	-	-
11-12	"	-	
11-12	"	-	-
11-12	"	-	-
11-12	"	-	
11-12	"	-	-
11-12	"	-	-
11-12	"	-	-
11-12	"	-	-
11-12	"	-	
11-12	"	-	-
11-25	"	-	-
11-25	"	-	-
11-25	"	-	
11-25	"	-	-
11-25	"	-	
11-25	"	-	-
11-25	"	-	-
11-25	"	-	
12-17	"	-	-
12-17	"		
12-17	"		
12-17	"		
12-17	"		
12-17	"		
12-13	"	-	-

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 (Continued)

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Finley			
12-9	Widgeon		
12-9	"		
12-26	"		
10-22	Mallard		
10-22	"	-	
10-22	"	-	
10-22	"	-	
12-9	"		
12-9	"		
12-26	"		
12-26	"		
12-26	"		
12-26	"		
12-26	"	-	-
12-26	"	-	-
12-26	"	-	-
12-26	"	-	-
12-26	"	-	-
12-26	"		
12-26	"		
Horse Heaven			
10-27	Widgeon	10	
12-9	"		
12-9	"		
12-9	"		
12-9	"		
12-9	"		
12-9	"		
12-9	"		
12-9	"		
10-27	Mallard		
Ice Harbor			
12-17	Mallard	-	-

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 (Continued)

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961
Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Kahlotus			
10-28	Widgeon	-	-
10-21	Teal	-	-
10-21	Mallard	-	-
10-21	"	-	-
10-21	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
Kennewick			
10-14	Mallard	-	
10-14	"	-	
10-14	"	-	
10-14	"	-	
Kiona			
10-14	Widgeon	-	-
10-14	"	-	-
10-14	"	-	-
10-14	"		
10-14	"	-	-
10-14	"	-	-
10-14	"	5.0	-
11-13	Teal	-	
11-13	"	-	
11-13	"	-	
11-13	"	-	
11-13	"	-	
11-13	"	-	
11-13	"	-	-
12-16	"		

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 (Continued)

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Kiona (Continued)			
10-14	Mallard	-	-
10-14	"	-	-
10-16	"	14	-
10-16	"	-	-
10-16	"	-	-
10-16	"	-	-
10-16	"		
10-16	"	14	
10-16	"	-	
10-16	"	-	
11-13	"	-	
11-13	"	-	
11-13	"	-	
11-13	"	-	
11-13	"	-	
11-13	"	-	
11-13	"	6.4	
11-13	"	-	
11-13	"	-	
12-16	"		
12-16	"	-	-
12-16	"		
12-16	"		
12-16	"		
Mabton			
12-25	Bufflehead	-	-
12-25	Teal		
12-25	Mallard		
12-25	"	-	-
12-25	"	-	-
12-25	"		
12-25	"		
12-25	Bufflehead	-	-

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 (Continued)

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
McNary			
10-30	Widgeon	-	-
10-21	"	< 6.2	
10-21	"	36	
10-21	"	< 6.7	
10-21	"	< 6.5	
10-21	"	< 6.3	
10-21	"	< 5.4	
10-21	"	< 5.6	
10-21	"	< 6.4	
10-21	"	< 5.8	
10-21	"	< 5.9	
10-21	Teal	-	-
12-4	"		
10-30	Shoveler	-	
10-30	"	-	-
10-21	"	< 6.0	
10-21	"	-	
10-21	"	< 5.7	
10-21	"	< 6.6	
10-21	"	21	
10-21	"	< 6.0	
10-21	"	-	
10-21	"	< 6.8	
10-21	"	-	
10-21	"	< 5.3	
10-21	Scaup	-	
10-21	Ruddy Duck	< 5.7	
10-21	" "	< 5.9	
10-21	" "	< 5.2	
10-21	Pintail	-	
10-21	Mallard	-	
10-21	"	-	
10-21	"	-	-
10-30	"	-	-
11-2	"	-	-
11-2	"	-	

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 (Continued)

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
McNary (Continued)			
11-2	Mallard	-	
11-2	"	-	
11-2	"	-	
10-28	Mallard	6.0	-
10-28	"	6.6	
10-28	"	13	13
10-28	"	7.0	
10-28	"	-	-
10-28	"	12	
10-28	"	50	54
10-28	"	5.4	
10-28	"	41	
10-28	"	-	-
10-28	"	-	-
10-28	"	13	
10-28	"	-	
10-28	"	-	
10-28	"	9.3	
10-21	"	-	
10-21	"	-	
10-21	"	-	
10-21	"	-	
10-21	"	-	
12-4	"		
12-4	"	-	-
11-4	Bufflehead	-	-
11-4	"	98	
11-4	"	-	-
11-4	"	-	-
10-21	"	< 6.7	
10-21	"	< 8.2	
10-21	"	< 8.4	
10-21	"	41	37
10-21	"	< 6.3	

Results less than reporting limit are indicated by a (-).
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APPENDIX A
TABLE 10 (Continued)

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Mesa			
10-15	Widgeon	-	
10-15	"	-	
10-15	"	-	
10-15	"	-	
10-15	"	-	
10-15	"	-	
10-15	"	-	
10-15	"	-	
10-15	"	-	
10-22	"	-	
10-28	"	-	-
10-28	"	-	-
11-5	"	-	-
11-11	"	21	
12-1	"		
12-1	"		
12-1	"		
12-1	"		
12-1	"	-	-
12-1	"		
10-15	Teal	-	
10-15	"	-	
10-19	"	-	-
11-5	"	< 5.4	
11-4	"	< 5.7	
10-15	Shoveler	-	
10-15	"	-	
10-19	Pintail	-	-
10-28	"	-	-
11-4	Merganser		
10-15	Mallard	8.5	
10-15	"	-	
10-15	"	-	
10-15	"	-	
10-15	"	-	
10-15	"	-	

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 (Continued)

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Mesa (Continued)			
10-15	Mallard	-	
10-15	"	-	
10-15	"	-	
10-15	"	-	
10-15	"	-	
10-15	"	-	
10-18	"	13	
10-18	"		
10-22	"	-	
10-22	"	-	
10-22	"	-	
10-22	"	-	
10-22	"	-	
10-22	"	-	
10-19	"	-	-
10-19	"	-	-
10-19	"	-	-
10-19	"	< 5.3	
10-19	"	< 6.2	
10-19	"	-	-
10-19	"	-	-
10-19	"	7.7	
10-19	"	-	-
10-28	"	-	-
10-28	"	7.2	
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"		
11-5	"	-	-
11-5	"	-	-
11-5	"	-	

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 (Continued)

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961
Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Mesa (Continued)			
11-5	Mallard	-	-
11-5	"	-	-
11-5	"	-	-
11-5	"	-	-
11-5	"	-	
11-5	"	-	
11-5	"	-	-
11-5	"	-	
11-5	"	-	
11-4	"	-	
11-4	"		
11-4	"	-	-
11-4	"	-	
11-4	"	-	
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-5	"	-	
11-5	"	-	
11-5	"	< 8.5	
11-5	"	-	
11-5	"		
11-11	"		
11-11	"	-	-
11-11	"	-	-
11-11	"	-	-
11-11	"	-	
11-11	"	-	
11-11	"	-	-
11-11	"	-	-
11-11	"	-	
11-11	"	-	-
11-17	"		
11-17	"		
11-17	"		

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 (Continued)

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Mesa (Continued)			
11-17	Mallard	-	
11-17	"		
11-17	"		
11-16	"	-	
11-16	"	-	
11-16	"	-	
11-16	"	8.6	
11-27	"	32	30
11-27	"	-	
11-27	"	-	
11-27	"	11	
11-24	"		
11-24	"		
11-24	"	-	-
12-1	"		
12-1	"		
12-1	"		
12-1	"		
12-1	"		
12-1	"		
12-1	"		
12-1	"		
10-28	Bufflehead	-	-
Othello			
10-21	Widgeon	-	
10-21	"	-	
10-28	"	-	-
10-28	"	-	-
11-5	"	6.2	
11-5	"	-	
11-4	"	-	
11-5	"	-	-
11-11	"	-	-
12-2	"	-	-
12-2	"	-	-

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 (Continued)

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Othello (Continued)			
12-9	Widgeon		
12-27	"	-	-
10-22	Teal	-	-
10-22	"	-	-
10-22	"	-	-
10-22	"	-	-
10-22	"	-	-
10-28	"	-	-
11-11	"		
11-11	"		
11-11	"	200	200
11-18	"	-	-
11-18	"	11	
12-2	"		
10-22	Shoveler	-	-
11-4	Pintail	< 9.7	
11-11	"	-	-
12-24	"		
12-27	"		
10-15	Mallard	-	
10-15	"	-	
10-15	"	34	< 34
10-15	"	-	
10-15	"	-	
10-15	"	5.8	< 7.6
10-15	"	-	
10-21	"	-	
10-21	"	30	
10-21	"	-	
10-21	"	-	
10-21	"	-	
10-21	"	-	
10-21	"	-	
10-21	"	5.6	

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 (Continued)

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Othello (Continued)			
10-21	Mallard	-	
10-21	"	-	
10-21	"	-	
10-21	"	-	
10-21	"	-	
10-21	"	-	
10-22	"	-	
10-22	"	-	
10-22	"	-	-
10-22	"	< 5.9	
10-22	"	-	-
10-22	"	8.3	
10-28	"	-	
10-28	"	-	
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	10	< 11
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	
11-4	"	-	-
11-4	"	-	
11-4	"	-	-
11-4	"	-	-
11-4	"	-	
11-4	"	-	
11-4	"	11	
11-11	"	-	
11-11	"	-	-
11-11	"	-	-
11-11	"	-	

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 (Continued)

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Othello (Continued)			
11-11	Mallard	-	-
11-11	"	-	-
11-11	"	-	-
11-11	"	24	
11-11	"	12	
11-11	"	-	-
11-11	"	-	-
11-11	"	-	-
11-11	"	-	-
11-11	"	-	
11-11	"	-	-
11-11	"	-	-
11-18	"	6.2	
11-18	"	-	
11-18	"	-	
11-18	"	-	
11-18	"	-	-
11-18	"	11	11
11-18	"	-	
11-18	"	-	
11-18	"	7.8	
11-18	"	17	17
11-18	"	12	13
11-18	"	-	-
11-18	"		
11-18	"		
11-18	"	-	-
11-18	"	-	-
11-18	"	27	
11-18	"	-	
11-18	"	-	
11-18	"	-	
12-2	"		
12-2	"		
12-2	"		
12-2	"		

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 (Continued)

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Othello (Continued)			
12-2	Mallard		
12-2	"		
12-2	"		
12-2	"		
12-2	"		
12-2	"		
12-2	"	-	-
12-2	"		
12-2	"		
12-2	"	-	-
12-2	"		
12-2	"		
12-2	"	-	-
12-2	"		
12-9	"		
12-9	"		
12-9	"		
12-9	"		
12-9	"		
12-9	"		
12-9	"		
12-9	"		
12-9	"		
12-9	"		
12-9	"		
12-9	"		
12-9	"		
12-9	"		
12-9	"		
12-9	"		
12-9	"		
12-9	"		
12-9	"		
12-9	"	-	-
12-9	"		
12-9	"		

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 (Continued)

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Othello (Continued)			
12-9	Mallard		
12-9	"		
12-9	"		
12-9	"	-	-
12-9	"		
12-16	"	-	-
12-16	"	-	-
12-16	"		
12-16	"	-	-
12-16	"	-	-
12-16	"		
12-16	"	-	-
12-16	"		
12-16	"	-	-
12-16	"		
12-16	"	-	-
12-16	"		
12-16	"	-	-
12-16	"	-	-
12-16	"	-	-
12-16	"	-	-
12-16	"	-	-
12-16	"		
12-16	"	-	-
12-24	"		
12-24	"		
12-24	"		
12-24	"		
12-24	"		
12-24	"	-	-
12-24	"		
12-24	"	-	-
12-24	"		
12-24	"	-	-
12-24	"		
12-24	"	-	-

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 (Continued)

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Othello (Continued)			
12-24	Mallard		
12-24	"		
12-24	"		
12-24	"		
12-24	"		
12-24	"		
12-24	"	-	-
12-24	"		
12-27	"		
12-27	"		
12-27	"	-	-
12-27	"		
12-27	"		
12-27	"		
12-27	"		
12-27	"		
11-18	Golden Eye, American		
10-15	Gadwall	-	
11-18	"	-	-
12-16	"	-	-
Page			
12-17	Mallard		
12-17	"	-	-
12-17	"	-	-
Pasco			
10-22	Widgeon	-	-
10-22	"	-	-
10-28	"	-	
11-4	"	-	-
11-4	"	-	-
11-4	"	26	
11-11	"	-	-
11-11	"	-	-

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 (Continued)

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Pasco (Continued)			
11-11	Widgeon	-	
10-15	Teal	6.0	
11-12	"	-	-
11-11	"	-	
12-3	"	-	-
10-15	Shoveler	-	
10-28	"	-	-
10-30	"	-	-
10-30	"	-	-
11-4	"	-	-
11-4	Scaup	-	-
11-11	Ruddy Duck	-	-
10-22	Pintail	-	-
10-31	"	-	-
10-31	"		
10-31	"	18	
10-31	"	-	
10-18	Mallard	-	
10-18	"	8.3	
10-22	"	-	-
10-22	"	-	-
10-22	"	-	-
10-22	"	-	
10-22	"	-	-
10-22	"	-	-
10-22	"	-	-
10-21	"	-	-
10-22	"	-	-
10-22	"	-	
10-22	"	-	
10-22	"	-	
10-22	"	8.2	< 7.3
10-22	"	-	
10-28	"	-	
10-28	"	-	-
10-28	"	-	

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 (Continued)

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Pasco (Continued)			
10-28	Mallard	-	
10-30	"	-	-
10-30	"	-	-
10-30	"	-	-
10-30	"	-	-
10-30	"	-	-
10-30	"	-	-
10-30	"	-	-
10-30	"		
10-30	"	-	
10-31	"	-	-
10-31	"	-	
10-31	"	-	
11-1	"	-	-
11-1	"	-	-
11-1	"	-	
11-1	"	-	-
11-1	"	-	-
11-6	"	-	
11-4	"	-	
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	5.1	
11-4	"	-	-
11-12	"	-	
11-12	"	-	-
11-12	"	29	
11-11	"	-	
11-11	"	6.6	5.3
11-11	"	-	
11-11	"	-	
11-11	"	-	
12-17	"	-	-
12-17	"		

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 (Continued)

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Pasco (Continued)			
12-17	Mallard		
12-17	"		
12-16	"		
12-16	"		
12-16	"		
12-16	"		
10-22	Bufflehead	-	-
10-22	"	-	-
11-11	"	-	-
Patterson			
12-9	Pintail		
11-4	Mallard	-	
12-9	"		
11-14	Golden Eye, American	110	110
Pot Holes			
10-22	Widgeon	-	-
10-20	Teal	-	-
10-22	Scaup	-	
10-20	Mallard	-	-
10-22	"	-	-
11-4	"	-	
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	
11-4	"	-	
11-4	"	-	
11-4	"	-	-
11-4	"	-	
11-4	"	-	-
11-4	"		
11-4	"	6.5	
11-5	"	-	-
11-5	"	-	-

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 (Continued)

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Pot Holes (Continued)			
11-5	Mallard	-	-
11-5	"	-	-
11-5	"	-	-
11-30	"	-	-
11-30	"		
11-30	"	-	
11-30	"	-	-
11-30	"	-	-
11-5	Golden Eye, American	-	-
10-22	Bufflehead	-	-
10-22	"	-	-
Prosser			
10-14	Widgeon	-	-
10-14	"	-	-
10-14	"	-	-
10-14	"	-	-
10-14	"	-	-
10-16	"	-	
10-16	"	-	
10-21	"	-	-
10-21	"	-	-
10-21	"	-	-
10-21	"	-	-
10-28	"	-	-
10-28	"	-	
11-19	"	-	-
12-16	"		
10-16	Teal	-	
10-21	"	-	-
10-21	"	< 5.3	
10-28	"	-	-
11-4	"	-	
12-1	"	-	-

Results less than reporting limit are indicated by a (-).
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APPENDIX A
TABLE 10 (Continued)

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Prosser (Continued)			
12-1	Teal	-	-
12-16	"	-	-
12-16	"	-	-
12-16	"	-	-
12-16	"	-	-
11-18	Shoveler	-	-
10-21	Pintail	-	
11-4	"	-	
11-4	"	-	-
12-16	"	-	-
12-16	"		
10-14	Mallard	-	-
10-14	"	-	-
10-14	"	24	-
10-14	"	-	-
10-14	"		
10-14	"	-	-
10-14	"	5.2	-
10-14	"	-	-
10-14	"	-	-
10-16	"	-	
10-16	"	-	
10-18	"	-	
10-18	"	-	
10-18	"	-	
10-18	"		
10-18	"		
10-18	"		
10-20	"	-	-
10-20	"	-	-
10-21	"	-	-
10-21	"	-	-
10-21	"	-	-
10-28	"	-	
10-28	"	-	-
11-4	"	-	-

Results less than reporting limit are indicated by a (-).
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APPENDIX A
TABLE 10 (Continued)

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Prosser (Continued)			
11-4	Mallard	-	-
11-4	"	< 7.6	
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	
11-4	"	-	
11-4	"	-	-
11-4	"	-	
11-4	"	-	
11-4	"	-	-
11-4	"	-	
11-4	"	-	
11-4	"	-	
11-4	"	-	
11-4	"	-	
11-4	"	-	
11-4	"	-	
11-4	"	-	
11-4	"	-	
11-4	"	-	-
11-4	"	-	-
12-1	"	-	-
12-1	"	-	-
12-1	"		
12-1	"	-	-
12-9	"	-	-
12-10	"		
12-10	"	-	-
12-10	"		
12-10	"	-	-
12-10	"	-	-

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 (Continued)

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Prosser (Continued)			
12-10	Mallard		
12-10	"	-	-
12-10	"		
12-10	"	-	-
12-10	"		
12-10	"	-	-
12-10	"		
12-10	"	-	-
12-10	"		
12-10	"		
12-10	"		
12-10	"		
10-21	Golden Eye, American	-	-
12-1	" " "		
Richland			
10-14	Widgeon	-	-
10-15	"	-	-
10-15	"	-	-
10-15	"	6.2	-
10-21	"	-	-
10-23	"	-	
10-23	"	< 9.5	
11-4	"	-	
11-4	"	-	
10-28	Teal	-	-
11-18	"	61	63
11-19	"	-	
10-22	Shoveler	-	-
10-21	Pintail	-	-
10-15	Mallard	-	-
10-15	"	11	-
10-16	"	-	
10-16	"	-	
10-21	"	-	-

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 (Continued)

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1960

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Richland (Continued)			
10-23	Mallard	-	-
10-23	"	-	
10-23	"	-	-
10-22	"	-	-
10-22	"	7.8	
10-22	"	-	-
11-4	"	13	
11-4	"	-	
11-4	"	-	
11-4	"	-	
11-4	"	-	-
11-4	"	5.6	
11-4	"	15	13
11-4	"	5.9	
11-4	"	-	-
11-4	"	-	-
11-4	"	-	
11-4	"	-	
11-4	"	-	
11-4	"	-	
11-7	"	-	
11-7	"	-	
11-7	"	-	
11-15	"	-	
11-15	"	-	
11-3	"		
11-3	"		
11-3	"		
11-3	"		
11-3	"		
11-3	"	5.6	
11-3	"		
11-3	"	-	-
11-3	"		
11-4	"	-	-
11-4	"	-	-
11-4	"	-	

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 (Continued)

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961
Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Richland (Continued)			
11-4	Mallard	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	
11-4	"	-	-
11-4	"	-	
11-4	"	-	
11-4	"	-	-
11-4	"	-	
11-4	"	-	
11-4	"	-	-
11-4	"	-	-
11-4	"	-	
11-19	"	-	-
11-19	"	16	15
11-19	"	10	
12-19	"		
12-19	"		
12-19	"		
12-19	"	-	-
12-19	"		
12-19	"	-	-
12-19	"		
12-19	"		
12-19	"	-	-
12-19	"		
12-19	"		
11-6	Golden Eye, American	150	150
11-6	" " "	-	-
11-19	Golden Eye, Barrow	16	16
11-14	Gadwall	-	-
11-19	Bufflehead	-	-

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 (Continued)

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED IN VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Richland "Y"			
10-21	Widgeon	-	-
10-21	"	-	-
10-21	"	-	-
10-21	"	-	-
10-21	"	-	-
10-14	Teal	-	-
10-14	"	-	-
10-14	"	-	-
10-21	Mallard	-	
10-21	"	-	
10-21	"	-	-
Ringold			
12-3	Widgeon	-	-
12-3	Teal	-	-
12-1	Mallard		
12-14	"		
12-14	"		
12-14	"		
12-14	"		
12-14	"		
12-14	"		
Roza			
10-21	Widgeon	< 6.9	
10-21	"	-	-
10-21	Teal	-	-
10-21	"	-	-
10-21	"	-	-
11-11	"	-	-
10-21	Mallard	6.3	
10-21	"	-	-
11-11	"	-	-
11-11	"	-	-

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 (Continued)

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Scootney			
10-15	Widgeon	-	-
10-21	"	-	
10-21	"	-	
11-18	"		
12-3	"	-	-
10-16	Teal	-	-
10-20	"		
10-22	"	-	-
11-18	"	-	-
10-22	Pintail	-	-
10-21	"	-	-
10-21	"	-	-
11-5	"	-	-
11-4	"	-	
11-4	"	-	-
11-4	"	-	
12-3	"		
12-3	"		
10-14	Mallard	-	-
10-14	"		
10-14	"		
10-14	"	-	-
10-14	"		
10-14	"	-	-
10-14	"	-	-
10-14	"	260	-
10-14	"		
10-14	"	-	-
10-14	"	-	-
10-14	"	-	-
10-14	"	-	-
10-14	"	-	-
10-14	"	-	-
10-14	"	8.8	-
10-14	"	8.7	8.7

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Scootney (Continued)			
10-15	Mallard	-	-
10-16	"	-	-
10-16	"	9.1	
10-20	"		
10-21	"		
10-22	"	-	-
10-22	"	< 5.1	
10-22	"	< 5.2	
10-22	"	-	-
10-22	"	-	-
10-22	"	-	-
10-22	"	-	-
10-22	"	-	-
10-22	"	-	-
10-22	"	-	-
10-22	"	-	-
10-22	"	< 6.0	
10-22	"	-	-
10-22	"	-	-
10-21	"	-	-
10-21	"	-	-
10-21	"	-	-
10-21	"	-	-
11-4	"	-	
11-5	"	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	
11-4	"	-	-
11-4	"	-	
11-4	"	-	-
11-4	"	-	
11-4	"	-	-
11-4	"	9.3	
1 -4	"	-	

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Scootney (Continued)			
11-4	Mallard	-	
11-4	"	-	
11-4	"	-	-
11-4	"	-	
11-4	"	-	
11-4	"	-	
11-4	"	-	
11-4	"		
11-18	"	-	-
11-18	"	-	-
11-18	"	-	
11-18	"	-	
12-3	"		
12-3	"	-	
12-9	"		
12-9	"		
12-9	"		
12-9	"		
12-9	"		
Toppenish			
10-14	Wood Duck	< 9.4	
10-28	" "	-	-
10-15	Widgeon	-	
10-15	"		
10-15	"	-	
10-15	"	5.0	
10-15	"		
10-14	"	5.0	
10-14	"	-	
10-14	"	11	
10-14	"	-	
10-14	"	< 7.9	
10-14	"	-	
10-14	"	< 6.7	

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

CONCENTRATIONS OF BETA EMITTERS IN WATERFOWL HEADS HARVESTED AT VARIOUS LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Toppenish (Continued)			
10-14	Widgeon	-	
10-14	"	< 9.5	
10-14	"	< 5.5	
10-14	"	< 5.7	
10-14	"	< 5.9	
10-14	"	-	
10-14	"	-	
10-14	"	< 5.2	
10-14	"	< 12	
10-14	"	< 6.0	
10-14	"	-	
10-14	"	-	
10-24	"	7.7	
10-24	"		
10-24	"	-	-
10-24	"	-	
10-24	"	-	-
10-24	"	-	
10-28	"	-	
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
11-11	"	-	-
11-11	"	-	-
11-11	"	-	-
11-11	"		
11-11	"	-	-
11-11	"	-	
11-11	"	-	-
11-11	"	-	-
11-11	"	-	
11-11	"	-	-
11-11	"	-	-
11-11	"	-	-
11-11	"	-	-
11-25	"	-	
11-25	"	-	
11-25	"	-	-

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Toppenish (Continued)			
11-25	Widgeon	-	-
11-25	"	-	-
12-13	"	-	-
12-13	"		
12-13	"	-	-
12-13	"		
12-13	"	-	-
12-13	"	-	-
12-13	"		
12-13	"		
12-20	"		
12-20	"		
12-20	"	-	-
12-20	"	-	-
12-20	"	-	-
12-20	"		
12-17	"		
12-20	"	-	-
12-20	"	-	-
12-20	"	-	-
12-20	"	-	-
12-20	"	-	-
12-26	"	-	-
12-26	"	-	-
10-15	Teal	-	
10-15	"	-	
10-15	"	-	
10-15	"		
10-15	"	-	
10-15	"	-	
10-15	"	-	
10-14	"	-	
10-14	"		
10-14	"	-	-
10-14	"	-	
10-14	"	-	

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Toppenish (Continued)			
10-14	Teal	-	
10-14	"	-	
10-14	"	-	
10-14	"	-	
10-14	"	< 14	
10-14	"	-	
10-14	"	-	
10-14	"	< 7.4	
10-14	"	-	
10-14	"	-	
10-14	"	-	
10-14	"	-	
10-14	"	-	
10-14	"	< 5.7	
10-14	"	< 5.2	
10-14	"	< 5.7	
10-14	"		
10-14	"	< 5.9	
10-14	"	-	
10-14	"	< 12	
10-14	"	< 7.3	
10-14	"	-	
10-14	"	< 7.1	
10-14	"	< 7.1	
10-14	"	-	
10-14	"	< 17.0	
10-14	"	< 14	
10-14	"	< 6.1	
10-24	"	-	
10-24	"	-	-
10-24	"	< 6.7	
10-24	"	-	
10-21	"	-	-
10-28	"		
10-28	"	-	-
10-28	"	-	-
11-11	"	-	-
11-11	"	-	-
11-11	"	-	-
11-11	"	-	-

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Toppenish (Continued)			
11-25	Teal	-	-
11-25	"	-	-
11-25	"	-	-
12-20	"	-	-
12-20	"	-	-
12-20	"	-	-
12-20	"	-	-
12-17	"	-	-
12-26	"		
12-26	"	-	-
10-15	Shoveler	-	
10-15	"	-	
10-15	"	-	
10-14	"	-	
10-14	"	-	
10-14	"	-	
10-14	"	-	
10-14	"	-	
10-14	"	-	
10-14	Ring Neck		
10-24	Pintail	-	
10-24	"	-	
10-24	"	-	
10-24	"	-	-
10-24	"	< 5.4	
10-24	"	-	-
10-24	"	-	-
10-28	"	-	-
10-28	"	-	
10-28	"	-	-
10-28	"	-	-
11-11	"	-	-
11-25	"	-	-
11-25	"	-	-
12-20	"	-	-
12-20	"		
12-20	"	-	-

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Toppenish (Continued)			
12-20	Pintail		
12-20	"		
12-20	"	-	-
12-20	"	-	-
12-20	"		
12-26	"	-	-
12-26	"	-	-
10-14	Mallard	-	
10-14	"		
10-14	"	-	
10-14	"	-	
10-14	"		
10-14	"	< 7.0	
10-14	"	< 7.6	
10-14	"	-	
10-14	"		
10-14	"	-	
10-14	"	< 26	
10-14	"	-	
10-14	"	-	
10-14	"	< 7.5	
10-14	"	-	
10-14	"	< 6.1	
10-14	"	-	
10-14	"	-	
10-14	"	-	
10-14	"	6.2	
10-14	"	-	
10-14	"	< 5.4	
10-14	"		
10-14	"	-	
10-14	"	< 7.2	
10-14	"	< 6.2	
10-14	"	< 6.0	
10-14	"	< 5.5	
10-14	"	< 7.4	

Results less than reporting limit are indicated by a (-).
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APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Toppenish (Continued)			
10-14	Mallard	-	
10-14	"	-	
10-14	"	-	
10-14	"	-	
10-14	"		
10-14	"		
10-14	"	-	
10-14	"	-	
10-14	"	-	
10-14	"		
10-14	"	-	
10-14	"	-	
10-14	"	-	
10-14	"	-	
10-14	"	-	
10-14	"		
10-14	"	-	
10-14	"	-	
10-14	"	-	
10-14	"	-	
10-14	"	< 6.5	
10-14	"	-	
10-14	"	-	
10-14	"	-	
10-14	"	-	
10-14	"	-	
10-14	"	-	
10-14	"	-	
10-14	"	-	
10-14	"	-	
10-14	"	-	
10-14	"	-	
10-14	"	15	-
10-24	"	-	
10-24	"	-	
10-24	"	-	

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Toppenish (Continued)			
10-24	Mallard		
10-24	"		
10-24	"	6.9	6.1
10-24	"	-	
10-24	"	-	
10-24	"		
10-24	"	-	
10-24	"	-	
10-24	"	-	
10-24	"	-	
10-24	"	-	-
10-24	"	-	-
10-24	"	-	-
10-24	"	-	
10-24	"	-	-
10-24	"	-	-
10-24	"	-	-
10-24	"	-	-
10-24	"	< 6.4	
10-24	"	-	-
10-24	"	-	
10-24	"	-	-
10-24	"	-	-
10-24	"	-	
10-24	"	-	
10-24	"	-	-
10-24	"	-	-
10-24	"	-	-
10-24	"	< 6.7	
10-24	"	-	-
10-24	"	-	-
10-24	"	-	-
10-24	"		
10-24	"	-	-
10-24	"	-	-
10-24	"	-	

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Toppenish (Continued)			
10-24	Mallard	-	
10-24	"	-	-
10-24	"	-	
10-24	"	-	-
10-24	"	-	-
10-24	"	11	
10-24	"	-	
10-24	"	10	
10-24	"	-	-
10-24	"	-	
10-24	"	-	-
10-24	"	-	
10-24	"		
10-24	"	-	-
10-24	"	-	-
10-24	"	-	-
10-24	"	-	-
10-24	"	< 5.5	
10-24	"	-	-
10-24	"	-	-
10-24	"	-	-
10-24	"	-	-
10-24	"	-	-
10-24	"	-	-
10-24	"	-	
10-24	"	-	-
10-24	"	-	-
10-24	"	-	-
10-24	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-

Results less than reporting limit are indicated by a (-).
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APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Toppenish (Continued)			
10-28	Mallard	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"		
10-28	"	-	-
10-28	"	-	-
10-28	"	-	
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	7.3	
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	
10-28	"	-	-
10-28	"	-	-
10-28	"	-	
10-28	"	-	
10-28	"	-	-
10-28	"	-	-
10-28	"	-	
10-28	"	-	-
10-28	"	-	-

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Toppenish (Continued)			
10-28	Mallard	< 9.3	
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	
11-4	"	-	-
11-4	"	-	-
11-4	"		
11-4	"	-	-
11-4	"	-	
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	
11-4	"	-	-
11-4	"	-	
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	
11-4	"	-	
11-4	"	-	
11-4	"	-	-
11-4	"	-	-
11-4	"	-	
11-4	"	-	
11-4	"	-	-
11-4	"	-	

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Toppenish (Continued)			
11-4	Mallard	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	
11-4	"	-	
11-4	"	-	-
11-4	"	-	-
11-4	"	-	
11-4	"		
11-4	"	-	
11-4	"	-	-
11-4	"	-	
11-4	"	-	
11-4	"	-	-
11-4	"	-	
11-4	"	25	12
11-4	"	-	-
11-4	"	-	
11-4	"	-	-
11-4	"	-	
11-11	"	-	-
11-11	"	-	-

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Toppenish (Continued)			
11-11	Mallard	-	-
11-11	"	-	-
11-11	"	-	-
11-11	"	-	
11-11	"	-	-
11-11	"	-	-
11-11	"	-	-
11-11	"	-	-
11-11	"	-	-
11-11	"	-	
11-11	"	-	-
11-11	"	-	-
11-11	"	-	-
11-11	"	-	-
11-11	"	-	
11-11	"	-	-
11-11	"	-	-
11-11	"	-	-
11-11	"	-	-
11-11	"	-	-
11-11	"	-	-
11-11	"	-	-
11-11	"	-	-
11-11	"	-	-
11-11	"	-	
11-11	"	-	-
11-11	"	-	-
11-11	"	-	-
11-11	"	-	-
11-11	"	-	
11-11	"	-	-
11-11	"	-	
11-11	"	-	-
11-11	"	-	-
11-11	"	-	-
11-11	"	-	-

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Toppenish (Continued)			
11-11	Mallard	-	-
11-11	"	-	-
11-11	"	-	-
11-11	"	-	-
11-11	"	-	-
11-11	"	-	-
11-11	"	-	-
11-11	"	-	-
11-11	"	-	-
11-11	"	-	-
11-11	"	-	
11-11	"	-	-
11-18	"	-	-
11-18	"	-	
11-18	"	-	-
11-18	"	-	-
11-18	"	-	
11-18	"	-	-
11-18	"	-	-
11-18	"		
11-18	"	-	-
11-18	"	-	-
11-18	"	-	-
11-18	"	-	-
11-18	"	-	-
11-18	"	-	-
11-25	"	-	-
11-25	"	5.8	
11-25	"	-	-
11-25	"	-	-
11-25	"	-	-
11-25	"	-	-
11-25	"	-	
11-25	"	-	
11-25	"	-	-
11-25	"	-	
11-25	"	-	-

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Toppenish (Continued)			
11-25	Mallard	-	-
11-25	"	-	-
11-25	"	-	-
11-25	"	-	
11-25	"	-	-
11-25	"	-	-
11-25	"	-	-
11-25	"	-	-
11-25	"	-	-
11-25	"	-	-
11-25	"	-	-
11-25	"	-	-
12-13	"	-	-
12-13	"	-	-
12-13	"	-	-
12-13	"		
12-13	"	-	-
12-13	"		
12-13	"	-	-
12-13	"		
12-13	"		
12-13	"		
12-13	"	-	-
12-13	"		
12-13	"		
12-13	"	-	-
12-13	"	-	-
12-13	"	-	-
12-13	"	-	-
12-13	"		
12-13	"	-	-
12-13	"	-	-
12-13	"		
12-13	"		
12-13	"		

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Toppenish (Continued)			
12-13	Mallard	-	-
12-13	"	-	-
12-13	"	-	-
12-13	"	-	-
12-13	"	-	-
12-13	"	-	-
12-13	"	-	-
12-13	"		
12-13	"		
12-13	"		
12-13	"	-	-
12-13	"		
12-13	"	-	-
12-13	"		
12-13	"		
12-13	"		
12-13	"	-	-
12-13	"		
12-13	"		
12-13	"	-	-
12-13	"		
12-13	"	-	-
12-13	"		
12-13	"		
12-13	"		
12-13	"		
12-13	"		
12-13	"		
12-13	"	-	-
12-13	"	-	-
12-13	"		
12-13	"	-	-
12-13	"		
12-13	"		
12-13	"		

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Toppenish (Continued)			
12-13	Mallard		
12-13	"		
12-13	"	-	-
12-13	"		
12-13	"		
12-13	"		
12-13	"		
12-13	"	-	-
12-13	"	-	-
12-13	"		
12-20	"	-	-
12-20	"	-	-
12-20	"	-	-
12-20	"		
12-20	"	-	-
12-20	"	-	-
12-20	"	-	-
12-20	(Freak Mallard)	-	-
12-20	Mallard	-	-
12-20	"		
12-20	"		
12-20	"	-	-
12-20	"		
12-20	"		
12-20	"	-	-
12-20			
12-20	"		
12-20	"		
12-20	"	-	-
12-20	"		
12-20	"	-	-
12-20	"		
12-20	"	-	-
12-20	"		
12-20	"		

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Toppenish (Continued)			
12-20	Mallard	-	-
12-20	"	-	-
12-20	"	-	-
12-20	"		
12-20	"		
12-20	"	-	-
12-20	"		
12-20	"		
12-20	"		
12-20	"		
12-20	"		
12-20	"		
12-20	"		
12-20	"		
12-20	"		
12-20	"		
12-20	"		
12-20	"	-	-
12-20	"	-	-
12-20	"	-	-
12-20	"	-	-
12-20	"		
12-20	"	-	-
12-20	"	-	-
12-20	"	-	-
12-20	"	-	-
12-20	"	-	-
12-20	"	-	-
12-20	"	-	-
12-20	"		
12-20	"	-	-
12-20	"	-	-
12-20	"	-	-
12-20	"	-	-
12-20	"	-	-
12-20	"	-	-

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Toppenish (Continued)			
12-20	Mallard		
12-20	"	-	-
12-20	"	-	-
12-20	"		
12-20	"	-	-
12-20	"		
12-20	"	-	-
12-20	"	-	-
12-20	"	-	-
12-20	"		
12-20	"	-	-
12-20	"		
12-20	"	-	-
12-20	"	-	-
12-20	"	-	-
12-20	"		
12-20	"	-	-
12-20	"	-	-
12-20	"	-	-
12-20	"	-	-
12-20	"	-	-
12-20	"	-	-
12-20	"	-	-
12-20	"	-	-
12-20	"		
12-20	"	-	-
12-20	"	-	-
12-20	"		
12-20	"		
12-20	"	-	-
12-20	"		
12-20	"		
12-20	"	-	-
12-20	"	-	-
12-20	"		
12-20	"		
12-20	"		

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Toppenish (Continued)			
12-20	Mallard	-	-
12-20	"		
12-20	"	-	-
12-20	"		
12-20	"		
12-20	"		
12-20	"	-	-
12-20	"		
12-20	"	-	-
12-20	"	-	-
12-20	"	-	-
12-20	"		
12-20	"	-	-
12-20	"		
12-20	"	-	-
12-20	"		
12-20	"	-	-
12-20	"		
12-20	"		
12-20	"	-	-
12-20	"	-	-
12-20	"		
12-17	"		
12-17	"	-	-
12-17	"		
12-17	"	-	-
12-17	"		
12-17	"		
12-17	"		
12-17	"		
12-20	"		
12-20	"		
12-20	"	-	-
12-20	"		

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Toppenish (Continued)			
12-20	Mallard	-	-
12-20	"		
12-20	"		
12-20	"	-	-
12-20	"		
12-20	"		
12-20	"		
12-20	"	-	-
12-20	"	-	-
12-20	"	-	-
12-20	"		
12-20	"	-	-
12-20	"		
12-20	"		
12-20	"		
12-20	"		
12-20	"	-	-
12-20	"		
12-20	"	-	-
12-20	"		
12-20	"	-	-
12-20	"	-	-
12-20	"		
12-20	"	-	-
12-20	"	-	-
12-20	"		
12-20	"		
12-20	"		
12-20	"		
12-20	"		
12-20	"		
12-20	"	-	-
12-20	"	-	-
12-20	"	-	-
12-20	"		
12-20	"		

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Toppenish (Continued)			
12-20	Mallard	-	-
12-20	"		
12-20	"	-	-
12-20	"		
12-20	"		
12-20	"		
12-20	"		
12-20	"	-	-
12-20	"	-	-
12-20	"	-	-
12-20	"		
12-20	"	-	-
12-20	"		
12-20	"	-	-
12-20	"	-	-
12-20	"		
12-20	"		
12-20	"	-	-
12-20	"	-	-
12-20	"		
12-20	"		
12-20	"	-	-
12-20	"	-	-
12-20	"		
12-20	"	-	-
12-20	"		
12-20	"	-	-
12-20	"	-	-
12-20	"		
12-20	"	-	-
12-20	"	-	-
12-20	"	-	-
12-20	"	-	-
12-20	"		
12-20	"	-	-

Results less than reporting limit are indicated by a (-).
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APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Toppenish (Continued)			
12-20	Mallard		
12-26	"	-	-
12-26	"	-	-
12-26	"	-	-
12-26	"	-	-
12-26	"	-	-
12-26	"	-	-
12-26	"		
12-26	"	-	-
12-26	"		
12-26	"		
12-26	"	-	-
12-26	"	-	-
12-26	"	-	-
12-26	"		
12-26	"		
12-26	"	-	-
12-26	"	-	-
12-26	"	-	-
12-26	"	-	-
12-26	"	-	-
12-26	"		
12-26	"		
12-26	"		
12-26	"	-	-
12-26	"	-	-
12-26	"	-	-
12-26	"	-	-
12-26	"	-	-
12-26	"	-	-
12-26	"		
12-26	"	-	-
12-26	"	-	-
12-26	"		
12-26	"		

Results less than reporting limit are indicated by a (-).
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APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Toppenish (Continued)			
12-26	Mallard	-	-
12-26	"	-	-
12-26	"	-	-
12-26	"	-	-
12-26	"	-	-
12-26	"	-	-
10-14	Gadwall	-	
10-14	"	-	
Touchet			
10-15	Widgeon		
10-15	"		
Twin Bridges			
10-14	Widgeon	-	-
10-14	"	-	-
10-14	"		
10-14	"	-	-
10-14	"	-	-
10-14	Teal	-	-
10-14	Mallard	-	-
10-14	"	-	-
10-14	"	-	-
10-14	"	-	-
10-14	"	18	-
10-14	"	-	-
12-19	"	-	-
12-19	"		
10-14	Gadwall	-	-
Twin Lakes			
11-4	Teal	-	-
11-4	Scaup	-	-
11-4	Merganser	-	
11-4	"	-	-

Results less than reporting limit are indicated by a (-).
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APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Walla Walla			
12-18	Widgeon		
12-18	"	-	-
12-1	Mallard	-	-
12-13	"	-	-
12-13	"	-	-
12-13	"	-	-
12-18	"		
12-18	"		
Wallula			
10-23	Widgeon	-	-
10-23	"	-	
10-23	Mallard	-	
West Richland			
10-15	Widgeon	-	
10-15	"	-	
10-15	"	-	
10-22	"	-	-
10-22	"	-	-
10-22	"	-	-
10-22	"	-	-
10-22	"	-	-
10-22	"	-	-
10-22	"	-	-
10-22	"	-	-
10-22	"	-	
11-2	"	< 5.2	
11-5	"	-	-
11-5	"	-	-
11-5	"	-	-
11-5	"	-	-
11-5	"	-	-

Results less than reporting limit are indicated by a (-).
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APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
West Richland (Continued)			
10-15	Teal	-	
10-15	"	-	
10-15	"	-	
10-22	"	-	-
11-2	"	-	-
11-15	"	-	-
11-19	"	-	-
10-22	Pintail	< 7.5	
10-21	"	-	-
11-15	"	-	-
11-15	"	-	
10-21	Mallard	-	
10-22	"	-	-
10-22	"	-	-
10-22	"	-	-
10-22	"	-	-
10-22	"	7.9	< 6.0
10-22	"	8.6	< 9.1
10-22	"	-	-
10-22	"	-	-
11-5	"	-	-
11-5	"	-	-
11-5	"	-	
11-15	"	-	-
11-19	"	6.0	< 5.8
11-19	"	-	
11-19	"	-	-
11-19	"	-	
11-19	"	-	
11-19	"	-	
1 -19	"	12	
11-19	"	-	
11-25	"	-	
11-25	"	-	

Results less than reporting limit are indicated by a (-).
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APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Yakima			
12-23	Pintail	-	-
11-21	Mallard	-	-
11-21	"	-	
11-21	"	-	-
11-21	"	-	
11-21	"	-	
11-21	"	-	
11-21	"	7.0	
11-21	"	-	-
11-21	"	-	
12-23	"		
12-23	"		
12-23	"		
12-23	"	-	-
Yakima River (and Horn Rapids)			
11-19	Widgeon	-	
11-12	Mallard	12	
11-12	"	30	
11-12	"	5.1	
11-12	"	-	-
11-12	"	-	
11-13	"	-	-
11-13	"	-	-
11-13	"	-	-
11-13	"	-	-
11-13	"	-	
11-13	"	-	-
11-13	"	-	-
11-13	"	-	-
12-9	"	-	-
12-9	"	-	-

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APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Sauvie Island, Oregon			
10-28	Widgeon	-	-
10-28	"	-	-
11-1	White Wine Scooter	-	
11-1	" " "	-	
10-28	Pintail	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	
10-28	"	-	
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"		
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	
10-28	"	-	
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-

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APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Sauvie Island, Oregon (Continued)			
10-28	Pintail		
10-28	"	-	
10-28	"	-	-
10-28	"	-	-
10-28	"	-	
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
11-10	"	-	
11-10	"	-	
11-10	"	-	
11-10	"	-	
11-10	"	-	
11-10	"	-	
11-10	"	-	
11-10	"	-	
11-10	"	-	-
11-10	"	-	-
11-10	"	-	-
11-10	"	-	-
11-10	"	-	-
11-10	"	-	
11-10	"	-	-
11-10	"	-	
11-10	"	-	-
11-10	"	-	
11-10	"	-	
11-7	"	-	-
11-7	"	-	-

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APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Sauvie Island, Oregon (Continued)			
11-7	Pintail	-	-
11-7	"	-	-
11-7	"	-	-
11-7	"	-	-
11-7	"	-	-
11-7	"	-	-
11-7	"	-	
11-7	"	-	
11-7	"	-	
11-7	"	-	
11-7	"	-	-
11-7	"	-	-
11-7	"	-	-
11-7	"	-	-
11-7	"	-	-
11-7	"	-	-
11-7	"	-	
11-7	"	-	
11-7	"	-	-
11-7	"	No weight recorded	
11-7	"	-	-
11-7	"	-	-
11-9	"	-	-
11-9	"	-	-
11-9	"	-	-
11-9	"	-	-
11-9	"	-	-
11-9	"	-	-
11-9	"	-	-
11-9	"	-	-
11-9	"	-	-
11-9	"	-	
11-9	"	-	
11-9	"	-	
11-9	"	-	-
11-9	"	-	-

Results less than reporting limit are indicated by a (-).
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APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Sauvie Island, Oregon (Continued)			
11-9	Pintail	6.3	
11-9	"	-	
11-9	"	-	-
11-9	"	-	
11-9	"	-	-
11-9	"	-	
11-9	"		
11-9	"	-	
11-9	"	-	
11-9	"	-	
11-9	"	-	-
11-9	"	-	-
11-9	"	-	-
11-9	"	-	-
11-9	"	-	
11-9	"	-	
11-9	"	-	
11-9	"	-	
11-9	"	-	-
11-9	"	-	-
11-9	"	-	-
11-9	"	-	-
11-9	"	-	-
11-9	"	-	-
11-9	"	-	
11-9	"	-	-
11-9	"	-	-
11-9	"	-	-
11-9	"	-	
11-9	"	-	-
11-9	"	-	-
11-9	"	-	-
11-9	"	-	-
11-9	"	-	
11-9	"		

Results less than reporting limit are indicated by a (-).
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APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Sauvie Island, Oregon (Continued)			
11-9	Pintail	-	
11-9	"	-	-
11-9	"	5.4	
11-11	"	-	
11-11	"	-	-
11-11	"	-	-
11-11	"	-	-
11-11	"	-	-
11-11	"	-	-
11-11	"	-	-
11-11	"	-	
11-11	"	-	-
11-11	"	-	
11-11	"	-	-
11-23	"	-	-
11-23	"	-	-
11-23	"	-	-
11-23	"	-	-
11-23	"	-	-
11-23	"	-	-
11-23	"	-	-
11-23	"		
11-23	"	-	-
11-23	"	-	-
11-23	"	-	-
11-23	"	-	-
11-23	"	-	-
11-23	"	-	-
11-23	"	-	-
11-23	"	-	-
11-23	"	-	-
11-23	"	-	
11-23	"	-	-
11-23	"	-	-
11-23	"	-	-

Results less than reporting limit are indicated by a (-).
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APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Sauvie Island, Oregon (Continued)			
11-23	Pintail	-	-
11-23	"	-	-
11-23	"	-	-
11-23	"	-	-
11-23	"	-	
11-23	"	-	
11-23	"	-	
11-23	"	-	
11-23	"	-	
11-23	"	-	
11-23	"	-	
11-23	"	-	
11-23	"	-	
11-23	"	-	
11-23	"	-	
11-23	"	-	
11-23	"	-	
11-23	"	-	
11-23	"	-	
11-23	"	-	
11-23	"	-	
11-23	"	-	
11-23	"	-	
11-23	"	-	
11-23	"	-	
11-23	"	-	
11-23	"	-	
11-23	"	-	
11-23	"	-	-
11-23	"	-	-
11-23	"	-	-
11-23	"	-	-
11-23	"	-	-
11-23	"	-	-
11-23	"	-	-
11-23	"	-	-

Results less than reporting limit are indicated by a (-).
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APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Sauvie Island, Oregon (Continued)			
12-11	Pintail		
12-11	"	-	-
12-11	"		
12-11	"	-	-
12-11	"		
12-11	"	-	-
12-11	"	-	-
12-11	"	-	-
12-11	"	-	-
12-11	"	-	-
12-11	"		
12-11	"	-	-
12-11	"	-	-
12-11	"	-	-
12-11	"		
12-11	"	-	-
12-11	"	-	-
12-11	"	-	-
12-11	"	-	-
12-11	"	-	-
12-11	"	-	-
12-11	"	-	-
12-11	"	-	-
12-11	"		
12-11	"		
12-11	"	-	-
12-11	"	-	-
12-11	"	-	-
12-11	"	-	-
12-11	"	-	-
12-11	"	-	-
12-11	"	-	-
12-11	"	-	-
12-11	"		

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Sauvie Island, Oregon (Continued)			
12-11	Pintail	-	-
12-11	"	-	-
12-11	"		
12-11	"		
12-11	"	-	-
12-11	"	-	-
12-11	"	-	-
12-11	"	-	-
12-11	"		
12-11	"	-	-
12-11	"	-	-
12-11	"	-	-
12-20	"		
12-20	"	-	-
12-20	"		
12-20	"		
12-20	"		
12-20	"	-	-
12-20	"		
12-20	"		
12-20	"		
12-20	"	-	-
12-20	"		
12-20	"	-	-
12-20	"	-	-
12-20	"		
12-20	"	-	-
12-20	"	-	-
12-20	"	-	-
12-20	"	-	-
12-20	"		
12-20	"	-	-
12-20	"		
12-20	"		
12-20	"		

Results less than reporting limit are indicated by a (-).
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APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Sauvie Island, Oregon (Continued)			
12-20	Pintail	-	-
12-20	"		
12-20	"	-	-
12-20	"		
12-20	"	-	-
12-20	"	-	-
12-20	"		
12-20	"	-	-
12-20	"	-	-
12-20	"	-	-
12-20	"	-	-
12-20	"	-	-
12-20	"		
12-20	"	-	-
12-27	"	-	-
12-27	"		
12-27	"	-	-
12-27	"	-	-
12-27	"		
12-27	"	-	-
12-27	"	-	-
12-27	"		
12-27	"	-	-
12-27	"		
12-27	"	-	-
12-27	"	-	-
12-27	"		
12-27	"	-	-
12-27	"	-	-
12-27	"		
12-27	"		
12-27	"		
12-27	"	-	-

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Sauvie Island, Oregon (Continued)			
12-27	Pintail	-	-
12-27	"	-	-
12-27	"	-	-
12-27	"	-	-
12-27	"	-	-
12-27	"	-	-
12-27	"		
12-27	"	-	-
12-27	"		
12-27	"	-	-
12-27	"	-	-
12-27	"	-	-
12-27	"	-	-
12-27	"	-	-
12-27	"		
12-27	"		
12-27	"		
12-27	"	-	-
12-27	"	-	-
12-27	"	-	-
12-27	"	-	-
12-27	"	-	-
12-27	"	-	-
12-27	"		
12-27	"		
12-27	"		
12-27	"	-	-
12-27	"		
12-27	"		
12-27	"	-	-
12-27	"	-	-
12-27	"	-	-
12-27	"	-	-
12-27	"		

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APPENDIX A
TABLE 10

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Sauvie Island, Oregon (Continued)			
12-27	Pintail	-	-
12-27	"	-	-
12-27	"	-	-
12-27	"	-	-
11-1	Canvas Back	-	
Summer Lake, Oregon			
11-5	Pintail	-	-
11-11	"	-	
11-11	"	-	-
11-11	"	-	-
11-11	"	-	
Boise, Idaho			
12-26	Wood Duck		
12-15	Widgeon		
12-15	"		
12-15	"		
12-15	"		
12-15	"		
12-15	"		
12-15	"		
12-15	"		
12-15	"		
12-15	"		
12-15	"		
12-15	"		
12-15	"		
12-15	"		
12-26	"	-	-
12-26	"		
12-26	"		
12-26	"	-	-
12-26	"	-	-

Results less than reporting limit are indicated by a (-).
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APPENDIX A
TABLE 10

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Boise, Idaho (Continued)			
12-26	Widgeon	-	-
12-26	"	-	-
12-26	"	-	-
12-26	"		
12-15	Teal		
12-15	"	-	-
12-15	"		
12-15	"	-	-
12-15	"	-	-
12-15	"		
12-26	Scaup	-	-
12-26	Ruddy Duck	-	-
12-15	Pintail	-	-
12-15	"	-	-
12-15	"	-	-
12-15	"	-	-
12-15	"	-	-
12-15	"	-	-
12-20	"		
12-20	"		
12-20	"		
12-20	"	-	-
12-20	"		
12-20	"		
12-15	Mallard		
12-15	"	-	-
12-15	"	-	-
12-15	"	-	-
12-15	"	-	-
12-15	"	-	-
12-15	"	-	-
12-15	"	-	-
12-15	"	-	-
12-15	"	-	-
12-15	"		

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Boise, Idaho (Continued)			
12-15	Mallard	-	-
12-15	"	-	-
12-15	"	-	-
12-15	"	-	-
12-15	"	-	-
12-15	"	-	-
12-15	"	-	-
12-15	"	-	-
12-15	"	-	-
12-15	"	-	-
12-15	"	-	-
12-15	"	-	-
12-15	"	-	-
12-15	"	-	-
12-15	"	-	-
12-15	"	-	-
12-15	"	-	-
12-15	"	-	-
12-15	"	-	-
12-15	"	-	-
12-15	"	-	-
12-15	"	-	-
12-15	"	-	-
12-26	"	-	-
12-26	"		
12-26	"		
12-26	"		
12-26	"		
12-26	"		
12-26	"	-	-
12-26	"	-	-
12-26	"		
12-26	"	-	-
12-26	"	-	-
12-26	"		
12-26	"		

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Boise, Idaho (Continued)			
12-26	Mallard		
12-26	"		
12-26	"		
12-26	"	-	-
12-26	"	-	-
12-15	Golden Eye	-	-
12-15	" "		
12-15	" "	-	-
12-15	" "		
12-15	" "	-	-
12-15	" "	-	-
12-15	" "		
12-15	" "	-	-
12-26	" "	-	-
12-26	" "	-	-
12-26	" "	-	-
12-15	Gadwall	-	-
12-15	"	-	-
Fresno, California			
11-4	Widgeon	-	
11-4	"	9.2	-
11-18	"		
11-18	"	-	-
12-16	"	-	-
12-16	"	-	-
12-16	"	-	-
12-16	"	-	-
12-16	"	-	-
12-16	"		
12-16	"	-	-
12-16	"	-	-
12-16	"	-	-

Results less than reporting limit are indicated by a (-).
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APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Fresno, California (Continued)			
12-31	Widgeon	-	-
12-31	"	-	-
12-31	"	-	-
12-31	"	-	-
12-31	"	-	-
12-31	"	-	-
12-31	"	-	-
12-31	"	-	-
12-31	"		
12-31	"	-	-
12-31	"	-	-
12-31	"	-	-
12-31	"	-	-
12-31	"	-	-
12-31	"	-	-
12-31	"	-	-
12-31	"	-	-
11-4	Teal	-	
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	
11-4	"	-	
11-18	"	-	-
11-18	"	-	-
11-18	"	-	-
11-18	"	-	-
11-18	"	-	-
12-7	"	-	-
12-7	"	-	-
12-7	"		

Results less than reporting limit are indicated by a (-).
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APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Fresno, California (Continued)			
12-7	Teal	-	-
12-7	"	-	-
12-7	"	-	-
12-7	"		
12-7	"	-	-
12-7	"	-	-
12-16	"	-	-
12-16	"	-	-
12-16	"	-	-
12-16	"	-	-
12-16	"	-	-
12-16	"		
12-16	"	-	-
12-16	"	-	-
12-16	"		
12-16	"	-	-
12-16	"	-	-
12-16	"	-	-
12-16	"	-	-
12-16	"		
12-16	"	-	-
12-16	"	-	-
12-30	"	-	-
12-30	"	-	-
12-30	"		
12-31	"	-	-
12-31	"	-	-
12-31	"	-	-
12-31	"	-	-
12-31	"	-	-
12-31	"		
12-31	"	-	-
12-31	"	-	-
12-31	"	-	-

Results less than reporting limit are indicated by a (-).
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APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Fresno, California (Continued)			
12-31	Teal	-	-
12-31	"	-	-
12-31	"	-	-
12-31	"		
12-31	"	-	-
12-31	"	-	-
12-31	"	-	-
12-31	"	-	-
12-31	"	-	-
12-31	"	-	-
12-31	"	-	-
12-31	"	-	-
12-31	"		
12-31	"	-	-
11-4	Shoveler	-	-
11-4	"	-	
11-4	"	-	
11-4	"	-	
11-4	"	-	
11-4	"	-	
11-4	"	-	
11-4	"	-	
11-4	"	-	
11-4	"	-	
12-16	"	-	-
12-16	"	-	-
12-16	"	-	-
12-16	"	-	-
12-16	"	-	-
12-31	"	-	-
12-31	"	-	-
12-31	"		
12-31	"	-	-
12-31	"	-	-
12-31	"	-	-

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Fresno, California (Continued)			
12-31	Shoveler	-	-
12-31	"		
11-4	Ruddy Duck	-	-
12-31	" "	-	-
12-31	" "	-	-
12-31	" "	-	-
12-31	" "	-	-
11-4	Pintail	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	6.4	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	
11-4	"	-	-
11-4	"	-	-
11-4	"	-	
11-4	"	-	
11-4	"	-	
11-4	"	-	
11-4	"	-	-
11-4	"	-	
11-4	"	-	
11-4	"	-	
11-4	"	-	
11-4	"	-	
11-4	"	-	
11-4	"	-	
11-4	"	-	
11-4	"	-	
11-4	"	-	
11-4	"	-	
11-4	"	-	
11-4	"	No weight recorded.	
11-4	"	-	
11-18	"	-	

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Fresno, California (Continued)			
11-18	Pintail	-	-
11-18	"	-	-
11-18	"	-	-
11-18	"	-	-
11-18	"	-	-
11-18	"	-	-
11-18	"	-	-
11-18	"	-	-
11-18	"	-	-
11-18	"	-	
12-2	"	-	-
12-2	"	-	-
12-2	"	-	-
12-2	"		
12-2	"	-	-
12-2	"		
12-2	"		
12-2	"	-	-
12-2	"	-	-
12-2	"	-	-
12-2	"	-	-
12-2	"	-	-
12-2	"	-	-
12-2	"	-	-
12-2	"	-	-
12-2	"	-	-
12-16	"	-	-
12-16	"	-	-
12-16	"	-	-
12-31	"		
12-31	"		
12-31	"		
12-31	"		
12-31	"		

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Fresno, California (Continued)			
12-31	Pintail		
12-31	"		
12-31	"		
12-31	"		
12-31	"		
12-31	"		
12-31	"		
12-31	"		
12-31	"		
12-31	"		
11-4	Mallard	-	-
11-4	Gadwall	-	
Sacramento Valley, California			
11-18	Widgeon	-	
11-18	"	-	-
11-18	"	-	
11-18	"	-	
11-18	"	-	-
11-18	"	-	-
11-18	"	-	-
11-18	"	-	-
11-18	"	-	
11-18	"	-	-
11-18	"	-	-
11-18	"	-	-
11-18	"	-	-
11-18	"	-	-
11-18	Pintail	-	-
11-18	"	-	-
11-18	"	-	-
11-18	"	-	
11-18	"	-	-
11-18	"	-	-

Results less than reporting limit are indicated by a (-).
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APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Sacramento Valley, California (Continued)			
11-18	Pintail	-	-
11-18	"	-	-
11-18	"	-	-
11-18	"	-	-
11-18	"	-	-
Tule Lake, California			
11-4	Pintail	-	-
11-4	"	-	
11-4	"	-	-
11-4	"	-	-
11-4	"	-	
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	
11-4	"	-	-
11-4	"	-	
11-4	"	-	-
11-4	"	-	-
11-4	"	-	
11-4	"	-	
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Tule Lake, California (Continued)			
11-4	Pintail	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	
11-4	"	-	-
11-4	"	-	-
11-4	"	-	
11-4	"	-	
11-4	"	-	-
11-4	"	-	
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	
11-4	"	-	-
11-4	"	-	-
11-4	"	-	
11-17	"	-	-
11-17	"	-	-
11-17	"	-	-
11-17	"	-	-
11-17	"	-	-
11-17	"	-	-
11-17	"	-	-
11-17	"	-	-
11-17	"	-	-

Results less than reporting limit are indicated by a (-).
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APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Tule Lake, California (Continued)			
11-17	Pintail	-	
11-17	"	-	-
11-17	"	-	-
11-17	"	-	-
11-17	"	-	-
11-17	"	-	-
11-17	"	-	-
11-17	"	-	-
11-17	"	-	-
11-17	"	-	
11-17	"	-	-
11-17	"	-	-
11-17	"	-	-
11-17	"	-	-
11-17	"	-	-
11-17	"	-	-
11-17	"	-	-
11-17	"	-	-
11-17	"	-	
11-17	"	-	-
11-17	"	-	-
11-17	"	-	-
11-17	"	-	-
11-17	"	-	-
11-17	"	-	
11-17	"	-	-
11-17	"	-	-
11-17	"	-	-
11-17	"	-	
11-17	"	-	-
11-17	"	-	-
11-17	"	-	-
11-17	"	-	-
11-17	"	-	-
11-17	"	-	-

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Tule Lake, California (Continued)			
11-17	Pintail	-	-
11-17	"	-	-
11-17	"	-	-
11-17	"	-	-
11-17	"	-	-
11-17	"	-	-
11-17	"	-	-
11-26	"	-	
11-26	"	-	
11-26	"	-	
11-26	"	-	
11-26	"	-	
11-26	"	-	
11-26	"	-	
11-26	"	-	
11-26	"	-	
11-26	"	-	
11-26	"	-	
11-26	"	-	
11-4	Gadwall	-	-
11-4	"	-	-
GEESE			
Horse Heaven			
10-15	Lesser Canadian	-	
10-15	" "	-	
10-15	" "	-	
10-27	Basin	-	
11-18	Lesser Canadian	-	-
11-18	" "	-	-
11-18	" "	-	-
11-19	White Fronted	-	-

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
GEESE			
Horse Heaven (Continued)			
12-9	Lesser Canadian		
Eureka			
10-14	Lesser Canadian	-	
10-14	" "	-	
11-4	" "	-	
11-4	" "	-	
11-4	" "	-	
11-4	" "	-	
11-4	" "	-	
11-4	" "	-	
11-11	" "	-	-
11-4	Cackling	-	-
11-4	Lesser	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-12	Cackling	-	
11-12	Lesser	-	
11-12	"	-	-
11-12	"	-	-
11-12	"	-	-
11-12	"	-	-
11-12	"	-	-
11-12	"	-	-
11-12	"	-	-
11-12	Basin	-	
11-25	Lesser Snow	-	
11-25	" "	-	

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
GEESE			
Eureka (Continued)			
11-25	Lesser Snow	-	-
11-25	" "	-	
12-6	Lesser		
12-20	"		
12-20	"		
12-24	"		
12-24	"	-	-
12-13	"		
12-13	"	-	-
12-13	"	-	-
12-13	"	-	-
12-13	Cackler	-	-
12-13	Lesser	-	-
12-13	"		
Richland "Y"			
10-22	Lesser Canadian		
10-22	" "		
10-22	" "		
10-21	Lesser	-	
10-21	"	-	
10-28	Lesser Canadian	-	-
11-11	Canadian	-	
Richland			
10-22	Basin	-	
10-23	Lesser	-	-
10-21	Cackler	-	-
10-21	Lesser	-	-
10-21	"	7.0	
10-21	"	-	-
10-21	"	-	
10-21	"	-	

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APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
GEESE			
Richland (Continued)			
10-21	Lesser	-	-
11-15	Basin	-	-
11-15	Lesser Canadian	-	-
11-3	" "	< 5.5	
11-4	Basin Canadian	-	-
11-4	Lesser Canadian	-	
11-4	" "	-	
11-4	" "	-	
12-19	Cackling		
12-19	Basin Canadian		
West Richland			
11-15	Basin Canadian	-	
Toppenish			
10-24	Lesser Canadian	-	
12-20	" "	-	-
Pasco			
10-22	Basin Canadian	20	
10-23	" "	-	-
10-23	" "	-	-
10-23	" "	-	-
10-23	" "	-	
10-23	" "	-	-
10-22	" "	-	
10-22	" "	< 6.8	
10-22	" "	-	-
10-21	" "	-	-
10-21	" "	-	

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
GEESE			
Pasco (Continued)			
10-21	Basin Canadian	-	-
10-21	" "	-	-
10-21	" "	-	
10-21	" "	-	-
11-22	White Fronted	-	
11-22	" "	-	
12-3	Lesser Canadian		
12-9	" "		
12-9	" "	-	-
12-9	" "	-	-
12-9	" "		
12-9	" "		
12-9	" "		
12-9	" "		
12-9	" "		
12-9	" "	-	-
12-17	" "	-	-
12-17	" "	-	-
12-17	" "	-	-
12-17	" "		
12-17	" "		
12-17	" "		
12-16	" "		
12-16	" "		
12-16	Basin Canadian		
12-16	Lesser Canadian	-	-
Finley			
10-22	" "		
10-22	" "		
10-22	" "		
12-26	" "		

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
GEESE			
Burbank			
10-24	Common Golden Eye	-	-
10-24	Barrow Golden Eye		
10-25	Basin	-	-
10-25	"	-	-
10-25	"	-	
10-25	"	-	
11-5	Lesser Canadian	-	
11-5	" "	-	
10-15	" "	-	
10-15	" "	-	
10-28	A. C. Golden Eye	-	-
10-28	Barrow Golden Eye	-	-
10-28	Basin	-	
10-28	"	7.1	
11-11	Lesser Canadian	-	
11-11	" "	-	-
11-11	" "	-	
11-11	Basin Canadian	-	
11-11	" "	-	
11-15	Lesser Canadian	-	
11-15	" "	-	-
12-10	" "		
12-10	" "		
12-10	" "		
12-10	Cackler	-	-
Kalotus			
10-21	Canadian Basin	-	-
10-28	Cackling	-	-

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
GEESE			
Benton City			
10-22	Basin	5.4	-
10-22	"	-	-
10-22	"	-	
Page			
10-29	Lesser Canadian	-	-
12-9	" "		
12-9	" "		
Ringold			
10-28	Lesser Canadian	-	
10-28	" "	-	
10-28	" "	-	
Scootney			
11-5	Lesser Snow	-	-
Patterson			
11-4	Lesser Snow	-	
11-11	Canadian	-	
11-11	Basin Canadian	-	
11-11	Lesser Canadian	-	
11-11	" "	-	-
11-11	" "	-	< 5.1
Twin Lakes			
11-4	Lesser	-	
11-4	"	-	
11-4	"	-	

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
GEESE			
McNary			
11-12	Lesser Canadian	-	-
10-21	Basin Canadian	-	
12-4	White Fronted		
Walla Walla			
12-1	Cackler	-	-
12-18	Lesser Canadian		
12-18	" "		
12-18	" "		
12-18	" "		
12-18	" "	-	-
12-18	" "		
Othello			
12-16	Lesser Canadian		
12-24	" "		
White Swan			
12-16	Basin		
Columbia River			
10-22	Basin	19	18
10-22	"	27	15
11-8	Lesser Canadian	-	
11-8	" "	-	-
11-29	" "		
12-14	" "		

Results less than reporting limit are indicated by a (-).
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APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
GEESE			
Ice Harbor			
11-26	White Fronted	-	-
12-16	Lesser Canadian	-	-
12-16	" "		
12-16	" "		
Snake River Junction			
11-15	Lesser Canadian	-	
Radar Hill			
11-5	Lesser Canadian	-	
Summer Lake, Oregon			
10-28	Snow (Ross)	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	-
10-28	"	-	
10-29	Lesser Snow	-	
10-29	" "	-	-
10-29	" "	-	-
10-29	" "	-	-
10-29	" "	-	-

Results less than reporting limit are indicated by a (-).
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APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
GEESE			
Summer Lake, Oregon (Continued)			
10-29	Lesser Snow	-	
10-29	" "	-	-
10-29	" "	-	-
10-29	" "	-	-
10-29	" "	-	-
10-29	" "	-	-
10-29	" "	-	-
10-29	" "	-	-
10-29	" "	-	-
10-29	" "	-	-
10-29	" "	-	
10-29	" "	-	-
10-29	" "	-	-
10-29	" "	-	-
10-29	" "	-	-
10-29	" "	-	-
10-29	" "	-	-
10-29	" "	-	-
10-29	" "	-	
10-29	" "	-	-
10-29	" "	< 8.4	
10-29	" "	-	-
10-29	" "	-	-
10-29	" "	-	-
10-29	" "	-	-
10-29	" "	-	-
10-29	" "	-	-
10-29	" "	-	-
10-29	" "	-	-
10-29	" "	-	
10-29	" "	-	
10-29	" "	-	
*10-28	" "	-	-

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.
* Banded in Russia.

APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
GEESE			
Summer Lake, Oregon (Continued)			
11-5	Snow	-	-
11-5	"	-	-
11-5	"	-	-
11-5	"	-	-
11-5	"	-	-
11-5	"	-	-
11-5	"	-	-
11-5	"	-	
11-5	"	-	
11-5	"	-	
11-5	"	-	
11-5	"	-	
11-5	"	-	
11-5	"	-	
11-5	"	-	-
11-5	"	-	
11-5	"	-	-
11-5	"	-	
11-5	"	-	
11-5	"	-	-
11-5	"		
11-5	"	-	-
11-5	"	-	
11-5	"	-	
11-5	"	-	-
11-5	"	-	-
11-5	"	-	-
11-5	"	-	-
11-5	"	-	
11-5	"	-	-
11-5	"	-	-
11-5	"	-	-
11-5	"	-	-

Results less than reporting limit are indicated by a (-).
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APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
GEESE			
Summer Lake, Oregon (Continued)			
11-5	Snow	-	-
11-5	"	-	-
11-5	"	-	-
11-5	"	-	-
11-5	"	-	
11-5	"	-	-
11-5	"	-	-
11-5	"	-	
11-5	"	-	-
11-5	"	-	-
11-5	"	-	-
11-5	"	-	
11-5	"	-	-
11-5	"	-	-
11-5	"	-	-
11-5	"	-	-
11-5	"	-	-
11-5	"	-	-
11-5	"	-	-
11-5	"	-	-
11-5	"	-	-
11-11	Lesser Snow	-	-
11-11	" "	-	-
11-11	" "	-	-
11-11	" "	-	-
11-11	" "	-	-
11-11	" "	-	-
11-11	" "	-	-
11-11	" "	-	
11-11	" "	-	-
11-11	" "	-	-

Results less than reporting limit are indicated by a (-).
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APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
GEESE			
Summer Lake, Oregon (Continued)			
11-11	Lesser Snow	-	-
11-11	" "	-	-
11-11	" "	-	-
11-11	" "	-	-
11-11	" "	-	-
11-11	" "	-	-
11-11	" "	-	-
11-11	" "	-	
11-11	" "	-	-
11-11	" "	-	-
11-11	" "	-	-
11-11	" "	-	-
11-11	" "	-	-
11-11	" "	-	
11-11	" "	-	-
11-11	" "	-	-
11-11	" "	-	-
11-11	" "	-	
*11-11	" "	-	-
11-11	" "	-	-
11-11	" "	-	-
11-11	" "	-	-
11-11	" "	-	-
11-11	" "	-	-
11-11	" "	-	-
11-11	" "	-	-
11-11	" "	-	-
11-11	" "	-	-

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.
* Banded in Russia.

APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
GEESE			
Boise, Idaho			
12-16	Basin		
12-16	"		
12-16	"		
12-16	"		
12-16	"		
Fresno, California			
12- -	Cackling	-	-
12- -	"	-	-
12- -	"	-	-
11- -	Lesser Snow		
11- -	White Fronted	-	-
11- -	" "	-	-
11- -	" "	-	-
11- -	" "	-	-
11- -	" "	-	-
11- -	" "	-	-
11- -	" "		
11- -	" "		
11- -	" "		
12-2	Lesser Snow	-	-
12-2	Cackling	-	-
12-2	"	-	-
12-2	Snow	-	-
12-2	"	-	-
12-2	"	-	-
12-2	Cackling	-	-
12-2	Lesser	-	-
12-2	White Fronted	-	-
12-2	" "		
12-2	" "	-	-
12-2	" "	-	-

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
GEESE			
Fresno, California (Continued)			
12-2	Snow		
12-2	"	-	-
12-2	"	-	-
12-2	"	-	-
12-16	"	-	-
12-16	White Fronted	-	-
12-16	Cackler	-	-
12-16	"	-	-
12-16	"	-	-
12-16	"	-	-
12-31	White Fronted	-	-
12-31	" "	-	-
12-31	" "	-	-
12-31	" "	-	-
12-31	Lesser		
12-31	"		
12-31	Cackler		
Sacramento Valley, California			
11-18	Lesser Snow	-	-
11-18	" "	-	-
11-18	" "	-	-
11-18	" "	-	
11-18	" "	-	-
11-18	" "	-	-
11-18	" "	-	-
11-18	Ross	-	-
11-18	"	-	-
11-18	Basin	-	-
11-18	White Fronted	-	-
11-18	" "	-	-
11-18	" "	-	-

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
GEESE			
Sacramento Valley, California (Continued)			
11-18	White Fronted	-	
11-18	" "	-	-
11-18	" "	-	-
11-18	" "	-	-
11-18	" "	-	-
11-18	" "	-	-
Tule Lake, California			
11-4	Cackler	-	-
11-4	"	-	
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	-
11-4	"	-	
11-4	"	-	-
11-4	"	-	-
11-4	Snow	-	-
11-4	"	-	-
11-4	"	-	-
11-4	White Fronted	-	-
11-4	" "	-	-
11-4	" "	-	-
11-4	" "	-	-
11-4	" "	-	
11-4	" "	-	-
11-17	Cackling	-	-
11-17	"	-	-
11-17	"	-	-
11-17	"	-	
11-17	"	-	-
11-17	"	-	-
11-17	"	-	-

Results less than reporting limit are indicated by a (-).
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APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
GEESE			
Tule Lake, California (Continued)			
11-17	Cackling	-	-
11-17	"	-	-
11-17	"		
11-17	"	-	-
11-17	"	-	-
11-17	"	-	-
11-17	"	-	
11-17	"	-	-
11-17	"	-	-
11-17	"	-	
11-17	"	-	-
11-17	"	-	-
11-17	"	-	-
11-17	"	-	-
11-17	Lesser	-	-
11-17	"	-	-
11-17	"	-	-
11-17	"	-	-
11-17	"	-	-
11-17	Snow	-	
11-17	White Fronted	-	-
11-17	" "	-	
11-17	" "	-	-
11-17	" "	-	-
11-17	" "	-	-
11-17	" "	-	-
11-17	" "	-	-
11-17	" "	-	
11-17	" "	-	-
11-17	" "	-	
11-17	" "	-	-
11-17	" "	-	-
11-17	" "	-	-
11-17	" "	-	

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
GEESE			
Tule Lake, California (Continued)			
11-17	White Fronted	-	-
11-17	" "	-	-
11-17	" "	-	-
11-17	" "	-	-
11-17	" "	-	
11-17	" "	-	
11-17	" "		
11-17	" "	-	-
11-17	" "	-	-
11-26	Cackler	-	
11-26	"	-	
11-26	"	-	
11-26	"	-	
11-26	"	-	
11-26	"	-	
11-26	"	-	
11-26	"	-	
11-26	"	-	
11-26	"	-	
11-26	"	-	
11-26	Lesser	-	
11-26	Snow	-	-
11-26	"	-	-
11-26	"	-	-
11-26	"	-	-
11-26	"	-	-
11-26	"	-	-
11-26	"	-	-
11-26	"	-	-
11-26	"	-	-
11-26	"	-	
11-26	"	-	-
11-26	"	-	-
11-26	"	-	-

Results less than reporting limit are indicated by a (-).
No entry indicates that the particular analysis has not been completed.

APPENDIX A
TABLE 10 Continued

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL HEADS HARVESTED AT VARIOUS
LOCATIONS AS CONTRIBUTED BY WATERFOWL HUNTERS - 1961

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
GEESE			
Tule Lake, California (Continued)			
11-26	Snow	-	-
11-26	"	-	-
11-26	"	-	-
11-26	"	-	-
11-26	White Fronted	-	-
11-26	" "	-	-
11-26	" "	-	
11-26	" "	-	-
11-26	" "		
11-26	" "	-	
11-26	" "	-	-
11-26	" "	-	-
11-26	" "	-	-
11-26	" "	-	-
11-26	" "	-	-
11-26	" "	-	-
11-26	" "	-	
11-26	" "	-	-
11-26	" "	-	-
11-26	" "	-	-
11-26	" "	-	-
11-26	" "	-	

APPENDIX A
TABLE 11

CONCENTRATIONS OF BETA EMITTERS IN WATERFOWL HEADS AND MUSCLES SAMPLED WITHIN THE HANFORD RESERVATION - 1961

Units of 10^{-5} μc/g

Date	Specie	Head		Muscle	
		Beta	P^{32}	Beta	P^{32}
Reporting Limit*		5	5	5	5
200 E Swamps					
9-27	Mallard	Not sampled		-	-
9-27	"	"	"	-	-
9-27	"	"	"	-	-
9-27	"	"	"	-	-
9-27	"	"	"	-	-
11-27	"	-			
9-28	Coot	-		-	
9-28	"	-		-	
9-28	"	-		-	
9-28	"	-		-	
9-28	"	-		-	
200 W Swamps					
11-27	Widgeon				
11-28	Teal	6.4			
11-27	"	-			
11-28	"	-			
12-19	Shoveler				
12-19	"				
12-19	"				
12-19	"				
12-19	Scaup				
12-19	"				
11-27	Pintail	-			
12-19	"				
10-20	Merganser	-			
10-26	Mallard	15	< 5.7		
10-26	"	9.4	< 5.3	-	
10-26	"	9.1	< 5.4		
10-26	"	-	-		
10-26	"	9.8	< 5.8		
10-26	"	25	< 7.9		
10-26	"	19	< 7.6		
11-28	"	-	-		
11-28	"	-			

* Results less than reporting limit are indicated by a (-).
No entry indicates analysis not completed.

APPENDIX A
TABLE 11 (Continued)

CONCENTRATIONS OF BETA EMITTERS IN WATERFOWL HEADS AND MUSCLES SAMPLED WITHIN THE HANFORD RESERVATION - 1961

Units of 10^{-5} μc/g

Date	Specie	Head		Muscle	
		Beta	P^{32}	Beta	P^{32}
Reporting Limit*		5	5	5	5
200 W Swamps (Continued)					
12-19	Mallard				
12-19	"				
12-19	"				
12-19	"				
12-19	"				
12-19	"				
12-19	"				
11-27	Golden Eye	-			
11-27	Golden Eye, American	-			
10-26	Coot	-			
10-26	"	-			
10-26	"	15			
11-28	"	-			
11-28	"	-			
11-28	"	-			
11-28	"	-			
11-28	"	-			
12-19	"				
10-26	Bufflehead	< 88			
11-27	"	-			
11-27	"	-			
11-27	"	-			
11-28	"	-			
Lower River - Hanford Ferry and Downstream to Project Boundary					
11-7	Teal	83	84		
11-2	Old Squaw	200		No muscle	
9-25	Merganser			64	62
9-25	"			240	210
9-25	"			100	92
9-25	"			160	140
9-25	"			190	180
9-25	"			410	380

* Results less than reporting limit are indicated by a (-).
No entry indicates analysis not completed.

APPENDIX A
TABLE 11 (Continued)

CONCENTRATIONS OF BETA EMITTERS IN WATERFOWL HEADS AND MUSCLES SAMPLED WITHIN THE HANFORD RESERVATION - 1961

Units of 10^{-5} μc/g

Date	Specie	Head		Muscle	
		Beta	P^{32}	Beta	P^{32}
Reporting Limit*		5	5	5	5
Lower River - Hanford Ferry and Downstream to Project Boundary - Continued					
11-3	Merganser	-			
11-3	"	120			
11-7	"	40			
9-25	Mallard	Not sampled		110	96
9-25	"	" "		-	-
10-30	"	-			
10-30	"	-			
10-30	"	-			
10-30	"				
10-30	"	-			
10-30	"	-			
11-2	"	6.1			
11-2	"	9.4			
11-7	"	8.5			
11-29	"	-			
11-29	"	40			
11-29	"	-			
11-29	"	-			
11-29	"	-			
11-29	"	-			
11-29	"	-			
11-30	"	15			
11-29	"				
12-5	"				
11-7	Golden Eye, Barrow	67	63		
12-1	" " "				
10-30	Coot	120	130		
11-2	"	5.9			
11-2	"	< 5.7			
11-30	"	310	96		
12-5	"				
12-14	"				
12-14	"				

* Results less than reporting limit are indicated by a (-).
No entry indicates analysis not completed.

APPENDIX A
TABLE 11 (Continued)

CONCENTRATIONS OF BETA EMITTERS IN WATERFOWL HEADS AND MUSCIES SAMPLED WITHIN THE HANFORD RESERVATION - 1961

Units of 10^{-5} μc/g

Date	Specie	Head		Muscle	
		Beta	P^{32}	Beta	P^{32}
Reporting Limit*		5	5	5	5
Lower River - Hanford Ferry and Downstream to Project Boundary - Continued					
12-14	Coot				
12-14	"				
12-14	"				
12-14	"				
Upper River - Hanford Ferry and Upstream to Project Boundary					
9-26	Wood Duck	140	130	120	
10-25	Teal			-	
12-6	"				
12-6	"				
12-12	Ruddy Duck				
12-12	" "				
12-12	" "				
12-12	" "				
12-12	" "				
10-23	Merganser			-	
10-23	"	55			
10-25	"	38			
10-25	"	120	130		
10-25	"	230	220		
10-25	"	47			
10-25	"	47			
10-25	"	32	33		
11-16	"	180			
11-16	"	63			
11-16	"	150			
12-6	"				
12-15	"				
10-23	Mallard				
10-23	"	-			
10-23	"	7.8			

* Results less than reporting limit are indicated by a (-).
No entry indicates analysis not completed.

APPENDIX A
TABLE 11 (Continued)

CONCENTRATIONS OF BETA EMITTERS IN WATERFOWL HEADS AND MUSCLES SAMPLED WITHIN THE HANFORD RESERVATION - 1961

Units of 10^{-5} μc/g

Date	Specie	Head		Muscle	
		Beta	P^{32}	Beta	P^{32}
Reporting Limit*		5	5	5	5
Upper River - Hanford Ferry and Upstream to Project Boundary - Continued					
10-23	Mallard	7.8	< 7.7		
10-23	"	-			
11-7	"	21			
11-16	"	79			
11-16	"	-			
12-6	"				
12-6	"				
12-6	"				
12-6	"				
12-6	"				
11-9	Golden Eye, Barrow	-			
11-9	" " "	-			
11-16	Golden Eye, American	88			
11-16	" " "	190			
11-16	Golden Eye, Barrow	380			
11-20	" " "	17			
12-12	" " "				
12-12	" " "				
12-15	" " "				
12-15	" " "				
12-15	" " "				
12-15	" " "				
12-15	" " "				
10-25	Coot	49			
10-25	"	-			
11-16	"	5.5			
12-15	"				
12-15	Bufflehead				
12-15	"				

VIX. APPENDIX B

ATMOSPHERIC AND VEGETATION SAMPLE RESULTS

APPENDIX B
TABLE 1

AVERAGE RADIOACTIVE PARTICLE CONCENTRATIONS
AT SELECTED PACIFIC NORTHWEST LOCATIONS - 1961
Units of particles/m^3 of Filtered Air

Date	Richland, Washington	Spokane, Washington	Boise, Idaho	Hanford Project (200-W)	Klamath Falls, Oregon	Lewiston, Idaho	Walla Walla, Washington
1-3	0.0014	< 0.0016	0.0098	0.0056	< 0.0014	0.0027	< 0.0014
1-9		< 0.0016	< 0.0014	0.014	0.0029	< 0.0014	< 0.0014
1-16	0.0008	0.0014	0.047	0.0083			0.0014
1-23	0.0016	0.0014	0.0041	0.0041	0.0014	0.0007	0.0084
1-30	0.0014	0.0028	< 0.0012	0.0060		0.0014	0.0028
2-6	0.0014	0.0014	0.0049	< 0.0017	0.0007	0.0028	< 0.0014
2-13	< 0.0014	0.0014	0.0014	0.0029		0.0014	0.0014
2-20	0.0014	< 0.0014	0.0014	0.011		0.0028	< 0.0014
2-27	< 0.0014	< 0.0014	0.0016	0.0014	< 0.0005	< 0.0012	< 0.0014
3-6	< 0.0015	< 0.0014	< 0.0014	< 0.0014	0.0014	< 0.0017	< 0.0014
3-13	< 0.0014	< 0.0014	< 0.0014	0.0043	< 0.0016	< 0.0012	0.0014
3-20	< 0.0014	< 0.0014	< 0.0014	< 0.0014	< 0.0011	< 0.0016	< 0.0014
3-21	< 0.0014	< 0.0014	< 0.0014	0.0028		< 0.0013	< 0.0014
3-28	< 0.0014	< 0.0014	< 0.0014	0.007	< 0.0010	< 0.0011	0.0014
4-4	0.0014	< 0.0014	< 0.0014	0.0018	< 0.0012	< 0.0018	< 0.0014
4-11	0.0014		< 0.0014	0.0084	< 0.0003	< 0.0016	< 0.0014
4-18	0.0014	< 0.0014	< 0.0014	0.0028		< 0.0014	< 0.0014
4-25	< 0.0014	< 0.0014	< 0.0014	0.0014		< 0.0014	< 0.0014
5-2	< 0.0014	< 0.0007	0.0014	0.014		< 0.0016	< 0.0014
5-9	< 0.0014		0.0014	0.0041		0.0014	< 0.0014
5-16	< 0.0014	< 0.0014	< 0.0014	0.0084	< 0.0008	< 0.0014	0.0028
5-23	< 0.0012	< 0.0014	< 0.0008	0.0110		0.0015	< 0.0014
5-31	0.0016	< 0.0007	< 0.0014	0.0110	< 0.0038	< 0.0012	0.0028
6-6	0.0029		< 0.0014	0.0057	< 0.0007	< 0.0016	0.0014
6-13	0.0029	< 0.0014		0.0033		< 0.0014	0.0014
6-20	< 0.0014	< 0.0014	< 0.0014	0.018	< 0.0008	< 0.0015	< 0.0014
6-27	0.0011	0.0014	< 0.0017	0.0014		< 0.0014	0.0014
7-6	0.0041	< 0.0014	< 0.0013	0.0084		< 0.0013	0.0028
7-11	< 0.0014	< 0.0014	< 0.0014	0.0055	< 0.0007	< 0.0014	< 0.0014

No entry indicates no analysis made.

APPENDIX B
TABLE 1 (Continued)

AVERAGE RADIOACTIVE PARTICLE CONCENTRATIONS
AT SELECTED PACIFIC NORTHWEST LOCATIONS - 1961

Units of particles/m^3 of Filtered Air

Date	Richland, Washington	Spokane, Washington	Boise, Idaho	Hanford Project (200-W)	Klamath Falls, Oregon	Lewiston, Idaho	Walla Walla, Washington
7-18	0.0014	< 0.0014	< 0.0010	< 0.0014		0.0014	< 0.0014
7-25	0.0042	< 0.0013	0.0021	0.026	< 0.0007	0.0014	< 0.0014
8-1	< 0.0014	< 0.0015	< 0.0011	0.0033		< 0.0014	< 0.0014
8-8	0.0086	< 0.0014	< 0.0021	0.012	< 0.0007	< 0.0014	< 0.0014
8-15	< 0.0012	< 0.0014	< 0.0007	0.0041		< 0.0014	< 0.0014
8-23	< 0.0014	< 0.0014		< 0.0014	< 0.0009	< 0.0012	< 0.0014
8-30	< 0.0014		< 0.0014	0.0028		< 0.0016	0.0028
9-6	0.0095		0.063	0.078	0.0032	0.063	0.053
9-13	0.14	0.099	0.12	0.28	0.12	0.062	0.070
9-20	0.37	0.057	0.38		0.40	0.45	0.61
9-27	1.3	0.40				0.40	0.69
10-2	1.2	0.63					
10-6	0.86	0.37	0.42			0.48	0.45
10-13		0.078	0.29		0.79	0.26	0.45
10-20	0.70	0.12	0.49		0.41	0.30	0.31
10-28	0.46	0.066	0.74		2.2	0.37	0.32
11-4	0.81	0.37	1.3		1.7	0.43	0.61
11-11	0.52	0.19	0.72		0.56	0.62	0.49
11-18	0.54	0.21	0.45		0.65	0.55	0.21
11-25	0.48	0.23	0.58		0.66	0.38	
12-2	0.41	0.32	0.74		0.81		
12-9	0.57	0.15	0.38		1.3	0.43	0.34
12-16	0.41		0.56		0.29	0.40	0.29
12-23							

No entry indicates no analysis made.

APPENDIX B
TABLE 1 (Continued)

AVERAGE RADIOACTIVE PARTICLE CONCENTRATIONS
AT SELECTED PACIFIC NORTHWEST LOCATIONS - 1961

Units of particles/m^3 of Filtered Air

Date	Yakima, Washington	Pasco, Washington	Kennewick, Washington	Benton City, Washington	Seattle, Washington	Meacham, Oregon	Great Falls, Montana
8-15	< 0.0005	< 0.0012	< 0.0012		< 0.0014	< 0.0014	< 0.0014
8-23		0.0028	< 0.0014	< 0.0014	< 0.0014	< 0.0014	< 0.0014
8-30		< 0.0014	< 0.0014		< 0.0014	< 0.0014	< 0.0012
9-6	0.038	0.015	< 0.0032		< 0.011	0.0028	0.017
9-13	0.065	0.062	0.044	0.063	0.058	0.082	0.16
9-20	0.41	0.27	0.17	0.29	0.078	0.090	0.13
9-27	0.68	0.97	0.52	0.91	0.43	0.49	0.43
10-2		1.5	0.57	0.94	0.63	1.1	1.0
10-6	0.22				0.29	0.47	0.62
10-13		0.51	0.17	0.22	0.11	0.23	0.35
10-20	0.11	0.50	0.25	0.21	0.17	0.15	0.24
10-28	0.55	0.28	0.14	0.26	0.63	0.37	0.50
11-4	0.18	0.66	0.44	0.17	0.65	0.042	0.59
11-11		0.42	0.26	0.44	0.46	0.46	0.59
11-18		0.34	0.23	0.33	0.31	0.29	0.55
11-25	0.24	0.37	0.51	0.20	0.39	0.11	0.71
12-2	0.33	0.28	0.26	0.35	0.11	0.18	0.55
12-9	0.37	0.36	0.43	0.38	0.32	0.084	0.31
12-16	0.27	0.39	0.42		0.45		0.24
12-23							

No entry indicates no analysis made.

APPENDIX B
TABLE 1 (Continued)

AVERAGE RADIOACTIVE PARTICLE CONCENTRATIONS
AT SELECTED PACIFIC NORTHWEST LOCATIONS - 1961
Units of particles/m^3 of Filtered Air

Date	Yakima, Washington	Pasco, Washington	Kennewick, Washington	Benton City, Washington	Seattle, Washington	Meacham, Oregon	Great Falls, Montana
1-3		0.0014	0.0014	< 0.0016	< 0.0014	< 0.0014	< 0.0014
1-9		< 0.0015	< 0.0016	< 0.0016	0.0028	0.0028	< 0.0014
1-16	< 0.0007	< 0.0012	0.0037	< 0.0014	0.0014	0.0014	0.0028
1-23	< 0.0012	0.0014	0.0014	0.0014		0.0098	< 0.0290
1-30	0.0020	0.0014	0.0014	< 0.0014	0.0014	0.0014	
2-6	< 0.0014	< 0.0014	< 0.0014	0.0028	0.0028	0.0014	
2-13	< 0.0014	0.013	< 0.0014	0.0014	< 0.0014	< 0.0014	0.0025
2-20		0.0028	0.0042	0.0014	< 0.0014	0.0014	< 0.0014
2-27	< 0.0007	< 0.0014	0.0028	< 0.0014	< 0.0014	0.0014	< 0.0014
3-6	0.0014	< 0.0014	< 0.0014	< 0.0014	< 0.0014	< 0.0014	< 0.0014
3-13		< 0.0014	< 0.0014	< 0.0014	< 0.0014	< 0.0014	0.0014
3-20	0.0005	< 0.0014	< 0.0014	< 0.0014	< 0.0012	< 0.0014	< 0.0028
3-21	< 0.0014	< 0.0014	< 0.0014	< 0.0014	< 0.0014	< 0.0014	0.0014
3-28	< 0.0007	< 0.0014	< 0.0014	< 0.0014	< 0.0016	< 0.0014	< 0.0014
4-4		0.0014	< 0.0014	< 0.0014	< 0.0014	< 0.0014	< 0.0014
4-11	< 0.0007	< 0.0014	< 0.0014	< 0.0014	< 0.0014	< 0.0014	< 0.0014
4-18		< 0.0014	< 0.0014	< 0.0014	< 0.0014	< 0.0014	< 0.0014
4-25	< 0.0015	< 0.0014	< 0.0014	< 0.0014	< 0.0014	< 0.0014	< 0.0014
5-2	< 0.0013	< 0.0014	< 0.0014	< 0.0014	< 0.0011	< 0.0014	< 0.0014
5-9	0.0014	< 0.0014	< 0.0014	< 0.0014	0.0019	< 0.0013	< 0.0014
5-16	< 0.0004	< 0.0014	< 0.0014	0.0016	< 0.0011	< 0.0014	< 0.0014
5-23		< 0.0012	< 0.0012	< 0.0012	< 0.0016	0.0014	< 0.0014
5-31		< 0.0016	< 0.0016	< 0.0016	< 0.0016	< 0.0014	< 0.0014
6-6		< 0.0014	< 0.0014	< 0.0016	< 0.0014	0.0014	< 0.0014
6-13	< 0.0017	< 0.0014	< 0.0014	< 0.0014	< 0.0014	< 0.0014	< 0.0014
6-20	< 0.0004	0.0014	< 0.0014	< 0.0016		0.0014	0.0015
6-27		< 0.0011	0.0011	0.0011	0.0014	< 0.0014	< 0.0011
7-6	< 0.0002	< 0.0020	0.0039	< 0.0019	< 0.0015	< 0.0014	< 0.0017
7-11		< 0.0014	< 0.0014	< 0.0014	< 0.0014	< 0.0014	< 0.0016
7-18		0.0014	< 0.0014	< 0.0014	< 0.0014	< 0.0014	< 0.0014
7-25		0.0042	0.0014	< 0.0014	< 0.0014	< 0.0014	< 0.0014
8-1		0.0099	< 0.0014	0.0014	< 0.0014	< 0.0014	0.0028
8-8		< 0.0014	0.0028	0.0014	< 0.0014	< 0.0014	< 0.0014

No entry indicates no analysis made.

APPENDIX B
TABLE 2

AVERAGE BETA ACTIVITY ON FILTERS
FROM SELECTED PACIFIC NORTHWEST LOCATIONS - 1961

Units of 10^{-2} d/s per m^3 of Filtered Air

Date	Richland, Washington	Spokane, Washington	Boise, Idaho	Hanford Project (200-W)	Klamath Falls, Oregon	Lewiston, Idaho	Walla Walla, Washington
1-3	0.33	0.07	0.57	0.65	0.20	0.20	0.13
1-9		0.05	0.40	0.62	0.25	0.18	0.27
1-16	0.28	0.08	0.99	0.42			0.15
1-23	0.35	0.15	0.58	0.73	0.27	0.12	0.32
1-30	0.42	0.28	0.12	0.97		0.20	0.23
2-6	0.32	0.07	0.18	0.72	0.08	0.10	0.13
2-13	0.18	0.12	0.22	0.22		0.10	0.15
2-20	0.15	0.08	0.20	0.55		0.15	0.08
2-27	0.22	0.08	0.20	0.47	0.07	0.15	0.12
3-6	0.08	0.10	0.18	0.52	0.13	0.13	0.13
3-13	0.13	0.10	0.30	0.57	0.05	0.20	0.22
3-20	0.22	0.13	0.22	0.68	0.17	0.13	0.07
3-21	0.18	0.12	0.18	0.53		0.17	0.17
3-28	0.23	0.07	0.15	0.60	0.17	0.17	0.18
4-4	0.23	0.28	0.30	0.27	0.25	0.22	0.23
4-11	0.38		0.33	0.38	0.17	0.23	0.30
4-18	0.30	0.15	0.42	0.53		0.33	0.28
4-25	0.27	0.23	0.48	0.50		0.18	0.22
5-2	0.33	0.17	0.23	0.40		0.18	0.27
5-9	0.27		0.25	0.62		0.23	0.25
5-16	0.35	0.23	0.72	0.77	0.25	0.53	0.45
5-23	0.37	0.35	0.50	0.84		0.42	0.35
5-31	0.40	0.27	0.62	0.63	0.17	0.23	0.28
6-6	0.45		0.45	0.75	0.30	0.45	0.53
6-13	0.60	0.35		0.40		0.48	0.57
6-20	0.52	0.62	0.53	1.6	0.37	0.43	0.38
6-27	0.32	0.27	0.78	0.48		0.27	0.28

No entry indicates no analysis made.

APPENDIX B
TABLE 2 (Continued)

AVERAGE BETA ACTIVITY ON FILTERS
FROM SELECTED PACIFIC NORTHWEST LOCATIONS - 1961

Units of 10^{-2} d/s per m^3 of Filtered Air

Date	Richland, Washington	Spokane, Washington	Boise, Idaho	Hanford Project (200-W)	Klamath Falls, Oregon	Lewiston, Idaho	Walla Walla, Washington
7-6	0.47	0.42	0.37	0.62		0.30	0.38
7-11	0.33	0.18	0.47	0.73	0.30	0.35	0.32
7-18	0.37	0.23	0.35	0.50		0.33	0.35
7-25	0.47	0.30	0.40	0.78	0.15	0.38	0.43
8-1	0.25	0.40	0.18	0.38		0.23	0.32
8-8	0.37	0.30	0.17	0.38	0.10	0.18	0.27
8-15	0.25	0.13	0.15	1.1		0.17	0.18
8-23	0.20	0.23		0.38	0.10	0.17	0.13
8-30	0.18		0.12	0.58		0.15	3.8
9-6	1.3		3.0	4.8	0.12	2.5	3.3
9-13	3.9	1.8	6.3	4.9	6.2	3.5	2.6
9-20	9.8	1.7	6.3	9.6	6.2	3.5	2.6
9-27	8.9	1.3		11		19	18
10-2	23	7.4		14			
10-6	23	11	24	27		28	18
10-13	25	7.8	18	25	20	20	12
10-20	24	15	36	22	37	20	18
10-28	17	5.9	52	17	16	41	20
11-4	20	5.6	37	17	37	21	22
11-11	19	11	30	17	46	29	19
11-18	88	20	64	34	57	55	42
11-25	14	6.0	26	17	20	13	5.6
12-2	11	7.0	33	13	15	19	
12-9	9.3	5.0	28	9.0	20		
12-16	24	6.0	14	12	24	17	15
12-23	10		21	10	9.7	11	6.4
12-29	10	5.6	36	9.7	23	24	18

No entry indicates no analysis made.

APPENDIX B
TABLE 2 (Continued)

AVERAGE BETA ACTIVITY ON FILTERS
FROM SELECTED PACIFIC NORTHWEST LOCATIONS - 1961

Units of 10^{-2} d/s per m^3 of Filtered Air

Date	Yakima, Washington	Pasco, Washington	Kennewick, Washington	Benton City, Washington	Seattle, Washington	Meacham, Oregon	Great Falls, Montana
1-3		0.23	0.13	0.17	0.02	1.0	0.07
1-9		0.43	0.25	0.17	0.17	0.30	0.05
1-16	0.05	0.20	0.10	0.13	0.05	0.13	0.02
1-23	0.05	0.32	0.18	0.23		0.17	0.53
1-30	0.20	0.40	0.18	0.45	0.10	0.20	
2-6	0.17	0.25	0.15	0.22	0.03	0.10	
2-13	0.10	0.27	0.07	0.15	0.07	0.07	0.12
2-20		0.17	0.07	0.10	0.05	0.07	0.10
2-27	0.03	0.15	0.08	0.32	0.02	0.10	0.15
3-6	0.10	0.10	0.08	0.13	0.08	0.07	0.10
3-13		0.15	0.05	0.15	0.08	0.12	0.22
3-20	0.03	0.28	0.18	0.25	0.07	0.15	0.41
3-21	0.12	0.10	0.12	0.15	0.03	0.07	0.03
3-28	0.12	0.23	0.18	0.20	0.10	0.08	0.12
4-4		0.17	0.05	0.27	0.10	0.12	0.10
4-11	0.17	0.42	0.23	0.37	0.25	0.15	0.20
4-18		0.22	0.13	0.23	0.07	0.15	0.20
4-25	0.15	0.30	0.17	0.25	0.23	0.22	0.27
5-2	0.12	0.32	0.15	0.27	0.20	0.12	0.22
5-9	0.17	0.37	0.20	0.25	0.22	0.17	0.30
5-16	0.17	0.32	0.18	0.45	0.18	0.18	0.22
5-23		0.38	0.12	0.32	0.15	0.30	0.23
5-31		0.42	0.25	0.47	0.12	0.22	0.27
6-6		0.42	0.28	0.23	0.18	0.25	0.40
6-13	0.30	0.63	0.32	0.53	0.28	0.35	0.35
6-20	0.15	0.55	0.30	0.50		0.40	0.40
6-27		0.22	0.13	0.23	0.07	0.20	0.13

No entry indicates no analysis made.

APPENDIX B
TABLE 2 (Continued)

AVERAGE BETA ACTIVITY ON FILTERS
FROM SELECTED PACIFIC NORTHWEST LOCATIONS - 1961
Units of 10^{-2} d/s per m^3 of Filtered Air

Date	Yakima, Washington	Pasco, Washington	Kennewick, Washington	Benton City, Washington	Seattle, Washington	Meacham, Oregon	Great Falls, Montana
7-6	0.13	0.52	0.32	0.60	0.07	0.20	0.28
7-11		0.33	0.18	0.27	0.13	0.22	0.23
7-18		0.40	0.23	0.35	0.13	0.25	0.23
7-25		0.45	0.30	0.37	0.10	0.25	0.22
8-1		0.60	0.13	0.20	0.17	0.23	0.20
8-8		0.43	0.25	0.32	0.12	0.28	0.45
8-15	0.08	0.25	0.13		0.07	0.08	0.20
8-23		0.27	0.05	0.17	0.13	0.20	0.20
8-30		0.17	0.12	0.17	0.05	0.07	0.10
9-6	1.3	2.0	0.38		2.0	0.37	0.73
9-13	4.2	1.9	1.1	3.8	1.9	1.4	5.4
9-20	4.2			3.0	1.9	1.4	5.4
9-27	12	7.5	4.0	9.4	1.9	2.3	3.6
10-2		43	25	23	10	16	17
10-6	15				18	21	23
10-13		17	8.9	20	7.0	17	13
10-20	8.9	13	5.0	16	10	18	18
10-28	8.5	15	9.9		9.6	17	16
11-4	14	14	15	11	8.6	16	23
11-11		18	15	20	25	22	57
11-18	8.9	24	23	37	34	19	14
11-25		10	7.8	13	10	11	19
12-2	6.6	9.7	8.3	13	9.5	15	16
12-9	10	8.4	9.1	9.5	9.4	9.7	17
12-16	7.2	12	9.6	12	8.8	6.1	21
12-23	5.0	9.7	9.4	9.4	7.6		18
12-29	7.1	15	12	13	7.7	11	20

No entry indicates no analysis made.

APPENDIX B
TABLE 3

ATMOSPHERIC CONCENTRATIONS OF I^{131}
AT PERIMETER COMMUNITIES - 1961

Units of 10^{-14} µc/cc of Air

Date	Richland, Washington	North Richland, Washington	Benton City, Washington	Pasco, Washington
1-3	0.4	1.7	2.4	5.5
1-9	5.9	7.5	7.1	4.2
1-16	1.6	2.6	2.1	0.7
1-24	3.2	4.9	6.1	1.0
1-31	3.9	6.6	7.7	4.4
2-7	1.4	3.9	4.4	1.7
2-13	1.1	2.1	2.7	2.9
2-21	2.0		0.3	3.2
2-28	0.4	0.9	0.5	2.8
3-7	0.4	0.2	< 0.2	2.2
3-14	0.6	1.1	1.3	1.4
3-21	3.8	1.6	3.9	1.8
3-28	1.8	3.2		2.8
4-4	2.1	3.8	1.8	3.7
4-11	0.9	1.0	1.9	0.3
4-18	0.8	1.0	0.6	0.5
4-25	1.0	2.6	0.3	< 0.4
5-2	< 0.6	1.2	0.4	0.6
5-9	< 0.1	0.5	< 1.4	1.0
5-16	0.1	0.4	0.3	< 0.1
5-23	0.8	1.1		< 0.1
5-31	0.4	0.9	1.0	< 0.1
6-6	2.2		2.7	2.0
6-13	1.6	1.3	< 0.2	1.8
6-20	1.1	2.0	0.4	0.6
6-27	0.6	0.6	0.4	0.6
7-6	0.8	0.2	< 0.3	< 0.3
7-11	< 0.6	0.3	0.4	2.0
7-18	0.6	1.6	0.4	1.0
7-25	1.1	0.6	0.4	1.3
8-1	1.3	1.3	2.0	0.7
8-8	1.4	3.3	2.9	0.8
8-15	0.5	3.0	0.3	1.7
8-23	3.4	1.8	16	1.3
8-30	0.8	1.3		1.1

No entry indicates no analysis made.

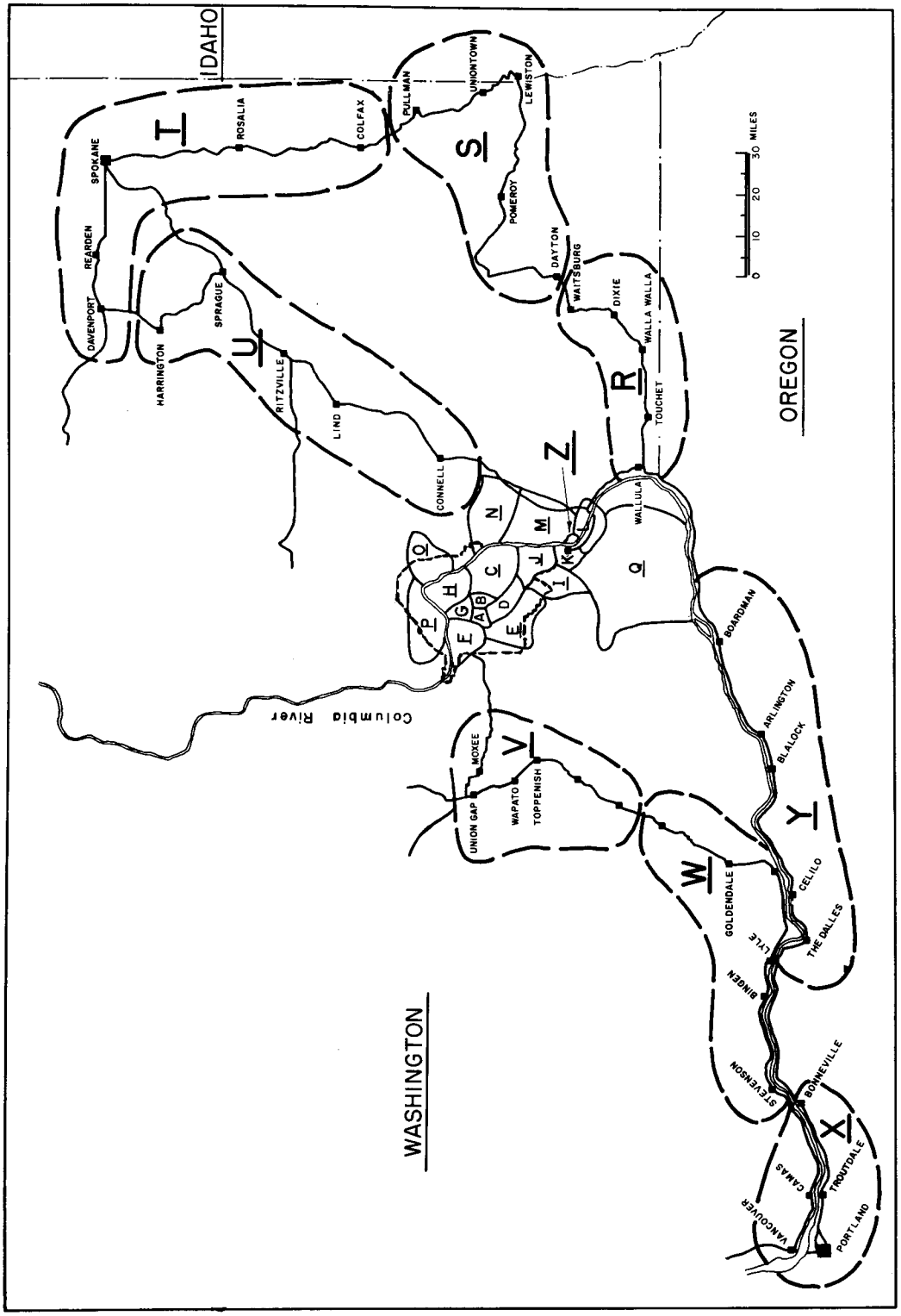
APPENDIX B
TABLE 3 (Continued)

ATMOSPHERIC CONCENTRATIONS OF I^{131}
AT PERIMETER COMMUNITIES - 1961

Units of 10^{-14} μc/cc of Air

Date	Richland, Washington	North Richland, Washington	Benton City, Washington	Pasco, Washington
9-6	0.2	< 0.6	0.6	1.0
9-12	0.5	1.3	0.6	< 0.2
9-20	1.8	1.8	0.9	2.8
9-27	1.3	1.8	2.0	6.1
10-2	5.1	10	5.7	10
10-9	6.1	20	2.9	21
10-16	4.9	8.7	3.6	15
10-24	11	2.9	2.9	19
10-31	9.4	12	2.3	4.7
11-7	8.4	18		
11-14	5.5	18	4.4	
11-21	2.4	28	4.9	4.3
11-28	2.3	12	1.4	6.9
12-5	6.1	5.6	0.7	3.2
12-12	4.9	6.5	0.7	11
12-19	0.8	5.5	0.3	11
12-26	3.3	6.0	0.9	12

No entry indicates no analysis made.



Reference Locations for Vegetation Sampling Zones Indicated in Tables IV Through X

APPENDIX B
TABLE 4

CONCENTRATIONS OF SELECTED RADIONUCLIDES ON NATIVE GRASSES
BENTON CITY, WASHINGTON AND VICINITY, ZONE I - 1961

Units of 10^{-6} μc/g of Vegetation

Date	Ba^{140}-La^{140}	Zr^{95}-Nb^{95}	Ru^{103}+Ru^{106}	I^{131}	Ce^{141}+Ce^{144}
Reporting Limits*	2.0	2.0	2.0	1.5	5.0
1-19	-	-	-	-	-
2-2	-	-	8.5	2.1	-
2-22	-	-	-	-	-
3-2	-	-	-	-	-
3-16	-	-	-	-	5.3
3-30	-	-	-	-	-
4-13	-	-	-	-	-
4-27	-	-	-	-	-
5-11	-	-	-	-	-
5-25	-	-	-	-	-
6-8	-	-	2.1	-	-
6-22	-	-	-	-	7.8
7-6	-	-	-	-	-
7-20	-	-	-	-	-
8-3	-	-	-	-	-
8-17	-	-	-	-	-
8-31	-	-	-	-	-
9-14	-	-	-	-	8.5
9-28	10	9.0	26	2.2	52
10-12	44	75	83	8.2	310
10-26	130	130	200	35	1,100
11-9	57	120	180	9.4	490
12-7	44	280	78	-	510
12-21	19	220	64	-	380

*Analytical results below reporting limits are indicated by a (-).

APPENDIX B
TABLE 5

CONCENTRATIONS OF SELECTED RADIONUCLIDES ON NATIVE GRASSES
RICHLAND, WASHINGTON AND VICINITY, ZONE K - 1961

Units of 10^{-6} μc/g of Vegetation

Date	Ba^{140}-La^{140}	Zr^{95}-Nb^{95}	Ru^{103}+Ru^{106}	I^{131}	Ce^{141}+Ce^{144}
Reporting Limits*	2.0	2.0	2.0	1.5	5.0
1-5	-	-	-	2.3	7.4
1-19	-	-	-	-	-
2-2	-	-	-	-	-
3-2	-	-	-	-	-
3-16	-	-	-	-	-
3-30	-	-	-	-	-
4-13	-	-	-	-	-
4-27	-	-	-	-	-
5-11	-	-	-	-	-
5-25	-	-	-	-	-
6-8	-	-	2.7	-	-
6-22	-	-	-	-	-
7-6	-	-	2.3	-	-
7-20	-	-	-	-	-
8-3	-	-	-	-	-
8-17	-	-	-	-	-
8-31	-	-	-	-	-
9-14	-	-	-	-	-
9-28	5.4	3.0	10	1.5	40
10-12	43	55	74	10	360
10-26	77	90	110	19	530
11-9	60	96	150	7.5	270
12-7	31	170	85	-	350
12-21	41	260	61	-	480

*Analytical results below reporting limits are indicated by a (-).

APPENDIX B
TABLE 6

CONCENTRATIONS OF SELECTED RADIONUCLIDES ON NATIVE GRASSES
KENNEWICK, WASHINGTON AND VICINITY, ZONE L - 1961

Units of 10^{-6} μc/g of Vegetation

Date	Ba^{140}-La^{140}	Zr^{95}-Nb^{95}	Ru^{103}+Ru^{106}	I^{131}	Ce^{141}+Ce^{144}
Reporting Limits*	2.0	2.0	2.0	1.5	5.0
1-4	-	-	-	-	-
1-23	-	-	-	-	-
2-20	-	-	-	-	-
3-6	-	-	-	-	-
3-20	-	-	-	-	-
4-3	-	-	-	-	-
4-17	-	-	-	-	-
5-1	-	-	-	-	-
5-15	-	-	-	-	-
5-29	-	-	-	-	-
6-12	-	-	-	-	-
6-26	-	-	-	-	-
7-10	-	-	2.9	-	5.5
7-24	-	-	-	-	-
8-7	-	-	-	-	6.2
8-21	-	-	-	-	-
9-5	-	-	-	-	-
9-18	-	-	-	-	-
10-2	7.4	8.9	16	1.9	77
10-16	15	11	35	2.9	100
10-30	52	51	110	14	540
11-13	42	57	57	6.6	240
11-27	46	131	61	6.2	340
12-11	31	160	89	-	380

*Analytical results below reporting limits are indicated by a (-).

APPENDIX B
TABLE 7

CONCENTRATIONS OF SELECTED RADIONUCLIDES ON NATIVE GRASSES
PASCO TO ELTOPIA, WASHINGTON, ZONE M - 1961

Units of 10^{-6} μc/g of Vegetation

Date	Ba^{140}-La^{140}	Zr^{95}-Nb^{95}	Ru^{103}+Ru^{106}	I^{131}	Ce^{141}+Ce^{144}
Reporting Limits*	2.0	2.0	2.0	1.5	5.0
1-4	-	-	-	1.8	6.7
1-23	-	-	-	2.7	-
2-20	-	-	2.0	-	-
3-6	-	-	-	-	-
3-20	-	-	-	-	-
4-3	-	-	-	-	-
4-17	-	-	-	-	-
5-1	-	-	-	-	-
5-15	-	-	2.1	-	-
5-29	-	-	-	-	-
6-12	-	-	-	-	-
6-26	-	-	-	-	-
7-10	-	-	-	-	-
7-24	-	-	-	-	-
8-7	-	-	-	-	-
8-21	-	-	-	-	-
9-5	-	2.2	-	-	-
9-18	-	-	-	-	6.1
10-2	13	12	19	2.5	89
10-16	29	26	54	5.8	220
10-30	96	120	170	23	480
11-13	110	170	170	20	710
11-27	64	210	87	3.2	510
12-11	26	160	84	-	330

*Analytical results below reporting limits are indicated by a (-).

APPENDIX B
TABLE 8

CONCENTRATIONS OF SELECTED RADIONUCLIDES ON NATIVE GRASSES
MESA, WASHINGTON AND VICINITY, ZONE N - 1961

Units of 10^{-6} μc/g of Vegetation

Date	Ba^{140}-La^{140}	Zr^{95}-Nb^{95}	Ru^{103}+Ru^{106}	I^{131}	Ce^{141}+Ce^{144}
Reporting Limits*	2.0	2.0	2.0	1.5	5.0
1-4	-	-	2.0	-	-
1-23	-	-	-	-	-
2-20	-	-	-	-	-
3-6	-	-	-	-	-
3-20	-	-	-	-	-
4-3	-	-	-	-	-
4-17	-	-	-	-	-
5-1	-	-	-	-	-
5-15	-	-	-	-	-
5-29	-	-	-	-	-
6-12	5.6	-	-	-	-
6-26	-	-	-	-	-
7-10	-	-	2.8	-	-
7-24	-	-	-	-	-
8-7	-	-	-	-	-
8-21	-	-	-	-	-
9-5	-	-	-	-	-
9-18	-	-	-	-	9.9
10-2	13	11	26	4.2	120
10-16	41	98	72	7.3	380
10-30	120	98	230	25	1,100
11-13	78	130	130	13	530
11-27	29	120	47	4.2	310
12-11	25	190	62	-	290

*Analytical results below reporting limits are indicated by a (-).

APPENDIX B
TABLE 9

CONCENTRATIONS OF SELECTED RADIONUCLIDES ON NATIVE GRASSES
WAHLUKE SLOPE EAST, ZONE 0 - 1961

Units of 10^{-6} μc/g of Vegetation

Date	Ba^{140}-La^{140}	Zr^{95}-Nb^{95}	Ru^{103}+Ru^{106}	I^{131}	Ce^{141}+Ce^{144}
Reporting Limits*	2.0	2.0	2.0	1.5	5.0
1-9	-	-	6.9	1.9	25
1-30	-	-	2.6	-	-
2-27	-	-	-	-	-
3-13	-	-	-	-	-
3-27	-	-	-	-	-
4-10	-	-	-	-	-
4-24	-	-	-	-	-
5-8	-	-	-	-	-
5-24	-	-	-	-	-
6-5	-	-	-	-	-
6-19	-	-	2.2	1.9	-
7-17	-	-	-	-	-
7-31	-	-	2.8	-	-
8-14	-	-	2.3	-	-
8-28	-	-	3.4	-	6.4
9-11	-	2.9	4.0	-	9.4
9-25	13	10	25	3.2	65
10-9	35	53	78	7.7	240
10-23	89	93	160	25	750
11-6	94	160	160	15	620
11-20	96	260	190	8.2	640
12-4	48	200	120	5.2	610
12-18	40	370	120	-	780

*Analytical results below reporting limits are indicated by a (-).

APPENDIX B
TABLE 10

CONCENTRATIONS OF SELECTED RADIONUCLIDES ON NATIVE GRASSES
WAHLUKE SLOPE WEST, ZONE P - 1961

Units of 10^{-6} μc/g of Vegetation

Date	Ba^{140}-La^{140}	Zr^{95}-Nb^{95}	Ru^{103}+Ru^{106}	I^{131}	Ce^{141}+Ce^{144}
Reporting Limits*	2.0	2.0	2.0	1.5	5.0
1-9	-	-	-	-	6.0
1-30	-	-	2.8	-	-
2-27	-	-	-	-	-
3-13	-	-	-	-	-
3-27	-	-	-	-	5.7
4-10	-	-	-	-	-
4-24	-	-	-	-	-
5-8	-	-	-	-	-
5-22	-	-	-	-	-
6-5	-	-	-	-	-
6-19	-	-	-	-	-
7-17	-	-	-	-	6.6
7-31	-	-	-	-	-
8-14	-	-	-	2.2	-
8-28	-	-	-	-	-
9-11	2.4	3.2	4.3	-	59
9-25	8.1	9.5	7.8	1.9	47
10-9	52	44	110	7.9	270
10-23	54	120	170	11	500
11-6	79	180	140	12	650
11-20	110	350	250	15	1,200
12-4	57	280	130	3.1	770
12-18	29	300	950	-	470

*Analytical results below reporting limits are indicated by a (-).

APPENDIX B
TABLE 11

QUANTITY OF I^{131} RELEASED FROM THE SEPARATIONS AREAS' PROCESS STACKS - 1961

Month	Average curies/day
January	0.79
February	0.46
March	0.81
April	0.66
May	0.79
June	0.91
July	0.60
August	0.96
September	0.79
October	0.79
November	0.63
December	0.23

APPENDIX B
TABLE 12

I^{131} IN BEEF CATTLE THYROIDS FROM CATTLE SLAUGHTERED AT PASCO, WASHINGTON - 1961

Units of 10^{-6} μc/g of Thyroids

Date Sampled	Thyroid Wt (g)	μc I^{131} Concentration
1-5	23.7	1.6
1-5	25.4	16
1-5	20.3	7.1
1-5	30.2	6.7
1-19	28.84	18
1-19	27.55	16
1-19	17.91	42
1-19	20.56	1.3
1-19	23.33	14
2-2	17.5	16
2-2	26.2	76
2-2	42.7	14
2-2	26.6	45
2-2	25.3	3.1
2-16	45.5	3.4
2-16	33.9	6.1
2-16	25.6	12
2-16	22.9	8.2
2-16	39.9	21
3-2	27.98	5.6
3-2	24.38	13
3-16	59.95	2.3
3-16	25.71	6.8
3-16	35.49	2.3
3-16	38.12	1.6
3-16	46.11	1.6
3-31	26.60	3.3
3-31	31.38	2.6
3-31	23.91	6.9
3-31	34.67	16
3-31	25.38	7.5
4-13	32.80	8.7
4-13	24.73	88
4-13	41.56	200
4-13	29.51	38
4-13	42.54	0.12
4-28	41.56	16
4-28	23.59	0.48
4-28	36.33	5.0
4-28	43.41	0.61
4-28	50.29	19
5-11	75.98	15
5-11	75.98	15
5-11	49.45	3.1
5-11	37.23	1.5
5-11	21.58	1.7

APPENDIX B
TABLE 12 (Continued)

I^{131} IN BEEF CATTLE THYROIDS FROM
CATTLE SLAUGHTERED AT PASCO, WASHINGTON - 1961

Units of 10^{-6} μc/g of Thyroids

Date Sampled	Thyroid Wt (g)	μc I^{131} Concentration
5-11	19.64	2.2
5-25	27.45	5.7
5-25	24.51	1.8
5-25	30.82	0.24
5-25	34.53	2.2
5-25	26.22	1.7
7-6	40.25	3.2
7-6	32.29	1.5
7-6	40.70	4.1
7-6	16.41	3.9
7-6	51.16	18
8-3	39.25	2.3
8-3	46.15	8.5
8-3	37.89	3.1
8-3	56.25	4.0
8-3	23.30	0.77
8-28	31.84	1.5
8-28	26.23	5.1
8-28	24.05	5.1
8-28	26.30	1.2
8-28	21.15	10
10-12	37.61	0.11
10-12	22.75	3.1
10-12	62.50	1.9
10-12	38.40	0.24
10-12	45.85	6.0
10-26	95.54	360
10-26	47.12	22
10-26	44.03	1100
10-26	48.34	17
10-26	34.16	710
12-14	33.58	32
12-14	47.90	24
12-14	50.82	13
12-14	46.65	41
12-19	26.0	2.8
12-19	36.0	4.0
12-19	29.0	98
12-19	26.0	91
12-19	29.0	420
12-19	28.0	140
12-19	26.0	1300
12-19	43.0	14
12-26	70.0	240
12-26	61.0	120
12-26	57.0	46

APPENDIX B
TABLE 12 (Continued)

I^{131} IN BEEF CATTLE THYROIDS FROM
CATTLE SLAUGHTERED AT PASCO, WASHINGTON - 1961

Units of 10^{-6} μc/g of Thyroids

Date Sampled	Thyroid Wt (g)	μc I^{131} Concentration
12-27	55.0	13
12-28	39.0	29
12-28	51.0	24
12-28	54.0	620
12-28	69.0	61
12-29	16.0	57
12-29	29.0	67
12-29	29.0	41
12-29	41.0	150
12-29	30.0	440
12-29	27.0	48
12-29	17.0	65
12-30	57.0	0.59
12-30	52.0	26
12-30	66.0	59
12-30	42.0	66
12-30	59.0	320

XX. APPENDIX C

FARM PRODUCE AND COMMERCIAL FOODSTUFF RESULTS

APPENDIX C
TABLE 1

CONCENTRATIONS OF SEVERAL RADIONUCLIDES IN MILK
PURCHASED FROM PRODUCERS AT SELECTED LOCATIONS - 1961

Units of 10^{-6} μc/g

Date	K^{40}	Zn^{65}	Cs^{137}	I^{131}	P^{32}	Sr^{90}
Reporting Limits*	0.3	0.08	0.03	0.05	0.1	0.002
Ringold						
1-10	2.0	0.56	-	-	0.71	0.0021
1-17	1.8	0.56	0.15	0.061	1.4	-
1-27	1.6	0.49	-	-	0.54	-
2-1	1.8	0.63	-	-	0.67	-
2-14	1.2	0.56	-	-	0.49	-
2-22	1.4	0.59	-	-	0.45	0.0026
2-28	1.7	0.54	-	-	0.54	-
3-7	2.0	0.57	-	-	0.50	-
3-16	1.5	0.58	-	-	0.37	-
3-21	1.3	0.61	-	-	0.46	0.0022
3-28	1.4	0.58	-	-	0.39	0.0026
4-5	1.3	-	0.034	-	0.33	0.0041
4-13	1.5	0.54	-	-	0.30	-
4-18	1.0	0.55	-	-	0.19	0.0024
4-25	1.2	0.46	-	0.079	0.31	
5-2	1.4	0.51	-	-	0.22	
5-11	1.4	0.76	-	0.082	0.46	
5-16	1.2	0.72	-	0.051	0.57	0.0022
5-23	1.5	0.80	-	-	0.59	
6-2	1.7	0.96	-	-	0.44	
6-6	2.0	1.0	0.045	0.054	0.31	
6-13	1.8	0.82	-	0.12	0.34	
6-21	1.7	0.56	-	-	0.31	0.0046
7-18	1.0	0.52	-	-	0.34	-
8-2	1.5	0.60	-	-	0.59	
9-6	1.1	0.65	-	-	0.22	-
9-12	1.4	0.63	-	-	1.4	
9-19	1.6	0.89	-	0.098	1.7	
9-26	1.4	0.18	-	0.054	1.6	
10-3	1.4	0.91	-	0.22	1.5	
10-9	1.7	0.82	-	(0.27)	0.17	0.0022
10-17	1.6	0.84	-	(0.34)	1.5	
10-23	1.7	0.71	-	(0.40)	1.2	
10-27	1.7	1.1	-	0.23	2.2	
10-31	1.6	0.76	-	(0.68)	0.64	
11-16	1.4	0.66	-	0.068	0.53	
11-20	1.7	0.68	-	-	0.28	

* Results less than the reporting limit are indicated by a (-).
- No entry indicates no analysis made.
I^{131} results in parenthesis have a reporting limit of 0.001 x 10^{-6} μc/g.

APPENDIX C
TABLE 1 (Continued)

CONCENTRATIONS OF SEVERAL RADIONUCLIDES IN MILK
PURCHASED FROM PRODUCERS AT SELECTED LOCATIONS - 1961

Units of 10^{-6} μc/g

Date	K^{40}	Zn^{65}	Cs^{137}	I^{131}	P^{32}	Sr^{90}
Reporting Limits*	0.3	0.08	0.03	0.05	0.1	0.002
Ringold (Continued)						
11-28	2.0	0.65	-	-	0.26	
12-6	1.4	0.48	-	-	0.45	-
12-12	1.0	0.63	-	(0.013)	0.38	
12-20	1.9	0.69	-	-	0.27	
12-28	2.2	0.80	-	-	0.36	
Riverview Irrigation District						
1-4	1.5	0.22	-	-	-	0.0025
1-17	1.2	0.25	0.032	-	0.11	0.0034
1-27	1.4	0.16	-	-	0.14	0.0022
2-1	1.2	0.18	-	-	-	0.0029
2-14	1.3	0.12	0.031	-	-	0.0030
3-1	1.5	0.13	-	-	-	0.0031
3-7	1.4	0.14	-	-	-	0.0037
3-16	1.3	0.16	-	-	-	0.0039
3-21	1.2	0.15	-	-	-	0.0022
3-28	1.3	0.14	-	-	-	
4-4	1.8	0.11	-	-	-	
4-13	1.4	0.10	-	-	-	0.0025
4-18	1.2	0.11	-	0.12	-	-
4-25	1.4	0.082	-	-	-	0.0039
5-2	1.7	0.099	-	-	-	
5-10	1.8	0.14	0.040	0.097	0.45	
5-16	1.4	0.62	-	-	1.2	0.0029
5-24	1.6	-	-	-	1.4	
6-2	2.0	0.86	-	-	0.92	
6-6	2.0	0.76	0.046	-	0.67	
6-13	1.8	0.72	-	0.067	0.55	
6-21	1.7	0.55	-	-	0.42	0.0058
8-2	1.4	0.66	-	-	1.5	
8-15	1.5	0.67	-	-	0.75	0.0041
9-6	1.0	0.46	-	-	0.91	0.0033
9-19	1.4	0.75	-	-	0.95	
9-26	2.2	0.74	-	0.14	2.1	

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.
I^{131} results in parenthesis have a reporting limit of 0.001 x 10^{-6} μc/g.

APPENDIX C
TABLE 1 (Continued)

CONCENTRATIONS OF SEVERAL RADIONUCLIDES IN MILK
PURCHASED FROM PRODUCERS AT SELECTED LOCATIONS - 1961

Units of 10^{-6} μc/g

Date	K^{40}	Zn^{65}	Cs^{137}	I^{131}	P^{32}	Sr^{90}
Reporting Limits*	0.3	0.08	0.03	0.05	0.1	0.002
Riverview Irrigation District (Continued)						
10-3	1.5	0.73	-	-	1.4	
10-9	2.0	0.45	0.078	(0.012)	0.40	-
10-17	1.8	0.54	-	(0.039)	2.3	
10-31	1.8	1.1	-	(0.18)	1.7	
11-7	1.3	1.4	-	(0.12)	1.3	0.0046
11-15	1.5	1.4	-	(0.12)	0.73	
11-21	1.8	1.3	-	(0.082)	0.44	
11-28	1.7	1.3	-	(0.070)	0.44	
12-5	1.6	1.2	-	(0.013)	0.19	0.0051
12-12	1.5	0.79	-	(0.012)	-	
12-18	1.6	0.61	-	(0.011)	-	
12-26	1.6	0.37	-	(0.001)	-	
Benton City						
Farm 2						
1-17	1.3	-	0.035	-	-	0.0029
2-22	1.0	-	-	-	-	-
3-10	1.2	-	-	-	-	0.0020
4-6	1.5	-	-	-	-	0.0025
4-25	1.6	-	-	-	-	
5-2	1.4	-	-	-		
5-10	1.6	-	-	0.059		
5-16	1.6	-	-	-	-	0.0026
5-24	1.8	-	-	-	-	
5-31	1.9	-	0.040	-	-	
6-6	2.1	-	0.081	-	-	
6-13	1.9	-	0.039	0.050		
6-21	1.9	-	-	-	-	0.0032
7-6	1.5	-	-	-		
7-19	1.3	-	-	-	0.29	-
8-2	1.5	-	-	-	0.21	
8-15	1.2	-	-	-	-	0.0065
9-12	1.7	-	-	-	-	
9-19	1.5	-	-	-	-	
9-26	1.2	-	-	-	0.12	

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.
I^{131} results in parenthesis have a reporting limit of 0.001 x 10^{-6} μc/g.

APPENDIX C
TABLE 1 (Continued)

CONCENTRATIONS OF SEVERAL RADIONUCLIDES IN MILK
PURCHASED FROM PRODUCERS AT SELECTED LOCATIONS - 1961

Units of 10^{-6} μc/g

Date	K^{40}	Zn^{65}	Cs^{137}	I^{131}	P^{32}	Sr^{90}
Reporting Limits*	0.3	0.08	0.03	0.05	0.1	0.002
Benton City (Continued)						
Farm 2						
10-3	1.5	-	-	-	-	
10-9	1.4	-	0.045	-	-	0.0042
10-13				(0.13)		
10-17	1.7	-	0.040	0.27	-	
10-26	1.7	-	-	0.12	-	
11-2	1.1	-	-	1.5	-	
11-14	1.8	-	-	0.60	-	
Farm 3						
10-27	1.7	-	-	(0.26)	-	
11-2	1.1	-	-	(0.007)	-	
11-8	1.7	-	-	(0.020)	-	0.0032
11-14	1.8	-	-	(0.021)	-	
11-22				(0.017)		
11-29				(0.023)		
12-7	1.5	-	-	(0.020)	-	-
12-13				(0.025)		
12-20				(0.001)		
12-28				(0.004)		
Local Purchase - Commercial Milk						
Brand A						
1-17	1.4	-	0.056	-	-	0.0031
2-22	1.2	-	-	-	-	0.0030
3-16	1.1	-	-	-	-	0.0035
4-6	1.5	-	-	-	-	-
10-10	1.5	-	-	-	-	
11-10	0.64	-	-	(0.083)	-	0.0042
11-14				(0.017)		
11-16				(0.051)		
11-27				(0.007)		
12-4	1.5	-	-	(0.021	-	0.0033
12-11				(0.012)		
12-19				(0.014)		
12-26				(0.002)		

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.
I^{131} results in parenthesis have a reporting limit of 0.001 x 10^{-6} μc/g.

APPENDIX C
TABLE 1 (Continued)

CONCENTRATIONS OF SEVERAL RADIONUCLIDES IN MILK
PURCHASED FROM PRODUCERS AT SELECTED LOCATIONS - 1961

Units of 10^{-6} μc/g

Date	K^{40}	Zn^{65}	Cs^{137}	I^{131}	P^{32}	Sr^{90}
Reporting Limits*	0.3	0.08	0.03	0.05	0.1	0.002
Local Purchase - Commercial Milk (Continued)						
Ardens						
11-10	0.67	-	-	(0.069)	-	0.0030
11-16				(0.033)		
11-20				(0.007)		
11-14				(0.017)		
Brand F						
1-17	1.3	-	0.063	-	-	0.0031
2-22	0.99	-	-	-	-	0.0020
3-10	1.2	-	-	-	-	0.0032
4-4	1.3	-	-	-	-	0.0038
10-10	1.4	-	0.033	(0.027)	0.27	
11-8	1.7	-	-	(0.044)	-	0.0024
11-13				(0.035)		
11-20				(0.030)		
12-4	1.8	-	-	-	-	-
Brand G						
2-22	1.1	-	-	-	-	-
3-14	1.3	-	-	-	-	0.0049
4-4	1.3	-	-	-	-	
10-10	1.6	-	-	0.051	0.20	0.0021
11-9	0.30	-	-	(0.17)	-	0.0026
11-13				(0.038)		
Brand H						
1-17	1.3	-	0.076	-	-	0.0046
2-22	1.3	-	-	-	-	0.0055
3-10	1.1	-	0.044	-	-	0.0081
4-4	1.3	-	-	-	-	
10-11	5.3	-	0.19	0.84	0.11	
11-21	1.6	-	-	-		
11-30	1.7	-	0.039	-	-	
12-6	1.6	-	-	-	0.41	0.0082
12-11	1.6	-	0.039	-		

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.
I^{131} results in parenthesis have a reporting limit of 0.001 x 10^{-6} μc/g.

APPENDIX C
TABLE 1 (Continued)

CONCENTRATIONS OF SEVERAL RADIONUCLIDES IN MILK
PURCHASED FROM PRODUCERS AT SELECTED LOCATIONS - 1961

Units of 10^{-6} μc/g

Date	K^{40}	Zn^{65}	Cs^{137}	I^{131}	P^{32}	Sr^{90}
Reporting Limits*	0.3	0.08	0.03	0.05	0.1	0.002
Local Purchase - Commercial Milk (Continued)						
Brand H						
12-19	1.5	-	0.031	-		
12-26	1.7	-	0.046	-		
Blossom Time						
10-11	1.3	-	-	0.094	-	
11-8	1.6	-	0.034	(0.13)	-	0.011

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.
I^{131} results in parenthesis have a reporting limit of 0.001 x 10^{-6} μc/g.

APPENDIX C
TABLE 2

CONCENTRATIONS OF SEVERAL RADIONUCLIDES IN ALFALFA
FROM THE RIVERVIEW IRRIGATION DISTRICT - 1961

Units of 10^{-6} μc/g of Alfalfa

Date	Sc^{46}	K^{40}	Zn^{65}	Zr^{95} -Nb^{95}	Cs^{137}	Ru^{103} +Ru^{106}	I^{131}	Cr^{51}	Ce^{144} -Pr^{144}	P^{32}	Sr^{89}	Sr^{90}
Reporting Limits*	0.05	0.3	0.08	0.05	0.03	0.5	0.05	0.5	0.5	0.1	0.004	0.002
5-3	-	6.6	0.57	-	0.054	-	-	4.2	0.77	0.67		
5-15	-	5.0	0.14	-	0.063	-	0.068	-	-	0.75	0.0081	0.084
7-6	-	8.7	0.54	-	-	-	-	-	-	0.19		
7-19	-	8.8	0.09	-	-	-	-	-	-	-	0.0075	0.048
8-15	0.25	5.6	3.9	-	-	-	-	22	-	7.4	0.010	-
9-6	0.051	5.2	0.23	0.16	-	-	-	-	-	0.59	-	0.0029
9-26	0.83	15	-	5.2	-	12	1.1	-	12	0.85		

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX C
TABLE 3

CONCENTRATIONS OF SEVERAL RADIONUCLIDES IN FARM PRODUCE PURCHASED FROM GROWERS AT SELECTED LOCATIONS - 1961

Units of 10^{-6} μc/g of Vegetable

Date	Crop	Sc^{46}	K^{40}	Zn^{65}	Zr^{95} -Nb^{95}	Cs^{137}	Ru^{103} +Ru^{106}	I^{131}	Cr^{51}	Ce^{141} +Ce^{144}	P^{32}	Sr^{89}	Sr^{90}
Reporting Limits*		0.05	0.3	0.08	0.05	0.03	0.5	0.05	0.5	0.5	0.1	0.004	0.002
Ringold													
7-6	Apricots	-	5.8	-	-	-	-	-	1.2	-	-	-	0.0062
7-6	Apples	-	1.1	-	-	-	-	-	-	-	-	-	0.0022
7-6	Beets	-	6.7	-	-	-	-	-	-	-	-	-	0.0039
7-6	Apricots	-	3.9	-	-	-	-	-	-	-	-	-	0.0046
8-2	Peaches	-	2.5	-	-	-	-	-	-	-	0.15		
8-2	Wheat	-	5.0	35	-	-	-	-	-	-	1.5	0.0090	0.012
8-22	Beans (green)	-	4.3	0.73	-	-	-	-	-	-	2.1	-	0.0047
8-22	Tomatoes	-	2.9	-	-	-	-	-	-	-	0.14	-	-
8-22	Wheat	-	4.3	3.7	-	-	-	-	-	-	0.51	0.0089	0.017
8-22	Cantaloupe	-	3.3	-	-	-	-	-	-	-	0.13	-	0.0026
Riverview													
7-6	Apricots	-	6.8	-	-	-	-	-	1.1	-	-	-	0.0044
8-2	Beans(green)	-	2.9	0.13	-	-	-	-	-	-	0.14	-	0.013
8-2	Potatoes	-	4.5	-	-	-	-	-	-	-	0.11	-	0.0096
8-2	Carrots	-	5.6	0.17	-	-	-	-	-	-	0.34	-	0.017
8-22	Beans (green)	-	3.2	0.20	-	-	-	-	-	-	0.55	-	0.0026
8-22	Tomatoes	-	1.6	-	-	-	-	-	-	-	-	-	-
8-22	Corn	-	2.9	0.47	-	-	-	-	-	-	0.75	0.014	0.044
8-22	Cantaloupe	-	2.6	0.12	-	-	-	-	-	-	-	-	0.0058

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX C
TABLE 3 (Continued)

CONCENTRATIONS OF SEVERAL RADIONUCLIDES IN FARM PRODUCE PURCHASED FROM GROWERS AT SELECTED LOCATIONS - 1961

Units of 10^{-6} μc/g of Vegetable

Date	Crop	Sc^{46}	K^{40}	Zn^{65}	Zr^{95} -Nb^{95}	Cs^{137}	Ru^{103} +Ru^{106}	I^{131}	Cr^{51}	Ce^{141} +Ce^{144}	P^{32}	Sr^{89}	Sr^{90}
Reporting Limits*		0.05	0.3	0.08	0.05	0.03	0.5	0.05	0.5	0.5	0.1	0.004	0.002
Benton City													
8-2	Potatoes	-	4.5	-	-	-	-	-	-	-	0.17	-	0.0030
8-2	Tomatoes	-	2.0	-	-	-	-	-	-	-	-	-	0.0029
8-2	Peaches	-	2.3	-	-	-	-	-	-	-	-	-	0.0030
8-22	Beans (green)	-	2.8	-	-	-	-	-	-	-	-	-	0.0038
8-22	Tomatoes	-	1.9	-	-	-	-	-	-	-	-	-	-
8-22	Corn	-	2.7	-	-	-	-	-	-	-	-	-	0.0021
8-22	Cantaloupe	-	3.0	0.15	-	-	-	-	-	-	-	-	0.0056
Richland													
7-26	Ground beef	-	3.4	-	-	0.11	-	-	-	-	-	-	0.0054
7-26	Ground beef	-	2.9	-	-	-	-	0.054	-	-	-	-	0.0080
8-17	Ground beef	-	5.1	-	-	0.040	-	-	-	-	0.19	0.0083	-
8-17	Ground beef	-	2.9	-	-	-	-	-	-	-	-	-	-
10-27	Ground beef	-	2.6	-	-	-	-	-	-	-	-		
10-27	Ground beef	-	2.5	-	-	-	-	-	-	-	-		
12-5	Ground beef	-	3.4	-	-	0.039	-	-	-	-	0.56	-	-
12-5	Ground beef	-	3.3	-	-	-	-	-	-	-	0.25	-	-

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX C
TABLE 4

CONCENTRATIONS OF SEVERAL RADIONUCLIDES
IN OYSTERS, WILLAPA BAY, WASHINGTON - 1961
Units of 10^{-6} μc/g of Oyster

Date	Sc^{46}	K^{40}	Zn^{65}	Zr^{95} -Nb^{95}	Cs^{137}	Ru^{103} +Ru^{106}	I^{131}	Cr^{51}	Ce^{141} +Ce^{144}	P^{32}
Reporting Limits*	0.05	0.3	0.08	0.05	0.03	0.5	0.05	0.5	0.5	0.1
2-7	0.064	1.6	49	-	-	-	-	-	-	
2-21	-	1.9	53	-	-	-	-	0.89	-	
3-14	-	2.4	64	-	-	-	-	1.2	0.82	
3-28	0.057	0.98	76	-	-	-	-	-	-	
4-11	0.081	0.42	66	-	-	-	-	-	-	
4-25	0.14	-	95	-	-	-	-	-	-	
5-9	0.12	1.1	82	-	-	-	-	-	-	
5-23	0.10	0.78	64	-	-	-	-	0.56	-	
6-6	0.31	1.8	140	-	-	-	-	-	-	
6-20	-	2.0	0.35	-	-	-	-	-	-	0.16
7-12	0.42	1.7	180	-	-	-	-	-	-	12
7-28	0.10	-	81	0.13	-	-	-	1.3	-	3.2
8-8	0.24	1.4	120	-	-	-	-	-	-	2.9
8-29	0.06	1.2	120	-	-	-	-	-	8.8	1.1
9-19	0.06	-	39	-	-	-	-	-	-	0.39
10-3	-	2.5	0.28	-	-	-	-	-	-	-
10-17	0.17	2.2	69	-	-	-	-	-	-	-
10-31	-	1.2	0.095	0.084	-	1.6	-	-	1.4	0.18
11-14	-	2.1	73	-	-	-	-	-	5.7	0.16
11-29	-	1.4	-	-	-	1.7	-	-	-	0.14
12-13	0.076	0.97	42	-	-	-	-	-	-	0.19
	0.11	1.4	67					0.59		1.7

* Results less than the reporting limit are indicated by a (-).

XXI. APPENDIX D

EXTERNAL RADIATION EXPOSURE RESULTS

APPENDIX D
TABLE 1

IONIZATION CHAMBER MEASUREMENTS OF EXTERNAL "BACKGROUND" DOSE RATE 3 FEET OFF GROUND AT HANFORD (PROJECT TEST LOCATION ROUTE 10, MI. 1.6) - 1961

Measurement Period	Mr/Day	Measurement Period	Mr/Day	Measurement Period	Mr/Day
12/28-1/3	0.33	4/19-4/21	0.31	8/4-8/7	0.31
1/3-1/6	0.37	4/21-4/24	0.29	8/7-8/9	0.33
1/6-1/9	0.34	4/24-4/26	0.26	8/9-8/11	0.40
1/9-1/11	0.37	4/26-4/28	0.25	8/11-8/14	0.50
1/11-1/13	0.34	4/28-5/1	0.31	8/14-8/16	0.45
1/13-1/16	0.32	5/1-5/3	0.26	8/16-8/18	0.39
1/16-1/18	0.35	5/3-5/5	0.30	8/18-8/23	0.47
1/18-1/20	0.40	5/5-5/8	0.28	8/23-8/25	0.46
1/20-1/23	0.42	5/8-5/10	0.31	8/25-8/28	0.47
1/23-1/27	0.44	5/10-5/12	0.24	8/28-8/30	0.41
1/27-1/30	0.43	5/12-5/15	0.27	8/30-9/1	0.48
1/30-2/1	0.34	5/15-5/17	0.29	9/1-9/6	0.43
2/1-2/3	0.33	5/17-5/19	0.28	9/6-9/8	0.32
2/3-2/6	0.38	5/19-5/22	0.32	9/8-9/11	0.47
2/6-2/9	0.34	5/22-5/24	0.23	9/11-9/13	0.34
2/8-2/10	0.35	5/24-5/26	0.31	9/13-9/15	0.38
2/10-2/13	0.31	5/26-5/29	0.29	9/15-9/18	0.41
2/13-2/15	0.41	5/29-5/31	0.25	9/18-9/20	0.35
2/15-2/17	0.29	5/31-6/2	0.26	9/20-9/22	0.37
2/17-2/20	0.35	6/2-6/5	0.30	9/22-9/25	0.35
2/20-2/22	0.31	6/5-6/7	0.29	9/25-9/27	0.30
2/22-2/24	0.31	6/7-6/9	0.26	9/27-9/29	0.31
2/24-2/27	0.42	6/9-6/12	0.23	9/29-10/2	0.35
2/27-3/1	0.24	6/12-6/14	0.24	10/2-10/4	0.43
3/1-3/3	0.28	6/14-6/16	0.25	10/4-10/6	0.37
3/3-3/6	0.36	6/16-6/19	0.32	10/6-10/9	0.34
3/6-3/8	0.28	6/19-6/21	0.25	10/9-10/11	0.30
3/8-3/10	0.30	6/21-6/23	0.24	10/11-10/13	0.38
3/10-3/13	0.30	6/23-6/26	0.26	10/13-10/16	0.42
3/13-3/15	0.29	6/26-6/28	0.20	10/16-10/18	0.34
3/15-3/17	0.27	6/28-6/30	0.22	10/18-10/20	0.39
3/17-3/20	0.33	6/30-7/5	0.26	10/20-10/23	0.40
3/20-3/22	0.28	7/5-7/7	0.23	10/23-10/25	0.40
3/22-3/24	0.32	7/7-7/10	0.26	10/25-10/27	0.45
3/24-3/27	0.28	7/10-7/12	0.26	10/27-10/30	0.47
3/27-3/29	0.26	7/12-7/14	0.26	10/30-11/1	0.56
3/29-3/31	0.27	7/14-7/17	0.26	11/1-11/3	0.43
3/31-4/3	0.28	7/17-7/19	0.23	11/3-11/6	0.43
4/3-4/5	0.27	7/19-7/21	0.24	11/6-11/8	0.52
4/5-4/7	0.28	7/21-7/24	0.17	11/8-11/10	0.67
4/7-4/10	0.26	7/24-7/26	0.26	11/10-11/13	0.40
4/10-4/12	0.27	7/26-7/28	0.27	11/13-11/15	0.46
4/12-4/14	0.23	7/28-7/31	0.27	11/15-11/17	0.47
4/14-4/17	0.28	7/31-8/2	0.25	11/17-11/20	0.56
4/17-4/19	0.28	8/2-8/4	0.34	11/20-11/22	0.43

APPENDIX D
TABLE 1 (Continued)

IONIZATION CHAMBER MEASUREMENTS OF EXTERNAL "BACKGROUND" DOSE RATE 3 FEET OFF GROUND AT HANFORD (PROJECT TEST LOCATION ROUTE 10, MI. 1.6) - 1961

Measurement Period	Mr/Day
11/22-11/25	0.55
11/25-11/27	0.54
11/27-11/29	0.55
11/29-12/1	0.52
12/1-12/4	0.43
12/4-12/6	0.43
12/6-12/8	0.46
12/8-12/11	0.53
12/11-12/13	0.48
12/13-12/15	0.52
12/15-12/18	0.49
12/18-12/20	0.34
12/20-12/22	0.38
12/22-12/26	0.47
12/26-12/29	0.52
12/29-1/2/62	0.51

XXII. APPENDIX E

ANALYTICAL METHODS

XXII. APPENDIX E

ANALYTICAL METHODS

1. Water Analyses

All water samples are analyzed for alpha emitters, beta emitters, and selected radionuclides. Alpha emitters are extracted with diethyl ether from 9 N nitric acid. The gross alpha activity is measured with a zinc sulfide (ZnS) scintillation counter. Gross beta activity is determined by evaporating a sample to dryness and counting the residual salts on a gas-flow proportional beta counter operated in the Geiger region.

Rare earths plus yttrium, silicon-31, iodine-131, phosphorous-32, strontium-89 and strontium-90 are measured by beta counting after chemical separation. The rare earths are isolated as a group by hydroxide, fluoride, and oxalate precipitations; silicon is precipitated as the dioxide; iodine is isolated by carbon tetrachloride extraction and precipitation as silver iodide; phosphorous by extraction of phosphomolybdic acid with butanol in diethyl ether or by direct precipitation as the phosphomolybdate; and strontium by successive precipitation of the nitrate and the carbonate. Yttrium-90, separated from the strontium after secular equilibrium is established, is measured to determine strontium-90. Beta decay curves are extrapolated to sampling time to determine the initial activity levels and to check separation effectiveness.

Manganese-56, zinc-69 and gallium-72 are determined by measurement of their characteristic gamma peaks with a multichannel gamma energy spectrometer using a 3- by 3-inch thallium-activated sodium iodide (NaI(Tl)) scintillation crystal detector. The measurements are made after the following chemical separations; manganese by precipitation as the dioxide, zinc by precipitation as the phosphate and ion exchange purification, and gallium by extraction with isopropyl ether and precipitation as the hydroxide. Sodium-24, neptunium-239, chromium-51 and cobalt-60 are also determined using a multichannel gamma energy spectrometer, but are determined from a direct count

of residual salts from the evaporated sample, without chemical separations. However, it may be necessary to chemically separate neptunium-239 and cobalt-60 for samples with low concentrations.

Copper-64 is determined from gamma-coincidence counting measurements of the annihilation photons produced by positron emission. Scandium-46 is measured by gamma-coincidence counting of the 0.885 Mev and and 1.12 Mev photons.

Arsenic-76 is determined from the counting rate of its 2.97 Mev beta. Particles of lower energy from other beta emitters are shielded out by use of a 504 mg/cm^2 absorber.

Uranium concentrations are determined with a fluorophotometer, using standard techniques.

2. Vegetation and Produce Analyses

Samples of native grasses (vegetation samples) are analyzed with a multichannel gamma energy spectrometer for selected radionuclides. The spectrometer utilizes the 3- by 3-inch NaI(Tl) scintillation crystal used in analyzing water samples. These analyses are conducted for 150 gram samples which have been shredded and placed in a 9-ounce glass jar. Background analysis includes the effects of the jar glass which contains minute amounts of radioactivity. There is no ashing or chemical separation performed on vegetation samples.

Farm products, including milk, are analyzed for several radionuclides including those measured in vegetation samples. Increased sensitivity is achieved in produce analysis by using a 9-inch diameter well-type NaI(Tl) scintillation crystal as the detector of a multichannel gamma energy spectrometer. In addition, the analysis includes a determination of the radiostrontium and radiophosphorous after chemical separation. The chemical separation for radiostrontium analysis is performed in the following manner:

Barium and strontium carriers are added to 500 gram samples of produce and 1000 gram samples of milk. The produce samples are

then ashed at 500 to 650 C from four to six hours and the ash dissolved in nitric acid. The milk samples are passed through a Dowex 50 by 8, 50 to 100 mesh Na_+ form resin column to separate the anion and cation fractions. Alkaline earths plus some other cations are eluted with dilute nitric acid. The alkaline earths are then precipitated from all samples as carbonates. Strontium and alkaline arth metals are precipitated with fuming nitric acid. Calcium is separated by washing with acetone. Strontium and remaining alkaline earths are dissolved and reprecipitated with fuming nitric acid. The rare earths are removed from an aqueous solution of the nitrates by a $Fe(OH_3)$ precipitation and barium is removed as the chromate. Strontium is precipitated as the carbonate and then dried in a one-inch stainless steel counting dish to constant weight. The strontium mixture is counted for one hour in a low background (anticoincidence) gas-flow proportional beta counter.

Strontium-90 is allowed to reach secular equilibrium with its daughter, yttrium-90, which is then extracted with buffered TTA. Yttrium-90 is counted in the same manner as the strontium mixture. The strontium-90 content is calculated from the yttrium-90 counting rate, and the strontium-89 content from the difference in counting rates of total strontium and strontium-90.

The chemical separation for radiophosphorous is performed on samples of sufficient size to yield 40-50 mg of phosphorus.

The sample is wet ashed with nitric acid. Phosphorous is precipitated from the acid solution as ammonium phosphomolybdate. This precipitate is dissolved in ammonium hydroxide, ammonium citrate is added to complex most of the remaining interferring elements, and the phosphorous is precipitated as magnesium ammonium phosphate. After dissolving the precipitate in hydrochloric acid, ammonium citrate is again added and phosphorous is reprecipitated as magnesium ammonium phosphate.

The precipitate is dried in a 1-1/2 inch stainless steel counting dish under heat lamps and counted over a period of two weeks in a gas-flow proportional beta counter.

3. Air Sample Analyses

Air-borne concentrations of radioactive materials are measured principally by Iodine-131 scrubber samplers. These samplers consist of a calibrated, electrically-driven vacuum pump which draws 2.0 cfm (3.4 cubic meters per hour) of air through one liter of 0.1 normal NaOH solution. A balancing platform and siphon arrangement permits introduction of distilled water into the scrubber at a rate equal to the rate of evaporation. This water feeder helps maintain constant liquid head, air flow rate, and scrubber efficiency.

After one week of operation, the scrubber bottle is replaced and taken to the radiochemical analysis laboratory for determination of the iodine-131 content. The analytical procedure used provides for the addition of an iodine carrier and $AgNO_3$ to the scrubber solution, followed by filtration of the resulting silver iodide precipitate. The radiation from the iodine-131 on the filter is measured by an end-window GM tube connected to a scale-of-64 scaler. Atmospheric concentrations of iodine-131 are then calculated from these counting rates by applying factors for counter calibration, chemical recovery of the iodine-131, scrubber efficiency and the volume of air sampled.

Measurements for concentrations of radioactive particulates in the atmosphere are made with 2- by 4-inch HV-70 filter paper in conjunction with Motoaire filter samplers. The filters are changed on either a daily or a weekly schedule and then are autoradiographed using Eastman Kodak, Type-K, X-ray film. The filters are placed in direct contact with the film for one week, the filter is removed, and the film is developed. The developed film is viewed on a standard X-ray viewer and each image produced is counted as one radioactive particle. Air-borne concentrations of radioactive particles are calculated by dividing the number of images obtained per filter by the total volume (nominal 2.5 cfm) of air sampled.

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