

JANZER & SAINDON

U.S. DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY

U.S. GEOLOGICAL SURVEY  
WRD, LIBRARY  
P. O. Box 4339  
Albuquerque, N. Mex. 87106

Radiochemical Analyses of Surface Water from  
U.S. Geological Survey Hydrologic Bench-mark Stations

by

V. J. Janzer and L. G. Saindon

Approved for release to the  
open file January 14, 1972

U.S. DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY

Radiochemical Analyses of Surface Water from  
U.S. Geological Survey Hydrologic Bench-mark Stations

by

V. J. Janzer and L. G. Saindon

Approved for release to the  
open file January 14, 1972

## CONTENTS

	Page
Abstract . . . . .	1
Introduction . . . . .	1
Radiochemical sampling program . . . . .	5
Sample collection . . . . .	6
Analytical procedures . . . . .	6
Gross alpha and gross beta radioactivity . . . . .	6
Radium . . . . .	8
Uranium . . . . .	10
Reporting of data . . . . .	11
Discussion . . . . .	12
References . . . . .	41

## ILLUSTRATIONS

Figure 1. Locations of the U.S. Geological Survey hydrologic bench-mark stations . . . . .	3
---	---

## TABLES

Table 1. U.S.G.S. bench-mark sampling stations and locations . .	4
2. Radiochemical determinations, parameter codes and significant figures for the reported data . . . . .	14
3. Radiochemical analyses of bench-mark samples collected during 1967-1971 . . . . .	15

Radiochemical Analyses of Surface Water from  
U.S. Geological Survey Hydrologic Bench-mark Stations

By V. J. Janzer and L. G. Saindon

ABSTRACT

The U.S. Geological Survey's program for collecting and analyzing surface-water samples for radiochemical constituents at hydrologic bench-mark stations is described. Analytical methods used during the study are described briefly and data obtained from 55 of the network stations in the United States during the period from 1967 to 1971 are given in tabular form.

Concentration values are reported for dissolved uranium, radium, gross alpha and gross beta radioactivity. Values are also given for suspended gross alpha radioactivity in terms of natural uranium. Suspended gross beta radioactivity is expressed both as the equilibrium mixture of strontium-90/yttrium-90 and as cesium-137.

Other physical parameters reported which describe the samples include the concentrations of dissolved and suspended solids, the water temperature and stream discharge at the time of the sample collection.

INTRODUCTION

A program for the collection of hydrologic data from a network of bench-mark stations was initiated by the U.S. Geological Survey in 1958. Langbein and Hoyt (1959) and Leopold (1962) proposed a bench-mark

network consisting of approximately 100 basins to be selected from areas which were as free as possible from man-induced changes. Basins selected were to provide a variety of physiographic, climatic and geologic conditions to enable comparison with developed basins exhibiting similar natural characteristics. Additional criteria for the selection of the basins in the existing network are given by Cobb and Biesecker (1971) who described 57 bench-mark basins over a 37 state area. The current network consists of 58 basins with a median size of approximately 55 square miles. Approximate locations of the hydrologic bench-mark stations, which are also surface-water stations, in these basins are shown on figure 1.

Hydrologic data obtained from such a network of relatively undeveloped drainage basins will permit the separation and identification of natural changes from manmade changes that have been observed in more developed basins. These baseline data will serve as reference points for the evaluation of any future changes which may be observed in the nation's waters.

Names and locations of the surface-water gaging stations established in hydrologic bench-mark basins at the present time are listed in table 1. These locations are listed alphabetically by state as given in the National Reference List of Water Quality Stations, Water Year 1971, published by the U.S. Geological Survey, Water Resources Division. Station numbers listed in table 1 are those used by Cobb and Biesecker (1971) with the exception of the Alaska station which was added to the network in the spring of 1971. The U.S.G.S. identification number,

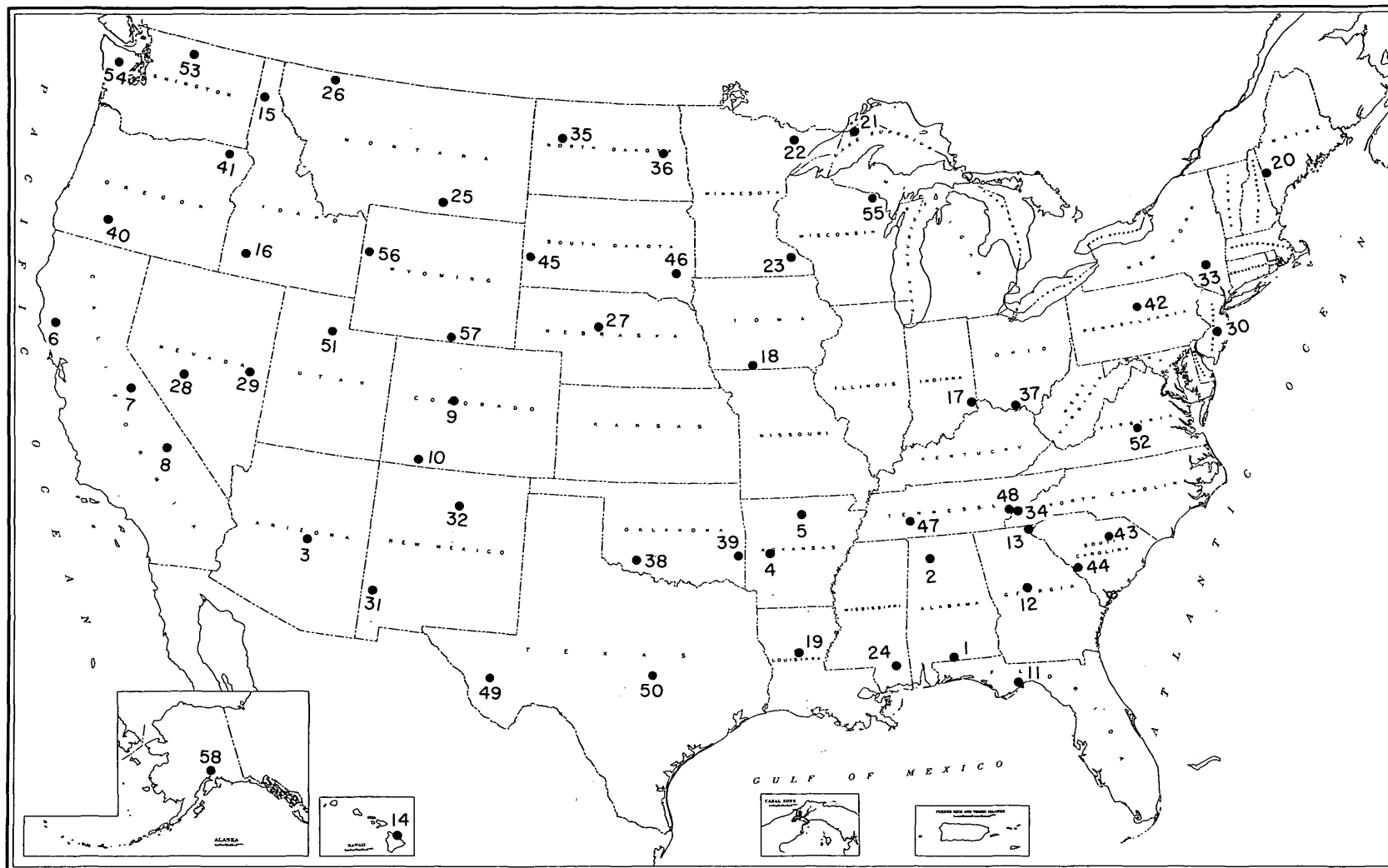


FIGURE 1.—Locations of the U.S. Geological Survey hydrologic bench-mark stations.

TABLE 1.--U.S.G.S. HYDROLOGIC BENCH-MARK SAMPLING STATIONS AND LOCATIONS

STATION NO.	STATION NAME	IDENTIFICATION NO.	LATITUDE	LONGITUDE
1	BLACKWATER RIVER NEAR BRADLEY, ALABAMA	02369800	310145N	0864235
2	SIPSEY FORK NEAR GRAYSON, ALABAMA	02450250	341947N	0872237
3	WET BOTTOM CREEK NEAR CHILDS, ARIZONA	09508300	340945N	1114130
4	COSSATOT RIVER NEAR VANDERVOORT, ARKANSAS <sup>1</sup>	07340300	342246N	0941408
5	NORTH SYLAMORE CREEK NEAR FIFTY SIX, ARKANSAS	07060710	355930N	0921250.1
6	ELDER CREEK NEAR BRANSCOMB, CALIFORNIA	11475560	394347N	1233834
7	MERCED RIVER AT HAPPY ISLES BRIDGE, NEAR YOSEMITE, CALIFORNIA	11264500	374354N	1193328
8	WILDROSE CREEK NEAR WILDROSE STATION, CALIFORNIA	10250600	361555N	1171040
9	HALFMOON CREEK NEAR MALTA, COLORADO	07083000	391020N	1062319
10	VALLECITO CREEK NEAR BAYFIELD, COLORADO	09352900	372845N	1073235
11	SOPCHOPPY RIVER NEAR SOPCHOPPY, FLORIDA	02327100	300745N	0842940
12	FALLING CREEK NEAR JULIETTE, GEORGIA	02212600	3306 N	08343
13	TALLULAH RIVER NEAR CLAYTON, GEORGIA	02178400	345325N	0833150
14	HONOLII STREAM NEAR PAPAIIKU, HAWAII	16717000	194600N	1550916
15	HAYDEN CREEK BELOW NORTH FORK, NEAR HAYDEN LAKE, IDAHO	12416000	474922N	1163910
16	WICKAHONEY CREEK NEAR BRUNEAU, IDAHO <sup>2</sup>	13169500	424706N	1155900
17	SOUTH HOGAN CREEK NEAR DILLSBORO, INDIANA	03276700	390147N	0850217
18	ELK CREEK NEAR DECATUR CITY, IOWA	06897950	404318N	0935619
19	BIG CREEK AT POLLOCK, LOUISIANA	07373000	313210N	0922430
20	WILD RIVER AT GILEAD, MAINE	01054200	442325N	0705855
21	WASHINGTON CREEK AT WINDIGO, ISLE ROYALE, MICHIGAN <sup>3</sup>	04001000	475515N	0890850
22	KAWISHIWI RIVER NEAR ELY, MINNESOTA	05124480	475522N	0913206
23	NORTH FORK WHITEWATER RIVER NEAR ELBA, MINNESOTA	05376000	440530N	0920357
24	CYPRESS CREEK NEAR JANICE, MISSISSIPPI	02479155	310130N	0890100.1
25	BEAUVAIS CREEK NEAR ST. XAVIER, MONTANA	06288200	452840N	1080033
26	SWIFTCURRENT CREEK AT MANY GLACIER, MONTANA	05014500	484806N	1133918
27	DISMAL RIVER NEAR THEODOR, NEBRASKA	06775900	414645N	1003130
28	SOUTH TWIN RIVER NEAR ROUND MOUNTAIN, NEVADA	10249300	385300N	1171435
29	STEPTOE CREEK NEAR ELY, NEVADA	10244950	391205N	1144115
30	MCDONALDS BRANCH IN LEBANON STATE FOREST, NEW JERSEY	01466500	395305N	0743020
31	MOGOLLON CREEK NEAR CLIFF, NEW MEXICO	09430600	331001N	1083858
32	RIO MORA NEAR TERRERO, NEW MEXICO	08377900	354638N	1053926
33	ESOPUS CREEK AT SHANDAKEN, NEW YORK	01362198	420659N	0742320
34	CATALOOCHIE CREEK NEAR CATALOOCHIE, NORTH CAROLINA	03460000	354002N	0830423
35	BEAR DEN CREEK NEAR MANUAREE, NORTH DAKOTA	06332515	474720N	1024610
36	BEAVER CREEK NEAR FINLEY, NORTH DAKOTA	05064900	473540N	0974218
37	UPPER TWIN CREEK AT MCGAN, OHIO	03237280	383815N	0831330
38	BLUE BEAVER CREEK NEAR CACHE, OKLAHOMA	07311200	343724N	0983348
39	KIAMICHI RIVER NEAR BIG CEDAR, OKLAHOMA	07335700	343818N	0943645
40	CRATER LAKE NEAR CRATER LAKE, OREGON	11492200	425845N	1220445
41	MINAM RIVER AT MINAM, OREGON	13331500	453712N	1174328
42	YOUNG WOMANS CREEK NEAR RENOV, PENNSYLVANIA	01545600	412322N	0774128
43	SCAPE ORE SWAMP NEAR BISHOPVILLE, SOUTH CAROLINA	02135300	340902N	0801818
44	UPPER THREE RUNS NEAR NEW ELLENTON, SOUTH CAROLINA	02197300	332305N	0813700
45	CASTLE CREEK ABOVE DEERFIELD RESERVOIR NEAR HILL CITY, SOUTH DAKOTA	06409000	440049N	1034948
46	LITTLE VERMILLION RIVER NEAR SALEM, SOUTH DAKOTA <sup>4</sup>	06478540	434740N	0972200
47	BUFFALO RIVER NEAR FLAT WOODS, TENNESSEE	03604000	352945N	0874958
48	LITTLE RIVER ABOVE TOWNSEND, TENNESSEE	03497300	353952N	0834241
49	LIMPIA CREEK ABOVE FORT DAVIS, TEXAS	08431700	303655N	1040010
50	SOUTH FORK ROCKY CREEK NEAR BRIGGS, TEXAS	08103900	305440N	0980210
51	RED BUTTE CREEK AT FORT DOUGLAS, NEAR SALT LAKE CITY, UTAH	10172200	404648N	1114819
52	HOLIDAY CREEK NEAR ANDERSONVILLE, VIRGINIA	02038850	372455N	0783810
53	ANDREWS CREEK NEAR MAZAMA, WASHINGTON	12447390	484928N	1200850
54	NORTH FORK QUINULT RIVER NEAR AMANDA PARK, WASHINGTON	12039300	473546N	1233723
55	POPPLE RIVER NEAR FENCE, WISCONSIN	04063700	454550N	0882750
56	CACHE CREEK NEAR JACKSON, WYOMING	13018300	432650N	1104150
57	ENCAMPMENT RIVER ABOVE HOG PARK CREEK, NEAR ENCAMPMENT, WYOMING	06623800	410125N	1064927
58	TALKEETNA RIVER NEAR TALKEETNA, ALASKA	15292700	622050N	1500045

<sup>1</sup> FROM NATIONAL REFERENCE LIST OF WATER QUALITY STATIONS WATER YEAR 1968.<sup>2</sup> LISTED AS BIG JACKS CREEK NEAR BRUNEAU, IDAHO IN DISTRICT FILES.<sup>3</sup> LATITUDE AND LONGITUDE WERE REVERSED IN NATIONAL REFERENCE LIST OF WATER QUALITY STATIONS WATER YEAR 1971.<sup>4</sup> FROM COBB AND BIESECKER (1971).

latitudes and longitudes are also given and were obtained from the 1971 Water Year National Reference list except as noted.

The U.S.G.S. identification number is an eight digit number such as 01034500. The first two digits "01" are the "part" number which identifies the surface-water drainage area in which the station is located. The last six digits "034500" constitute the downstream order number of the stream within the "part". Drainage basins in the United States have been divided into 18 parts which are defined in the Geological Survey Water Supply Papers (WSP) published periodically under the general designation of "Quality of Surface Water of the United States," such as WSP 1965.

#### RADIOCHEMICAL SAMPLING PROGRAM

Within the 58 bench-mark basins, continuous streamflow records are obtained at 57 sites. Samples of water from 55 of these locations have been analyzed for radiochemical constituents during the period 1967-71. For some of the locations this consisted of a single sample. In slightly over 80 percent of the locations the following organized program of collection has been followed.

Water samples were collected twice each year, once during a period of high discharge for the stream and once during low flow for water years 1968-70. During the 1971 water year (October 1970-September 1971) the sampling frequency for each stream was reduced to one sample per year taken at low flow.

The radiochemical analytical data of both the miscellaneous and regular collection programs are included in this report. Two hundred



and seventy six samples were analyzed for the 55 locations sampled under the programs described.

#### Sample Collection

Samples were collected in clean 4 liter polyethylene bottles and mailed to the Radiochemical Surveillance Unit laboratory at Denver as soon as possible after collection. Specific conductance, temperature, dissolved oxygen, pH, and instantaneous discharge were measured at the time of sample collection. The radiochemical analyses were performed as soon as possible after the samples were received in Denver.

#### ANALYTICAL PROCEDURES

##### Gross Alpha and Gross Beta Radioactivity

The concentration of the suspended solids in the water samples was determined for an aliquot after thoroughly dispersing the sediment throughout the sample. The aliquot (1 liter, maximum) was filtered through a weighed, 2-inch diameter 0.45 micron porosity, membrane filter. After drying, the filter and the retained solids were weighed and the weight of suspended solids per liter of sample was calculated.

A conductivity bridge was used to determine the specific conductance of the filtrate in terms of micromhos per centimeter ( $\mu\text{mhos/cm}$ ). Using the approximation: Specific conductance ( $\mu\text{mhos/cm}$ )  $\times$  0.65  $\approx$  mg/l, an estimate of the dissolved solids was obtained and a volume of sample was selected to be evaporated that would yield approximately 100 milligrams of residue. The resulting residue from each sample was transferred to individual ridged stainless steel planchets.

Alpha and beta radioactivity of the suspended solids obtained by filtration and the dissolved solids obtained by evaporation was then measured by counting the prepared planchets in an automatic low background flowing gas proportional counting system. Each sample was counted for a minimum of 150 minutes. Sample counts obtained were compared to standards having the same residue weight. A series of standards containing known amounts of strontium-90/yttrium-90 or cesium-137 as the beta calibration isotope, or natural uranium as an alpha calibration isotope had been used to calibrate the counting instruments for different residue weights. The calibration procedure and sample preparation were essentially as described by Barker and Robinson (1963).

The radioactivity measured in the dissolved salts is reported as equivalent natural uranium for gross alpha and as strontium-90/yttrium-90 or cesium-137 equivalent for gross beta. The units used for reporting gross alpha radioactivity are micrograms or picocuries of natural uranium per liter ( $\mu\text{g U nat/l}$  or  $\text{pCi U nat/l}$ ). Gross beta radioactivity is reported in terms of picocuries per liter ( $\text{pCi/l}$ ) of either calibration isotope.

For the suspended solids, the gross alpha concentration is reported as micrograms or picocuries per liter ( $\mu\text{g/l}$  or  $\text{pCi/l}$ ). The specific alpha activity based on the suspended solid concentration is reported in micrograms U natural per gram ( $\mu\text{g/g}$ ) and picocuries U natural per gram ( $\text{pCi/g}$ ). The gross beta activity of the suspended solids is reported as picocuries per liter ( $\text{pCi/l}$ ) and the specific activity as picocuries per gram ( $\text{pCi/g}$ ) for the respective calibration isotope.

Natural uranium was chosen as the alpha calibration isotope and the counting instruments were calibrated for alpha counting efficiency in terms of alpha counts per minute per microgram of natural uranium. The conversion for alpha radioactivity from terms of  $\mu\text{g}$  of natural uranium per liter to picocurie of natural uranium per liter is based on the definition given in the U.S. Atomic Energy Commission rules and regulations (1967). "One curie of natural uranium is equivalent to 3000 kilograms." Conversion of the gross alpha radioactivity concentrations expressed in terms of a weight of natural uranium ( $\mu\text{g/l}$ ) to an activity of natural uranium ( $\text{pCi/l}$ ), based on the above definition, assumes that the uranium-234/uranium-238 activity ratio in the samples is 1. Uranium is present in most natural waters and consequently accounts for some, if not most of the alpha radioactivity present. The uranium-234/uranium-238 ratio in natural waters is usually greater than 1 and the above conversion, although commonly used, is not totally valid.

The isotopes used by the U.S.G.S. laboratory for calibration of the counting equipment and for reporting the radioactivity results obtained were selected on the basis of common use by many radiochemical laboratories and should facilitate the intercomparison of data given in this report with that provided by other agencies.

#### Radium

Radium-226 concentrations were determined on sample aliquots filtered through 0.45 micron porosity membrane filters. Radium in solution was coprecipitated with barium sulfate and then determined by either of two methods.

Using the planchet precipitate counting method described in U.S.G.S. Water Supply Paper 1696-B, the barium-radium sulfate precipitate was separated from the solution by filtration through a membrane filter. After aging the precipitate for approximately 12-14 days, it was counted for alpha radioactivity using a thin window proportional counter. The aging period allows short lived radium daughter products to approach secular equilibrium. The increased count rate which results, increases the sensitivity of the determination.

An alternate radium method was adopted by the laboratory during the study. The alternate method is less subject to interferences and has a lower detection level. In this method, radon-222, the gaseous daughter of radium-226 is separated and then determined by alpha scintillation counting. Alkaline sodium diethylene triamine penta acetate solution was used to dissolve the barium-radium sulfate precipitate described above. The resulting solution was transferred to radon bubbler tubes and the radon present was removed by helium gas sparging to establish a zero calculation time for radon ingrowth. Radon in the purged solution was allowed to form for several days, transferred from the bubbler tubes to alpha scintillation counting cells by a second helium sparging and then determined by alpha counting.

Radium-226 concentrations (parent to radon measured) in the original water samples were calculated from the alpha radioactivity observed by either the planchet or radon method. Concentrations were reported in terms of picocuries of radium-226 per liter (pCi/l).

### Uranium

Dissolved uranium concentrations were determined by using one of two procedures utilizing reflectance fluorometry. Fluorescence intensity measurements were made on fusion pellets prepared from the sample and a mixed carbonate-fluoride flux. Measurements obtained on sample and standard pellets were used to calculate and report uranium concentrations of the samples in terms of micrograms of natural uranium per liter ( $\mu\text{g/l}$ ).

The first procedure used a maximum sample volume of seven milliliters which was evaporated to dryness. The residue was then incorporated into the fusion mixture and the fluorescence of the resulting pellet was measured and converted to terms of dissolved uranium concentration in the original sample.

Uranium in very dilute samples was determined by the second procedure involving precipitation and extraction steps to concentrate dissolved uranium in sample aliquots up to 400 ml. The resulting concentrate was then incorporated in the fusion mixture and analyzed as described above.

Uranium analyses obtained by direct evaporation of the samples are identified as "direct fluorometric". Analyses obtained by precipitation and extraction are identified as "extraction fluorometric". The methods used are similar to those described by Barker et al (1965).

## REPORTING OF DATA

Abbreviations, reporting units, parameter codes, and significant figures for the surface-water quality determinations which were made are listed in table 2, titled "Radiochemical Determinations, Parameter Codes and Significant Figures for the Reported Data" in the order in which they appear in table 3, "Radiochemical Analyses of Bench-Mark Samples Collected During 1967-1971." The parameter codes shown for each "determination" in table 2 are the identification code numbers used for the storage and retrieval of surface-water quality data by the Water Resources Division.

Table 3 lists values of dissolved gross alpha, gross beta, uranium and radium obtained at 55 surface-water stations over a more than three year period from September 1967 through June 1971. Table 3 also lists gross alpha and gross beta radioactivity of the suspended solids. These values are given both in terms of picocuries per liter (pCi/l), and as specific activity of the solids in terms of picocuries per gram (pCi/g) for the same period of record. Temperatures listed in table 3 are given in degrees Celsius. Prior to water year 1969, water temperature was recorded in degrees Fahrenheit. Temperature measurements made prior to 1969 WY have been converted to  $^{\circ}\text{C}$  and were rounded to the nearest whole number. Measurements made subsequent to the 1969 WY were made and are reported to the nearest  $0.5^{\circ}\text{C}$ . Radium-226 and uranium results which were obtained by alternate methods of analysis are indicated and identified on table 3 by footnotes. "Residue, total filtrable" is the concentration of dissolved solids residue on evaporation, and "residue, total non-filtrable" is the concentration of suspended solids retained on the 0.45 micron filter.

## DISCUSSION

Radiochemical data has been obtained from 55 of the 58 bench-mark stations which were active during the course of this study. These and subsequent data to be collected from the network will provide a basis for evaluation of the variations observed in background radiation levels in developed as opposed to undeveloped drainage basins. A report evaluating the observed variations will be prepared when a sufficient amount of data is available.

Average values for the dissolved radiochemical constituents in the bench-mark samples should generally be lower than those obtained at other surface water network sampling sites within the conterminous United States. This is due, in part, to the relatively small size of most of the bench-mark basins. Most water draining from these basins has been in contact with predominantly surficial geologic materials for relatively short periods of time. Consequently, the dissolved solid concentrations and the associated radioactivity in the water is usually lower than that in waters from larger drainage basins where the travel and contact times are greater.

Dissolved gross alpha values ranged from an equivalent concentration of less than 0.4  $\mu\text{g}$  of natural uranium per liter ( $\mu\text{g}/\text{l}$ ) to the 46  $\mu\text{g}/\text{l}$  maximum found in the August 18, 1969 sample from Bear Den Creek near Mandaree, North Dakota. Gross beta values as strontium-90/yttrium-90 ranged from less than 0.4 pCi/l to the 24 pCi/l high value detected in the July 24, 1968 sample from Beaver Creek near Finley, North Dakota.

Radium levels in most of the bench-mark samples were comparatively low and ranged from less than 0.01 pCi/l to a maximum of 2.4 pCi/l. The high value was found in the April 16, 1969 sample collected from Upper Three Runs near Ellenton, South Carolina. Dissolved radium-226 in the eight samples collected from Upper Three Runs averaged 1.06 pCi/l during the period from November 2, 1967 through December 28, 1970. Other samples relatively high in radium included those from McDonalds Branch, New Jersey, which exhibited dissolved radium concentrations ranging from 0.11 to 0.32 pCi/l and Bear Den Creek, North Dakota which exhibited a high of 0.24 pCi/l. The average radium concentration for all stations was approximately 0.07 pCi/l.

Uranium concentrations ranged from less than 0.01  $\mu\text{g/l}$  to the maximum of 6.5  $\mu\text{g/l}$  observed in the July 24, 1968 sample from Beaver Creek near Finley, North Dakota. This maximum is comparable to the normal value of 5-8  $\mu\text{g/l}$  present in both the Missouri and Colorado Rivers. The average uranium concentration for the 55 stations was approximately 0.5  $\mu\text{g/l}$ .

Additional radiochemical data are being collected during the 1972 Water Year (October 1971 - September 1972) and will be released in subsequent publications. These data will also be available through the U.S.G.S. Water Resources Division's Automatic Data Processing Unit, by using the appropriate station identification number and parameter codes for the constituents desired.



TABLE 2.--RADIOCHEMICAL DETERMINATIONS, PARAMETER CODES AND SIGNIFICANT FIGURES FOR THE REPORTED DATA.

DETERMINATION	ABBREVIATION	PARAMETER CODE	UNITS REPORTED		SIGNIFICANT FIGURES									
			PCI/L	UG/L	0 TO <1.0		>1.0 TO <10		>10 TO <100		>100 TO <1,000		>1,000	
					ONE	TWO	ONE	TWO	ONE	TWO	TWO	THREE	TWO	THREE
DATE OF COLLECTION	--	--	DAY/MO/YR		--	--	--	--	--	--	--	--	--	--
TIME	--	--	24 HOUR		--	--	--	--	--	--	--	--	--	--
STREAM FLOW	--	00060	CU FT/SEC		--	0.XX	--	X.X	--	XX.	--	XXX.	--	XXX0
WATER TEMPERATURE	WATER TEMP	00010	DEG C		--	--	--	--	--	--	--	--	--	--
URANIUM, DISSOLVED, EXTRACTION FLUOROMETRIC	U-NAT-D EXT FLUOR	80020		X	--	.XX	--	X.X	--	XX.	XX0.	--	XX00.	--
URANIUM, DISSOLVED, DIRECT FLUOROMETRIC	ALL VALUES FOOTNOTED	22793		X	0.X	--	--	X.X	--	XX.	XX0.	--	XX00.	--
RADIUM-226, DISSOLVED, RADON METHOD	RA-226-D RADON	09511		X	--	.XX	--	X.X	--	XX.	XX0.	--	XX00.	--
RADIUM-226, DISSOLVED, PLANCHET COUNT	ALL VALUES FOOTNOTED	09510		X	0.X	--	--	X.X	--	XX.	XX0.	--	XX00.	--
ALPHA, GROSS, DISSOLVED, AS U-NATURAL	ALPHA-D U-NAT	80030		X	0.X	--	--	X.X	--	XX.	XX0.	--	XX00.	--
ALPHA, GROSS, DISSOLVED, AS U-NATURAL	ALPHA-D U-NAT	01515		X	0.X	--	--	X.X	--	XX.	XX0.	--	XX00.	--
BETA, GROSS, DISSOLVED, AS STRONTIUM/YTTRIUM-90	BETA-D SR/Y-90	80050		X	0.X	--	--	X.X	--	XX.	XX0.	--	XX00.	--
BETA, GROSS, DISSOLVED, AS CESIUM-137	BETA-D CS-137	03515		X	0.X	--	--	X.X	--	XX.	XX0.	--	XX00.	--
RESIDUE, TOTAL FILTRABLE (AT 125°C)	RESIDUE TOT FLT	00515	MG/L		--	--	X.	--	--	XX.	XX0.	--	XX00.	--
ALPHA, GROSS, SUSPENDED, AS U-NATURAL	ALPHA-S U-NAT	80040		X	0.X	--	--	X.X	--	XX.	XX0.	--	XX00.	--
ALPHA, GROSS, SUSPENDED, AS U-NATURAL	ALPHA-S U-NAT	01516		X	0.X	--	--	X.X	--	XX.	XX0.	--	XX00.	--
BETA, GROSS, SUSPENDED, AS STRONTIUM/YTTRIUM-90	BETA-S SR/Y-90	80060		X	0.X	--	--	X.X	--	XX.	XX0.	--	XX00.	--
BETA, GROSS, SUSPENDED, AS CESIUM-137	BETA-S CS-137	03516		X	0.X	--	--	X.X	--	XX.	XX0.	--	XX00.	--
RESIDUE, TOTAL NONFILTRABLE (AT 125°C)	RESIDUE TOT NFLT	00530	MG/L		--	--	X.	--	--	XX.	XX0.	--	XX00.	--
ALPHA, SUSPENDED, SPECIFIC ACTIVITY AS U-NATURAL	ALPHA-S,SPEC ACT,U-NAT	01518	UG/G		--	--	X.	--	--	XX.	XX0.	--	XX00.	--
ALPHA, SUSPENDED, SPECIFIC ACTIVITY AS U-NATURAL	ALPHA-S,SPEC ACT,U-NAT	01517	PCI/G		--	--	X.	--	--	XX.	XX0.	--	XX00.	--
BETA, SUSPENDED, SPECIFIC ACTIVITY AS STRONTIUM/YTTRIUM-90	BETA-S,SPEC ACT,SR/Y-90	03517	PCI/G		--	--	X.	--	--	XX.	XX0.	--	XX00.	--
BETA, SUSPENDED, SPECIFIC ACTIVITY AS CESIUM-137	BETA-S,SPEC ACT,CS-137	03518	PCI/G		--	--	X.	--	--	XX.	XX0.	--	XX00.	--

TABLE 3.--RADIOCHEMICAL ANALYSES OF BENCHMARK SAMPLES COLLECTED DURING 1967-1971

DATE OF COLLECTION	TIME	STREAM FLOW (CU FT/SEC)	WATER TEMP (DEG C)	U-NAT-D EXT FLUOR (UG/L)	RA-226-D RADON (PCI/L)	ALPHA-D GROSS U-NAT (UG/L)	ALPHA-D GROSS U-NAT (PCI/L)	BETA-D GROSS SR/Y-90 (PCI/L)	BETA-D GROSS CS-137 (PCI/L)	RESIDUE TOT FLT (MG/L)
		00060	00010	80020	09511	80030	01515	80050	03515	00515
(1) BLACKWATER RIVER NEAR BRADLEY, ALABAMA (02369800)										
--	--	--	--	--	--	--	--	--	--	--
(2) SIPSEY FORK NEAR GRAYSON, ALABAMA (02450250)										
11/08/67	1405	46	8	.08	.08	1.7	.6	1.9	2.4	68
05/13/68	1400	--	--	< .01	.03	.6	.2	1.1	1.4	39
10/01/68	1100	2.1	--	< .01	.01	.8	.3	2.2	2.8	44
02/01/69	1320	3760	11	.03	.05	.7	.2	1.7	2.1	34
08/12/70	0955	48	--	.07	.04	.4	.1	2.5	3.0	32
(58) TALKEETNA RIVER NEAR TALKEETNA, ALASKA (15292700)										
01/06/71	1330	--	--	.20	.04	< 1.2	< .4	1.6	2.0	120
04/01/71	1730	--	--	.21	.03	1.7	.6	2.7	3.4	130
(3) WET BOTTOM CREEK NEAR CHILDS, ARIZONA (09508300)										
01/29/68	1100	--	--	.05	.14	2.4	.8	3.9	4.9	51
04/15/68	--	--	--	.18	.04	3.0	1.0	2.7	3.4	130
10/15/68	1025	.12	19	.7 *	.01	4.2	1.4	2.3	2.9	200
03/18/69	1230	26	11	< .4 *	.05	2.5	.8	2.2	2.7	61
09/10/69	0900	.10	26	.7 *	.06	6.2	2.1	4.2	5.2	250
08/19/70	1000	--	--	2.2 *	.05	12	3.9	3.7	4.6	260
(4) COSSATOT RIVER NEAR VANDERVOORT, ARKANSAS (07340300)										
01/22/68	1300	--	8	< .01	.04	.6	.2	2.7	3.3	29
04/08/68	1300	--	--	< .4 *	.16	.8	.3	1.2	1.5	23
(5) NORTH SYLAMORE CREEK NEAR FIFTY SIX, ARKANSAS (07060710)										
09/08/67	1230	--	--	< .4 *	< .1 **	1.1	.4	2.0	2.5	140
04/11/68	--	30	12	.24	.04	2.4	.8	1.5	1.9	150
10/15/68	1300	11	--	.19	< .01	2.2	.7	1.6	2.0	170
06/26/69	1100	10	24	.14	.06	2.3	.8	1.9	2.4	180
12/04/69	1145	--	--	.36	.04	< 1.6	< .5	2.6	3.3	170
06/25/70	1100	--	22.0	.23	.05	2.9	1.0	2.6	3.3	160
10/30/70	1045	--	12.5	.15	.05	2.2	.7	1.7	1.9	130

TABLE 3.--RADIOCHEMICAL ANALYSES OF BENCHMARK SAMPLES COLLECTED DURING 1967-1971--CONTINUED

DATE OF COLLECTION	TIME	ALPHA-S GROSS U-NAT (UG/L) 80040	ALPHA-S GROSS U-NAT (PCI/L) 01516	BETA-S GROSS SR/Y-90 (PCI/L) 80060	BETA-S GROSS CS-137 (PCI/L) 03516	RESIDUE TOT NFLT (MG/L) .00530	ALPHA-S SPEC ACT U-NAT (UG/G) 01518	ALPHA-S SPEC ACT U-NAT (PCI/G) 01517	BETA-S SPEC ACT SR/Y-90 (PCI/G) 03517	BETA-S SPEC ACT CS-137 (PCI/G) 03518
(1) BLACKWATER RIVER NEAR BRADLEY, ALABAMA (02369800)										
--	--	--	--	--	--	--	--	--	--	--
(2) SIPSEY FORK NEAR GRAYSON, ALABAMA (02450250)										
11/08/67	1405	.9	.3	1.7	1.8	1	900	300	1700	1800
05/13/68	1400	< .4	< .1	< .4	< .4	9	< 44	< 15	< 44	< 44
10/01/68	1100	< .4	< .1	< .4	< .4	< 1	--	--	--	--
02/01/69	1320	5.1	1.7	2.8	3.3	94	54	18	30	35
08/12/70	0955	.6	.2	.9	1.0	16	38	12	56	62
(58) TALKEETNA RIVER NEAR TALKEETNA, ALASKA (15292700)										
01/06/71	1330	< .4	< .1	< .4	< .4	< 1	--	--	--	--
04/01/71	1730	< .4	< .1	< .4	< .4	< 1	--	--	--	--
(3) WET BOTTOM CREEK NEAR CHILDS, ARIZONA (09508300)										
01/29/68	1100	2.2	.7	2.1	2.4	15	150	49	140	160
04/15/68	--	< .4	< .1	.8	.9	< 1	--	--	--	--
10/15/68	1025	< .4	< .1	< .4	< .4	5	< 80	< 27	< 80	< 80
03/18/69	1230	1.2	.4	.4	.5	7	170	57	57	71
09/10/69	0900	.4	.1	.8	.9	1	400	130	800	900
08/19/70	1000	< .4	< .1	.4	.4	< 1	--	--	--	--
(4) COSSATOT RIVER NEAR VANDERVOORT, ARKANSAS (07340300)										
01/22/68	1300	< .4	< .1	1.9	2.0	1	< 400	< 130	1900	2000
04/08/68	1300	< .4	< .1	.8	.9	2	< 200	< 67	400	450
(5) NORTH SYLAMORE CREEK NEAR FIFTY SIX, ARKANSAS (07060710)										
09/08/67	1230	< .4	< .1	.5	.6	< 1	--	--	--	--
04/11/68	--	< .4	< .1	.6	.7	< 1	--	--	--	--
10/15/68	1300	< .4	< .1	< .4	< .4	4	< 100	< 33	< 100	< 100
06/26/69	1100	< .4	< .1	< .4	< .4	< 1	--	--	--	--
12/04/69	1145	< .4	< .1	< .4	< .4	< 1	--	--	--	--
06/25/70	1100	< .4	< .1	< .4	< .4	< 1	--	--	--	--
10/30/70	1045	< .4	< .1	< .4	< .4	< 1	--	--	--	--

TABLE 3.--RADIOCHEMICAL ANALYSES OF BENCHMARK SAMPLES COLLECTED DURING 1967-1971--CONTINUED

DATE OF COLLECTION	TIME	STREAM FLOW (CU FT/SEC)	WATER TEMP (DEG C)	U-NAT-D EXT FLUOR (UG/L)	RA-226-D RADON (PCI/L)	ALPHA-D GROSS U-NAT (UG/L)	ALPHA-D GROSS U-NAT (PCI/L)	BETA-D GROSS SR/Y-90 (PCI/L)	BETA-D GROSS CS-137 (PCI/L)	RESIDUE TOT FLT (MG/L)
		00060	00010	80020	09511	80030	01515	80050	03515	00515
(6) ELDER CREEK NEAR BRANSCOMB, CALIFORNIA (11475560)										
03/14/68	1230	--	--	< .01	< .01	4.2	1.4	1.9	2.4	55
11/07/68	1525	--	--	< .01	.02	< .6	< .2	1.2	1.6	77
03/20/69	0900	--	--	< .01	.03	.7	.2	.9	1.1	57
08/26/69	1445	--	--	.03	.02	1.1	.4	2.4	3.0	83
08/04/70	0800	--	--	.24	.05	< .7	< .2	.9	1.2	83
09/08/70	1700	.60	16.5	.01	.04	< .9	< .3	1.1	1.3	88
01/12/71	1400	--	--	.03	.02	< .4	< .1	.7	.8	49
(7) MERCED RIVER AT HAPPY ISLES BRIDGE, NEAR YOSEMITE, CALIFORNIA (11264500)										
11/20/67	1600	--	6	.53	.03	1.1	.4	3.3	3.9	23
10/16/68	1200	15	7	1.3 *	.02	2.3	.8	4.1	4.9	26
09/26/69	1130	24	10	.4 *	.06	.9	.3	3.3	4.2	72
08/26/70	0950	29	13.0	.5 *	.05	.7	.2	2.5	2.9	16
(8) WILDROSE CREEK NEAR WILDROSE STATION, CALIFORNIA (10250600)										
--	--	--	--	--	--	--	--	--	--	--
(9) HALFMOON CREEK NEAR MALTA, COLORADO (07083000)										
11/09/67	1410	9.9	0	.06	.07	< .5	< .2	1.2	1.5	53
06/18/68	1625	--	10	< .01	.01	.5	.2	1.9	2.3	28
10/16/68	1345	10	2	.08	< .1 **	< .6	< .2	1.3	1.6	47
05/22/69	1215	71	6	.07	.05	.5	.2	2.4	3.0	34
10/16/69	1100	15	.0	.08	.04	.8	.3	1.4	1.8	52
06/10/70	1215	107	6.0	.07	.04	< .4	< .1	1.7	2.1	35
10/09/70	1130	--	.0	.11	.03	< .5	< .2	1.6	2.0	52
(10) VALLECITO CREEK NEAR BAYFIELD, COLORADO (09352900)										
10/08/70	0845	72	1.0	.46	.09	1.0	.3	1.8	2.2	49

TABLE 3.--RADIOCHEMICAL ANALYSES OF BENCHMARK SAMPLES COLLECTED DURING 1967-1971--CONTINUED

DATE OF COLLECTION	TIME	ALPHA-S GROSS U-NAT (UG/L) 80040	ALPHA-S GROSS U-NAT (PCI/L) 01516	BETA-S GROSS SR/Y-90 (PCI/L) 80060	BETA-S GROSS CS-137 (PCI/L) 03516	RESIDUE TOT NFLT (MG/L) 00530	ALPHA-S SPEC ACT U-NAT (UG/G) 01518	ALPHA-S SPEC ACT U-NAT (PCI/G) 01517	BETA-S SPEC ACT SR/Y-90 (PCI/G) 03517	BETA-S SPEC ACT CS-137 (PCI/G) 03518
(6) ELDER CREEK NEAR BRANSCOMB, CALIFORNIA (11475560)										
03/14/68	1230	1.2	.4	1.5	1.7	7	170	57	210	240
11/07/68	1525	< .4	< .1	< .4	< .4	< 1	--	--	--	--
03/20/69	0900	< .4	< .1	< .4	< .4	< 2	< 200	< 67	< 200	< 200
08/26/69	1445	< .4	< .1	< .4	< .4	< 1	--	--	--	--
08/24/70	0800	< .4	< .1	< .4	< .4	< 1	--	--	--	--
09/08/70	1700	< .4	< .1	< .4	< .4	< 1	--	--	--	--
01/12/71	1400	< .4	< .1	< .4	< .4	2	< 200	< 67	< 200	< 200
(7) MERCED RIVER AT HAPPY ISLES BRIDGE, NEAR YOSEMITE, CALIFORNIA (11264500)										
11/20/67	1600	< .4	< .1	< .4	< .4	< 1	--	--	--	--
10/16/68	1200	< .4	< .1	< .7	< .7	< 1	--	--	--	--
09/26/69	1130	.5	.2	< .6	< .6	< 1	--	--	--	--
08/26/70	0950	.4	.1	.5	.6	< 1	--	--	--	--
(8) WILDROSE CREEK NEAR WILDROSE STATION, CALIFORNIA (10250600)										
--	--	--	--	--	--	--	--	--	--	--
(9) HALFMOON CREEK NEAR MALTA, COLORADO (07083000)										
11/09/67	1410	< .4	< .1	.7	.7	< 1	--	--	--	--
06/18/68	1625	.4	.1	.5	.5	5	80	27	100	100
10/16/68	1345	< .4	< .1	.6	.6	< 1	--	--	--	--
05/22/69	1215	< .4	< .1	.5	.5	3	< 130	< 44	170	170
10/16/69	1100	< .4	< .1	< .4	< .4	< 1	--	--	--	--
06/10/70	1215	< .4	< .1	.4	.4	1	< 400	< 130	400	400
10/09/70	1130	< .4	< .1	.4	.5	3	< 130	< 44	130	170
(10) VALLECITO CREEK NEAR BAYFIELD, COLORADO (09352900)										
10/08/70	0845	< .4	< .1	< .4	< .4	< 1	--	--	--	--

TABLE 3.--RADIOCHEMICAL ANALYSES OF BENCHMARK SAMPLES COLLECTED DURING 1967-1971--CONTINUED

DATE OF COLLECTION	TIME	STREAM FLOW (CU FT/SEC)	WATER TEMP (DEG C)	U-NAT-D EXT FLUOR (UG/L)	RA-226-D RADON (PCI/L)	ALPHA-D GROSS U-NAT (UG/L)	ALPHA-D GROSS U-NAT (PCI/L)	BETA-D GROSS SR/Y-90 (PCI/L)	BETA-D GROSS CS-137 (PCI/L)	RESIDUE TOT FLT (MG/L)
		00060	00010	80020	09511	80030	01515	80050	03515	00515
(11) SOPCHOPPY RIVER NEAR SOPCHOPPY, FLORIDA (02327100)										
10/25/67	1500	--	--	.27	.30	5.4	1.8	3.6	4.6	150
03/18/69	1225	1310	11	< .01	.02	2.4	.8	3.7	4.6	50
09/23/69	1230	--	--	.03	.06	.7	.2	3.3	4.1	42
10/27/70	1415	113	19.5	.03	.09	< 1.0	< .3	3.5	4.4	76
(12) FALLING CREEK NEAR JULIETTE, GEORGIA (02212600)										
10/04/67	1130	5.4	15	.01	.03	1.3	.4	3.2	4.1	88
09/25/68	0900	25	--	< .01	< .01	< 1.1	< .4	3.0	3.8	100
08/13/70	1150	--	--	.02	.03	< .8	< .3	3.5	4.4	100
(13) TALLULAH RIVER NEAR CLAYTON, GEORGIA (02178400)										
10/11/67	1100	135	12	< .01	.08	.6	.2	1.1	1.2	20
(14) HONOLULU STREAM NEAR PAPAIIKOU, HAWAII (16717000)										
12/17/69	1100	36	17.5	.02	.03	< .4	< .1	2.4	2.9	36
06/08/70	1310	--	20	.01	.03	< .4	< .1	2.7	3.3	40
10/13/70	1430	19	21.0	.02	.02	.6	.2	2.0	2.5	43
(15) HAYDEN CREEK BELOW NORTH FORK, NEAR HAYDEN LAKE, IDAHO (12416000)										
09/23/67	1150	--	14	< .4 *	< .1 **	< .6	< .2	1.4	1.8	48
02/27/68	1000	--	--	< .01	.07	.5	.2	.9	1.1	38
09/24/68	1030	6.0	8	< .4 *	.02	.8	.3	1.1	1.3	54
09/03/69	0945	4.0	11	.02	.08	1.1	.4	2.8	3.5	53
06/15/70	1120	59	--	.08	.03	.8	.3	2.4	3.0	48
08/18/70	1010	6.5	5.5	.04	.04	< .5	< .2	1.9	2.3	48
09/23/70	1430	4.8	9.6	.03	.03	< .5	< .2	1.2	1.5	53

TABLE 3.--RADIOCHEMICAL ANALYSES OF BENCHMARK SAMPLES COLLECTED DURING 1967-1971--CONTINUED

DATE OF COLLECTION	TIME	ALPHA-S GROSS U-NAT (UG/L) 80040	ALPHA-S GROSS U-NAT (PCI/L) 01516	BETA-S GROSS SR/Y-90 (PCI/L) 80060	BETA-S GROSS CS-137 (PCI/L) 03516	RESIDUE TOT NFLT (MG/L) 00530	ALPHA-S SPEC ACT U-NAT (UG/G) 01518	ALPHA-S SPEC ACT U-NAT (PCI/G) 01517	BETA-S SPEC ACT SR/Y-90 (PCI/G) 03517	BETA-S SPEC ACT CS-137 (PCI/G) 03518
(11) SOPCHOPPY RIVER NEAR SOPCHOPPY, FLORIDA (02327100)										
10/25/67	1500	.7	.2	1.1	1.2	< 1	--	--	--	--
03/18/69	1225	< .5	< .2	< .9	< .9	3	< 170	< 56	< 300	< 300
09/23/69	1230	1.1	.4	.8	.9	6	180	61	130	150
10/27/70	1415	< .4	< .1	< .7	< .7	< 1	--	--	--	--
(12) FALLING CREEK NEAR JULIETTE, GEORGIA (02212600)										
10/24/67	1130	< .4	< .1	.8	.9	2	< 200	< 67	400	450
09/25/68	0900	< .4	< .1	< .4	< .4	< 1	--	--	--	--
08/13/70	1150	< .4	< .1	< .4	< .4	1	< 400	< 130	< 400	< 400
(13) TALLULAH RIVER NEAR CLAYTON, GEORGIA (02178400)										
10/11/67	1100	< .4	< .1	.7	.8	2	< 200	< 67	350	400
(14) HONOLII STREAM NEAR PAPAIIKOU, HAWAII (16717000)										
12/17/69	1100	1.0	.3	1.7	1.8	< 1	--	--	--	--
06/08/70	1310	< .4	< .1	1.0	1.0	< 1	--	--	--	--
10/13/70	1430	< .4	< .1	.5	.6	1	< 400	< 130	500	600
(15) HAYDEN CREEK BELOW NORTH FORK, NEAR HAYDEN LAKE, IDAHO (12416000)										
09/20/67	1150	< .4	< .1	1.0	1.1	< 1	--	--	--	--
02/27/68	1000	< .4	< .1	< .4	< .4	< 1	--	--	--	--
09/24/68	1030	< .4	< .1	< .4	< .4	< 1	--	--	--	--
09/03/69	0945	< .4	< .1	.7	.7	< 1	--	--	--	--
06/15/70	1120	< .4	< .1	1.4	1.5	6	< 67	< 22	230	250
08/18/70	1010	< .4	< .1	< .4	< .4	< 1	--	--	--	--
09/23/70	1430	< .4	< .1	< .4	< .4	< 1	--	--	--	--

TABLE 3.--RADIOCHEMICAL ANALYSES OF BENCHMARK SAMPLES COLLECTED DURING 1967-1971--CONTINUED

DATE OF COLLECTION	TIME	STREAM FLOW (CU FT/SEC)	WATER TEMP (DEG C)	U-NAT-D EXT FLUOR (UG/L)	RA-226-D RADON (PCI/L)	ALPHA-D GROSS U-NAT (UG/L)	ALPHA-D GROSS U-NAT (PCI/L)	BETA-D GROSS SR/Y-90 (PCI/L)	BETA-D GROSS CS-137 (PCI/L)	RESIDUE TOT FLT (MG/L)
		00060	00010	80020	09511	80030	01515	80050	03515	00515
(16) WICKAHONEY CREEK NEAR BRUNEAU, IDAHO (13169500)										
02/20/68	1128	--	--	.02	.03	2.0	.7	7.7	9.2	120
01/22/69	1250	104	2	.13	.06	3.6	1.2	6.6	8.3	84
04/29/69	1135	10	8	.20	.11	2.7	.9	4.5	5.5	110
08/09/69	1200	1.4	26	.19	.05	2.2	.7	5.1	6.3	140
01/11/71	1130	3.4	.5	.02	.04	2.6	.9	4.0	5.0	94
(17) SOUTH HOGAN CREEK NEAR DILLSBORO, INDIANA (03276700)										
09/10/69	1040	.68	18	.32	.06	3.5	1.2	9.2	11	250
03/06/70	1130	73	5.0	.38	.03	< 2.9	< 1.0	6.9	8.7	270
09/29/70	1100	2.8	16.5	.48	.06	< 2.5	< .8	8.4	10	310
(18) ELK CREEK NEAR DECATUR CITY, IOWA (06897950)										
09/05/69	0830	.61	21	3.6 *	.04	3.4	1.1	11	13	320
05/06/70	1630	12	--	5.0 *	.12	15	4.9	9.5	12	360
08/20/70	1045	1.1	22.5	2.7 *	.05	5.8	1.9	9.2	11	240
(19) BIG CREEK AT POLLOCK, LOUISIANA (07373000)										
02/06/68	1130	--	9	< .01	.05	1.4	.5	3.4	4.2	46
04/25/68	--	--	--	.04	.05	1.0	.3	3.7	4.7	49
07/03/68	1145	25	24	< .4 *	< .1 **	.6	.2	2.4	3.0	47
08/19/70	1215	17	24.0	.06	.05	< .4	< .1	1.9	2.4	42
02/04/71	1400	--	12.0	.02	.03	< .4	< .1	2.0	2.5	44
(20) WILD RIVER AT GILEAD, MAINE (01054200)										
10/13/67	1015	--	8	< .4 *	.09	1.3	.4	2.8	3.3	33
04/30/68	1200	--	9	.04	.03	.5	.2	1.8	2.1	22
10/29/68	1245	30	9	< .01	.03	.6	.2	2.5	2.9	25
04/29/69	1300	--	3	.04	.03	.5	.2	2.5	2.9	20
10/29/69	1300	--	3.5	.03	.05	.5	.2	3.5	4.1	29
04/25/70	1300	--	3.0	.05	.02	.5	.2	2.4	2.8	21
09/24/70	1200	--	19.5	.03	.03	< .4	< .1	1.8	2.2	25



TABLE 3.--RADIOCHEMICAL ANALYSES OF BENCHMARK SAMPLES COLLECTED DURING 1967-1971--CONTINUED

DATE OF COLLECTION	TIME	ALPHA-S GROSS U-NAT (UG/L) 80040	ALPHA-S GROSS U-NAT (PCI/L) 01516	BETA-S GROSS SR/Y-90 (PCI/L) 80060	BETA-S GROSS CS-137 (PCI/L) 03516	RESIDUE TOT NFLT (MG/L) 00530	ALPHA-S SPEC ACT U-NAT (UG/G) 01518	ALPHA-S SPEC ACT U-NAT (PCI/G) 01517	BETA-S SPEC ACT SR/Y-90 (PCI/G) 03517	BETA-S SPEC ACT CS-137 (PCI/G) 03518
(16) WICKAHONEY CREEK NEAR BRUNEAU, IDAHO (13169500)										
02/20/68	1128	61	20	27	33	470	130	43	57	70
01/22/69	1250	140	47	44	52	430	330	110	100	120
04/29/69	1135	1.8	.6	1.3	1.5	18	100	33	72	83
08/09/69	1200	.7	.2	.8	.9	10	70	23	80	90
01/11/71	1130	1.1	.4	1.4	1.5	10	110	37	140	150
(17) SOUTH HOGAN CREEK NEAR DILLSBORO, INDIANA (03276700)										
09/10/69	1040	3.1	1.0	5.1	5.7	34	91	30	150	170
03/06/70	1130	1.1	.4	2.7	3.1	33	33	11	82	94
09/29/70	1100	1.6	.5	2.3	2.6	26	62	21	88	100
(18) ELK CREEK NEAR DECATUR CITY, IOWA (06897950)										
09/05/69	0830	< .6	< .2	3.7	4.1	21	< 29	< 10	180	200
05/06/70	1630	1.2	.4	2.2	2.5	31	39	13	71	81
08/20/70	1045	3.9	1.3	4.5	5.8	63	62	21	71	92
(19) BIG CREEK AT POLLOCK, LOUISIANA (07373000)										
02/06/68	1130	2.0	.7	1.5	1.6	10	200	67	150	160
04/25/68	--	1.0	.3	2.1	2.4	13	77	26	160	180
07/03/68	1145	.6	.2	1.6	1.8	12	50	17	130	150
08/19/70	1215	1.1	.4	2.4	2.7	21	52	17	110	130
02/04/71	1400	< .4	< .1	< .4	< .4	5	< 80	< 27	< 80	< 80
(20) WILD RIVER AT GILEAD, MAINE (01054200)										
10/13/67	1015	< .4	< .1	.8	.8	< 1	--	--	--	--
04/30/68	1200	< .4	< .1	.7	.7	< 1	--	--	--	--
10/29/68	1245	< .4	< .1	< .4	< .4	1	< 400	< 130	< 400	< 400
04/29/69	1300	< .4	< .1	< .4	< .4	2	< 200	< 67	< 200	< 200
10/29/69	1300	< .4	< .1	< .4	< .4	< 1	--	--	--	--
04/25/70	1300	< .4	< .1	.4	.5	5	< 80	< 27	80	100
09/24/70	1200	< .4	< .1	< .4	< .4	< 1	--	--	--	--

TABLE 3.--RADIOCHEMICAL ANALYSES OF BENCHMARK SAMPLES COLLECTED DURING 1967-1971--CONTINUED

DATE OF COLLECTION	TIME	STREAM FLOW (CU FT/SEC)	WATER TEMP (DEG C)	U-NAT-D EXT FLUOR (UG/L)	RA-226-D RADON (PCI/L)	ALPHA-D GROSS U-NAT (UG/L)	ALPHA-D GROSS U-NAT (PCI/L)	BETA-D GROSS SR/Y-90 (PCI/L)	BETA-D GROSS CS-137 (PCI/L)	RESIDUE TOT FLT (MG/L)
		00060	00010	80020	09511	80030	01515	80050	03515	00515
(21) WASHINGTON CREEK AT WINDIGO, ISLE ROYALE, MICHIGAN (04001000)										
10/17/67	1100	3.2	6	< .4 *	.11	1.9	.6	3.1	3.9	120
05/10/68	1000	22	6	.06	.08	< .8	< .3	2.4	3.0	78
10/22/68	1100	12	9	< .01	.06	< 1.2	< .4	3.9	4.9	110
05/01/69	1100	57	4	.04	.02	1.5	.5	2.8	3.5	64
10/22/69	1100	--	2.0	.05	.03	< 1.7	< .6	4.5	5.6	120
05/01/70	1750	157	2.5	.06	.02	< .5	< .2	6.4	8.1	70
10/15/70	1130	5.7	5.5	.05	.03	< 1.5	< .5	3.7	4.5	110
(22) KAWISHIWI RIVER NEAR ELY, MINNESOTA (05124480)										
11/02/67	1420	31	6	< .4 *	< .1 **	.8	.3	5.1	6.2	38
05/02/68	1230	1030	7	< .01	.03	< .5	< .2	5.9	7.2	34
10/23/68	1430	373	9	< .01	.05	1.2	.4	5.1	6.4	58
09/30/69	1545	121	13	< .01	.03	.6	.2	5.2	6.4	39
10/21/70	1335	--	8.0	.03	.03	.5	.2	6.0	7.3	38
(23) NORTH FORK WHITEWATER RIVER NEAR ELBA, MINNESOTA (05376000)										
10/25/67	1435	--	7	.63	.09	5.4	1.8	3.4	4.3	250
05/06/68	1745	13	11	.59	.15	< 3.4	< 1.1	3.2	4.1	260
10/10/68	1345	--	--	.7 *	.05	5.0	1.7	6.2	7.7	300
03/24/69	1600	164	2	< .4 *	.04	< 1.6	< .5	8.7	11	130
09/17/69	1600	18	--	.7 *	.06	3.3	1.1	4.2	5.3	300
07/15/70	1340	24	18.5	.8 *	.07	< 3.3	< 1.1	3.8	4.8	320
10/29/70	1315	45	9.0	.7 *	.08	< 3.8	< 1.3	6.0	7.5	290
(24) CYPRESS CREEK NEAR JANICE, MISSISSIPPI (02479155)										
10/24/67	1830	7.4	--	< .4 *	< .1 **	1.3	.4	1.9	2.3	33
10/09/68	1030	7.2	23	< .01	.02	< .4	< .1	1.4	1.7	27
04/13/69	2100	--	18	< .01	.06	1.0	.3	8.5	10	24
08/18/69	1600	--	24	.10	.09	2.9	1.0	5.4	6.8	53
09/08/70	1300	84	25.0	.06	.06	1.5	.5	3.9	4.8	38

TABLE 3.--RADIOCHEMICAL ANALYSES OF BENCHMARK SAMPLES COLLECTED DURING 1967-1971--CONTINUED

DATE OF COLLECTION	TIME	ALPHA-S GROSS U-NAT (UG/L) 80040	ALPHA-S GROSS U-NAT (PCI/L) 01516	BETA-S GROSS SR/Y-90 (PCI/L) 80060	BETA-S GROSS CS-137 (PCI/L) 03516	RESIDUE TOT NFLT (MG/L) 00530	ALPHA-S SPEC ACT U-NAT (UG/G) 01518	ALPHA-S SPEC ACT U-NAT (PCI/G) 01517	BETA-S SPEC ACT SR/Y-90 (PCI/G) 03517	BETA-S SPEC ACT CS-137 (PCI/G) 03518
(21) WASHINGTON CREEK AT WINDIGO, ISLE ROYALE, MICHIGAN (04001000)										
10/17/67	1100	< .4	< .1	.7	.8	1	< 400	< 130	700	800
05/10/68	1000	< .4	< .1	1.0	1.1	2	< 200	< 67	500	550
10/22/68	1100	< .4	< .1	.8	.9	2	< 200	< 67	400	450
05/01/69	1100	1.1	.4	1.2	1.3	8	140	46	150	160
10/22/69	1100	< .4	< .1	< .4	< .4	< 1	--	--	--	--
05/01/70	1750	.8	.3	1.9	2.2	23	35	12	83	96
10/15/70	1130	< .4	< .1	< .5	< .6	< 1	--	--	--	--
(22) KAWISHIWI RIVER NEAR ELY, MINNESOTA (05124480)										
11/02/67	1420	.7	.2	1.6	1.8	< 1	--	--	--	--
05/02/68	1230	< .4	< .1	2.1	2.2	< 1	--	--	--	--
10/23/68	1430	< .4	< .1	1.3	1.5	2	< 200	< 67	650	750
09/30/69	1545	< .4	< .1	.5	.5	1	< 400	< 130	500	500
10/21/70	1335	< .4	< .1	< .5	< .6	< 1	--	--	--	--
(23) NORTH FORK WHITEWATER RIVER NEAR ELBA, MINNESOTA (05376000)										
10/25/67	1435	.8	.3	1.2	1.3	1	800	270	1200	1300
05/06/68	1745	< .4	< .1	.9	1.0	4	< 100	< 33	225	250
10/10/68	1345	4.3	1.4	4.4	5.2	100	43	14	44	52
03/24/69	1600	8.8	2.9	6.9	8.2	140	63	21	49	59
09/17/69	1600	< .4	< .1	.9	.9	3	< 130	< 44	300	300
07/15/70	1340	1.0	.3	1.3	1.4	27	37	12	48	52
10/29/70	1315	2.6	.9	4.4	5.3	100	26	9	44	53
(24) CYPRESS CREEK NEAR JANICE, MISSISSIPPI (02479155)										
10/24/67	1830	< .4	< .1	.8	.9	3	< 130	< 44	270	300
10/09/68	1030	< .4	< .1	< .4	< .4	2	< 200	< 67	< 200	< 200
04/13/69	2100	3.4	1.1	6.3	7.2	60	57	19	100	120
08/18/69	1600	2.7	.9	1.6	1.8	28	96	32	57	64
09/08/70	1300	1.0	.3	1.4	1.6	16	62	21	88	100

TABLE 3.--RADIOCHEMICAL ANALYSES OF BENCHMARK SAMPLES COLLECTED DURING 1967-1971--CONTINUED

DATE OF COLLECTION	TIME	STREAM FLOW (CU FT/SEC)	WATER TEMP (DEG C)	U-NAT-D EXT FLUOR (UG/L)	RA-226-D RADON (PCI/L)	ALPHA-D GROSS U-NAT (UG/L)	ALPHA-D GROSS U-NAT (PCI/L)	BETA-D GROSS SR/Y-90 (PCI/L)	BETA-D GROSS CS-137 (PCI/L)	RESIDUE TOT FLT (MG/L)
		00060	00010	80020	09511	80030	01515	80050	03515	00515
(25) BEAUVAIS CREEK NEAR ST. XAVIER, MONTANA (06288200)										
10/10/67	1500	56+	11	3.7 *	.1 **	24	7.8	7.3	8.9	1400
06/19/68	1700	--	20	3.8 *	.1 **	16	5.4	4.7	5.6	1200
08/06/68	1510	3.0	21	3.8 *	.1 **	21	6.9	6.5	7.3	1400
06/27/69	1230	253	14	1.2 *	.05	< 3.6	< 1.2	7.8	9.5	440
10/30/69	1030	8.2	2.5	4.6 *	.08	40	13	14	18	1300
05/05/70	1530	125	20.0	3.9 *	.08	15	4.9	12	14	730
10/07/70	1130	7.9	6.5	4.4 *	.10	< 13	< 4.4	4.5	5.1	1100
(26) SWIFTCURRENT CREEK AT MANY GLACIER, MONTANA (05014500)										
09/15/67	0940	--	13	< .4 *	< .1 **	< .4	< .1	2.1	2.6	50
05/30/68	1800	564	6	.04	.05	.6	.2	2.3	2.8	51
(27) DISMAL RIVER NEAR THEDFORD, NEBRASKA (06775900)										
10/17/67	1200	--	11	< .4 *	.09	< 1.9	< .6	4.2	5.2	140
04/30/68	1000	208	20	< .4 *	.07	2.4	.8	5.1	6.2	140
10/15/68	1145	184	14	.25	< .01	< 2.2	< .7	4.6	5.5	150
05/27/69	1020	190	20	.25	.04	< 1.7	< .6	5.6	6.8	150
10/07/69	1150	187	13.0	.29	.07	< 1.7	< .6	4.2	5.1	150
04/14/70	1000	208	7.0	.31	.04	1.5	.5	4.5	5.6	84
11/16/70	1340	192	9.0	.17	.06	< 1.6	< .5	5.1	6.2	140
(28) SOUTH TWIN RIVER NEAR ROUND MOUNTAIN, NEVADA (10249300)										
10/28/67	1115	3.4	8	1.5 *	.05	3.2	1.1	4.4	5.5	78
06/20/68	1010	8.8	9	1.0 *	.08	4.2	1.4	1.8	2.3	67
10/22/68	1555	1.9	7	1.5 *	.02	5.7	1.9	1.6	2.0	92
05/23/69	1000	51	7	.7 *	.06	3.1	1.0	2.0	2.5	65
10/24/69	1000	2.8	6.0	2.2 *	.07	5.4	1.8	2.0	2.4	92
05/28/70	1130	16	7.5	.26	.03	1.7	.6	4.4	5.5	73
10/29/70	1100	1.7	2.5	1.0 *	.04	3.2	1.1	1.6	2.0	86

TABLE 3.--RADIOCHEMICAL ANALYSES OF BENCHMARK SAMPLES COLLECTED DURING 1967-1971--CONTINUED

DATE OF COLLECTION	TIME	ALPHA-S GROSS U-NAT (UG/L) 80040	ALPHA-S GROSS U-NAT (PCI/L) 01516	BETA-S GROSS SR/Y-90 (PCI/L) 80060	BETA-S GROSS CS-137 (PCI/L) 03516	RESIDUE TOT NFLT (MG/L) 00530	ALPHA-S SPEC ACT U-NAT (UG/G) 01518	ALPHA-S SPEC ACT U-NAT (PCI/G) 01517	BETA-S SPEC ACT SR/Y-90 (PCI/G) 03517	BETA-S SPEC ACT CS-137 (PCI/G) 03518
(25) BEAUVAIS CREEK NEAR ST. XAVIER, MONTANA (06288200)										
06/19/68	1700	8.8	2.9	7.1	9.0	280	31	10	25	32
10/10/67	1500	11	3.6	3.7	4.4	120	92	31	31	37
08/06/68	1510	1.0	.3	1.3	1.5	13	77	26	100	120
06/27/69	1230	660	220	210	260	7600	87	29	28	34
10/30/69	1030	97	32	34	41	1000	97	32	34	41
05/05/70	1530	140	47	45	55	1500	93	31	30	37
10/07/70	1130	1.4	.5	3.0	3.4	60	23	8	50	57
(26) SWIFTCURRENT CREEK AT MANY GLACIER, MONTANA (05014500)										
09/15/67	0940	< .4	< .1	.7	.8	< 1	--	--	--	--
05/30/68	1800	< .4	< .1	.8	.8	1	< 400	< 130	800	800
(27) DISMAL RIVER NEAR THEDFORD, NEBRASKA (06775900)										
10/17/67	1200	2.8	.9	2.0	2.5	46	61	20	43	54
04/30/68	1000	15	5.1	5.7	6.4	150	100	33	38	43
10/15/68	1145	< .4	< .1	.4	.5	12	< 33	< 11	33	42
05/27/69	1020	6.0	2.0	2.5	3.1	77	78	26	32	40
10/07/69	1150	3.6	1.2	1.7	2.1	75	48	16	23	28
04/14/70	1000	11	3.7	6.0	6.4	170	65	22	35	38
11/16/70	1340	4.6	1.5	3.8	4.8	120	38	13	32	40
(28) SOUTH TWIN RIVER NEAR ROUND MOUNTAIN, NEVADA (10249300)										
10/28/67	1115	< .4	< .1	.8	.8	3	< 130	< 44	270	270
06/20/68	1010	1.5	.5	.7	.7	8	190	62	88	88
10/22/68	1555	< .4	< .1	.6	.7	< 1	--	--	--	--
05/23/69	1000	22	7.4	7.9	9.5	120	180	61	66	79
10/24/69	1000	< .4	< .1	.5	.6	1	< 400	< 130	500	600
05/28/70	1130	4.9	1.6	2.2	2.6	20	240	82	110	130
10/29/70	1100	< .4	< .1	< .4	< .4	< 1	--	--	--	--

TABLE 3.--RADIOCHEMICAL ANALYSES OF BENCHMARK SAMPLES COLLECTED DURING 1967-1971--CONTINUED

DATE OF COLLECTION	TIME	STREAM FLOW (CU FT/SEC)	WATER TEMP (DEG C)	U-NAT-D EXT FLUOR (UG/L)	RA-226-D RADON (PCI/L)	ALPHA-D GROSS U-NAT (UG/L)	ALPHA-D GROSS U-NAT (PCI/L)	BETA-D GROSS SR/Y-90 (PCI/L)	BETA-D GROSS CS-137 (PCI/L)	RESIDUE TOT FLT (MG/L)
		00060	00010	80020	09511	80030	01515	80050	03515	00515

## (29) STEPTOE CREEK NEAR ELY, NEVADA (10244950)

06/19/68	0940	13	7	.29	.05	2.2	.7	.8	1.1	170
09/24/68	1000	5.1	7	.4 *	.05	2.3	.8	1.0	1.3	170
05/21/69	1610	28	9	.6 *	.06	5.7	1.9	2.4	3.1	200
10/23/69	1000	6.5	6.0	.27	.07	5.7	1.9	1.1	1.4	180
05/27/70	0830	8.8	7.0	.44	.08	2.5	.8	1.0	1.3	180
10/23/70	1025	4.0	6.5	.48	.08	< 1.7	< .6	1.3	1.6	160

## (30) MCDONALDS BRANCH IN LEBANON STATE FOREST, NEW JERSEY (01466500)

10/20/67	1400	120 +	7	.01	.16	1.9	.6	2.1	2.5	24
12/13/68	1630	1.5+	5	.03	.24	2.6	.9	3.5	4.1	25
03/20/69	1830	2.3+	--	< .01	.28	2.9	1.0	4.6	5.7	39
06/25/69	1105	--	17	.02	.32	3.5	1.2	6.0	7.4	42
09/29/69	1200	2.3+	13	.02	.14	.9	.3	1.6	1.9	26
06/25/70	0930	2.1+	15.5	.02	.12	.9	.3	2.6	3.2	28
09/28/70	1500	1.3+	--	.02	.11	.9	.3	1.9	2.2	23

## (31) MOGOLLON CREEK NEAR CLIFF, NEW MEXICO (09430600)

02/20/68	1130	192	5	.01	< .01	1.7	.6	2.0	2.5	91
05/27/68	1315	31	18	.05	.07	1.2	.4	1.2	1.6	55
10/24/68	1100	1.2	11	.08	.04	< .7	< .2	1.6	2.0	92
04/23/69	1110	22	13	< .01	.05	1.1	.4	1.2	1.5	52
10/29/69	0930	--	--	.05	.04	< 2.1	< .7	1.4	1.7	190
04/21/70	1645	21	--	.04	.08	1.4	.5	1.5	1.9	67
08/06/70	1720	--	21.0	< .01	.03	.6	.2	3.5	4.4	110

## (32) RIO MORA NEAR TERRERO, NEW MEXICO (08377900)

10/23/67	1450	13	4	< .4 *	.13	1.9	.6	1.0	1.2	57
05/15/68	1115	73	3	.07	.04	1.0	.3	1.2	1.5	56
10/16/68	1200	7.8	6	.13 ✓	.03 ✓	< .8	< .3	1.0	1.2	63 ✓
04/18/69	1040	18	--	.16	< .01	1.1	.4	1.6	1.9	62
10/15/69	1315	--	--	.16	.04	.9	.3	1.2	1.4	52
04/15/70	1315	19	--	.30	.03	2.2	.7	1.5	1.9	76
10/05/70	0920	11	6.0	.21	.04	1.5	.5	1.1	1.4	66

Cont.  
page 28Cont.  
page 28

TABLE 3.--RADIOCHEMICAL ANALYSES OF BENCHMARK SAMPLES COLLECTED DURING 1967-1971--CONTINUED

DATE OF COLLECTION	TIME	ALPHA-S GROSS U-NAT (UG/L) 80040	ALPHA-S GROSS U-NAT (PCI/L) 01516	BETA-S GROSS SR/Y-90 (PCI/L) 80060	BETA-S GROSS CS-137 (PCI/L) 03516	RESIDUE TOT NFLT (MG/L) 00530	ALPHA-S SPEC ACT U-NAT (UG/G) 01518	ALPHA-S SPEC ACT U-NAT (PCI/G) 01517	BETA-S SPEC ACT SR/Y-90 (PCI/G) 03517	BETA-S SPEC ACT CS-137 (PCI/G) 03518
(29) STEPTOE CREEK NEAR ELY, NEVADA (10244950)										
06/19/68	0940	< .4	< .1	< .4	< .4	13	< 31	< 10	< 31	< 31
09/24/68	1000	.6	.2	< .4	< .4	5	120	40	< 80	< 80
05/21/69	1610	1.3	.4	1.3	1.5	48	27	9	27	31
10/23/69	1000	1.2	.4	1.3	1.4	2	600	200	650	700
05/27/70	0830	.9	.3	.6	.7	17	53	18	35	41
10/23/70	1025	< .4	< .1	< .4	< .4	1	< 400	< 130	< 400	< 400
(30) McDONALDS BRANCH IN LEBANON STATE FOREST, NEW JERSEY (01466500)										
10/20/67	1400	< .4	< .1	.5	.6	< 1	--	--	--	--
12/13/68	1630	< .4	< .1	< .4	< .4	< 1	--	--	--	--
03/20/69	1830	< .4	< .1	< .4	< .4	< 1	--	--	--	--
06/25/69	1105	< .4	< .1	< .4	< .4	< 1	--	--	--	--
09/29/69	1200	1.1	.4	< .6	< .6	< 1	--	--	--	--
06/25/70	0930	< .4	< .1	< .4	< .4	< 1	--	--	--	--
09/28/70	1500	< .4	< .1	.6	.7	2	< 200	< 67	300	350
(31) MUGOLLON CREEK NEAR CLIFF, NEW MEXICO (09430600)										
02/20/68	1130	1.5	.5	1.5	1.6	6	250	83	250	270
05/27/68	1315	< .4	< .1	< .4	< .4	1	< 400	< 130	< 400	< 400
10/24/68	1100	< .4	< .1	.7	.8	< 1	--	--	--	--
04/23/69	1110	< .4	< .1	< .4	< .4	< 1	--	--	--	--
10/29/69	0930	< .4	< .1	< .4	< .4	< 1	--	--	--	--
04/21/70	1645	< .4	< .1	< .4	< .4	< 1	--	--	--	--
08/06/70	1720	200	66	81	97	1500	130	44	54	65
(32) RIO MORA NEAR TERRERO, NEW MEXICO (08377900)										
10/23/67	1450	< .4	< .1	.6	.6	< 1	--	--	--	--
05/15/68	1115	< .4	< .1	< .4	< .4	4	< 100	< 33	< 100	< 100
10/16/68	1200	< .4	< .1	< .4	< .4	< 1	--	--	--	--
04/18/69	1040	< .4	< .1	< .4	< .4	< 1	--	--	--	--
10/15/69	1315	< .4	< .1	< .4	< .4	2	< 200	< 67	< 200	< 200
10/05/70	0920	< .4	< .1	< .4	< .4	< 1	--	--	--	--
04/15/70	1315	< .4	< .1	.5	.6	2	< 200	< 67	250	300

TABLE 3.--RADIOCHEMICAL ANALYSES OF BENCHMARK SAMPLES COLLECTED DURING 1967-1971--CONTINUED

DATE OF COLLECTION	TIME	STREAM FLOW (CU FT/SEC)	WATER TEMP (DEG C)	U-NAT-D EXT FLUOR (UG/L)	RA-226-D RADON (PCI/L)	ALPHA-D GROSS U-NAT (UG/L)	ALPHA-D GROSS U-NAT (PCI/L)	BETA-D GROSS SR/Y-90 (PCI/L)	BETA-D GROSS CS-137 (PCI/L)	RESIDUE TOT FLT (MG/L)
		00060	00010	80020	09511	80030	01515	80050	03515	00515
(33) ESOPUS CREEK AT SHANDAKEN, NEW YORK (01362198)										
09/19/67	0910	--	17	< .01	.06	.5	.2	.7	.9	51
03/28/68	1030	350	5	< .01	< .1 **	.5	.2	.7	.8	31
09/25/68	1100	7.9	20	< .01	.02	.9	.3	.9	1.1	41
05/08/69	1100	90	8	< .01	.03	.4	.1	.7	.8	29
09/24/69	1000	14	12	< .01	.05	2.1	.7	< .4	< .4	110
04/30/70	1100	395	10.0	.02	.03	< .4	< .1	1.0	1.1	28
10/14/70	1630	20	18.5	.03	.03	.5	.2	1.7	2.1	41
(34) CATALDOOCHEE CREEK NEAR CATALDOOCHEE, NORTH CAROLINA (03460000)										
10/03/67	1100	54	9	.03	.06	< .4	< .1	.5	.6	16
10/29/68	1200	31	11	< .01	.01	< .4	< .1	.9	1.1	16
08/22/69	1130	960	--	.02	.03	.8	.3	2.9	3.4	28
12/01/69	1100	47	3.0	< .01	.04	< .4	< .1	1.1	1.3	20
09/02/70	1215	29	17.5	.03	.02	.6	.2	1.4	1.7	24
(35) BEAR DEN CREEK NEAR MANDAREE, NORTH DAKOTA (06332515)										
09/14/67	1440	.21	--	3.5 *	.1 **	22	7.4	9.2	11	2600
03/01/68	1155	35	1	< .4 *	.24	4.8	1.6	16	20	280
10/07/68	1150	.16	8	1.9 *	.04	< 22	< 7.4	5.4	6.7	2100
03/25/69	1145	35	1	.4 *	.07	< 2.4	< .8	16	21	190
08/18/69	1500	.17	21	3.9 *	.08	46	15	16	20	1800
03/24/70	1525	29	.0	.7 *	.05	< 4.4	< 1.5	17	20	400
09/21/70	1200	.23	10.5	4.2 *	.08	31	10	11	14	2200
(36) BEAVER CREEK NEAR FINLEY, NORTH DAKOTA (05064900)										
03/26/68	1115	17	2	2.9 *	.03	13	4.3	13	16	390
07/24/68	1100	24	21	6.5 *	< .1 **	19	6.5	24	28	1200
04/14/69	1330	186	--	2.8 *	.03	12	3.9	14	17	390
09/18/69	1130	1.0	13	2.6 *	.06	5.2	1.7	12	14	460
11/04/70	1615	.80	2.0	5.3 *	.08	< 14	< 4.6	23	28	1200



TABLE 3.--RADIOCHEMICAL ANALYSES OF BENCHMARK SAMPLES COLLECTED DURING 1967-1971--CONTINUED

DATE OF COLLECTION	TIME	ALPHA-S GROSS U-NAT (UG/L) 80040	ALPHA-S GROSS U-NAT (PCI/L) 01516	BETA-S GROSS SR/Y-90 (PCI/L) 80060	BETA-S GROSS CS-137 (PCI/L) 03516	RESIDUE TOT NFLT (MG/L) 00530	ALPHA-S SPEC ACT U-NAT (UG/G) 01518	ALPHA-S SPEC ACT U-NAT (PCI/G) 01517	BETA-S SPEC ACT SR/Y-90 (PCI/G) 03517	BETA-S SPEC ACT CS-137 (PCI/G) 03518
(33) ESOPUS CREEK AT SHANDAKEN, NEW YORK (01362198)										
09/19/67	0910	< .4	< .1	.7	.8	< 1	--	--	--	--
03/28/68	1030	< .4	< .1	.9	1.0	2	< 200	< 67	450	500
09/25/68	1100	.7	.2	.8	.9	20	35	12	40	45
05/08/69	1100	< .4	< .1	< .4	< .4	< 1	--	--	--	--
09/24/69	1000	8.8	2.9	3.8	4.7	98	90	30	39	48
04/30/70	1100	< .4	< .1	< .4	< .4	2	< 200	< 67	< 200	< 200
10/14/70	1630	< .4	< .1	< .4	< .4	2	< 200	< 67	< 200	< 200
(34) CATALDOOCHEE CREEK NEAR CATALDOOCHEE, NORTH CAROLINA (03460000)										
10/03/67	1100	< .4	< .1	.6	.7	5	< 80	< 27	120	140
10/29/68	1200	< .4	< .1	.8	.8	< 1	--	--	--	--
08/22/69	1130	21	7.0	13	17	210	100	33	62	81
12/01/69	1100	.4	.1	< .4	< .4	< 1	--	--	--	--
09/02/70	1215	< .4	< .1	< .4	< .4	< 1	--	--	--	--
(35) BEAR DEN CREEK NEAR MANDAREE, NORTH DAKOTA (06332515)										
09/14/67	1440	5.8	1.9	5.5	6.6	110	53	18	50	60
03/01/68	1155	11	3.5	9.6	12	140	79	26	69	86
10/07/68	1150	1.7	.6	1.9	2.2	46	37	12	41	48
03/25/69	1145	5.0	1.7	7.4	8.7	110	45	15	67	79
08/18/69	1500	1.1	.4	3.4	3.9	45	24	8	76	87
03/24/70	1525	10	3.3	8.0	9.3	180	56	19	44	52
09/21/70	1200	3.2	1.1	6.7	7.9	79	41	14	85	100
(36) BEAVER CREEK NEAR FINLEY, NORTH DAKOTA (05064900)										
03/26/68	1115	.5	.2	3.4	3.8	11	45	15	310	350
07/24/68	1100	.7	.2	4.2	4.7	18	39	13	230	260
04/14/69	1330	2.8	.9	2.3	2.6	31	90	30	74	84
09/19/69	1130	1.0	.3	1.7	1.8	20	50	17	85	90
11/04/70	1615	1.2	.4	3.5	4.0	22	55	18	160	180

TABLE 3.--RADIOCHEMICAL ANALYSES OF BENCHMARK SAMPLES COLLECTED DURING 1967-1971--CONTINUED

DATE OF COLLECTION	TIME	STREAM FLOW (CU FT/SEC)	WATER TEMP (DEG C)	U-NAT-D EXT FLUOR (UG/L)	RA-226-D RADON (PCI/L)	ALPHA-D GROSS U-NAT (UG/L)	ALPHA-D GROSS U-NAT (PCI/L)	BETA-D GROSS SR/Y-90 (PCI/L)	BETA-D GROSS CS-137 (PCI/L)	RESIDUE TOT FLT (MG/L)
		00060	00010	80020	09511	80030	01515	80050	03515	00515
(37) UPPER TWIN CREEK AT MCGAW, OHIO (03237280)										
01/23/68	1640	30	3	< .01	.02	< .5	< .2	2.4	3.0	50
09/26/68	1130	.33	19	< .01	.05	< .8	< .3	2.7	3.5	78
09/24/69	0930	.28	19	.01	.07	1.9	.6	1.2	1.5	100
03/31/70	0900	--	5.5	.03	.04	.6	.2	2.2	2.8	51
09/21/70	1430	--	28.0	.01	.08	1.0	.3	3.3	4.2	77
(38) BLUE BEAVER CREEK NEAR CACHE, OKLAHOMA (07311200)										
12/07/67	1515	.65	9	.01	.04	< 1.1	< .4	2.7	3.4	100
11/15/68	1320	.73	11	< .01	.09	< 1.2	< .4	3.8	4.7	110
05/07/69	1200	213	18	.04	.05	1.8	.6	7.4	9.2	85
(39) KIAMICHI RIVER NEAR BIG CEDAR, OKLAHOMA (07335700)										
09/13/67	0735	--	22	< .4 *	< .1 **	< .4	< .1	1.6	1.9	30
10/30/67	1653	1190	13	.04	.15	12	4.0	7.0	8.3	28
03/20/68	0945	3150	11	.01	.02	1.1	.4	3.4	3.9	23
09/18/68	1030	1.3	20	< .01	.04	.4	.1	4.3	5.1	28
08/28/69	0950	--	25	< .01	.03	.4	.1	1.6	1.9	27
10/30/69	1000	108	11.0	.03	.02	.6	.2	3.3	3.9	25
09/15/70	1245	2.0	26.5	< .01	.03	< .4	< .1	1.8	2.2	28
11/03/70	1700	--	9.5	.02	.04	< .4	< .1	1.2	1.4	20
(40) CRATER LAKE NEAR CRATER LAKE, OREGON (11492200)										
10/05/67	1500	--	--	< .4 *	.08	< .4	< .1	2.4	3.1	80
06/02/69	1450	--	4	.01	.05	< .6	< .2	2.4	3.0	78
10/01/69	0815	--	--	< .01	.01	< .6	< .2	2.1	2.7	77
(41) MINAM RIVER NEAR MINAM, OREGON (13331500)										
09/21/67	1405	--	21	< .4 *	< .1 **	.7	.2	1.8	2.2	34
06/17/68	1405	--	--	.03	.05	< .4	< .1	1.6	1.9	23
10/24/68	0830	175	6	.14	.08	< .4	< .1	1.7	2.1	40
10/12/69	1130	90	4.0	.06	.02	.6	.2	1.4	1.7	55
02/08/71	1355	288	2.0	.30	.03	< .5	< .2	2.1	2.6	66

TABLE 3.--RADIOCHEMICAL ANALYSES OF BENCHMARK SAMPLES COLLECTED DURING 1967-1971--CONTINUED

DATE OF COLLECTION	TIME	ALPHA-S GROSS U-NAT (UG/L) 80040	ALPHA-S GROSS U-NAT (PCI/L) 01516	BETA-S GROSS SR/Y-90 (PCI/L) 80060	BETA-S GROSS CS-137 (PCI/L) 03516	RESIDUE TOT NFLT (MG/L) 00530	ALPHA-S SPEC ACT U-NAT (UG/G) 01518	ALPHA-S SPEC ACT U-NAT (PCI/G) 01517	BETA-S SPEC ACT SR/Y-90 (PCI/G) 03517	BETA-S SPEC ACT CS-137 (PCI/G) 03518
(37) UPPER TWIN CREEK AT MCGAW, OHIO (03237280)										
01/23/68	1640	.4	.1	1.1	1.2	7	57	19	160	170
09/26/68	1130	< .4	< .1	< .4	< .4	< 1	--	--	--	--
09/24/69	0930	< .4	< .1	< .4	< .4	1	< 400	< 130	< 400	< 400
03/31/70	0900	.4	.1	.7	.7	1	400	130	700	700
09/21/70	1430	< .4	< .1	< .4	< .4	< 1	--	--	--	--
(38) BLUE BEAVER CREEK NEAR CACHE, OKLAHOMA (07311200)										
12/07/67	1515	3.6	1.2	1.9	2.3	44	82	27	43	52
11/15/68	1320	.5	.2	1.0	1.1	9	56	19	110	120
05/07/69	1200	7.7	2.6	10	12	110	70	23	91	110
(39) KIAMICHI RIVER NEAR BIG CEDAR, OKLAHOMA (07335700)										
09/13/67	0735	< .4	< .1	.6	.7	3	< 130	< 44	200	230
10/30/67	1653	2.4	.8	1.7	2.0	22	110	36	77	91
03/27/68	0945	5.0	1.7	4.5	5.6	69	72	24	65	81
09/18/68	1030	1.6	.5	3.4	3.8	28	57	19	120	140
08/28/69	0950	< .4	< .1	< .4	< .4	1	< 400	< 130	< 400	< 400
10/30/69	1000	1.2	.4	1.4	1.5	12	100	33	120	120
09/15/70	1245	.5	.2	.6	.6	3	170	56	200	200
11/03/70	1700	< .4	< .1	< .4	< .4	1	< 400	< 130	< 400	< 400
(40) CRATER LAKE NEAR CRATER LAKE, OREGON (11492200)										
10/05/67	1500	< .4	< .1	.6	.7	1	< 400	< 130	600	700
06/02/69	1450	< .4	< .1	< .4	< .4	< 1	--	--	--	--
10/01/69	0815	< .4	< .1	< .4	< .4	< 1	--	--	--	--
(41) MINAM RIVER NEAR MINAM, OREGON (13331500)										
09/21/67	1405	< .4	< .1	.7	.8	< 1	--	--	--	--
06/17/68	1405	< .4	< .1	< .4	< .4	5	< 80	< 27	< 80	< 80
10/24/68	0830	< .4	< .1	.8	.9	< 1	--	--	--	--
10/12/69	1130	< .4	< .1	< .4	< .4	< 1	--	--	--	--
02/08/71	1355	< .4	< .1	< .4	< .4	3	< 130	< 44	< 130	< 130

TABLE 3.--RADIOCHEMICAL ANALYSES OF BENCHMARK SAMPLES COLLECTED DURING 1967-1971--CONTINUED

DATE OF COLLECTION	TIME	STREAM FLOW (CU FT/SEC)	WATER TEMP (DEG C)	U-NAT-D EXT FLUOR (UG/L)	RA-226-D RADON (PCI/L)	ALPHA-D GROSS U-NAT (UG/L)	ALPHA-D GROSS U-NAT (PCI/L)	BETA-D GROSS SR/Y-90 (PCI/L)	BETA-D GROSS CS-137 (PCI/L)	RESIDUE TOT FLT (MG/L)
		00060	00010	80020	09511	80030	01515	80050	03515	00515
(42) YOUNG WOMANS CREEK NEAR RENOVO, PENNSYLVANIA (01545600)										
09/21/67	1300	--	--	< .4 *	< .1 **	.4	.1	1.2	1.5	30
06/28/68	1130	--	--	< .4 *	< .1 **	.9	.3	1.3	1.5	26
07/10/69	1315	9.7	17	< .01	.07	1.1	.4	1.2	1.5	31
10/30/69	1430	7.5	--	< .01	.03	.5	.2	1.4	1.6	31
10/15/70	1130	85	11.0	< .01	.06	< .9	< .3	1.4	1.7	82
(43) SCAPE ORE SWAMP NEAR BISHOPVILLE, SOUTH CAROLINA (02135300)										
12/15/70	0920	--	--	.10	.10	.9	.3	1.2	1.5	30
(44) UPPER THREE RUNS NEAR NEW ELLENTON, SOUTH CAROLINA (02197300)										
11/02/67	1110	154	17	< .4 *	1.2 **	4.2	1.4	2.6	3.1	23
08/05/68	1100	--	20	< .4 *	.70	2.4	.8	.8	.9	15
01/02/69	1100	102	9	.05	.75	1.4	.5	.8	.9	18
04/01/69	1415	93	16	.03	.84	2.0	.7	1.1	1.2	16
04/16/69	1100	--	17	.09	2.4	8.4	2.8	8.9	11	35
10/08/69	1035	89	18.5	.02	.88	4.2	1.4	2.4	2.8	17
05/05/70	1145	100	15.5	.01	.98	3.5	1.2	1.7	1.9	19
12/28/70	1100	104	10.0	.08	.71	2.2	.7	2.7	3.1	15
(45) CASTLE CREEK ABOVE DEERFIELD RESEVOIR, NEAR HILL CITY, SOUTH DAKOTA (06409000)										
09/19/67	1215	--	9	1.0 *	.1 **	9.7	3.2	3.3	4.0	390
09/18/68	1300	11	10	.8 *	.09	< 2.4	< .8	1.4	1.8	220
04/15/69	1500	17	6	.9 *	.13	< 3.6	< 1.2	2.7	3.4	270
10/27/69	1300	12	.0	1.0 *	.09	5.8	1.9	1.8	2.3	270
01/13/70	1000	--	--	.8 *	.10	6.7	2.2	1.3	1.7	280
04/21/70	1100	9.1	.0	1.0 *	.10	5.9	2.0	3.3	4.2	280
10/12/70	1240	11	5.5	.9 *	.07	3.5	1.2	2.1	2.7	220

TABLE 3.--RADIOCHEMICAL ANALYSES OF BENCHMARK SAMPLES COLLECTED DURING 1967-1971--CONTINUED

DATE OF COLLECTION	TIME	ALPHA-S GROSS U-NAT (UG/L) 80040	ALPHA-S GROSS U-NAT (PCI/L) 01516	BETA-S GROSS SR/Y-90 (PCI/L) 80060	BETA-S GROSS CS-137 (PCI/L) 03516	RESIDUE TOT NFLT (MG/L) 00530	ALPHA-S SPEC ACT U-NAT (UG/G) 01518	ALPHA-S SPEC ACT U-NAT (PCI/G) 01517	BETA-S SPEC ACT SR/Y-90 (PCI/G) 03517	BETA-S SPEC ACT CS-137 (PCI/G) 03518
(42) YOUNG WOMANS CREEK NEAR RENOVO, PENNSYLVANIA (01545600)										
09/21/67	1300	< .4	< .1	.9	1.0	< 1	--	--	--	--
06/28/68	1130	.5	.2	.5	.6	3	170	56	170	200
07/10/69	1315	< .4	< .1	< .4	< .4	2	< 200	< 67	< 200	< 200
10/30/69	1430	.5	.2	.5	.5	< 1	--	--	--	--
10/15/70	1130	< .4	< .1	< .4	< .4	< 1	--	--	--	--
(43) SCAPE ORE SWAMP NEAR BISHOPVILLE, SOUTH CAROLINA (02135300)										
12/15/70	0920	.5	.2	< .5	< .6	7	71	24	< 71	< 86
(44) UPPER THREE RUNS NEAR NEW ELLENTON, SOUTH CAROLINA (02197300)										
11/02/67	1110	2.6	.9	1.9	2.1	4	650	220	480	520
08/05/68	1100	1.5	.5	1.1	1.2	4	380	120	280	300
01/02/69	1100	.8	.3	.6	.7	2	400	130	300	350
04/01/69	1415	.8	.3	< .4	< .4	2	400	130	< 200	< 200
04/16/69	1100	2.5	.8	1.8	1.9	12	210	69	150	160
10/08/69	1035	1.2	.4	< .5	< .5	2	600	200	< 250	< 250
05/05/70	1145	1.2	.4	.7	.8	5	240	80	140	160
12/28/70	1100	1.2	.4	.8	.8	4	300	100	200	200
(45) CASTLE CREEK ABOVE DEERFIELD RESEVOIR, NEAR HILL CITY, SOUTH DAKOTA (06409000)										
09/19/67	1215	< .4	< .1	.7	.8	5	< 80	< 27	140	160
09/18/68	1300	< .4	< .1	< .4	< .4	2	< 200	< 67	< 200	< 200
04/15/69	1500	.8	.3	1.4	1.6	29	28	9	48	55
10/27/69	1300	< .4	< .1	< .4	< .4	4	< 100	< 33	< 100	< 100
01/13/70	1000	.7	.2	.6	.6	11	64	21	55	55
04/21/70	1100	.7	.2	1.7	2.0	20	35	12	85	100
10/12/70	1240	< .4	< .1	< .4	< .4	1	< 400	< 130	< 400	< 400

TABLE 3.--RADIOCHEMICAL ANALYSES OF BENCHMARK SAMPLES COLLECTED DURING 1967-1971--CONTINUED

DATE OF COLLECTION	TIME	STREAM FLOW (CU FT/SEC)	WATER TEMP (DEG C)	U-NAT-D EXT FLUOR (UG/L)	RA-226-D RADON (PCI/L)	ALPHA-D GROSS U-NAT (UG/L)	ALPHA-D GROSS U-NAT (PCI/L)	BETA-D GROSS SR/Y-90 (PCI/L)	BETA-D GROSS CS-137 (PCI/L)	RESIDUE TOT FLT (MG/L)
		00060	00010	80020	09511	80030	01515	80050	03515	00515
(46) LITTLE VERMILLION RIVER NEAR SALEM, SOUTH DAKOTA (06478540)										
--	--	--	--	--	--	--	--	--	--	--
(47) BUFFALO RIVER NEAR FLAT WOODS, TENNESSEE (03604000)										
10/23/67	1055	217	13	< .4 *	.08	< .8	< .3	2.5	3.1	63
03/26/68	0940	2560 †	--	< .01	.01	< .4	< .1	1.0	1.2	41
09/24/68	1530	179 †	22	< .4 *	.03	1.7	.6	1.5	1.9	60
02/24/69	1055	791	8	.02	.05	< .6	< .2	1.2	1.4	45
09/30/69	1430	180 †	20	.08	.05	< .8	< .3	1.1	1.4	62
04/08/70	1230	230 †	11.5	.04	.04	.8	.3	1.4	1.7	45
09/23/70	1200	195 †	24.5	.02	.03	< .6	< .2	1.5	1.9	62
(48) LITTLE RIVER ABOVE TOWNSEND, TENNESSEE (03497300)										
10/12/67	1230	96 †	12	< .4 *	.08	< .4	< .1	1.1	1.2	15
06/24/68	1300	111 †	21	< .4 *	< .1 **	< .4	< .1	1.0	1.2	16
10/25/68	1100	--	11	< .01	.08	< .4	< .1	1.2	1.3	16
(49) LIMPIA CREEK ABOVE FORT DAVIS, TEXAS (08431700)										
07/25/68	1015	--	--	< .4 *	.1 **	1.6	.5	4.7	5.7	120
09/05/68	1700	--	--	< .4 *	.06	< 1.5	< .5	3.2	3.9	140
(50) SOUTH FORK ROCKY CREEK NEAR BRIGGS, TEXAS (08103900)										
01/11/68	0958	--	--	1.1 *	.11	< 2.9	< 1.0	< 1.7	< 2.1	290
01/24/69	0930	.01	--	.8 *	.05	3.3	1.1	3.1	4.2	310
05/28/69	1050	--	--	.8 *	.04	< 2.3	< .8	2.9	3.6	290
12/19/69	1020	7.8	14.0	1.1 *	.07	< 3.0	< 1.0	2.3	2.9	290
02/27/70	0845	41	12.0	.9 *	.06	< 3.9	< 1.3	3.1	3.9	290

TABLE 3.--RADIOCHEMICAL ANALYSES OF BENCHMARK SAMPLES COLLECTED DURING 1967-1971--CONTINUED

DATE OF COLLECTION	TIME	ALPHA-S GROSS U-NAT (UG/L) 80040	ALPHA-S GROSS U-NAT (PCI/L) 01516	BETA-S GROSS SR/Y-90 (PCI/L) 80060	BETA-S GROSS CS-137 (PCI/L) 03516	RESIDUE TOT NFLT (MG/L) 00530	ALPHA-S SPEC ACT U-NAT (UG/G) 01518	ALPHA-S SPEC ACT U-NAT (PCI/G) 01517	BETA-S SPEC ACT SR/Y-90 (PCI/G) 03517	BETA-S SPEC ACT CS-137 (PCI/G) 03518
(46) LITTLE VERMILLION RIVER NEAR SALEM, SOUTH DAKOTA (06478540)										
--	--	--	--	--	--	--	--	--	--	--
(47) BUFFALO RIVER NEAR FLAT WOODS, TENNESSEE (03604000)										
10/23/67	1055	< .4	< .1	.6	.7	1	< 400	< 130	600	700
03/26/68	0940	.5	.2	1.1	1.3	14	36	12	79	93
09/24/68	1530	.5	.2	.6	.7	5	100	33	120	140
02/24/69	1055	.8	.3	.8	.9	6	130	44	130	150
09/30/69	1430	< .4	< .1	< .4	< .4	7	< 57	< 19	< 57	< 57
04/08/70	1230	.9	.3	.6	.6	11	82	27	55	55
09/23/70	1200	.8	.3	.4	.5	8	100	33	50	62
(48) LITTLE RIVER ABOVE TOWNSEND, TENNESSEE (03497300)										
10/12/67	1230	< .4	< .1	.6	.6	2	< 200	< 67	300	300
06/24/68	1300	< .4	< .1	< .4	< .4	3	< 130	< 44	< 130	< 130
10/25/68	1100	< .4	< .1	.8	.9	< 1	--	--	--	--
(49) LIMPIA CREEK ABOVE FORT DAVIS, TEXAS (08431700)										
07/25/68	1015	1.9	.6	2.6	2.9	27	70	23	96	110
09/05/68	1700	< .4	< .1	< .4	< .4	4	< 100	< 33	< 100	< 100
(50) SOUTH FORK ROCKY CREEK NEAR BRIGGS, TEXAS (08103900)										
01/11/68	0958	< .4	< .1	.6	.7	< 1	--	--	--	--
01/24/69	0930	< .4	< .1	< .4	< .4	< 1	--	--	--	--
05/28/69	1050	< .4	< .1	< .4	< .4	< 1	--	--	--	--
12/19/69	1020	< .4	< .1	< .4	< .4	< 1	--	--	--	--
02/27/70	0845	< .4	< .1	< .4	< .4	< 1	--	--	--	--

TABLE 3.--RADIOCHEMICAL ANALYSES OF BENCHMARK SAMPLES COLLECTED DURING 1967-1971--CONTINUED

DATE OF COLLECTION	TIME	STREAM FLOW (CU FT/SEC)	WATER TEMP (DEG C)	U-NAT-D EXT FLUOR (UG/L)	RA-226-D RADON (PCI/L)	ALPHA-D GROSS U-NAT (UG/L)	ALPHA-D GROSS U-NAT (PCI/L)	BETA-D GROSS SR/Y-90 (PCI/L)	BETA-D GROSS CS-137 (PCI/L)	RESIDUE TOT FLT (MG/L)
		00060	00010	80020	09511	80030	01515	80050	03515	00515
(51) RED BUTTE CREEK AT FORT DOUGLAS, NEAR SALT LAKE CITY, UTAH (10172200)										
09/22/67	1015	--	11	1.0 *	< .1 **	< 5.7	< 1.9	2.1	2.7	420
10/02/68	1440	1.8	13	.9 *	.06	< 3.8	< 1.2	3.9	4.7	450
04/11/69	1430	--	11	.9 *	.08	11	3.7	4.3	5.3	300
09/21/69	1330	1.3	12	1.1 *	.07	< 7.6	< 2.5	6.8	8.6	380
05/18/70	1430	16	13.5	1.0 *	.14	5.1	1.7	2.6	3.2	320
09/02/70	1000	1.9	11.5	1.1 *	.08	4.1	1.4	3.7	4.6	380
(52) HOLIDAY CREEK NEAR ANDERSONVILLE, VIRGINIA (02038850)										
10/23/67	1200	--	7	.03	.08	< .4	< .1	1.6	2.0	39
09/23/68	1320	--	19	< .01	.02	< .4	< .1	1.6	2.0	40
10/01/69	1130	1.8	15.0	< .01	.03	< .4	< .1	1.5	1.8	39
10/21/70	1200	--	--	.02	.03	< .4	< .1	3.2	3.9	37
(53) ANDREWS CREEK NEAR MAZAMA, WASHINGTON (12447390)										
--	--	--	--	--	--	--	--	--	--	--
(54) NORTH FORK QUINULT RIVER NEAR AMANDA PARK, WASHINGTON (12039300)										
09/13/67	1240	--	10	< .4 *	< .1 **	< .4	< .1	1.2	1.5	58
02/07/68	1315	974 +	3	< .01	.02	2.9	1.0	2.0	2.4	47
10/22/68	1215	1010 +	6	.11	.05	< .4	< .1	.9	1.1	42
02/19/69	1230	360 +	3	.02	.02	1.7	.6	1.6	2.0	58
10/22/69	1155	--	7.0	.04	.03	< .8	< .3	1.1	1.3	60
09/02/70	1100	--	11.0	.04	.05	< .6	< .2	.9	1.2	60
(55) POPPLE RIVER NEAR FENCE, WISCONSIN (04063700)										
09/29/67	1040	--	--	.10	.02	< 1.7	< .6	4.1	5.1	120
04/22/68	1230	--	--	< .4 *	.02	2.9	1.0	4.8	6.1	83
10/16/68	1300	137	16	.26	.03	3.1	1.0	3.6	4.4	110
04/14/69	0730	--	--	.02	.04	.7	.2	3.2	4.0	57
08/19/69	1030	35	18	< .01	.03	2.6	.9	3.3	4.1	140
04/22/70	1400	--	--	.10	.02	< .7	< .2	3.9	4.9	87
08/12/70	0830	--	24.5	.84	.03	1.8	.6	4.6	5.8	130



TABLE 3.--RADIOCHEMICAL ANALYSES OF BENCHMARK SAMPLES COLLECTED DURING 1967-1971--CONTINUED

DATE OF COLLECTION	TIME	ALPHA-S GROSS U-NAT (UG/L) 80040	ALPHA-S GROSS U-NAT (PCI/L) 01516	BETA-S GROSS SR/Y-90 (PCI/L) 80060	BETA-S GROSS CS-137 (PCI/L) 03516	RESIDUE TOT NFLT (MG/L) 00530	ALPHA-S SPEC ACT U-NAT (UG/G) 01518	ALPHA-S SPEC ACT U-NAT (PCI/G) 01517	BETA-S SPEC ACT SR/Y-90 (PCI/G) 03517	BETA-S SPEC ACT CS-137 (PCI/G) 03518
(51) RED BUTTE CREEK AT FORT DOUGLAS, NEAR SALT LAKE CITY, UTAH (10172200)										
09/22/67	1015	< .4	< .1	1.1	1.2	8	< 50	< 17	140	150
10/02/68	1440	< .4	< .1	1.2	1.3	13	< 31	< 10	92	100
04/11/69	1430	< .7	< .2	< .9	< 1.0	19	< 37	< 12	< 47	< 53
09/21/69	1330	< .4	< .1	< .5	< .5	10	< 40	< 13	< 50	< 50
05/18/70	1430	1.8	.6	1.4	1.6	34	53	18	41	47
09/02/70	1000	1.8	.6	1.3	1.5	21	86	29	62	71
(52) HOLIDAY CREEK NEAR ANDERSONVILLE, VIRGINIA (02038850)										
10/23/67	1200	.4	.1	1.1	1.3	9	44	15	120	140
09/23/68	1320	< .4	< .1	< .4	< .4	6	< 67	< 22	< 67	< 67
10/01/69	1130	< .4	< .1	< .5	< .6	7	< 57	< 19	< 71	< 86
10/21/70	1200	6.3	2.1	6.3	7.2	88	72	24	72	82
(53) ANDREWS CREEK NEAR MAZAMA, WASHINGTON (12447390)										
--	--	--	--	--	--	--	--	--	--	--
(54) NORTH FORK QUINULT RIVER NEAR AMANDA PARK, WASHINGTON (12039300)										
09/13/67	1240	< .4	< .1	.5	.6	< 1	--	--	--	--
02/07/68	1315	.8	.3	1.8	1.9	1	800	270	1800	1900
10/22/68	1215	< .4	< .1	.6	.6	< 1	--	--	--	--
02/19/69	1230	< .4	< .1	< .4	< .4	< 1	--	--	--	--
10/22/69	1155	< .4	< .1	< .4	< .4	< 1	--	--	--	--
09/02/70	1100	< .4	< .1	< .4	< .4	< 1	--	--	--	--
(55) POPPLE RIVER NEAR FENCE, WISCONSIN (04063700)										
09/29/67	1040	1.3	.4	1.7	1.9	3	430	140	570	630
04/22/68	1230	.5	.2	1.7	1.8	4	120	42	420	450
10/16/68	1300	1.3	.4	1.4	1.5	2	650	220	700	750
04/14/69	0730	< .4	< .1	< .5	< .5	5	< 80	< 27	< 100	< 100
08/19/69	1030	< .4	< .1	< .4	< .4	3	< 130	< 44	< 130	< 130
04/22/70	1400	.4	.1	.8	.9	6	67	22	130	150
08/12/70	0830	< .4	< .1	1.2	1.3	< 1	--	--	--	--

TABLE 3.--RADIOCHEMICAL ANALYSES OF BENCHMARK SAMPLES COLLECTED DURING 1967-1971--CONTINUED

DATE OF COLLECTION	TIME	STREAM FLOW (CU FT/SEC)	WATER TEMP (DEG C)	U-NAT-D EXT FLUOR (UG/L)	RA-226-D RADON (PCI/L)	ALPHA-D GROSS U-NAT (UG/L)	ALPHA-D GROSS U-NAT (PCI/L)	BETA-D GROSS SR/Y-90 (PCI/L)	BETA-D GROSS CS-137 (PCI/L)	RESIDUE TOT FLT (MG/L)
		00060	00010	80020	09511	80030	01515	80050	03515	00515

## (56) CACHE CREEK NEAR JACKSON, WYOMING (13018300)

09/12/67	1145	--	6	< .4 *	< .1 **	< 1.4	< .5	1.1	1.4	180
06/04/68	1100	54	3	.25	.05	< 2.3	< .8	2.1	2.7	180
10/08/68	1205	8.1	0	.36	.03	< 1.9	< .6	.6	.7	180
06/02/69	1820	47	7	.40	.06	1.9	.6	1.2	1.5	180
11/17/69	1330	5.1	.5	.30	.06	< 3.6	< 1.2	< .7	< .8	310
08/04/70	1115	17	7.0	.38	.08	< 1.8	< .6	1.3	1.6	170

## (57) ENCAMPMENT RIVER ABOVE HOG PARK CREEK, NEAR ENCAMPMENT, WYOMING (06623800)

10/05/67	--	10	--	.06	.03	.8	.3	3.3	4.1	45
06/26/68	1435	514	10	< .4 *	< .1 **	1.2	.4	2.2	2.7	29
10/03/68	1320	26	7	.18	.04	< .4	< .1	1.5	1.8	32
06/09/69	1800	461	10	.20	.03	1.5	.5	2.4	3.0	37
09/24/70	1620	44	8.5	.19	.03	1.0	.3	2.4	3.0	43

TABLE 3.--RADIOCHEMICAL ANALYSES OF BENCHMARK SAMPLES COLLECTED DURING 1967-1971--CONTINUED

DATE OF COLLECTION	TIME	ALPHA-S GROSS U-NAT (UG/L) 80040	ALPHA-S GROSS U-NAT (PCI/L) 01516	BETA-S GROSS SR/Y-90 (PCI/L) 80060	BETA-S GROSS CS-137 (PCI/L) 03516	RESIDUE TOT NFLT (MG/L) 00530	ALPHA-S SPEC ACT U-NAT (UG/G) 01518	ALPHA-S SPEC ACT U-NAT (PCI/G) 01517	BETA-S SPEC ACT SR/Y-90 (PCI/G) 03517	BETA-S SPEC ACT CS-137 (PCI/G) 03518
(56) CACHE CREEK NEAR JACKSON, WYOMING (13018300)										
09/12/67	1145	< .4	< .1	.8	.8	2	< 200	< 67	400	400
06/04/68	1100	2.2	.7	4.8	5.3	4	550	180	1200	1300
10/08/68	1205	< .4	< .1	< .4	< .4	2	< 200	< 67	< 200	< 200
06/02/69	1820	3.1	1.0	2.3	2.7	48	65	22	48	56
11/17/69	1330	< .4	< .1	< .4	< .4	< 1	--	--	--	--
08/04/70	1115	< .4	< .1	< .4	< .4	3	< 130	< 44	< 130	< 130
(57) ENCAMPMENT RIVER ABOVE HOG PARK CREEK, NEAR ENCAMPMENT, WYOMING (06623800)										
10/05/67	--	.5	.2	1.3	1.4	2	250	83	650	700
10/03/68	1320	< .4	< .1	< .4	< .4	< 1	--	--	--	--
06/26/68	1435	.5	.2	< .4	< .4	3	170	56	< 130	< 130
06/09/69	1800	< .4	< .1	.6	.6	2	< 200	< 67	300	300
09/24/70	1620	.4	.1	.9	1.0	< 1	--	--	--	--

\* URANIUM BY DIRECT FLUOROMETRIC METHOD (22733)

\*\*RADIUM BY PLANCHET PPT. COUNTING METHOD (09510)

† MEAN DISCHARGE

## REFERENCES

1. Barker, F. B., and Robinson, B. P., 1963, Determinations of beta activity in water: U.S. Geol. Survey Water-Supply Paper 1696-A, 32 p.
2. Barker, F. B., and Johnson, J. O., 1964, Determination of radium in water: U.S. Geol. Survey Water-Supply Paper 1696-B, 29 p.
3. Barker, F. B., Johnson, J. O., Edwards, K. W., and Robinson, B. P., 1965, Determination of uranium in natural waters: U.S. Geol. Survey Water-Supply Paper 1696-C, 25 p.
4. Cobb, E. D., and Biesecker, J. E., 1971, The national hydrologic bench-mark network, U.S. Geol. Survey Circ. 460 D, 38 p.
5. National reference list of water quality stations, Water Year 1971, U.S. Geol. Survey Water Resources Div. Admin. Rept., 825 p.
6. Langbein, Walter B., and Hoyt, William G., 1959, Water facts for the nation's future: New York, Ronald Press Co., 288 p.
7. Leopold, Luna B., 1962, A national network of hydrologic bench marks: U.S. Geol. Survey Circ. 460-B, 4 p.
8. U.S. Atomic Energy Commission, 1967, Conditions and limitations on the general license provisions of 10 CFR 150.20 Rules and regulations. Supplement to AEC form No. 241, "Report of proposed activities in nonagreement states". Division of radiation protection standards. U.S.A.E.C., Washington, D.C., 20545, 66 p.