COMMONWEALTH OF VIRGINIA
STATE COMMISSION ON CONSERVATION AND DEVELOPMENT
Division of Water Resources and Power
UNIVERSITY, VIRGINIA
J. J. DIRZULAITIS, *Chief Engineer*

BULLETIN No. 1

SPRINGS OF VIRGINIA

A report on the discharge, temperature and chemical character of Springs in the southern part of the Great Valley

By

W. D. COLLINS, MARGARET D. FOSTER, FRANK REEVES
AND R. P. MEACHAM

PREPARED IN
COOPERATION WITH THE UNITED STATES GEOLOGICAL SURVEY

RICHMOND:
DIVISION OF PURCHASE AND PRINTING
1930

CONTENTS

	Page
Introduction	8
Location	8
Geologic Occurrence	9
Discharge	9
Temperature	9
Chemical Character	10
Utilization	11

FOREWORD

The following report presents the results of spring investigations in the southern part of the Great Valley. It is the first of a series of reports which will be published on hydrometric investigations carried on by the Division of Water Resources and Power of the Conservation and Development Commission of the State of Virginia in cooperation with the U. S. Geological Survey.

Work on stream flow measurements in Virginia was begun in 1895, and the records to February 1, 1925, were collected by the United States Geological Survey. From February 1, 1925, to March 1, 1928, the work was conducted in cooperation with the Division of Geology of the Conservation and Development Commission, and after that date the water resource division was made a separate unit of the Commission.

The results of the work in stream gaging up to September 30, 1927, were published as Bulletin 31 of the Virginia Geological Survey. The purpose of that report was to present in one volume the stream flow measurements made in Virginia prior to September 30, 1927. A part of the data presented in that report had been published previously in Federal and State reports.

All the records from 1895 to September 30, 1924, have been published as collected in the annual reports, bulletins and water supply papers of the United States Geological Survey. The records for Potomac River Basin collected prior to 1906 were reviewed and republished in 1906 in Water Supply Paper No. 192. The records for New River Basin to September 30, 1920, were likewise republished in 1925 as Water Supply Paper No. 536.

All records in Virginia to December 31, 1905, were reviewed by the United States Geological Survey in 1906 and published by the State as Bulletin No. III of the Geological Survey of Virginia, entitled, "Hydrography of Virginia." Bulletin No. X of the same series, entitled, "Surface Water Supply of Virginia," is a continuation of Bulletin No. III, and contains the records collected during the years 1906 to 1914.

The records available for gaging stations in the Tennessee River Basin in Southwestern Virginia to September 30, 1924, were published by the Division of Geology, Department of Education, State of Tennessee, in 1925, in Bulletin No. 34, entitled, "Water Resources of Tennessee." The records for Roanoke River Basin to December 31, 1923, were published by the North Carolina Department of Conservation and Development in 1925 in Bulletin No. 34, entitled, "Discharge Records of North Carolina Streams."

Records in Bulletin No. 31 which differ from those in previous reports should be considered as superseding the records previously published.

Following is a list of Water-Supply Papers, Bulletins and Annual Reports published by the United States Geological Survey, containing results on hydrometric investigations in Virginia.

WATER-SUPPLY PAPERS

*No. 44, Profile of rivers in United States, by Henry Garnett, 1901.
Gives elevations and distances along rivers in United States (includes Roanoke, Potomac and James rivers).

*No. 103, A review of the laws forbidding pollution of inland waters in the United States, by E. B. Goodwell, 1904.
Cites statutory restrictions of water pollution in Virginia and other southern States.

*No. 114, Underground waters of eastern United States.
Contains brief report on Virginia by N. H. Darton and M. L. Fuller.

*No. 152, A review of the laws forbidding pollution of inland waters in the United States (second edition), by E. B Goodwell.
Cites statutory restriction of water pollution in Virginia and other southern States.

*No. 192, The Potomac River basin: Geographic history; rainfall and stream flow; pollution, typhoid fever, and character of water; relation of soils and forest cover to quality of surface waters; effect of industrial waste on fishes; by H. N. Parker, Bailey Willis, R. H. Bolster, W. W. Ashe and M. C. Marsh.

*No. 236, The quality of surface waters in the United States: Part , Analyses of water east of the one hundredth meridian, by R. B. Dole, 1909.
Describes collection of samples, methods of examination, preparation of solutions, accuracy of estimates and expression of analytical results; gives results of analyses of waters of James, Roanoke, Dan, Potomac and Shenandoah rivers.

No. 364, Water analyses from the laboratory of the United States Geological Survey, tabulated by F. W. Clarke, chief chemist.
Contains analyses of spring and well waters in Virginia and other southern States.

No. 536, Surface water supply of the New-Kanawha River basin, West Virginia, Virginia and North Carolina; N. C. Grover, Chief Hydraulic Engineer; A. H. Horton and G. C. Stevens, district engineers.
Discusses general features of basin and gives the gaging-station records for all stations in the basin from the time the stations were established to 1920, inclusive.

ANNUAL REPORTS

Tenth Annual Report of the United States Geological Survey, Part I, 1888-89, J. W. Powell, Director.
General account of the fresh-water morasses of the United States, with a description of the Dismal Swamp district of Virginia and North Carolina, by N. S. Shaler, pp. 235-339.

MISCELLANEOUS REPORTS

Hydrography of Virginia, by N. C. Grover and R. H. Bolser; Virginia Geological Survey Bulletin No. 3, 1906.
Underground water resources of the Coastal Plain province of Virginia, by Samuel Sanford; Virginia Geological Survey Bulletin No. 5, 1913.

Surface water supply of Virginia, by G. C. Stevens; Virginia Geological Survey Bulletin No. 10, 1916.

Note: Water-Supply Papers, Annual Reports and Bulletins published by United States Geological Survey can be purchased from the Superintendent of Documents, Washington, D. C. An asterisk (*) indicates that the report is out of print, but these and other publications of the United States Geological Survey can be consulted in public libraries of the large cities.

Bulletins published by the State of Virginia can be procured from Division of Water Resources and Power of the Conservation and Development Commission at the University of Virginia.

Springs of Virginia

A report on the discharge, temperature, and chemical character of springs in the Southern Part of the Great Valley.

By
W. D. Collins, Margaret D. Foster, Frank Reeves and R. P. Meacham.

Prepared in cooperation with the United States Geological Survey.

INTRODUCTION

This bulletin is the first of a series of proposed reports on the springs of Virginia. It gives the location, discharge, and temperature of more than 500 springs in the southern part of the Great Valley, with partial analyses of the waters from more than 400 springs.

Water from springs in Virginia has been used for private and public supplies and at resorts for many years. The water thus used, however, is only a small part of the total quantity available. Many springs in the State furnish unfailing supplies of clear water at practically constant temperature that would serve all the needs of a community or a manufacturing plant of considerable size.

This report is based on field work by Mr. Reeves and Mr. Meacham and analyses by Miss Foster. Mr. Reeves visited 337 springs in thirteen counties, mainly north and east of Roanoke, though he did not make a complete survey of the lower part of the Shenandoah Valley section, and only a few records were obtained north of Harrisonburg. He located the springs on topographic maps, noted the geologic formations from which the waters came, estimated the flows, measured the temperatures of water and air, and collected samples from many of the springs. Mr. Meacham visited 229 springs in twelve counties, mainly south and west of Roanoke, and obtained similar data except that he measured the flows of the springs with a current meter. His field notes were worked up under the direction of Mr. Dirzulaitis, and the results were reported in gallons a minute. Mr. F. F. Schrader collected samples from 133 of the springs visited by Mr. Reeves and measured the discharge of these springs. Mr. Collins examined springs at and near Warm Springs and Hot Springs, made measurements of temperature, and collected samples for analysis. Miss Foster made the analyses, prepared the table of descriptions and analyses, and located the springs on the map from the field notes of Mr. Reeves and Mr. Meacham. Mr. Collins prepared the original draft of the text, incorporating material prepared by Mr. Dirzulaitis on discharge and by Mr. Reeves on geology.

LOCATION

The map shows the approximate location of springs for which the flow was estimated or measured as 100 gallons a minute or more. In the descriptions in the table the location is given with reference to the nearest place shown on the map and also, for many of the springs, with reference to some well-known local place or landmark that is not shown on the map. It is probable that a few springs which should be shown on

the map were missed. The table contains descriptions of many springs flowing less than 100 gallons a minute in the area covered by Mr. Reeves. A considerable number of the smaller springs may have been missed. Mr. Meacham did not record all the small springs he noted, especially in the extreme southwestern counties. It is probable, however, that nearly all the springs of moderate size in the area are listed in the table.

GEOLOGIC OCCURRENCE

A description of the geology of the region is given by Mr. Reeves in a report on the warm springs of Virginia and West Virginia, now being prepared. His summary on the stratigraphic occurence of the cold and warm springs of the region is as follows:

Numerous cold springs issue at the outcrops of the Oriskany sandstone, the Helderberg limestone, and the limestone formations of Ordovician and Cambrian age. The springs found at the outcrops of the other formations are generally small, most of those in shale formations being confined to slight seepages of waters relatively high in sulphates. Practically all of the warm springs having temperatures above 60 degrees F., and many with temperatures between 55 degrees and 60 degrees, issue at the outcrops of the Oriskany sandstone (Lower Devonian), Lowville limestone (Middle Ordovician), and Copper Ridge dolomite (Ordovician or Cambrian).

DISCHARGE

An indication of the magnitude of each of the larger springs is given by the symbol used on the map to show its location. More definite estimates are given in the table. As the measured discharges represent the flow at a single time and many of the discharges were estimated, they must be understood to indicate merely about the yield that may be expected. Springs generally flow with reasonable uniformity throughout the year.

The quantity of water available at any place may be considerably more than is indicated in the table or on the map, because the observations were made on single springs. At many places several small springs might be combined to give a total flow greater than that of some springs that are shown on the map.

A spring with the smallest flow represented on the map, 100 gallons a minute, would furnish 144,000 gallons a day, the quantity required for a public supply for a community of 1,000 to 1,500 persons. A considerable number of the springs furnish over 1,000,000 gallons a day.

TEMPERATURE

The temperature of each spring visited is given in the table. In connection with a special study of the warm springs Mr. Reeves observed the temperatures of a number of springs at times when extremes were likely to be found. The average range in temperature of forty-nine springs having temperatures below 55 degrees F. was 5.7 degrees, whereas for fifty-seven springs having temperatures above 55 degrees the range was 2.2 degrees. The range in temperature of stream waters

in the region, other than small streams fed by springs, would probably be 30 degrees or 40 degrees.

CHEMICAL CHARACTER

The chemical character of the spring waters is shown by the analytical results given in the table. The methods of analysis are described in United States Geological Survey Water Supply Paper 596-H, "Notes on practical water analysis," by W. D. Collins. Partial analyses such as are given in the table show clearly the general character of the waters but can not take the place of complete analyses as a basis for exact estimates of the cost of treatment or for use in the study of geologic relations. A partial analysis requires only about one-tenth as much laboratory work as a complete analysis and thus makes it possible to examine a much larger number of samples.

Dissolved solids.—The figures given in the table for dissolved solids are calculated from the determinations of the acid radicles and do not include any allowance for silica. They serve to give a general idea of the total quantity of mineral matter in waters. The quantity of total dissolved material in the spring waters is of no particular significance. Practically all the waters fall in the class of lightly or moderately mineralized waters commonly found throughout the United States.

Iron.—Accurate determinations of iron were made only on samples that showed the presence of considerable quantities. If no visible precipitate of iron was found in the sample bottle after exposure to the air, the iron is recorded as "O," meaning less than one part per million. It is probable that few if any of the samples for which the iron is reported as "O" contain as much as 0.1 part per million. Practically all of them probably have more than 0.01 part per million.

This comparative freedom from iron is a valuable characteristic of the spring waters. Well water at many places in the United States carries so much iron that it can not be used satisfactorily until the iron is removed.

Calcium.—The turbidimetric determination of calcium serves as a check on the hardness. It also shows that nearly all the hardness of most of the waters is caused by calcium; in a few the hardness caused by magnesium is nearly 50 per cent of the total. The hardness is expressed as calcium carbonate ($CaCO_3$), which is equivalent to 2.5 times the calcium (Ca) plus 4.1 times the magnesium (Mg).

Sodium.—The calculated sodium shows that few of the spring waters carry any considerable quantity of compounds of sodium or potassium. The sodium reported is the quantity necessary to balance the acid radicles after allowance is made for the hardness. Thus, an error in any of the determinations involved will to that extent affect the calculation of sodium. There are, however, no large errors in the quantities of sodium as calculated.

Bicarbonate.—In most of the spring waters carbonate is more abundant than any other of the constituents reported. This is to be expected, because most of the waters have obtained the greater part of their mineral content by dissolving limestone or similar rock material. It requires 61 parts of bicarbonate to balance 20 parts of calcium or 12 parts of magnesium.

Sulphate.—Nearly all the spring waters have insignificant quantities of sulphate. Most of the results reported in the table were obtained turbidimetrically, but gravimetric determinations were made on some samples that had over 100 parts per million of sulphate. The waters containing the larger quantities of sulphate have usually come from shale or from other rock into which water from shales has percolated.

Chloride.—Most of the spring waters are notable for their small content of chloride. The quantities are so small that more accurate results could be obtained turbidimetrically than by the usual volumetric titration. The chloride was, therefore, determined by turbidity in most of the samples, but was titrated by the standard method for the larger quantities.

Nitrate.—The quantities of nitrate in the spring waters are not remarkable nor of much significance.

Hardness.—Hardness is the characteristic of the spring waters as a whole that has the chief effect on their utilization. The hardness is practically all due to the bicarbonates of calcium and magnesium, which make up the greater part of the dissolved solids. The waters cover a considerable range of hardness, but in general they are fairly hard.

Hardness of less than 50 parts per million is rarely noticed by anyone. If the hardness is between 50 and 100 parts per million the water is about as satisfactory as the softer water for all ordinary uses but can be noticeably improved for laundry and boiler use by softening. Where hard waters are softened for municipal supplies it was formerly the general practice to try to keep the hardness down to 100 parts per million, and the users were generally well satisfied. Recently, however, the limit is being lowered in some cities to about 80. Hardness of much more than 100 parts per million is easily noticeable, and softening is necessary to make the water suitable for most industrial uses.

Hardness was determined for all the samples except a few from Hot Springs, for which the hardness was calculated from determinations of calcium and magnesium.

UTILIZATION OF THE SPRING WATERS

Many of the springs listed in the table furnish enough excellent water for a small public supply or for a manufacturing plant of considerable size. Their general uniformity of discharge, temperature, and chemical composition and their freedom from suspended matter and iron make these waters of special value for such uses. Few of them would require any treatment beyond precautionary chlorination for public supplies. For industrial use selections must be made on the basis of the requirements of each plant.

Some of the spring waters are very soft. Others are harder than nearby surface water supplies and would require more softening to make them suitable for boiler or laundry use. Softening of the spring waters may be easier because of their uniformity of composition throughout the year and their freedom from suspended matter. The selection of spring supplies for individual industrial plants will depend on the importance to each plant of the characteristics shown in the table.

Number	LOCATION AND NAME	GEOLOGIC OCCURRENCE		Date, 1928	Flow (gallons a minute)	Temperatures (Degrees Fahrenheit) Water	Air	Approximate Partial Analysis (Parts per Million) Dissolved solids (calculated)	Iron (Fe)	Calcium (Ca) (by turbidity)	Sodium (Na) (calculated)	Bicarbonate (HCO_3)	Sulphate (SO_4) (by turbidity)	Chloride (Cl)	Nitrate (NO_3)	Total hardness (as $CaCO_3$)
1	Joe Parkey Spring—2 miles northeast of Gibson Station and 1 mile southwest of Gibson Postoffice, on Lee Highway	Lowville limestone		8-28-28	55	59.5	65									
2	Hall Spring—3½ miles northeast of Gibson Station and .2 mile northeast of Gibson Postoffice	Lowville limestone	a	8-28-28	340	57.5	70	153		64	b	170	6	.5	1.2	142
3	Haynes Spring—5 miles northeast of Gibson Station, 2.3 miles northeast of Gibson Postoffice, near Lee Highway	Lowville limestone		8-27-28	80	60.5	70									
4	W. T. Rose Spring—5¾ miles northeast of Gibson Station and 1.1 miles northwest of Caylor, on Indian Creek	Lowville limestone		8-23-28	580	59.5	73	166		56	13	183	6	.8	2.7	131
5	Wheeler Spring—6½ miles northeast of Gibson Station and ½ mile south of Caylor, ½ mile south of Indian Creek, near Lee Highway	Lowville limestone		8-27-28	45	59	65	184		48	19	207	4	.8	3.0	137
6	Spring—4.5 miles north of Clinchport, on Clinch River tributary, northwest of Carters Ferry	Beekmantown limestone near fault		8-23-28	165	55.5	71	214		72	14	240	4	.7	5.7	177
7	Big Spring—1 mile south of Castlewood, near Bickley Mill	Honaker limestone near fault		8-21-28	1,120	61.5	74	205		64	9	227	7	.5	3.9	177
8	Judge Hendricks Spring—4.1 miles southwest of Lebanon, on Little Cedar Creek	Contact of Beekmantown limestone and Copper Ridge dolomite	c	8-21-28	300	54	68	181		56		210	1	.3	2.7	184
9	Will Humbold Spring, No. 1—5.3 miles southwest of Lebanon, on Little Cedar Creek	Base of Beekmantown limestone	c	8-21-28	620	59	70	121		44	b	d 135	4	.3	1.2	110
10	Will Humbold Spring, No. 2—5.3 miles southwest of Lebanon, on Wolf Creek	Base of Beekmantown limestone		8-21-28	2,810	56	70	130		40	11	140	6	.5	3.0	109
11	Weatherly Spring—5 miles northwest of Bristol, on Cove Creek tributary	Honaker limestone, on limb of syncline		8-22-28	(1-200) (2-130)	55	68	185		52	12	208	2	.9	5.4	151
12	Three Springs—3 miles northwest of Bristol, on Steeles Creek	Beekmantown limestone near fault	e	8-22-28	340	56.6	65	168		68	b	190	1	.8	5.3	160

Number	LOCATION AND NAME	GEOLOGIC OCCURRENCE		Date, 1928	Flow (gallons a minute)	Temperatures (Degrees Fahrenheit) Water	Air	Approximate Partial Analysis (Parts per Million) Dissolved solids (calculated)	Iron (Fe)	Calcium (Ca) (by turbidity)	Sodium (Na) (calculated)	Bicarbonate (HCO_3)	Sulphate (SO_4) (by turbidity)	Chloride (Cl)	Nitrate (NO_3)	Total hardness (as $CaCO_3$)
13	C. D. Hardy Spring—2.8 miles north of Wallace, headwaters of Clear Creek	Honaker limestone near fault	e	8-20-28	320	56.5	70	154		60	b	178	1	.3	2.7	147
14	L. Fleenor Spring—2.6 miles north of Wallace, on Clear Creek	Honaker limestone near fault	e	8-20-28	670	54.5	68	165		64	b	190	1	.5	3.4	159
15	Fagan Spring—6 miles south of Wallace, near Norfolk and Western Railway	Honaker limestone near fault		8-18-28	80	56.5	68									
16	W. F. Daniel Spring—3.8 miles northeast of Bristol, on Lee Highway	Honaker limestone near fault	e	8-20-28	140	55.5	65	225		85	10	246	7	.7	6.3	194
17	Dr. Tecter Spring—4.3 miles northeast of Bristol, on Lee Highway	Honaker limestone, on limb of syncline		8-20-28	130	56.5	68	235		48	21	257	6	1.3	7.4	180
18	Lester Spring—2.4 miles north of Wallace and 1.5 miles northwest of Wyndale	Honaker limestone, on limb of syncline	e	8-18-28	195	55.5	70	192		80	b	220	3	.5	2.9	182
19	Nester Spring—2.7 miles northeast of Wallace, on Norfolk and Western Railway	Honaker limestone, on limb of syncline	e	8-18-28	160	54	68	192		80	b	216	2	1.0	5.5	182
20	H. P. King Spring—1.5 miles northeast of Wallace, near Norfolk and Western Railway	Top of Honaker limestone		8-21-28	1,380	54	65	192		64	18	216	6	.3	2.4	146
21	Percy Preston Spring—6.7 miles northeast of Bristol, on Lee Highway	Honaker limestone near fault		8-18-28	1,140	55.5	71	209		56	15	242	3	.2	2.3	171
22	Seven Springs (gauged)—.3 mile south of Greendale, on Greendale Creek	Nolichucky shale and Honaker limestone		8-16-28	2,090	55.5	70	211		60	10	238	6	.3	3.0	182
23	Bob Cummins Spring—2.3 miles northwest of Abingdon, on Wolf Creek	Honaker limestone near fault		8-20-28	2,520	54.5	66	194		44	12	224	3	.5	1.5	163
24	Widow Cummins Spring—1.3 miles northwest of Abingdon, on Wolf Creek	Honaker limestone near fault	e	8-20-28	160	55	66	242		85	5	270	7	.5	4.8	222
25	Pat Ryan Spring—5.2 miles northeast of Abingdon, on Shortsville road	Jonesboro limestone, on limb of syncline		8-16-28	40	55	70									
26	Giesler Mill Spring—1½ miles north of Meadowview	Nolichucky limestone near fault	f	8-9-28	910	54.5	68.9	206		80	b	233	2	.7	5.6	198
27	Cedarville Spring—Approximately 1 mile south of Meadowview	Jonesboro limestone, on limb of syncline	f	8-15-28	1,890	57.5	64	191		68	b	196	3	1.5	15	171
28	John Kelly Spring—1.7 miles southwest of Clinchburg, near Whites Creek	Beekmantown limestone		8-10-28	50	57.2	67.1									
29	Robinson Spring—3 miles southwest of Glade Spring and 1.4 miles southwest of Old Glade Springs, on Lee Highway	Jonesboro limestone	f	8-9-28	220	54.5	75.2	208		80	7	229	2	.9	9.1	184
30	Rhea Bros. Spring—1½ miles northwest of Damascus, near Laurel Creek	Shady dolomite, near top		8-16-28	1,420	54	67	114		34	10	126	5	.2	1.2	89
	ree Springs (gauged at bridge)—2½ miles south of Glade Spring and .8 mile south of Old Glade Spring, on Ebbing Spring Church oad	Jonesboro limestone, on limb of syncline	f	8-16-28	410	52.5	68	167		52	b	180	3	.7	8.3	156

a Sample for analysis collected April 26, 1929.
b Less than 5 parts per million.
c Sample for analysis collected April 25, 1929.
d Includes equivalent of small amount of carbonate
e Sample for analysis collected April 27, 1929.
f Sample for analysis collected April 28, 1929.

SPRINGS OF VIRGINIA—CONTINUED

Number	LOCATION AND NAME	GEOLOGIC OCCURRENCE		Date, 1928	Flow (gallons a minute)	Temperatures (Degrees Fahrenheit)		Approximate Partial Analysis (Parts per Million)									
						Water	Air	Dissolved solids (calculated)	Iron (Fe)	Calcium (Ca) (by turbidity)	Sodium (Na) (calculated)	Bicarbonate (HCO_3)	Sulphate (SO_4) (by turbidity)	Chloride (Cl)	Nitrate (NO_3)	Total hardness (as $CaCO_3$)
	Spring—3 miles southeast of Glade Spring and 2.3 miles northeast of Old Glade Spring, on Lee Highway	Jonesboro limestone near fault	f	8-9-28	1,070	53.6	67.1	192	.....	76	b	216	2	.6	5.8	176
33	J. L. Creger Spring—4 miles east of Glade Spring and 3.1 miles northeast of Old Glade Spring, on Lee Highway	Honaker limestone near fault		8-9-28	2,180	56.3	69.8	262	.....	52	15	250	30	.9	7.3	211
34	Clifford Cole Spring—1.2 miles south of Coles Mills, on Mill Creek	Watauga shale	g	8-14-28	500	54	70	98	.....	28	b	105	7	.5	.20	92
35	Widner Spring—2.3 miles south of Cole, headwaters of Mill Creek	Watauga shale	g	8-14-28	575	54	69	69	.....	18	b	76	3	.5	.5	58
36	Rich Valley Quarry Spring—3.4 miles south of Saltville	Lenoir limestone		8-11-28	2,500	62.6	65.3	176	.....	40	11	184	13	1.0	2.2	143
37	Gannaway Spring—2 miles south of Chilhowie, on Middle Fork of Holston River	Jonesboro limestone		8-14-28	290	54	66	248	.....	65	17	279	5	.5	5.6	202
38	Carter Spring—3.8 miles east of Saltville, head of Beaver Creek	Beekmantown limestone	f	8-11-28	640	53.6	68	167	.....	52	b	184	2	.8	6.7	153
39	Umbarger Spring—4 miles southwest of Marion, in headwaters of Umbarger Creek	Ottosee limestone near fault		8-10-28	808	54	.....	90	.....	28	8	101	3	.5	.55	70
40	Brittain Spring—8 miles southwest of Marion and 1.3 miles east of Holston Mill, on South Fork of Holston River	Watauga shale and Shady dolomite		8-14-28	2,010	51.5	71	67	.....	24	b	74	2	.5	1.1	60
41	Stuart Spring—8 miles southwest of Marion and 2.4 miles east of Holston Mill, on South Fork of Holston River	Watauga shale and Shady dolomite	g	8-14-28	500	56	64	44	.....	12	b	48	2	.5	.50	36
42	Tedder Spring—10 miles south of Marion and 5.8 miles southeast of Holston Mill, on Lewis Creek	Watauga shale and Shady dolomite	g	8-14-28	200	54	61	31	.....	8	b	33	2	.5	.25	20
43	Killinger Spring—3.6 miles south of Marion, near Staley Creek	Watauga shale	h	8-10-28	470	52.7	68	81	.....	22	b	d 92	2	.5	.38	74
44	Marion Town Spring (Surplus Water Supply)—4 miles southeast of Marion, Channel Nos. 1 and 2, on Staley Creek	Shady dolomite		8-10-28	675	53.6	68.9	55	.....	16	b	62	2	.3	.10	53

45	C. B. Scott Spring—3 miles west of Sugar Grove and .8 mile west of Rye Valley Postoffice, on South Fork of Holston River	Shady dolomite on limb of syncline		7-30-28	420	53.5	69	94	.....	12	6	106	3	.1	.73	78
46	L. M. Pugh Spring—2¾ miles west of Sugar Grove and .6 mile west of Rye Valley Postoffice, on South Fork of Holston River	Shady dolomite on limb of syncline		7-30-28	1,050	54	64	121	.....	32	6	d 136	3	.2	2.1	103
47	R. W. Griffith Spring—2¼ miles west of Sugar Grove and .6 mile west of Rye Valley Postoffice, on South Fork of Holston River	Shady dolomite on limb of syncline		7-30-28	150	54	65	128	.....	28	10	145	3	.1	2.1	103
48	Frank Griffith Spring—2½ miles west of Sugar Grove and .3 mile west of Rye Valley Postoffice, on South Fork of Holston River	Shady dolomite on limb of syncline	h	7-30-28	250	.....	.....	100	.....	24	b	d 112	3	.5	1.8	90
49	Blevin Spring—1½ miles west of Sugar Grove and 1.1 miles east of Rye Valley Postoffice, on South Fork of Holston River	Shady dolomite on limb of syncline		7-30-28	960	54	66	100	.....	19	14	108	6	.1	.18	64
50	Steve Keesling Spring—2 miles west of Sugar Grove, on Cressey Creek	Shady dolomite on limb of syncline		7-30-28	1,700	53	68	80	.....	28	6	92	2	.2	1.0	66
51	J. W. Anderson-Cox Spring—Near Sugar Grove Postoffice	Shady dolomite on limb of syncline		7-30-28	1,320	53.5	66	100	.....	14	9	d 112	3	.2	.65	76
52	Arnold Spring—.7 mile south of Atkins, off Lee Highway, on tributary of Middle Fork of Holston River	Watauga shale on limb of syncline	i	8-13-28	620	53.5	62	73	.....	22	b	82	3	.3	.10	70
53	H. L. Atkins Spring—1.5 miles south of Atkins, near Lee Highway, on tributary of Middle Fork of Holston River	Watauga shale on limb of syncline	g	8-13-28	890	49.5	70	34	.....	6	b	d 36	2	.6	.15	26
54	Cornett Spring—1.2 miles east of Atkins, near Lee Highway, on tributary of Middle Fork of Holston River	Watauga shale on limb of syncline	g	8-13-28	640	52.5	80	65	.....	12	b	60	10	.5	.46	52
55	Schuler Spring—2.8 miles east of Atkins, off Lee Highway	Watauga shale on limb of syncline		8-13-28	390	51	74	104	.....	20	5	84	22	.8	1.7	84
56	Norfolk and Western Railway Spring—Near Groseclose Station	Watauga shale near fault contact with Honaker limestone		8-13-28	70	54	69	.....	.....	.....	.....	.....	.....	.....	.....	.....
57	Landry's Blue Spring—4.9 miles southwest of Cedar Springs, headwaters of Cripple Creek	Shady dolomite		7-25-28	780	52	62	108	.....	32	10	d 122	4	.1	.75	83
58	Steffey Spring—3.5 miles southwest of Cedar Springs, on Cripple Creek	Shady dolomite		7-25-28	410	51	63	126	.....	30	10	d 153	3	.3	2.3	111
59	D. J. Horne Spring—3.1 miles south of Cedar Springs, on Cripple Creek	Shady dolomite		7-25-28	750	52	64	137	.....	32	5	d 151	5	.5	2.1	120

b Less than 5 parts per million.
d Includes equivalent of small amount of carbonate.
f Sample for analysis collected April 28, 1929.
g Sample for analysis collected April 29, 1929.
h Sample for analysis collected April 30, 1929.
i Sample for analysis collected May 29, 1929.

Number	LOCATION AND NAME	GEOLOGIC OCCURRENCE		Date, 1928	Flow (gallons a minute)	Temperatures (Degrees Fahrenheit) Water	Air	Approximate Partial Analysis (Parts per Million) Dissolved solids (calculated)	Iron (Fe)	Calcium (Ca) (by turbidity)	Sodium (Na) (calculated)	Bicarbonate (HCO_3)	Sulphate (SO_4) (by turbidity)	Chloride (Cl)	Nitrate (NO_3)	Total hardness (as $CaCO_3$)
60	...ing—1¾ miles south of Cedar Bluff, ½ mile northeast of Steelburg, on Richland road	Martinsburg shale		8-7-28	70	54.5	68	.....	.....	.....	.....	.....	.....	.....	.....	.....
61	Maiden Spring—6 miles east of Paint Lick and 3.4 miles southwest of Liberty Hill	Beekmantown limestone		8-6-28	4,050	56	66	151	.....	48	13	166	3	.5	5.4	117
62	Rise of Waters Spring—7 miles east of Paint Lick and 3½ miles southwest of Liberty Hill, on Liberty Hill Branch	Beekmantown limestone	j	8-6-28	1,760	65	72	101	.....	32	b	105	5	.9	3.4	90
63	Jeff Gillespie (Lost Mill)—10 miles east of Paint Lick and .6 mile south of Liberty Hill	Beekmantown limestone		8-6-28	1,360	56	66	179	.....	44	19	200	3	.7	5.2	131
64	Spring—4.7 miles north of Tazewell, on Cavitt Creek	Nolichucky shale		8-8-28	80	53.6	68	.....	.....	.....	.....	.....	.....	.....	.....	.....
65	S. Thompson Spring—1.7 miles southwest of Tazewell, Plum Creek headwaters, near highway	Murat limestone on limb of syncline	k	8-7-28	440	56.3	73.4	180	.....	60	6	178	5	.5	17	152
66	R. W. Kiser Spring—6 miles southwest of Tazewell, Thomson Valley tributary to Maiden Spring Creek	Contact of Copper Ridge dolomite and Beekmantown limestone		8-6-28	120	55	66	117	.....	24	6	136	1	.3	1.1	100
67	Alexander Scott Spring, 3.5 miles south of Tazewell, near Maiden Spring Creek	Beekmantown limestone	k	8-6-28	480	54.5	75	134	.....	44	b	148	4	.5	3.4	128
68	W. G. Correll Spring—Asberry Postoffice, near Laurel Creek	Romney shale on limb of syncline	j	8-8-28	2,000	54.5	64.4	29	.....	6	b	27	3	.5	1.0	18
69	W. C. Greever Spring at Five Oaks—2.5 miles south of Witten Mills, on North Fork of Clinch River	Beekmantown limestone	k	8-3-28	760	54	74	104	.....	30	6	110	5	.6	3.2	86
70	Natural Bridge Spring—3.9 miles east of Tazewell, on a tributary of the South Fork of Clinch River	Beekmantown limestone	k	8-7-28	1,800	52.7	64.4	83	.....	24	7	89	5	.3	1.3	64
71	W. C. Yost Spring—5½ miles east of Tazewell, headwaters of South Fork of Clinch River	Beekmantown limestone	l	8-8-28	120	53.6	69.8	123	.....	18	b	137	3	.5	2.4	117
72	Phillip Ball Spring—5¾ miles east of Tazewell and 1 mile southwest of Gratton, on South Fork of Holston River	Beekmantown limestone on limb of syncline	l	8-3-28	240	54	74	102	.....	20	b	113	3	.3	2.5	93

Number	LOCATION AND NAME	GEOLOGIC OCCURRENCE		Date, 1928	Flow (gallons a minute)	Temperatures (Degrees Fahrenheit) Water	Air	Approximate Partial Analysis (Parts per Million) Dissolved solids (calculated)	Iron (Fe)	Calcium (Ca) (by turbidity)	Sodium (Na) (calculated)	Bicarbonate (HCO_3)	Sulphate (SO_4) (by turbidity)	Chloride (Cl)	Nitrate (NO_3)	Total hardness (as $CaCO_3$)
73	R. P. Harmon Spring—2 miles southwest of Tiptop and 1 mile northwest of Springville, on Tiptop Road	Contact of Beekmantown limestone and Copper Ridge dolomite		8-4-28	20	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
74	Bailey Spring—3 miles northwest of Tiptop at Bailey Switch, near Norfolk and Western Railway	Gaspar and Ste. Genevieve limestones, on limb of syncline		8-4-28	250	55	75	189	.....	72	14	203	8	1.0	5.0	149
75	John Carter Spring—3½ miles east of Tiptop and 3.7 miles northeast of Springville, on Bluestone River tributary	Fault in Copper Ridge dolomite		8-3-28	190	55.5	75	150	.....	36	9	d 156	13	.1	1.5	123
76	Wallace Spring—3¾ miles southeast of Tiptop and .6 mile northeast of Springville	Beekmantown limestone on limb of syncline		8-4-28	770	54	70	104	.....	36	8	118	3	.2	.93	83
77	Crabtree Spring—1 mile southwest of Shawyer Mills and 2.2 miles northeast of Gratton, on Clear Fork Creek	Beekmantown limestone	l	8-3-28	980	53	74	100	.....	26	b	111	3	.3	2.3	90
78	H. S. Kinser Spring—½ mile southwest of Shawyer Mills and 3.1 miles northeast of Gratton, on Clear Fork Creek	Beekmantown limestone	l	8-3-28	1,210	55	76	73	.....	20	5	75	5	.7	1.4	58
79	Blue Spring—1.7 miles southwest of Burkes Garden	Beekmantown limestone	l	8-8-28	3,900	58.1	70.7	125	.....	36	9	d 132	7	.4	3.0	99
80	Fish Spring—4.8 miles northeast of Burkes Garden	Beekmantown limestone		8-8-28	950	54.5	70.7	156	.....	52	11	172	4	.5	4.2	126
81	Bluefield College Spring—At Bluefield, Va., Fair grounds	Clinch sandstone on limb of syncline		8-4-28	80	55.5	68	.....	.....	.....	.....	.....	.....	.....	.....	.....
82	R. L. Horner Spring—1.5 miles southwest of Ceres, on North Fork of Holston River	Honaker limestone on limb of syncline	l	7-31-28	110	.....	.....	151	.....	24	b	d 182	2	1	3.8	154
83	Charlie Handshoe Spring—2.7 miles south of Ceres, on Lick Creek tributary	Copper Ridge dolomite on limb of syncline	l	7-31-28	750	.....	.....	89	.....	24	5	97	4	.4	1.7	74
84	Boiling Spring—.3 mile northeast of Ceres, near North Fork of Holston River	Martinsburg shale on axis of syncline		7-31-28	50	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
85	Sharon Springs—At Sharon Springs and 4½ miles northeast of Ceres	Martinsburg shale on axis of syncline	l	7-31-28	500	.....	.....	113	.....	22	b	131	2	.5	.22	111
86	D. J. Walker Spring—1½ miles north of Bastian, near highway	Romney shale		7-26-28	1,250	58.5	75	60	.....	16	8	63	5	.2	.0	40
87	...Bruce Spring—At Bastian	Romney shale		7-26-28	45	52.5	74	48	.....	10	8	54	2	.2	.07	30
88	...lic Spring—At Bland	Honaker limestone near Nolichucky shale contact		7-26-28	120	54	74	.....	.....	.....	.....	255	2	.....	.....	195

b Less than 5 parts per million.
d Includes equivalent of small amount of carbonate.
j Sample for analysis collected May 3, 1929.
k Sample for analysis collected May 2, 1929.
l Sample for analysis collected May 1, 1929.

Number	LOCATION AND NAME	GEOLOGIC OCCURRENCE		Date, 1928	Flow (gallons a min. use)	Temperatures (Degrees Fahrenheit) Water	Air	Approximate Partial Analysis (Parts per Million) Dissolved solids (calculated)	Iron (Fe)	Calcium (Ca) (by turbidity)	Sodium (Na) (calculated)	Bicarbonate (HCO_3)	Sulphate (SO_4) (by turbidity)	Chloride (Cl)	Nitrate (NO_3)	Total hardness (as $CaCO_3$)
89	W. A. Newberry Spring—3.2 miles southeast of Bland, near Walker Creek	Contact of Copper Ridge dolomite and Beekmantown limestone		7-26-28	400	53.5	70	144		48	10	166	3	.5	3.0	120
90	J. B. Keesling Spring—Cedar Spring Postoffice	Shady dolomite	h	7-24-28	1,640	52	62	53		7	b	d 60	1	.4	.29	44
91	P. P. Keesling Spring—.4 miles southeast of Cedar Spring	Shady dolomite		7-24-28	2,480	52	70	104		26	16	121	2	.5	.0	67
92	J. C. Newland Spring—4.3 miles south of Cedar Spring, on Cripple Creek	Shady dolomite		7-25-28	1,760	51.5	80	103		28	9	d 118	3	.2	.44	81
93	Joseph Staley Spring—1 mile north of Rural Retreat, on Lee Highway	Honaker limestone		7-27-28	840	54.5	84	187		64	15	d 211	5	.2	3.1	149
94	Hendricks Spring—1 mile east of Rural Retreat, near Norfolk and Western Railway	Honaker limestone		7-24-28	225	52	64	263		60	39	288	7	8.0	.0	169
95	Neff-Litz Springs—3.5 miles northeast of Cedar Springs, on roadside	Watauga shale	h	7-24-28	2,140	52.5	62	113		40	b	d 126	4	.5	1.1	108
96	W. M. Buchanan Spring—5.6 miles west of Speedwell, near Cripple Creek	Shady dolomite		7-25-28	150	52	60	85		24	8	d 96	3	.3	.05	66
97	Bob James Spring—6.9 miles southwest of Speedwell, on Kinser Creek	Shady dolomite		7-25-28	90	55	67	115		28	10	128	4	.7	.96	89
98	Wyrick Mineral Spring—1 mile southeast of Crockett, on Tate Run tributary	Watauga shale on limb of syncline		7-27-28	450	58	82	155		52	10	d 178	4	.2	.15	129
99	Seven Springs—1.3 miles south of Speedwell, on Dry Branch, near highway	Shady dolomite on limb of syncline	h	7-28-28	170			59		20	b	64	3	.7	.42	50
100	Pierce Walters Spring—3.3 miles northwest of Wytheville, on Stony Creek tributary, Bland county highway	Jonesboro limestone on limb of syncline		7-28-28	80											
101	Ben Kelly Spring—5.7 miles north of Wytheville, on Cove Creek	Ottosee limestone		7-28-28	420	75	80	248		45	15	278	10	.2	1.4	206
102	Johnson Spring—.7 mile northeast of Wytheville, on Reed Creek tributary	Honaker limestone		7-24-28	50	54.5	66	228		56	13	247	3	1.6	11	188
103	N. Crockett Spring—6.8 miles northwest of Max Meadows, on Reed Creek tributary	Honaker limestone		7-24-28	130	53.5	70	197		64	19	221	2	1.0	6.0	149
104	McGavock Run Spring—1.7 miles northwest of Max Meadows, near Norfolk and Western Railway	Honaker limestone	h	7-24-28	1,080	53	70	269		90	b	304	3	.7	7.5	258

Number	LOCATION AND NAME	GEOLOGIC OCCURRENCE		Date, 1928	Flow (gallons a min. use)	Temperatures (Degrees Fahrenheit) Water	Air	Approximate Partial Analysis (Parts per Million) Dissolved solids (calculated)	Iron (Fe)	Calcium (Ca) (by turbidity)	Sodium (Na) (calculated)	Bicarbonate (HCO_3)	Sulphate (SO_4) (by turbidity)	Chloride (Cl)	Nitrate (NO_3)	Total hardness (as $CaCO_3$)
105	Beaver Spring—2.5 miles southwest of Max Meadows on Reed Creek tributary	Beekmantown limestone near fault with Watauga shale		7-23-28	140	54.5	62	151		32	12	172	2	.8	2.3	120
106	Spring—¾ mile south of Max Meadows near Reed Creek	Watauga shale		7-23-28	50	56.5	69									
107	Horkrader Spring—1.7 miles west of Grahams Forge near Glade Creek junction with Reed Creek	Watauga shale		7-23-28	2,500	56	70	141		28	12	d 162	3	.2	.40	111
108	Richardson Spring—6 miles southwest of Grahams Forge and 2½ miles northwest of Jackson's Ferry near highway	Honaker limestone		7-23-28	50	55.5	73									
109	Horkrader Spring—1.3 miles southwest of Grahams Forge near Reed Creek	Watauga shale		7-23-28	2,250	55.5	69	115		26	9	d 134	2	.4	.25	93
110	Graham Spring—3 miles southeast of Graham's Forge on Cedar Run	Watauga shale		7-23-28	70	54.5	70	185		48	10	216	2	.5	1.0	160
111	T. B. Francis Spring—½ mile northeast of White Gate, on Walker Creek	Fault plane between Beekmantown limestone and Martinsburg shale		7-10-28	50	65	75					d 164	3			106
112	A. J. Francis Spring—At White Gate	Fault plane between Beekmantown limestone and Martinsburg shale		7-10-28	70	53.5	71	194		56	31	220	3	.5	3.9	120
113	Cave Spring—1½ miles south of White Gate, on bank of Walker Creek	Beekmantown limestone near fault with Martinsburg shale		7-10-28	80	52.5	71	172		64	9	d 192	3	.5	5.2	146
114	Big Spring—2½ miles west of Poplar Hill, near bank of Walker Creek	Fault plane between Martinsburg shale and Beekmantown limestone		7-10-28	2,320	53	67	81		28	8	d 93	1	.3	1.2	61
115	Warner's Big Spring—1 mile northwest of Poplar Hill, on Mill Branch tributary	Beekmantown limestone		7-11-28	3,770	52.5	90	107		30	14	d 121	2	.5	2.1	74
116	Ed. Eaton Spring—2 miles northwest of Staffordville and 2 miles southwest of Bane, on Little Sugar Run	Beekmantown limestone		7-11-28	320	53	70					d 232	3			160
117	C. H. Shuffleberger Spring—2½ miles northwest of Staffordville and 1¾ miles southwest of Bane, on Little Sugar Run, ½ mile north of No. 116	Beekmantown limestone		7-11-28	10	54	71					279	2			183
118	H. M. Eaton Spring—1½ miles northwest of Staffordville and 1¾ miles southwest of Bane, on Little Sugar Run	Beekmantown limestone		7-11-28	50	53	70	234		40	22	268	3	.7	3.8	180
119	Mrs. W. P. Eaton Spring—1¾ miles east of Poplar Hill, near Walker Creek	Beekmantown limestone		7-11-28	40	53	67					302	2			203
120	T. B. Francis Spring—3 miles northeast of Staffordville, 1.6 miles southeast of Bane	Beekmantown limestone		7-11-28	700	53.5	72	360		60	19	342	5	1.0	4.2	250
121	Staffords Bear Spring—2½ miles east of Trigg, head of Bear Branch	Beekmantown limestone		7-11-28	220	52.5	71	197		24	18	224	3	.5	4.1	151

b Less than 5 parts per million.
d Includes equivalent of small amount of carbonate.
h Sample for analysis collected April 30, 1929.

Number	LOCATION AND NAME	GEOLOGIC OCCURRENCE		Date, 1928	Flow (gallons a minute)	Temperatures (Degrees Fahrenheit) Water	Air	Approximate Partial Analysis (Parts per Million) Dissolved solids (calculated)	Iron (Fe)	Calcium (Ca) (by turbidity)	Sodium (Na) (calculated)	Bicarbonate (HCO_3)	Sulphate (SO_4) (by turbidity)	Chloride (Cl)	Nitrate (NO_3)	Total hardness (as $CaCO_3$)
12	am Bradley Spring—½ mile west of Newport, ½ mile west of 123, on Sinking Creek	Beekmantown, Conococheague and Elbrook limestone series on or near crest of anticline	m	4-4-28	500	51	58	248	.....	72	b	275	4	1.2	7.9	228
123	Hardwick Spring—1 mile northwest of Newport, on Sinking Creek	Beekmantown, Conococheague and Elbrook limestone series on or near crest of anticline		4-4-28	4,000	51	58	122	.....	40	4.0	136	3	.5	3.0	109
124	Spring—½ mile west of Newport	Beekmantown, Conococheague and Elbrook limestone series on or near crest of anticline		4-4-28	30	52	58	.....	.....	.....	.....	.....	.....	.....	.....	.....
125	A. W. Smith Spring—1 mile north of Newport, on north bank of Sinking Creek, ½ mile below Clover Run	Beekmantown, Conococheague and Elbrook limestone series on or near crest of anticline	m	4-4-28	300	53	60	165	.....	60	6	190	2.5	.4	2.0	148
126	Newport High School Spring—At Newport	Beekmantown, Conococheague and Elbrook limestone series on or near crest of anticline		4-3-28	100	52	60	130	.....	44	b	144	2	.6	4.1	117
127	T. J. Sybold Spring, ½ mile northeast of Newport, at forks of road	Beekmantown, Conococheague and Elbrook limestone series on or near crest of anticline		4-3-28	60	53	64	.....	.....	.....	.....	.....	.....	.....	.....	.....
128	Mrs. Lucy Price Spring—1½ miles northeast of Newport	Beekmantown, Conococheague and Elbrook limestone series on or near crest of anticline		4-3-28	15	53	62	.....	.....	.....	.....	.....	.....	.....	.....	.....
129	M. W. Reynolds Spring—3 miles northeast of Newport, at base of hill	Beekmantown, Conococheague and Elbrook limestone series on or near crest of anticline	m	4-3-28	200	54	62	242	.....	60	b	281	2	1.0	2.8	234

Number	LOCATION AND NAME	GEOLOGIC OCCURRENCE	Date, 1928	Flow (gallons a minute)	Temperatures (Degrees Fahrenheit) Water	Air	Approximate Partial Analysis (Parts per Million) Dissolved solids (calculated)	Iron (Fe)	Calcium (Ca) (by turbidity)	Sodium (Na) (calculated)	Bicarbonate (HCO_3)	Sulphate (SO_4) (by turbidity)	Chloride (Cl)	Nitrate (NO_3)	Total hardness (as $CaCO_3$)
130	Mrs. W. P. Reynolds Spring—3 miles northeast of Newport, at base of high bank	Beekmantown, Conococheague and Elbrook limestone series on or near crest of anticline	4-3-28	200	54	64	153	.....	48	6	178	1	.2	2.4	137
131	Tickle Spring—8¼ miles north of Pulaski, on Back Creek	Elbrook, Conococheague and Beekmantown limestone series near fault with Price sandstone	7-21-28	15	55	60	.....	.....	.....	.....	234	14	.....	.....	180
132	Glendine Spring—9½ miles northeast of Pulaski, on Back Creek	Elbrook, Conococheague and Beekmantown limestone series near fault with Price sandstone	7-21-28	10	55	75.5	.....	.....	.....	.....	252	12	.....	.....	186
133	Spring—10.3 miles northeast of Pulaski on Back Creek	Elbrook, Conococheague and Beekmantown limestone series near fault with Price sandstone	7-21-28	50	53.5	72	.....	.....	.....	.....	314	3	.....	.....	250
134	Buford Spring—11.7 miles northeast of Pulaski, on Back Creek	Elbrook, Conococheague and Beekmantown limestone series near fault with Price sandstone	7-21-28	180	53.5	73.5	271	.....	80	27	288	4	1.2	17	197
135	Harmon Spring, No. 1—5 miles northeast of Pulaski, on Peak Creek tributary and on Lee Highway	Elbrook to Beekmantown limestone series	7-17-28	70	53.5	69.5	.....	.....	.....	.....	290	10	.....	.....	206
136	Harmon Spring, No. 2—5 miles northeast of Pulaski, 40 feet south of No. 1, on Peak Creek tributary and on Lee Highway	Elbrook to Beekmantown limestone series	7-17-28	250	53.5	81	263	.....	60	11	294	4	1.3	7.5	228
137	T. M. Painter Spring—4¾ miles northeast of Pulaski, on Peak Creek tributary, on Lee Highway	Elbrook to Beekmantown limestone series	7-17-28	100	53	72	280	.....	100	18	308	5	1.2	10	228
138	Cooling Springs—1.3 miles east of Pulaski, near Peak Creek, on Lee Highway	Elbrook to Beekmantown limestone series	7-17-28	380	53	71	128	.....	22	16	d 111	23	.3	4.5	80
139	J. L. Welch Spring—1½ miles south of Draper, on Harmony Branch	Fault contact of Martinsburg shale and Beekmantown limestone	7-19-28	270	56.5	74	.....	.....	.....	.....	328	10	.....	.....	229
140	K. Warden Spring—2½ miles northeast of Pulaski, on Peak Creek tributary	Elbrook to Beekmantown limestone series	7-20-28	380	54	72.5	243	.....	64	16	248	9	1.5	15	191
141	Spring—4.8 miles southeast of Pulaski, on Opossum Hollow Branch, near Cripple Creek extension of Norfolk and Western Railway	Watauga shale	7-19-28	20	53.5	78	.....	.....	.....	.....	209	20	.....	.....	149

b Less than 5 parts per million.
d Includes equivalent of small amount of carbonate.
m Sample for analysis collected May 7, 1929.

Number	LOCATION AND NAME	GEOLOGIC OCCURRENCE	Date, 1928	Flow (gallons a minute)	Temperatures (Degrees Fahrenheit)		Approximate Partial Analysis (Parts per Million)								
					Water	Air	Dissolved solids (calculated)	Iron (Fe)	Calcium (Ca) (by turbidity)	Sodium (Na) (calculated)	Bicarbonate (HCO_3)	Sulphate (SO_4) (by turbidity)	Chloride (Cl)	Nitrate (NO_3)	Total hardness (as $CaCO_3$)
142	R. L. Taylor Spring—4 miles southeast of Pulaski, on O'Possum Hollow Branch, near Cripple Creek Railway extension	Watauga shale	7-19-28	25	52.5	72.5					d 176	13			129
143	V. Jameson Spring—5.2 miles east of Pulaski, on Peak Creek tributary near Peak Creek	Elbrook to Beekmantown limestone series	7-17-28	10	54	68					216	7			149
144	Dobbin Spring—4.5 miles north of Dublin, on Back Creek tributary	Elbrook to Beekmantown limestone series	7-17-28	20	54.5	68					278	3			183
145	Leroux Spring—.6 miles southwest of Newbern, on road to Pulaski	Elbrook to Beekmantown limestone series	7-17-28	120	53	72.5	257		44	16	266	5	.9	19	206
146	J. F. Southern Spring—1½ miles southwest of Newbern on Peak Creek tributary	Elbrook to Beekmantown limestone series	7-17-28	100	54.5	72	289		100	23	324	7	1.3	5.0	228
147	E. B. Akers Spring—1.4 miles north of Newbern on Peak Creek tributary	Elbrook to Beekmantown limestone series	7-19-28	160	54.5	72	243		76	15	274	3	.8	6.4	202
148	Joe Vaughn Spring—1 mile south of Newbern on New River tributary	Elbrook to Beekmantown limestone series	7-19-28	80	54.5	72	272		80	22	275	9	1.5	20	206
149	T. W. Hudson Spring—7 miles northeast of Dublin, on Neck Creek	Beekmantown limestone	7-9-28	210	54	74	427		120	32	374	n 78	.8	3.8	322
150	Mrs. E. B. Hudson Spring—6½ miles northeast of Dublin, on Neck Creek tributary, ¼ mile south of road	Beekmantown limestone	7-9-28	100	54						432	20			307
151	Mrs. J. B. Anderson Spring—6 miles northeast of Dublin, ¼ mile west of No. 152, on Neck Creek tributary	Beekmantown limestone	7-9-28	40	54	68.5					282	40			257
152	E. A. Brown Spring—6 miles northeast of Dublin, on Neck Creek (¾ miles off macadam road)	Beekmantown limestone	7-9-28	480	53.5	70.5	231		56	28	252	5	.6	9.0	160
153	Flanagan Spring—5 miles northeast of Dublin, on Neck Creek	Beekmantown to Elbrook limestone series	7-17-28	240	53.5	70	275		88	20	314	4	1.0	4.4	222
154	Trinkle Spring—1 mile east of Dublin	Beekmantown to Elbrook limestone series	7-16-28	100	54.5	65	284		60	17	208	3	1.0	3.3	140
155	Wythroe Spring—1.3 miles southeast of Dublin	Beekmantown to Elbrook limestone series	7-16-28	80	54	68	208		56	19	236	3	1.8	3.1	160
156	Dudley Spring—1.6 miles east of Dublin	Beekmantown to Elbrook limestone series	7-16-28	10	54	69.5					247	6			166
157	Woolwine Spring—4 miles east of Newbern, near New River	Beekmantown to Elbrook limestone series	7-16-28	10,300	54.5	74	287		60	25	292	10	1.5	5.3	202
158	Dudley Spring—2¾ miles east of Dublin, about 200 yards east of No. 159	Beekmantown to Elbrook limestone series	7-16-28	10	55	73					248	6			171
159	T. S. Shufflebarger Spring—2¾ miles east of Dublin	Beekmantown to Elbrook limestone series	7-16-28	150	54	69	170		48	19	194	3	.6	2.5	123
160	Spring—½ mile north of Belspring, near New River	Beekmantown to Elbrook limestone series	7-20-28	70	56		234		76	20	234	10	1.5	16	174
161	Mrs. Alma Kirkwood Spring—.3 mile south of Belspring	Beekmantown limestone	7-9-28	130	57	73	328		70	25	340	20	.5	11	254
162	Boyd Spring—1 mile west of Radford on Norfolk and Western Railway	Elbrook to Beekmantown limestone series	7-20-28	3,400	54.5	77	283		90	15	300	15	1.1	7.3	236
163	Stone Spring—7 miles northeast of Newbern and 1.6 miles southwest of Ingles Ferry, at roadside	Elbrook to Beekmantown limestone series	7-19-28	20	50	74	342		120	12	396	4	1.3	3.3	307
164	Old Dublin Spring—6½ miles east of Newbern and 3.7 miles southwest of Ingles Ferry, near New River	Elbrook to Beekmantown limestone series	7-19-28	50	54.5	69					331	7			243
165	Kyle Meredith Spring—3½ miles southwest of Snowville, source of Clapboard Creek	Watauga shale	7-18-28	10	53.5	68.5					332	7			236
166	H. T. Vires Spring—.7 mile southwest of Snowville, near Burks Run	Watauga shale near contact with Shady dolomite	7-18-28	140	53.5	68	174		40	10	d 197	3	.5	3.4	146
167	Glenn Summers Spring—.6 mile south of Snowville, near road	Watauga shale and Shady dolomite	7-18-28	25	54	70					d 216	7			151
168	Hale Spring—10.2 miles south of Radford, Little River tributary, near Little River	Elbrook to Beekmantown limestone series	7-19-28	30	53	76.5					283	3			202
169	Blue Spring—4.9 miles south of Snowville, on Little Laurel Creek, near junction with Little River	Erwin quartzite, near Hampton shale contact	7-18-28	560	58	70					d 176	20			120
	C. H. Hambrie Spring—5.3 miles southeast of Snowville, 60 feet from bank of Little River	Watauga shale and Shady dolomite	7-18-28	1,790	53	70	148		40	14	d 159	9	.6	1.0	111
171	Otey's Spring—5 miles south of Blacksburg, on Tom's Creek	Copper Ridge dolomite	7-14-28	10	53.4	70					268	5			186

d Includes equivalent of small amount of carbonate.
n Determined gravimetrically.

SPRING WATERS IN VIRGINIA

Number	LOCATION AND NAME	GEOLOGIC OCCURRENCE	Date, 1928	Flow (gallons a minute)	Temperatures (Degrees Fahrenheit) Water	Air	Approximate Partial Analysis (Parts per Million) Dissolved solids (calculated)	Iron (Fe)	Calcium (Ca) (by turbidity)	Sodium (Na) (calculated)	Bicarbonate (HCO_3)	Sulphate (SO_4) (by turbidity)	Chloride (Cl)	Nitrate (NO_3)	Total hardness (as $CaCO_3$)
	H. Flanagan Spring—3 miles south of Blacksburg, on Tom's Creek road	Copper Ridge dolomite	7-14-28	50	54	67	255	.....	72	27	288	6	.7	3.8	188
173	City Springs (Christiansburg)—1¾ miles northwest of Christiansburg, off Lee Highway, on Crab Creek	Beekmantown limestone	6-30-28	70	57	68.5	305	.....	64	66	286	46	1.2	.05	140
174	Willow Springs—1 mile west of Christiansburg, on Lee Highway	Beekmantown limestone	6-30-28	60	53	60	217	.....	40	11	240	3	.7	8.2	183
175	Louis Jinnell Spring—4 miles south of Blacksburg just off paved road	Copper Ridge limestone	6-30-28	50	53	77	.....	.....	.....	.....	306	11	.....	.....	209
176	Shelton Spring—1.3 miles northeast of Cambria, on old Roanoke road	Beekmantown limestone	7-12-28	140	54	74	272	.....	40	16	308	2	1.5	7.0	228
177	Miss L. Willis Spring—2 miles north of Rogers, on Elliott Creek tributary	Beekmantown limestone near base	7-12-28	7	53.5	81	.....	.....	.....	.....	250	3	.....	.....	177
178	W. J. Peregoy Springs—6 miles south of Christiansburg, on Elliott Creek tributary	Watauga shale near Shady dolomite contact	6-30-28	20	53	64.5	.....	.....	.....	.....	256	6	.....	.....	169
179	J. E. Steele Spring—5½ miles south of Christiansburg and 1¾ miles northeast of Auburn, on Stony Branch	Shady dolomite	7-12-28	70	55	85	.....	.....	.....	.....	210	25	.....	.....	160
180	J. E. Steele Spring—5¼ miles south of Christiansburg and 2 miles northeast of Auburn, on Stony Branch	Shady dolomite	7-12-28	20	54	70	.....	.....	.....	.....	253	20	.....	.....	180
181	Hugh Hudgins Spring—1 mile northeast of Rogers, on Elliott Creek	Shady dolomite	7-12-28	20	53	72	.....	.....	.....	.....	d 172	3	.....	.....	120
182	E. M. Smith Spring—9 miles northeast of Blacksburg and 9 miles southwest of Shiloh Church, on Dry Run	Elbrook to Beekmantown limestone series near fault with Price sandstone	7-13-28	70	53	81	.....	.....	.....	.....	d 134	3	.....	.....	89
183	Mrs. M. A. Nutter Spring—9½ miles northeast of Blacksburg and 8¾ miles southwest of Shiloh Church, on Dry Run	Elbrook to Beekmantown limestone series near fault with Price sandstone	7-13-28	60	56	85	.....	.....	.....	.....	d 76	4	.....	.....	44
184	C. W. Wright Springs—7½ miles northeast of Blacksburg, near Bennett's Mill	Spring flows over large deposit of travertine, underlain by Beekmantown limestone	7-6-28	860	52.5	73	229	.....	40	32	241	17	.5	2.4	149

Number	LOCATION AND NAME	GEOLOGIC OCCURRENCE	Date, 1928	Flow (gallons a minute)	Temperatures (Degrees Fahrenheit) Water	Air	Approximate Partial Analysis (Parts per Million) Dissolved solids (calculated)	Iron (Fe)	Calcium (Ca) (by turbidity)	Sodium (Na) (calculated)	Bicarbonate (HCO_3)	Sulphate (SO_4) (by turbidity)	Chloride (Cl)	Nitrate (NO_3)	Total hardness (as $CaCO_3$)
185	C. W. Wright Spring—7¼ miles northeast of Blacksburg, near Wright house	Beekmantown limestone	7-6-28	20	53	68	.....	.....	.....	.....	442	30	.....	.....	336
186	J. W. Slusser Spring—4½ miles northeast of Blacksburg and 1.4 miles southwest of Bennett's Mill, on North Fork of Roanoke River	Near top of Beekmantown limestone	7-14-28	150	60	67	226	.....	48	23	238	15	1.0	3.6	166
187	Frank Slusser Spring—7 miles northeast of Blacksburg and .6 miles southeast of Bennett's Mill, on North Fork of Roanoke River	Ottosee limestone	7-14-28	110	54.5	71	209	.....	40	26	226	10	1.0	3.8	143
188	Montgomery White Sulphur Springs—6 miles northeast of Christiansburg and 2 miles northwest of Montgomery Station	Copper Ridge dolomite near contact with Beekmantown limestone	6-28-28	100	57	67	.....	.....	.....	.....	425	280	.....	.....	378
189	John Creasy Spring—6¼ miles northeast of Christiansburg and 1¾ miles northeast of Montgomery Station	Copper Ridge dolomite	6-28-28	20	57	64	.....	.....	.....	.....	340	12	.....	.....	236
190	Henry Allen Spring—12 miles northeast of Blacksburg, 6½ miles southwest of Shiloh Church, head of stream leading to McDonalds Mill	Elbrook to Beekmantown limestone series near Price sandstone fault	7-13-28	140	59.5	72	61	.....	6	11	d 66	3	.5	.35	36
191	Henry Allen Spring—12 miles northeast of Blacksburg, 6.3 miles southwest of Shiloh Church, head of stream leading to McDonalds Mill	Elbrook to Beekmantown limestone series near Price sandstone fault	7-13-28	60	53.5	80	122	.....	22	12	d 138	3	.6	1.6	93
192	W. K. Grubb Spring—11 miles northeast of Blacksburg, 2 miles southwest of McDonalds Mill, on North Fork of Roanoke River	Near top of Beekmantown limestone	7-13-28	370	55	71	244	.....	56	24	284	12	1.0	4.3	182
193	G. W. Shepherd Springs—13 miles northeast of Blacksburg and 2½ miles south of Shiloh Church, on tributary to McDonalds Mill	Elbrook to Beekmantown limestone series near Price sandstone fault	7-13-28	80	52	73.5	70	.....	12	9.8	d 82	2	.4	.15	49
194	O. E. Wells Spring—12 miles northeast of Blacksburg and ½ mile southwest of McDonalds Mill, on North Fork of Roanoke River	Near top of Beekmantown limestone	7-13-28	90	52.5	73	.....	.....	.....	.....	270	15	.....	.....	180
	G. W. Wells Spring, 10 miles northeast of Christiansburg and ½ mile north of Montgomery Station	Beekmantown limestone	6-28-28	10	54	64	.....	.....	.....	.....	323	15	.....	.....	214
196	J. A. Musselman Spring—2½ miles west of Shawsville, near Norfolk and Western Railway	Beekmantown limestone	6-28-28	110	54.5	64.5	411	.....	95	74	420	30	4.0	9.0	228
197	Cedar Spring—2 miles west of Shawsville, on Lee Highway, behind filling station	Beekmantown limestone	6-28-28	100	55	75	.....	.....	.....	.....	282	15	.....	.....	214

d Includes equivalent of small amount of carbonate.

Number	LOCATION AND NAME	GEOLOGIC OCCURRENCE	Date, 1928	Flow (gallons a minute)	Temperatures (Degrees Fahrenheit)		Approximate Partial Analysis (Parts per Million)								
					Water	Air	Dissolved solids (calculated)	Iron (Fe)	Calcium (Ca) (by turbidity)	Sodium (Na) (calculated)	Bicarbonate (HCO_3)	Sulphate (SO_4) (by turbidity)	Chloride (Cl)	Nitrate (NO_3)	Total hardness (as $CaCO_3$)
198	J. L. Vaughn Spring—2 miles west of Shawsville, just off Lee Highway	Beekmantown limestone	6-28-28	2,420	57	71	345	.....	60	65	392	10	.7	2.6	194
199	Shaws Spring—2 miles northwest of Shawsville, 1 mile north of Lee Highway	Beekmantown limestone near fault	6-27-28	80	60	70	.....	.....	.....	.....	274	30	.....	.....	226
200	N. W. Ryan Spring—1½ miles northwest of Shawsville, ½ mile north of Lee Highway	Fault in Beekmantown limestone	6-27-28	40	54	67	.....	.....	.....	.....	474	30	.....	.....	364
201	J. H. Kirby Spring—1½ miles northwest of Shawsville, ½ mile north of Lee Highway	Beekmantown limestone near fault	6-27-28	100	53.5	68.5	.....	.....	.....	.....	430	64	.....	.....	386
202	J. L. Vaughn Spring, 1 mile west of Shawsville, on Lee Highway, near Norfolk and Western Railway	Beekmantown limestone	6-28-28	100	55.5	66	.....	.....	.....	.....	416	50	.....	.....	350
203	J. L. Vaughn Spring—1¼ miles west of Shawsville, at house, 100 yards west of No. 204	Beekmantown limestone	6-27-28	100	53	71	.....	.....	.....	.....	413	10	.....	.....	314
204	J. L. Vaughn Spring—1¼ miles west of Shawsville, on Lee Highway	Beekmantown limestone	6-27-28	100	53	71	.....	.....	.....	.....	266	17	.....	.....	200
205	J. L. Vaughn Spring—¾ mile west of Shawsville, near Lee Highway	Beekmantown limestone	6-27-28	30	58.5	75	.....	.....	.....	.....	378	1,000	.....	.....	943
206	J. L. Vaughn Spring—½ mile west of Shawsville, on Lee Highway	Beekmantown limestone	6-27-28	35	58	63.5	.....	.....	.....	.....	373	1,400	.....	.....	943
207	J. L. Vaughn Spring—½ mile west of Shawsville, 40 feet east of No. 206	Beekmantown limestone	6-27-28	20	67.5	63.5	.....	.....	.....	.....	334	1,700	.....	.....	929
208	Alleghany Spring—At Alleghany Springs	Shady dolomite near Erwin quartzite contact	6-29-28	100	59	68.5	.....	.....	.....	.....	d 28	2,500	.....	.....	1,525
209	Crockett Spring—3¼ miles south of Alleghany Springs	Pre-Cambrian rocks	6-29-28	100	68	66.5	.....	.....	.....	.....	165	88	.....	.....	174
210	D. V. Jewell Spring—3 miles south of Alleghany Springs, 200 yards northwest of No. 211	Watauga shale and Shady dolomite	6-29-28	20	54	75	.....	.....	.....	.....	d 142	88	.....	.....	154
211	D. V. Jewell Spring—3 miles south of Alleghany Springs	Watauga shale and Shady dolomite	6-29-28	70	54	75	.....	.....	.....	.....	d 161	12	.....	.....	100
212	G. C. Worrell Spring—3½ miles south of Alleghany Springs, near Fishers View	Watauga shale	6-29-28	60	57	70	.....	.....	.....	.....	402	3	.....	.....	272
213	Big Springs—3 miles south of Elliston, on Lee Highway	Near contact Elbrook limestone and Watauga shale	6-26-28	1,980	55.5	74	351	.....	65	30	257	n 94	.7	3.2	238
214	J. L. Vaughn Spring—2 miles southeast of Elliston, on Brake Branch, ¼ mile southwest of No. 215	Watauga shale near contact with Shady dolomite	6-27-28	40	53	64	.....	.....	.....	.....	153	6	.....	.....	111
215	J. L. Vaughn Spring—2 miles southeast of Elliston, at foot of Poor Mountain, near Brake Branch	Watauga shale near contact with Shady dolomite	6-27-28	160	53	64	.....	.....	.....	.....	d 120	6	.....	.....	89
216	M. E. Taylor Spring—3 miles southwest of Simmonsville and 2 miles north of Huffman, in creek bottom	Beekmantown, Conococheague and Elbrook limestone series on or near crest of anticline	m 4-3-28	400	49	58	52	.....	13	b	d 58	2	.5	.25	40
217	D. A. Huffman Spring—2¾ miles southwest of Simmonsville and 1 mile north of Huffman, in creek bottom, 100 feet west of creek	Beekmantown, Conococheague and Elbrook limestone series on or near crest of anticline	m 4-3-28	650	53	60	139	.....	40	b	159	3	.5	1.4	134
218	Dr. A. L. Sybold Spring—3 miles southwest of Simmonsville and 1 mile east of Huffman, 1½ miles up Sinking Creek from Huffman store	Beekmantown, Conococheague and Elbrook limestone series on or near crest of anticline	4-4-28	60	50	62	.....	.....	.....	.....	.....	.....	.....	.....	.....
219	S. J. Oliver Spring—3½ miles southwest of Simmonsville and 2 miles east of Huffman, on east side of bridge over Sinking Creek	Beekmantown, Conococheague and Elbrook limestone series on or near crest of anticline	4-4-28	60	51	63	.....	.....	.....	.....	.....	.....	.....	.....	.....
220	Spring—9.4 miles southwest of Newcastle, 2 miles north of Sinking Creek Postoffice, on Meadow Creek road	Beekmantown, Conococheague and Elbrook limestone series on or near crest of anticline	4-4-28	30	49	57	.....	.....	.....	.....	.....	.....	.....	.....	.....
221	Spring—9.8 miles southwest of Newcastle, 1½ miles north of Sinking Creek Postoffice, on Meadow Creek road	Beekmantown, Conococheague and Elbrook limestone series on or near crest of anticline	4-4-28	10	49	60	.....	.....	.....	.....	.....	.....	.....	.....	.....

b Less than 5 parts per million.
d Includes equivalent of small amount of carbonate.
m Sample for analysis collected May 7, 1929.
n Determined gravimetrically.

Number	LOCATION AND NAME	GEOLOGIC OCCURRENCE		Date, 1928	Flow (gallons a minute)	Temperatures (Degrees Fahrenheit)		Approximate Partial Analysis (Parts per Million)									
						Water	Air	Dissolved solids (calculated)	Iron (Fe)	Calcium (Ca) (by turbidity)	Sodium (Na) (calculated)	Bicarbonate (HCO_3)	Sulphate (SO_4) (by turbidity)	Chloride (Cl)	Nitrate (NO_3)	Total hardness (as $CaCO_3$)	
222	Clarence Reynolds Spring—9 miles south of New Castle, 3 miles northeast of Sinking Creek Postoffice and 6 miles southwest of Looney	Beekmantown, Conococheague and Elbrook limestone series on or near crest of anticline		4-4-28	60	52	60										
223	Minor Taylor Spring—8.5 miles southwest of Newcastle, 3¼ miles northeast of Sinking Creek and 6 miles southwest of Looney	Beekmantown, Conococheague and Elbrook limestone series on or near crest of anticline		4-4-28	80	52	60										
224	J. M. Givens Spring—8.5 miles southwest of Newcastle, 2 miles northeast of Sinking Creek	Beekmantown, Conococheague and Elbrook limestone series on or near crest of anticline	o	4-4-28	600	49	59	93		26	b	104	3	.4	1.0	82	
225	Spring—6.4 miles southwest of Newcastle and 3½ miles southwest of Looney, on Meadow Creek, in creek bottom	Beekmantown, Conococheague and Elbrook limestone series on or near crest of anticline		4-4-28	30	52	64										
226	O. L. Huffman Spring—4.2 miles southwest of Newcastle and 1 mile west of Looney, on south side of Meadow Creek	Beekmantown, Conococheague and Elbrook limestone series on or near crest of anticline		4-4-28	40	52	65										
227	O. G. McCartney Spring—3.8 miles southwest of Newcastle and 1 mile northwest of Looney	Beekmantown, Conococheague and Elbrook limestone series on or near crest of anticline		4-4-28	15	47	65										
228	Clarence Dudding Spring—3 miles southwest of Newcastle and 1 mile north of Looney	Probably fed by Meadow Creek		4-4-28	2,000	52	68	133		50	4.2	152	2	.6	2.0	120	
229	C. E. Lefel Spring—2.2 miles southwest of Newcastle, on Meadow Creek	Beekmantown limestone on nose of anticline	o	4-4-28	200	51.5	75	129		40	b	d 144	3	.8	2.5	116	
230	C. E. Lefel Spring—2 miles southwest of Newcastle, at residence	Beekmantown limestone on nose of anticline	o	4-4-28	5,000	49.5	75	116		44	5	d 130	3	.5	1.7	100	
231	Walter Givens Spring—½ mile southwest of Newcastle, on Newport road	Oriskany sandstone on nose of anticline		4-4-28	60	55	75	13		2	.9	10	2	16	.50	9.5	
232	Beard Spring—16 miles northeast of Blacksburg and 1¾ miles south of Shiloh Church, near Gullion Branch	Fault in Elbrook limestone		7-13-28	15	52.5	70					d 162	2			117	
233	Spring—½ mile northeast of Bradshaw, on Bradshaw Creek	Romney shale		7-3-28	30	74	78					d 38	23			26	
234	Jerry Morgan Spring—At Catawba	Holston limestone		4-4-28	200	54	63	198		64	1.4	226	2	1.2	3.8	189	
235	Brown & Terry Spring—1 mile northeast of Catawba	Holston limestone		4-5-28	40	55	59										
236	C. W. Francisco Spring—2 miles northeast of Catawba	Holston limestone		4-5-28	60	54	59										
237	W. E. Thomas Spring—3 miles northeast of Catawba	Holston limestone		4-5-28	30	54	60										
238	Spring—7 miles northeast of Bradshaw, on Masons Creek	Romney shale		7-3-28	90	66.5	70					38	3			11	
239	Spring—7½ miles northeast of Bradshaw, on Masons Creek	Oriskany sandstone		7-3-28	20	75	72					d 53	4			26	
240	Spring—8½ miles northeast of Bradshaw, on Masons Creek	Romney shale		7-3-28	50	64	74					d 32	4			9.5	
241	Spring—9½ miles northeast of Bradshaw, on Masons Creek	Romney shale		7-3-28	50	64	74					38	6			9.5	
242	Erma Springs, 9 miles northwest of Roanoke, on Catawba road	Jennings formation near fault		6-26-28	1,220	55	69.5					d 275	2			18	
243	Bennett Spring, 9 miles northwest of Roanoke, 1½ miles east of Catawba road at base of McAfee's Knob	Romney shale near Jennings contact		6-26-28	100	56	76					245	5			134	
244	W. F. Fishers Spring—2½ miles northeast of Salem, 300 yards east of Hanging Rock, on Mason Creek	Jennings formation		6-26-28	10	56	78					204	10			149	
245	Judge Moir Spring—1½ miles north of Cave Spring, near Mud Lick Creek	Watauga shale		7-2-28	30	59.5	69					d 150	4			97	
246	H. F. Williams Spring—.6 mile north of Cave Spring, near Mud Lick Creek	Watauga shale near contact with crystaline rocks		7-2-28	110	55.5	68					d 124	12			94	
247	May McCampbell Spring—At Cave Spring, 200 yards southwest of Cave Spring	Watauga shale near Shady dolomite contact		7-2-28	300	57	71	189		40	16	d 153	40	1.6	2.1	137	
248	Cave Spring, at Cave Spring	Shady dolomite near Watauga shale contact		7-2-28	230	56	71	175		36	16	d 154	27	.9	5.0	126	
249	Greenwood Spring—¼ mile south of Cave Spring	Shady dolomite near contact with crystaline rocks		7-2-28	100	57.5	68					d 175	5			131	

b Less than 5 parts per million.

d Includes equivalent of small amount of carbonate.

o Sample for analysis collected May 8, 1929.

Number	LOCATION AND NAME	GEOLOGIC OCCURRENCE	Date, 1928	Flow (gallons a minute)	Temperatures (Degrees Fahrenheit) Water	Air	Approximate Partial Analysis (Parts per Million) Dissolved solids (calculated)	Iron (Fe)	Calcium (Ca) (by turbidity)	Sodium (Na) (calculated)	Bicarbonate (HCO_3)	Sulphate (SO_4) (by turbidity)	Chloride (Cl)	Nitrate (NO_3)	Total hardness (as $CaCO_3$)
250	George Harris Spring—1.7 miles south of Cave Spring	Crystaline rocks near Shady dolomite contact	7-2-28	109	55	70	.....	.....	.....	.....	53	2	.....	.....	20
251	J. C. Moomaw Springs—3 miles north of Roanoke, on Cave road, on Lick Creek	Elbrook limestone near Clinton formation, limb of syncline	7-4-28	1,320	56	91	203	.....	56	16	177	35	.7	3.6	151
252	Limestone Spring—At Hollins Institute, Botetourt Springs	Beekmantown limestone near Copper Ridge contact	7-2-28	40	57	67	.....	.....	.....	.....	392	37	.....	.....	314
253	Virginia Bridge and Iron Company Springs, Spring B, at Roanoke, Va	Watauga shale	7-5-28	80	58	88	616	.....	100	108	252	160	86	32	286
254	B. W. Mundy Spring—1 mile northeast of Roanoke, .2 mile south of Thomas's store, on Tinker Creek	Watauga shale	7-5-28	70	.....	80	.....	.....	.....	.....	185	54	.....	.....	174
255	Mason Cook Spring—½ mile north of Bonsacks, on Cloverdale road, near Glade Creek tributary	Elbrook limestone at contact with Watauga shale	7-4-28	250	61	80	224	.....	44	22	177	52	.6	1.6	154
256	W. M. Cook Spring—¾ mile east of Bonsacks, near Highway, on Glade Creek	Watauga shale near contact with Elbrook limestone	7-4-28	360	58.5	72	230	.....	40	17	d 222	28	.7	3.2	177
257	Cold Spring—¼ mile southeast of Sweet Chalybeate, 600 feet northeast of road	Lowville limestone on southeast limb of faulted anticline	4-2-28	5	47	55	.....	.....	.....	.....	.....	.....	.....	.....	.....
258	Sweet Chalybeate Spring—At Sweet Chalybeate Postoffice	Lowville limestone on southeast limb of faulted anticline	4-2-28	1,000	74.2	58	1,348	.....	400	95	777	n 466	30	.33	957
259	R. O. Stone Spring—At Sweet Chalybeate Postoffice, 1,000 feet down creek from No. 258	Lowville limestone on southeast limb of faulted anticline	p 4-2-28	150	66	65	1,133	.....	320	83	616	n 420	19	.70	788
260	C. B. Hunter Spring—½ mile north of Sweet Chalybeate, 100 feet west of road	Lowville limestone on southeast limb of faulted anticline	4-2-28	30	58	58	.....	.....	.....	.....	.....	.....	.....	.....	.....

Number	LOCATION AND NAME	GEOLOGIC OCCURRENCE	Date, 1928	Flow (gallons a minute)	Temperatures (Degrees Fahrenheit) Water	Air	Approximate Partial Analysis (Parts per Million) Dissolved solids (calculated)	Iron (Fe)	Calcium (Ca) (by turbidity)	Sodium (Na) (calculated)	Bicarbonate (HCO_3)	Sulphate (SO_4) (by turbidity)	Chloride (Cl)	Nitrate (NO_3)	Total hardness (as $CaCO_3$)
261	Spring—3 miles northeast of Sweet Chalybeate, on Snake Run, 1 mile above its mouth	Oriskany sandstone on northwest limb of anticline	4-2-28	200	56.5	66	196	.....	48	20	204	17	1.2	.25	143
262	Lee Carter Spring—1.4 miles northeast of Sweet Chalybeate, 100 feet north of Springhouse	Lowville limestone on southeast limb of faulted anticline	4-2-28	30	61	65	.....	.....	.....	.....	.....	.....	.....	.....	.....
263	Lee Carter Spring—1.4 miles northeast of Sweet Chalybeate, in Springhouse	Lowville limestone, on southeast limb of faulted anticline	p 4-2-28	250	52	65	289	.....	80	b	283	32	1.5	4.0	261
264	Iron Hill Spring—2.8 miles northeast of Sweet Chalybeate, on Snake Run, 2 miles above mouth, 200 feet east of summer hotel	Lowville limestone on southeast limb of faulted anticline	4-2-28	60	63	62	677	.....	100	70	416	n 226	8.0	.53	436
265	Iron Hill Spring—2.8 miles northeast of Sweet Chalybeate, on Snake Run, 2 miles above mouth, 400 feet east of summer hotel	Lowville limestone on southeast limb of faulted anticline	4-2-28	20	65.5	62	.....	.....	.....	.....	.....	.....	.....	.....	.....
266	Iron Hill Spring—3½ miles northeast of Sweet Chalybeate, on Snake Run, 2 miles above mouth, 1,200 feet east of summer hotel	Lowville limestone on southeast limb of faulted anticline	4-2-28	5	54	62	.....	.....	.....	.....	.....	.....	.....	.....	.....
267	Cave Spring—4 miles northeast of Sweet Chalybeate, on Snake Run, ½ mile above Iron Hill Springs	Lowville limestone, on southeast limb of faulted anticline	4-2-28	1,000	48.5	50	113	.....	24	b	128	3	.5	1.0	106
268	Bear Spring—4 miles northwest of Callahan, on South Fork of Ogles Creek	Devonian shale in syncline	3-30-28	30	44	62	.....	.....	.....	.....	.....	.....	.....	.....	.....
269	Hugh McCalister Spring—1 mile north of Callahan, on west bank of Johnson Run, 600 feet from mouth	Helderberg limestone on northwest limb of anticline	3-30-28	20	51	64	.....	.....	.....	.....	.....	.....	.....	.....	.....
270	C. H. Rumbold Spring—.8 mile northeast of Callahan, on east bank of Johnson Creek, 200 feet from mouth	Helderberg limestone on northwest limb of anticline	3-30-28	30	47	65	.....	.....	.....	.....	.....	.....	.....	.....	.....
271	Alfred Ball Spring—.6 mile northeast of Callahan, ½ mile east of Johnsons Creek, on north bank of Ogles Creek, ½ mile above mouth	Helderberg limestone on crest of anticline	3-30-28	60	47	65	.....	.....	.....	.....	.....	.....	.....	.....	.....
	C. H. Rumbold Spring—.4 mile northeast of Callahan, on south bank of Ogles Creek, 500 feet above mouth	Helderberg limestone on northwest limb of anticline	3-30-28	80	51	63	.....	.....	.....	.....	.....	.....	.....	.....	.....

b Less than five parts per million.
d Includes equivalent of small amount of carbonate.
n Determined gravimetrically.
p Sample for analysis collected May 14, 1929.

Number	LOCATION AND NAME	GEOLOGIC OCCURRENCE		Date, 1928	Flow (gallons a minute)	Temperatures (Degrees Fahrenheit)		Approximate Partial Analysis (Parts per Million)								
						Water	Air	Dissolved solids (calculated)	Iron (Fe)	Calcium (Ca) (by turbidity)	Sodium (Na) (calculated)	Bicarbonate (HCO_3)	Sulphate (SO_4) (by turbidity)	Chloride (Cl)	Nitrate (NO_3)	Total hardness (as $CaCO_3$)
273	Cave Spring—1.4 miles northeast of Callahan, on Cave Run, ¾ mile above its junction with Dunlop Creek, on property of C. H. Rumbold	Helderberg limestone on southeast limb of anticline	p	3-30-28	270	51.5	56	101	.....	32	b	d 104	7	1.3	1.7	87
274	C. H. Rumbold Spring—1.2 miles northeast of Callahan, ¼ mile southwest of No. 273, on northwest bank of Cave Run, ½ mile from mouth	Helderberg limestone on northwest limb of anticline		3-30-28	50	54.5	65	.....	.....	.....	.....	.....	.....	.....	.....	.....
275	C. H. Rumbold Spring—.8 mile northeast of Callahan, ½ mile southwest of No. 273 on north bank of Dunlap Creek, 500 feet above mouth of Cave Run	Helderberg limestone on northwest limb of anticline		3-30-28	30	54	65	.....	.....	.....	.....	.....	.....	.....	.....	.....
276	R. S. McClintock Spring—6¼ miles northeast of Callahan, 2.2 miles southwest of Barber, ¼ mile south of No. 277	Helderberg limestone on northwest limb of anticline	q	3-29-28	300	45.5	58	65	.....	16	6	58	10	.8	1.0	48
277	R. S. McClintock Spring—6½ miles northeast of Callahan, 2 miles southwest of Barber, on Indian Draft, 1½ miles above its mouth	Helderberg limestone on northwest limb of anticline		3-29-28	20	47.5	54	.....	.....	.....	.....	.....	.....	.....	.....	.....
278	G. A. McCallister Spring—7½ miles northeast of Callahan, at head of Cold Spring Creek, 1 mile from mouth of Indian Draft	Helderberg limestone probably fed by steam	q	3-29-28	1,320	45	63	54	.....	15	5	48	8	1.0	.60	38
279	Spring—8 miles north of Covington, 1.6 miles southwest of Barber, on Indian Draft, ¼ mile above its junction with Jackson River	Helderberg limestone on limb of anticline		3-29-28	200	56	63	143	.....	48	10	152	10	.8	.80	114
280	Spring—7 miles north of Covington, 2 miles south of Barber, ¼ mile below mouth of Indian Draft on west bank of Jackson River	Oriskany sandstone on southeast limb of anticline	r	3-29-28	100	59.8	80	143	.....	40	5	142	15	1.2	.91	123
281	Mrs. Jennie Layton Spring, 7 miles north of Covington, 2 miles south of Barber, on east bank of Jackson River, ¼ mile below mouth of Indian Draft	Oriskany sandstone on southeast limb of anticline		3-29-28	100	70.8	76	200	.....	64	14	190	28	1.3	.35	157

282	R. M. Perkins Spring—10½ miles north of Covington and 1 mile north of Barber, 800 feet northeast of Jackson River	Oriskany sandstone on limb of anticline	r	3-29-28	500	47	78	78	.....	24	b	76	8	.8	1.4	66
283	Smith's Chalybeate Spring—9 miles north of Covington, on west bank of Jackson River, 1 mile south of Barber	Romney shale in syncline		3-29-28	2	50	63	.....	.....	.....	.....	.....	.....	.....	.....	.....
284	Spring—10.2 miles south of Covington, ½ mile southwest of No. 286	Lowville limestone on nose of anticline	p	2-21-28	100	58	38	144	.....	48	7	166	3	.7	.50	126
285	Spring—10 miles south of Covington, .2 mile southwest of No. 286	Lowville limestone on nose of anticline	p	2-21-28	100	53.9	38	166	.....	60	b	180	8	.8	2.5	150
286	Blue Spring—9.2 miles south of Covington and 6 miles southwest of Old Rich Patch Postoffice, at head of Blue Spring Creek	Lowville limestone on nose of anticline		2-21-28	3,000	57.5	34	149	.....	52	13	160	9	.8	1.4	115
287	Falling Spring—9 miles northeast of Covington and 8 miles southwest of Healing Springs, at southwest end of Warm Spring Valley	Lowville limestone on Northwest limb of anticline		2-21-28	7,000	65	34	386	.....	100	27	220	140	1.5	2.9	272
288	Big Spring—2 miles southeast of Covington, on north side of highway, 500 feet north of Jackson River	Oriskany sandstone on northwest limb of anticline		3-29-28	300	55.5	52	126	.....	48	7	136	7	.6	1.2	106
289	Spring—3 miles southwest of Lowmoor, at north end of covered bridge on Jackson River	Clinton formation on limb of anticline		3-28-28	10	50.5	54	.....	.....	.....	.....	.....	.....	.....	.....	.....
290	Kayser's Spring—2½ miles southwest of Lowmoor, on south side of Jackson River, between highway and river, 1,000 feet east of covered bridge	Helderberg limestone on limb of anticline		3-28-28	200	56	50	108	.....	40	6	115	8	.2	.25	90
291	Spring—5.4 miles southwest of Covington and 1½ miles northwest of Rich Patch Postoffice, at base of large hill	Lowville limestone on northwest limb of anticline		2-21-28	60	52.2	34	.....	.....	.....	.....	.....	.....	.....	.....	.....
292	Spring—1.8 miles southwest of Lowmoor, on south side of Chesapeake and Ohio Railway, on Jackson River	Oriskany sandstone on limb of anticline	q	3-28-28	100	50.5	50	74	.....	18	b	78	5	.8	.50	62
293	Carne Creek Spring—3 miles southwest of Lowmoor and 2½ miles north of Rich Patch Postoffice, on Carne Creek	Oriskany sandstone		2-21-28	75	54.4	44	160	.....	40	10	135	33	.7	.10	125
294	Carne Creek Spring—4 miles southwest of Lowmoor and 1½ miles north of Rich Patch Postoffice, on Carne Creek	Trenton limestone on northwest limb of anticline	q	2-21-28	100	52	36	12	.....	2	b	10	2	.5	.15	3.5

b Less than 5 parts per million.
d Includes equivalent of small amount of carbonate.
p Sample for analysis collected May 14, 1929.
q Sample for analysis collected May 15, 1929.
r Sample for analysis collected May 16, 1929.

SPRINGS OF VIRGINIA—CONTINUED

Number	LOCATION AND NAME	GEOLOGIC OCCURRENCE	Date, 1928	Flow, (gallons a minute)	Temperatures (Degrees Fahrenheit) Water	Air	Approximate Partial Analysis (Parts per Million) Dissolved solids (calculated)	Iron (Fe)	Calcium (Ca) (by turbidity)	Sodium (Na) (calculated)	Bicarbonate (HCO_3)	Sulphate (SO_4) (by turbidity)	Chloride (Cl)	Nitrate (NO_3)	Total hardness (as $CaCO_3$)
	E. L. Kamsey Spring—4.2 miles southwest of Lowmoor and 1¼ miles north of Rich Patch Postoffice, on Carne Creek	Lowville limestone on northwest limb of anticline	2-21-28	500	51.2	35	157	.....	44	4	173	2	1.0	5.8	141
296	Spring—4 miles southwest of Lowmoor and 1 mile north of Rich Patch Postoffice, .3 mile up creek from No. 295	Beekmantown limestone on northwest limb of anticline	2-21-28	60	50.6	36	.....	.....	.....	.....	.....	.....	.....	.....	.....
297	W. R. Fridley Spring—5 miles southwest of Lowmoor and ½ mile southeast of Rich Patch Postoffice, ¼ mile above Hook's Mill at head of Roaring Run	Lowville limestone on southeast limb of anticline	2-21-28	4,000	51.9	36	173	.....	50	7	188	5	.7	5.8	150
298	W. R. Fridley Spring—5.1 miles southwest of Lowmoor and ½ mile southeast of Rich Patch Postoffice, 500 feet southeast of No. 297 in bank of creek	Lowville limestone on southeast limb of anticline	2-21-28	630	59	36	184	.....	56	b	151	40	.8	.67	160
299	Big Spring—At Lowmoor	Oriskany sandstone on limb of anticline	3-28-28	1,500	49.2	50	98	.....	34	5	99	8	1.1	1.7	82
300	Spout Spring—At Clifton Forge, at east end of town, at side of Clifton Forge-Fincastle Highway	Oriskany sandstone	2-20-28	100	52.4	32	7.8	.....	1	.6	2.0	1	1.3	1.9	4.7
301	Iron Spring—F. R. Terrell, 2.6 miles northeast of Clifton Forge	Romney shale	2-19-28	2	48.1	42	215	2.67	72	6	229	16	.7	.25	192
302	J. R. Rhodes Spring—5 miles southwest of Haymakertown	Copper Ridge dolomite	4-5-28	310	53	63	173	.....	56	b	199	3	.5	1.7	160
303	H. J. Old Spring—3.4 miles southwest of Haymakertown	Copper Ridge dolomite	4-5-28	100	55	65	170	.....	36	21	d187	6	1.0	3.0	117
304	T. H. Potter Spring—4 miles northwest of Daleville, 1.6 miles southeast of Haymakertown	Stones Run limestone	4-5-28	140	52	70	182	.....	56	10	198	8	.8	3.3	153
305	Ira Layman Spring—½ mile northwest of Daleville	Beekmantown limestone	4-5-28	60	57	75	.....	.....	.....	.....	.....	.....	.....	.....	.....
306	C. S. Ikenberry Spring—½ mile northwest of Daleville	Beekmantown limestone	4-5-28	30	52	75	.....	.....	.....	.....	.....	.....	.....	.....	.....
307	Spring—At Daleville	Stones Run limestone	4-5-28	30	55	75	.....	.....	.....	.....	.....	.....	.....	.....	.....
308	R. G. Layman Spring—¼ mile southwest of Cloverdale, on Norfolk and Western Railway	Beekmantown limestone near base	7-4-28	150	53.5	84	182	.....	48	14	205	5	.7	2.3	146
309	Zion Hill Church Spring—4.8 miles southwest of Eagle Rock, on Clifton Forge-Fincastle Highway, at base of high hill	Elbrook limestone	2-20-28	60	55	47	.....	.....	.....	.....	.....	.....	.....	.....	.....
310	J. L. Simmonds Spring—7 miles southwest of Indian Rock, 5 miles north of Fincastle, at base of hill	Beekmantown limestone	2-20-28	350	50.1	40	304	.....	56	7	344	7	.9	4.0	278
311	Mineral Spring—1 mile northeast of Fincastle	Athens shale near fault	2-20-28	2	39.2	38	880	.....	64	206	144	540	1.6	1.2	238
312	J. W. Owens Spring—1.4 miles southwest of Eagle Rock, near foot of Crawford Mountain	Elbrook limestone	2-20-28	60	54.2	46	.....	.....	.....	.....	.....	.....	.....	.....	.....
313	Flowing Spring of E. G. Sprinkle—3.6 miles northeast of Fincastle and 1 mile southeast of Kyles Mills	Beekmantown limestone	2-20-28	100	54.2	43	251	.....	56	17	276	3	1.7	10	203
314	Blue Ridge Spring—At Blue Ridge	Elbrook limestone	4-5-28	2	55	70	2,541	.....	360	13	120	n1,742	1.2	.05	1,886
315	Spring—3½ miles northeast of Glen Wilton, 1 mile south of Lick Run on Clifton Forge-Fincastle Highway	Romney shale	2-20-28	10	51	41	.....	.....	.....	.....	.....	.....	.....	.....	.....
316	Daggers Spring—2.8 miles east of Gala, on Mill Creek 100 feet east of road	Romney shale	2-20-28	2	47.1	39	568	.....	56	142	444	20	106	.25	225
317	Lithia Spring—3.2 miles east of Gala, at residence of W. H. Sorrell, 1 mile up creek from Daggers Spring at base of Sheetz Mt	Oriskany sandstone on nose of anticline	2-20-28	300	64.6	43	84	.....	20	4	96	2	.4	.50	73
318	Spring—3.4 miles east of Gala, ¼ mile northeast of No. 317 and 1 mile east of Daggers Spring, on east side of Mill Creek	Oriskany sandstone on nose of anticline	2-20-28	360	51	41	50	.....	14	b	d 56	2	.3	.15	39
319	Spring—4 miles east of Gala—1½ miles up Mill Creek from Daggers Spring on southeast side of Sheetz Mountain	Oriskany sandstone on nose of anticline	2-20-28	700	58	43	99	.....	32	5	d113	3	.5	.05	86
320	W. C. Karnes Spring—6½ miles north of Buchanan, 3.4 miles northwest of Indian Rock, 3 miles up Purgatory Creek from Lee Highway	Stone Run limestone	2-16-28	6,000	51	42	131	.....	36	7	142	6	.8	1.9	111
321	Spring—3.4 miles northwest of Indian Rock, 5½ miles north of Buchanan, .7 mile up Purgatory Creek from Harlow's residence	Martinsburg shale	2-11-28	180	51.4	40	123	.....	40	7	141	2	.7	1.4	105
322	Spring—1.8 miles southwest of Indian Rock, 2½ miles northeast of Buchanan, on east side of Lee Highway, at base of high hill, where side road leads to Roaring Creek	Beekmantown limestone	2-15-28	250	54.6	56	209	.....	48	17	22	6	.8	7.5	163
323	J. S. Pogue Spring—3.2 miles northeast of Indian Rock, 5 miles southwest of Natural Bridge, on Lee Highway at side of large hill, at residence	Beekmantown limestone	2-15-28	450	54.1	47	207	.....	56	14	224	7	1.0	6.4	168
	Mrs. Mary And[illegible] 4 miles south of Mountain Grove, on Back Creek	Helderberg limestone on northwest limb of anticline	3-20-28	30	49	39	.....	.....	.....	.....	.....	.....	.....	.....	.....

b Less than 5 parts per million.
d Includes equivalent of small mount of carbonate.
n Determined gravimetrically.
o Sample for analysis collected May 8, 1929.
p Sample for analysis collected May 14, 1929.
q Sample for analysis collected May 15, 1929.
s Sample for analysis collected May 9, 1929.

Number	LOCATION AND NAME	GEOLOGIC OCCURRENCE	Date, 1928		Flow (gallons a minute)	Temperatures (Degrees Fahrenheit)		Approximate Partial Analysis (Parts per Million)								
						Water	Air	Dissolved solids (calculated)	Iron (Fe)	Calcium (Ca) (by turbidity)	Sodium (Na) (calculated)	Bicarbonate (HCO_3)	Sulphate (SO_4) (by turbidity)	Chloride (Cl)	Nitrate (NO_3)	Total hardness (as $CaCO_3$)
325	P. Ayers Spring—2.4 miles south of Mountain Grove, on Back Creek, 1,000 feet up creek from No. 326	Helderberg limestone on northwest limb of anticline.	3-20-28		60	50.5	39	76	.....	26	2.1	88	2	.2	.....	70
326	G. T. Landes Spring—2.4 miles south of Mountain Grove	Helderberg limestone on axis of anticline	3-20-28		40	51	39	.....	.....	.....	.....	.....	.....	.....	.....	.....
327	M. O. Shaffer Spring—2.2 miles south of Mountain Grove, on Back Creek	Helderberg limestone on crest of anticline	3-20-28	r	900	49.8	39	93	.....	36	b	108	2	.3	.15	90
328	M. O. Shaffer Spring—2.4 miles south of Mountain Grove, on Back Creek, 500 feet south of No. 327	Helderberg limestone on crest of anticline	3-20-28		20	51.5	39	.....	.....	.....	.....	.....	.....	.....	.....	.....
329	Blowing Spring—2.4 miles south of Mountain Grove, on Back Creek	Helderberg limestone on crest of anticline	3-20-28		60	47.5	40	.....	.....	.....	.....	.....	.....	.....	.....	.....
330	Darnell Spring—2.6 miles south of Mountain Grove, ½ mile down Back Creek from No. 329	Helderberg limestone on crest of anticline	3-20-28	r	140	51.5	40	184	.....	64	b	214	3	.5	.57	176
331	Kershner Spring—1 mile northeast of Mountain Grove	Oriskany sandstone in northwest limb of anticline	3-20-28		5	45	36	.....	.....	.....	.....	.....	.....	.....	.....	.....
332	Rorke Spring—2 miles southeast of Mountain Grove, on Spring Branch, on Warm Springs road	Helderberg limestone on crest of anticline	3-20-28		30	46.5	40	99	.....	38	2.1	110	2	1.3	1.9	91
333	Fassifern Farm Spring—2.6 miles southeast of Mountain Grove, 4 miles northwest of Warm Springs, in bank of Run	Oriskany sandstone on southeast limb of anticline	3-21-28		30	51	46	.....	.....	.....	.....	.....	.....	.....	.....	.....
334	Spring—3¼ miles southwest of Hot Springs, at Healing Springs Postoffice, ¼ mile west of No. 335	Lowville limestone on northwest limb of anticline	2-22-28		15	53	35	.....	.....	.....	.....	.....	.....	.....	.....	.....
335	Healing Springs—3½ miles southwest of Hot Springs, at Healing Springs Postoffice, drinking fountain	Lowville limestone on northwest limb of anticline	2-22-28		2+	77.2	35	595	.....	140	55	473	140	3.0	.05	417
336	Cascade Springs—4 miles southwest of Hot Springs and 1 mile south of Healing Spring Postoffice, at base of small hill, 1 mile southwest of No. 335	Lowville limestone on northwest limb of anticline	2-21-28		3,000	55.0	29	225	.....	52	16	158	64	.6	2.1	163
337	Spout Spring—At Hot Springs	Lowville limestone near axis of anticline	2-22-28		36	103.8	32	544	.....	136	11	456	n 131	4.0	.08	492
338	Boiler Spring—At Hot Springs	Lowville limestone near axis of anticline	2-22-28		168	104	32	540	.....	137	9	456	n 131	2.0	.....	494
339	Octagon Spring—At Hot Springs	Lowville limestone near axis of anticline	2-22-28		67	95.1	40	.....	.....	.....	.....	.....	.....	.....	.....	.....
340	Hot Sulphur Spring—At Hot Springs	Lowville limestone near axis of anticline	2-22-28		40	97.3	32	.....	.....	.....	.....	.....	.....	.....	.....	.....
341	Magnesia Spring—At Hot Springs	Lowville limestone near axis of anticline	2-22-28		30	95.8	32	536	.....	135	9	447	n 133	2.0	.07	489
342	Spring—100 feet south of No. 341, at Hot Springs	Lowville limestone near axis of anticline	2-22-28		15	90	32	.....	.....	.....	.....	.....	.....	.....	.....	.....
343	Spring—100 feet southeast of No. 341, at Hot Springs	Lowville limestone near axis of anticline	2-22-28	r	70	56	32	110	.....	36	b	127	2	.5	.75	104
344	Soda Spring—At Hot Springs	Lowville limestone near axis of anticline	12-4-28		140	72.2	.....	385	.....	103	1.3	330	n 89	2.0	1.0	364
345	Drinking Spring—.6 mile northeast of Warm Springs	Lowville limestone on or near axis of anticline	2-22-28		1,200	95	38	388	.....	120	5.4	194	160	1.5	.10	316
	Gentlemen's Pool—At Warm Springs	Lowville limestone on or near axis of anticline				95.2	38									
	Ladies' Pool—At Warm Springs	Lowville limestone on or near axis of anticline				94	38									
346	Spring—.6 mile west of Warm Springs	Romney shale on northwest limb of anticline	3-21-28		5	42	39	.....	.....	.....	.....	.....	.....	.....	.....	.....
347	Spring—¾ mile northwest of Warm Springs, on north side of road to Fassifern Farm, at base of mountain	Oriskany sandstone on northwest limb of anticline	3-21-28		60	46.5	33	55	.....	16	4.6	64	1	.4	.....	44
348	Springs—.1 mile north of Warm Springs, on west side of road	Lowville limestone on crest of anticline	3-21-28		5	54	33	.....	.....	.....	.....	.....	.....	.....	.....	.....
349	Spring—¼ mile north of Warm Springs	Lowville limestone on crest of anticline	3-21-28		5	52.5	33	.....	.....	.....	.....	.....	.....	.....	.....	.....
350	Meadow Spring—.4 mile northeast of Warm Springs, in creek bottom, 600 feet southeast of No. 349, 1,000 feet southwest of bath house	Lowville limestone on crest of anticline	3-21-28	r	100	91	37	621	.....	180	9	191	n 329	1.0	.....	480
351	Spring—.5 mile northeast of Warm Springs, on side of road, 200 feet east of creek, 500 feet northeast of No. 350	Lowville limestone on crest of anticline	3-21-28	r	30	55	37	217	.....	80	b	136	70	1.2	2.4	182

b Less than 5 parts per million.

n Determined gravimetrically.

r Sample for analysis collected May 16, 1929.

Number	LOCATION AND NAME	GEOLOGIC OCCURRENCE		Date, 1928	Flow (gallons a minute)	Temperatures (Degrees Fahrenheit) Water	Air	Approximate Partial Analysis (Parts per Million) Dissolved solids (calculated)	Iron (Fe)	Calcium (Ca) (by turbidity)	Sodium (Na) (calculated)	Bicarbonate (HCO_3)	Sulphate (SO_4) (by turbidity)	Chloride (Cl)	Nitrate (NO_3)	Total hardness (as $CaCO_3$)
352	Spring—1.2 miles northeast of Warm Springs, on road to Staunton	Trenton limestone on southeast limb of anticline		3-21-28	200	46	33	79	.....	25	b	84	5	.6	.91	67
353	Cleeks Mills Spring—3.2 miles southwest of Bolar, on Jackson River, in Cove, 1,000 feet west of Mill	Probably fed by mountain stream	t	2-22-28	3,300	45.5	39	51	.....	15	b	57	2	.3	.05	40
354	Schoolhouse Spring—5 miles southwest of Bolar, on Rocky Run	Helderberg limestone in syncline		2-22-28	60	50	39	.....	.....	.....	.....	.....	.....	.....	.....	.....
355	A. E. McAllister Spring—6 miles southwest of Bolar, on Rocky Run	Helderberg limestone in syncline		2-22-28	80	50.4	39	105	.....	36	8	120	2	.5	.70	85
356	Spring—3 miles east of Warm Springs—1 mile northwest of Bath Alum Hotel	Oriskany sandstone on southeast limb of anticline		3-21-28	4	38	45	13	.....	3	.....	12	1	.7	.....	22
357	Bath Alum Spring—3 miles east of Warm Springs, 1½ mile west of McClelan Postoffice, at Bath Alum Hotel	Romney shale in syncline		3-21-28	10	49	44	37	.....	20	.....	40	2	.6	.....	85
358	Spring—9 miles southwest of Millboro Springs	Helderberg limestone on limb of anticline		3-28-28	16	52	45	.....	.....	.....	.....	.....	.....	.....	.....	.....
359	W. R. Neff Spring—1 mile north of Millboro Springs, on Stuart Run, at mouth of Pig Run	Romney shale in syncline		3-28-28	15	45	45	.....	.....	.....	.....	.....	.....	.....	.....	.....
360	Cold Spring—At Millboro Springs	Jennings formation in syncline		3-21-28	5	47	39	.....	.....	.....	.....	.....	.....	.....	.....	.....
361	Sulphur Spring—0.2 mile east of Millboro Springs	Romney shale in syncline		3-21-28	1	39	39	.....	.....	.....	.....	.....	.....	.....	.....	.....
362	S. A. Rhea Spring—3 miles northeast of Millboro Springs, on Pig Run	Oriskany sandstone on axis of anticline		3-28-28	30	51.5	41	.....	.....	.....	.....	.....	.....	.....	.....	.....
363	Spring—4.6 miles northeast of Millboro Springs and 3 miles south of Green Valley, near head of Pig Run	Oriskany sandstone on northwest limb of anticline		3-28-28	30	49.2	39	.....	.....	.....	.....	.....	.....	.....	.....	.....
364	Spring—5½ miles northeast of Millboro Springs and 1 mile southeast of Green Valley, on Pig Run road, 1 mile from Stuarts Run road	Oriskany sandstone on northwest limb of anticline		3-28-28	30	47	35	.....	.....	.....	.....	.....	.....	.....	.....	.....

Number	LOCATION AND NAME	GEOLOGIC OCCURRENCE		Date, 1928	Flow (gallons a minute)	Temperatures (Degrees Fahrenheit) Water	Air	Approximate Partial Analysis (Parts per Million) Dissolved solids (calculated)	Iron (Fe)	Calcium (Ca) (by turbidity)	Sodium (Na) (calculated)	Bicarbonate (HCO_3)	Sulphate (SO_4) (by turbidity)	Chloride (Cl)	Nitrate (NO_3)	Total hardness (as $CaCO_3$)
365	J. H. Revercomb Spring—1½ miles north of Armstrong, 200 feet west of road	Oriskany sandstone on northwest limb of anticline	u	3-27-28	130	54.5	38	130	.....	.....	b	141	6	.7	2.3	116
366	Dove Spring of Dr. Wandless—1.2 miles southwest of Armstrong, on Indian Draft	Oriskany sandstone on northwest limb of anticline	u	3-27-28	300	49	38	111	.....	40	b	127	2	.7	1.2	99
367	J. W. Wandless Spring—½ mile southwest of Armstrong	Helderberg limestone on northwest limb of anticline		3-28-28	300	52	36	123	.....	36	b	141	2	.4	1.5	114
368	Spring—3 miles south of Armstrong, 3 miles north of Yost, ½ mile north of No. 369	Helderberg limestone on limb of anticline	u	3-27-28	350	52.5	37	31	.....	10	b	32	2	.8	.28	27
369	J. M. Thomas Spring—2.6 miles south of Armstrong and 2¾ miles north of Yost, at edge of Mill Creek at low water level	Helderberg limestone on limb of anticline	u	3-27-28	30	50	34	60	.....	20	b	66	2	1.0	.15	54
370	Spring—3 miles south of Armstrong and 2½ miles north of Yost, on Mill Creek	Helderberg limestone on limb of anticline	u	3-27-28	60	51.5	39	84	.....	24	b	95	2	.6	.46	78
371	Spring—3.4 miles south of Armstrong and 2 miles north of Yost	Clinton formation on anticline	u	3-27-28	30	51	45	39	.....	12	b	36	2	.7	3.8	30
372	R. A. Kinkaid Spring—4 miles south of Armstrong and 1 mile north of Yost, on Mill Creek	Clinton formation on anticline		3-27-28	60	51.5	45	.....	.....	.....	.....	.....	.....	.....	.....	.....
373	A. L. Lyle Spring—5.2 miles northeast of Millboro Springs and ½ mile south of Yost, on Mill Creek	Oriskany sandstone on limb of anticline		3-27-28	400	54.5	45	102	.....	24	b	118	2	.4	.28	94
374	H. L. Gillock Spring—4¾ miles northeast of Millboro Springs and 1½ miles south of Yost	Oriskany sandstone on limb of anticline		3-27-28	60	51	45	.....	.....	.....	.....	.....	.....	.....	.....	.....
375	M. M. Lyle Spring—4¼ miles northeast of Millboro Springs and 1½ miles south of Yost, on Mill Creek	Oriskany sandstone on limb of anticline		3-27-28	500	51.5	45	80	.....	36	b	93	1	.4	.25	76
376	Spring—4.2 miles northeast of Millboro Springs and 2 miles south of Yost, on Mill Creek, 1½ miles north of Covington Highway	Oriskany sandstone on limb of anticline		3-27-28	60	45	40	.....	.....	.....	.....	.....	.....	.....	.....	.....
377	Crystal Spring—3.4 miles northeast of Millboro Springs and 4 miles northwest of Goshen, in Panther Gap, on south side of highway	Helderberg limestone on southeast limb of anticline		3-21-28	500	56	50	128	.....	44	8	128	15	.2	.....	103
378	Spring—4.4 miles northeast of Millboro Springs and 4 miles northwest of Goshen, in Panther Gap, 1 mile northeast of No. 361	Oriskany sandstone in northwest limb of anticline		3-21-28	10	48	41	.....	.....	.....	.....	.....	.....	.....	.....	.....

b Less than 5 parts per million.
t Sample for analysis collected May 17, 1929.
u Sample for analysis collected May 26, 1929.

Number	LOCATION AND NAME	GEOLOGIC OCCURRENCE		Date, 1928	Flow (gallons a minute)	Temperatures (Degrees Fahrenheit) Water	Air	Approximate Partial Analysis (Parts per Million) Dissolved solids (calculated)	Iron (Fe)	Calcium (Ca) (by turbidity)	Sodium (Na) (calculated)	Bicarbonate (HCO_3)	Sulphate (SO_4) (by turbidity)	Chloride (Cl)	Nitrate (NO_3)	Total hardness (as $CaCO_3$)
379	Reagon Spring—2 miles north of Rapp Mills, at head of North Fork of Buffalo Creek	Beekmantown, Conococheague and Elbrook limestone series		2-16-28	1,200	53.5	43	77	.....	24	5	86	1	.5	1.9	64
380	Henderson Spring—.8 mile southwest of Rapp Mills, at side of road on South Fork of Buffalo Creek	Beekmantown, Conococheague and Elbrook limestone series		2-16-28	1,000	51.2	44	97	.....	28	7	110	1	.9	1.7	79
381	Black Spring—1.2 miles northeast of Rapp Mills, on South Fork of Buffalo Creek	Beekmantown, Conococheague and Elbrook limestone series		2-16-28	5,000	53.1	46	140	.....	40	5	163	1	.6	1.6	125
382	C. B. Leech Spring—4.7 miles west of Murat, 4 miles southwest of Collierstown and 1 mile southwest of Oakdale, in creek bed	Beekmantown, Conococheague and Elbrook limestone series	v	2-16-28	630	46	46	124	.....	52	b	133	5	1.2	2.9	106
383	J. H. Ayers Spring—4 miles southwest of Murat, 4½ miles northeast of Rapp Mills, on South Fork of Buffalo Creek, 2 miles from junction with North Fork	Beekmantown, Conococheague and Elbrook limestone series		2-16-28	3,500	51.1	47	138	.....	40	8	150	5	.9	3.3	114
384	School House Spring—.7 mile north of Natural Bridge Station, on Lee Highway	Beekmantown, Conococheague and Elbrook limestone series		2-15-28	250	53.7	48	228	.....	60	12	256	6	1.0	3.2	194
385	S. R. Leckley Spring—3.4 miles north of Natural Bridge Station, at Fancy Hill Postoffice, at base of low hill	Beekmantown, Conococheague and Elbrook limestone series		2-15-28	125	54.8	50	233	.....	48	12	252	3	1.2	12	194
386	Spring—2.4 miles northwest of Collierstown, 1 mile west of Collier Creek Postoffice, ¼ mile west of No. 387	Stones River limestone	v	2-17-28	300	49.2	41	252	.....	100	b	277	4	.7	10	234
387	Seahorn Spring—2 miles northwest of Collierstown and ½ mile northwest of Collier Creek Postoffice, on Collier Creek	Stones River limestone		2-17-28	2,500	53.3	38	226	.....	64	13	246	8	.6	6.2	187
388	Dr. Coleman's Spring—½ mile northwest of Collierstown and 2 miles southeast of Collier Creek Postoffice, on Collier Creek	Stones River limestone, nose of anticline		2-17-28	1,200	59	46	204	.....	56	9	233	5	.5	1.4	179
389	Spring—At Collierstown, ¼ mile northeast of No. 388, on north side of creek	Stones River limestone	v	2-17-28	1,460	52	53	196	.....	72	b	222	5	.5	2.2	180
390	Spring—5 miles southeast of Collierstown, on Collier Creek, ¼ mile southeast of No. 388	Stones River limestone		2-17-28	30	54	46	.....	.....	.....	.....	.....	.....	.....	.....	.....
391	J. G. McCorkle Spring—1.4 miles west of Murat, on Buffalo Creek, at base of hill	Stones River limestone		2-17-28	1,400	52.3	46	172	.....	60	b	190	5	.7	4.3	156
392	Ira Dickson Spring—At Murat, on Buffalo Creek	Beekmantown, Conococheague and Elbrook limestone series	v	2-17-28	1,290	53.6	48	228	.....	90	9	250	7	1.2	5.9	200
393	J. A. Snyder Spring—3.6 miles southeast of Murat, 5½ miles southwest of Lexington, on Lee Highway, 500 feet north of Buffalo Creek bridge	Stones River limestone		2-15-28	40	55.5	56	282	4.8	60	17	296	18	1.0	6.2	230
394	Rockbridge Alum Spring—At Rockbridge Alum Springs	Romney shale		2-18-28	5+	42	37	.....	5.69	1	.....	Acid	540	.8	.15	617
395	J. C. Patty Spring—2 miles northeast of Rockbridge Alum Springs, on Bruttons Run, in creek bottom	Romney shale		2-18-28	5+	52	42	.....	.....	.....	.....	.....	.....	.....	.....	.....
396	R. L. Montgomery Spring—1.8 miles northeast of Rockbridge Alum Springs, at base of mountain	Devonian shale		2-18-28	60	52	39	.....	.....	.....	.....	.....	.....	.....	.....	.....
397	J. H. Knick Spring—4 miles northwest of Kerrs Creek and 1½ miles northwest of Denmark, on Kerrs Creek road	Stone River limestone		2-18-28	60	51.1	35	.....	.....	.....	.....	.....	.....	.....	.....	.....
398	C.H.Miller Spring—1.6 miles northwest of Kerrs Creek Postoffice, on Kerrs Creek	Stones River limestone	w	2-18-28	90	53.1	43	121	.....	28	16	d 133	3	.6	.62	84
399	H. H. Alpin Spring—.8 mile northwest of Kerrs Creek Postoffice, on Kerrs Creek	Probably fed by water from Kerrs Creek	w	2-17-28	380	49	43	72	.....	20	b	80	2	.6	1.1	60
400	Big Spring of Edgar Lackey—.8 mile southeast of Kerrs Creek Postoffice, on Kerrs Creek	Beekmantown, Conococheague and Elbrook limestone series		2-17-28	4,500	57.5	48	184	.....	56	10	193	12	1.0	3.3	152
401	Otto Obenchain Spring—5 miles northwest of Lexington, 1 mile southeast of Kerrs Creek Postoffice, on Kerrs Creek road, at base of hill	Beekmantown, Conococheague and Elbrook limestone series	w	2-17-28	80	54.8	50	228	.....	36	b	266	2	.5	3.2	222
402	—2½ miles northwest of Lexington, 2.2 southeast of Kerrs Creek Postoffice, on Kerrs Creek road near top of hill	Beekmantown, Conococheague and Elbrook limestone series		2-17-28	20	55	54	.....	.....	.....	.....	.....	.....	.....	.....	.....

b Less than 5 parts per million.
d Includes equivalent of small amount of carbonate.
v Sample for analysis collected May 23, 1929.
w Sample for analysis collected May 10, 1929.

Number	LOCATION AND NAME	GEOLOGIC OCCURRENCE		Date, 1928	Flow (gallons a minute)	Temperatures (Degrees Fahrenheit)		Approximate Partial Analysis (Parts per Million)									
						Water	Air	Dissolved solids (calculated)	Iron (Fe)	Calcium (Ca) (by turbidity)	Sodium (Na) (calculated)	Bicarbonate (HCO_3)	Sulphate (SO_4) (by turbidity)	Chloride (Cl)	Nitrate (NO_3)	Total hardness (as $CaCO_3$)
403	Warm Springs—1.6 miles west of Goshen, east of 2 springs on north side of Mill Creek, in east end of Panther Gap	Oriskany sandstone on southeast limb of anticline		3-21-28	50	66	41	124	.....	44	b	146	1	.5	.....	120
404	Warm Springs—1.6 miles northwest of Goshen, west of 2 springs on north side of Mill Creek, in east end of Panther Gap	Oriskany sandstone on southeast limb of anticline		3-21-28	60	58	41	.....	.....	.....	.....	.....	.....	.....	.....	.....
405	Warm Spring—1.6 miles northwest of Goshen, spring on south side of Mill Creek, in east end of Panther Gap	Oriskany sandstone on southeast limb of anticline		3-21-28	300	62.3	60	101	.....	24	b	115	3	.2	.25	94
406	Cold Sulphur Spring—1 mile southwest of Goshen	Jennings formation in syncline		3-22-28	5	51	44	154	.....	30	28	162	13	.2	.....	86
407	Oak Carter Spring—1 mile southeast of Goshen, on northeast bank of North River	Oriskany sandstone on northwest limb of anticline		3-22-28	150	57	64	107	.....	40	b	124	2	.4	.32	97
408	Spring—1.2 miles southeast of Goshen, 800 feet down river from No. 407	Helderberg limestone on northwest limb of anticline		3-22-28	10	51	66	.....	.....	.....	.....	.....	.....	.....	.....	.....
409	Spring—1.5 miles southeast of Goshen, in Gap	Clinch sandstone in anticline		2-25-28	20	36	32	.....	.....	.....	.....	.....	.....	.....	.....	.....
410	Bridge Spring—2.4 miles southeast of Goshen, at bridge across river	Probably fed by steam		3-22-28	80	43	62	.....	.....	.....	.....	.....	.....	.....	.....	.....
411	O. H. Humphrey Spring—2.2 miles southeast of Goshen, on north side of Maury highway	Helderberg limestone on southeast limb of anticline	x	3-22-28	20	54	54	97	.....	40	b	109	3	.7	.44	88
412	Wm. Wilfong Spring—3.2 miles southeast of Goshen, on south side of Maury Highway	Oriskany sandstone on northwest limb of anticline		3-22-28	10	49	59	.....	.....	.....	.....	.....	.....	.....	.....	.....
413	Wm. Wilfong Spring—4½ miles southeast of Goshen, 600 feet down river from No. 412	Helderberg limestone on northwest limb of anticline		3-23-28	60	51	59	.....	.....	.....	.....	.....	.....	.....	.....	.....
414	Old Distillery Spring—3.2 miles southeast of Goshen, at juncture of Big and Little Calf Pasture Rivers	Oriskany sandstone on northwest limb of anticline		3-22-28	500	54.5	62	93	.....	56	b	106	3	.2	.....	89

Number	LOCATION AND NAME	GEOLOGIC OCCURRENCE		Date, 1928	Flow (gallons a minute)	Temperatures (Degrees Fahrenheit)		Approximate Partial Analysis (Parts per Million)									
						Water	Air	Dissolved solids (calculated)	Iron (Fe)	Calcium (Ca) (by turbidity)	Sodium (Na) (calculated)	Bicarbonate (HCO_3)	Sulphate (SO_4) (by turbidity)	Chloride (Cl)	Nitrate (NO_3)	Total hardness (as $CaCO_3$)
415	Spring—3.5 miles southeast of Goshen, 1 mile below No. 409	Clinch sandstone on limb of anticline		2-25-28	20	41	32	.....	.....	.....	.....	.....	.....	.....	.....	.....
416	Spring—2.5 miles northwest of Rockbridge Baths, 1 mile below mouth of Laurel Run on North River	Martinsburg shale	x	2-25-28	200	37.5	32	.....	.....	1	b	2.0	2	.5	.15	b
417	Wilson Springs—2 miles northwest of Rockbridge Baths, on North River	Trenton limestone		2-25-28	160	52	34	181	.....	60	7	205	6	.9	.42	160
418	Wilson Sulphur Springs—2 miles northwest of Rockbridge Baths, on an island in North River	Martinsburg shale near fault		4-26-28	2	53	65	188	.....	20	45	d202	12	1.2	.5	83
419	Spring—1.4 miles northwest of Rockbridge Baths, ½ mile southeast of Wilson Spring	Probably fed by stream		2-25-28	80	46	33	.....	.....	.....	.....	.....	.....	.....	.....	.....
420	Spring—1.5 miles west of Rockbridge Baths	Moccasin limestone	x	2-25-28	250	51	34	152	.....	56	b	165	5	1.2	4.2	138
421	Lithia Spring—At Rockbridge Baths, 500 feet northwest of No. 423, in bathhouse	Copper Ridge dolomite		2-25-28	200	71.8	36	263	.....	65	16	231	18	1.3	1.2	218
422	Warm Spring—At Rockbridge Baths, southwest bank of North River, across river from No. 421	Copper Ridge dolomite near fault		3-29-28	60	63	58	.....	.....	.....	.....	.....	.....	.....	.....	.....
423	Magnesia Spring of Mrs. Lewis Blair—At Rockbridge Baths	Copper Ridge dolomite		2-25-28	600	71.8	36	289	.....	50	13	295	28	1.1	1.5	245
424	Stream fed by Spring—.1 mile southeast of Goshen, on right bank of North River	Romney shale in syncline	x	2-25-28	100	40	31	141	.....	28	9	106	18	12	6.2	108
425	Linwood Dill Spring—.5 mile east of Bells Valley, in bank of creek	Helderberg limestone on northwest limb of anticline		3-23-28	200	54	51	109	.....	40	b	122	4	.4	.45	103
426	Spring—5½ miles north of Brownsburg, 1½ miles north of No. 427	Beekmantown, Conococheague and Elbrook limestone series	y	2-25-28	180	53	38	208	.....	65	6	238	2	1.0	3.5	189
427	Spring—3.8 miles north of Brownsburg, on Middlebrook Highway	Beekmantown, Conococheague and Elbrook limestone series		2-25-28	30	53	40	.....	.....	.....	.....	.....	.....	.....	.....	.....
428	W. P. Whipple Spring—1.2 miles southwest of Brownsburg	Beekmantown, Conococheague and Elbrook limestone series		2-25-28	40	52	38	.....	.....	.....	.....	.....	.....	.....	.....	.....
429	Spring—2 miles southwest of Brownsburg	Beekmantown, Conococheague and Elbrook limestone series		2-25-28	5	51	40	.....	.....	.....	.....	.....	.....	.....	.....	.....
430	Gibson Spring—9 miles northeast of Lexington and 1½ miles southwest of Fairfield, on east side of Lee Highway	Beekmantown, Conococheague and Elbrook limestone series		2-14-28	60	52	38	.....	.....	.....	.....	.....	.....	.....	.....	.....

b Less than 5 parts per million.
d Includes equivalent of small mount of carbonate.
x Sample for analysis collected May 24, 1929.
y Sample for analysis collected May 22, 1929.

SPRINGS IN VIRGINIA—CONTINUED

Number	LOCATION AND NAME	GEOLOGIC OCCURRENCE	Date, 1928	Flow (gallons a minute)	Temperatures (Degrees Fahrenheit) Water	Air	Approximate Partial Analysis (Parts per Million) Dissolved solids (calculated)	Iron (Fe)	Calcium (Ca) (by turbidity)	Sodium (Na) (calculated)	Bicarbonate (HCO_3)	Sulphate (SO_4) (by turbidity)	Chloride (Cl)	Nitrate (NO_3)	Total hardness (as $CaCO_3$)
	G. C. Reed Spring—2.2 miles northeast of Fairfield, on west side of Lee Highway	Beekmantown, Conococheague and Elbrook limestone series													
432	M. E. Church Spring—1 mile north of Mill Gap. HIGHLAND	Beekmantown, Conococheague and Elbrook limestone series	2-14-28	10	49.4	45	197	.....	64	14	222	2	.6	6.0	160
433	Big Spring—½ mile northeast of Mill Gap, spring issues from bluff	Beekmantown, Conococheague and Elbrook limestone series	2-23-28	20	49	57	.....	.....	.....	.....	.....	.....	.....	.....	.....
434	Beulah Spring—2 miles southwest of Mill Gap, back of church, on Back Creek	Beekmantown, Conococheague and Elbrook limestone series	2-23-28	3,000	46.5	55	109	.....	32	5	123	2	.6	2.2	94
435	Gilmer Spring—1.4 miles southwest of Mill Gap Postoffice, at base of bluff	Oriskany sandstone, northwest limb of anticline z	2-23-28	980	48.8	58	119	.....	32	b	132	6	.5	.15	106
436	W. A. Crummett Spring—.8 mile south of Valley Center	Lowville limestone, northwest limb of anticline z	2-23-28	1,140	47	55	129	.....	48	b	142	4	.6	2.8	114
437	S. B. Rexrode Spring—1.6 miles south of Valley Center	Lowville limestone, northwest limb of anticline z	2-23-28	1,360	46	56	112	.....	40	b	124	4	.6	1.8	100
438	J. W. Gun Spring—1½ miles north of Crabbottom	Lowville limestone, northwest limb of anticline z	2-23-28	400	45	50	130	.....	44	5	145	4	.5	2.3	114
439	W. P. Wills Spring—1¼ miles north of Crabbottom	Beekmantown, Conococheague and Elbrook limestone series	3-16-28	30	43	42	.....	.....	.....	.....	.....	.....	.....	.....	.....
440	C. E. Arbogast Spring—1 mile north of Crabbottom	Beekmantown, Conococheague and Elbrook limestone series	3-16-28	10	47	35	.....	.....	.....	.....	.....	.....	.....	.....	.....
		Beekmantown, Conococheague and Elbrook limestone series	3-16-28	30	44	43	.....	.....	.....	.....	.....	.....	.....	.....	.....

441	Richard Crummett Spring—1.5 miles west of Crabbottom and 1½ miles northwest of New Hampden	Beekmantown, Conococheague and Elbrook limelimestone series, on or near crest of anticline z	3-15-28	960	48.5	49	147	.....	48	6	161	5	1.0	3.1	129
442	John Swecker Spring—½ mile west of Crabbottom	Beekmantown, Conococheague and Elbrook limestone series, on nose of anticline	3-16-28	1,500	48	50	180	.....	56	b	194	7	.9	5.0	162
443	Spring—5 miles northeast of Hightown, in creek bottom, ½ mile north of W. E. Snyder's residence	Beekmantown, Conococheague and Elbrook limestone series on or near crest of anticline z	3-15-28	80	46	50	151	.....	.....	b	168	4	1.0	3.0	138
444	W. E. Snyder Spring—4 miles northeast of Hightown	Beekmantown, Conococheague and Elbrook limestone series on or near crest of anticline	3-15-28	10	46	50	.....	.....	.....	.....	.....	.....	.....	.....	.....
445	C. E. Arbogast Spring—4 miles northeast of Hightown and 2½ miles south of New Hampden	Beekmantown, Conococheague and Elbrook limestone series on east limb of anticline	3-16-28	5	46.5	42	199	.....	80	b	214	8	.9	6.0	188
446	Spring—3.5 miles northeast of Hightown and 2¾ miles south of New Hampden, ½ mile south of George Swecker's residence	Beekmantown, Conococheague and Elbrook limestone series on east limb of anticline z	3-16-28	300	46	38	127	.....	48	6	137	5	1.0	3.0	108
447	D. W. Kiser Spring—3 miles northeast of Hightown, 200 feet west of creek	Beekmantown, Conococheague and Elbrook limestone series on or near crest of antieline z	3-15-28	900	49	53	151	.....	56	b	169	3	.9	2.9	138
448	Spring—2.5 miles northeast of Hightown, on east side of road to Crabbottom	Beekmantown, Conococheague and Elbrook limestone series on or near crest of anticline	3-15-28	95	49.5	52	129	.....	40	14	147	1	.4	3.5	94
449	R. Cobb Spring—1.2 miles northeast of ghtown	Beekmantown, Conococheague and Elbrook limestone series on or near crest of anticline	3-15-28	10	47.5	49	.....	.....	.....	.....	.....	.....	.....	.....	.....

b Less than 5 parts per million.
z Sample for analysis collected May 18, 1929.

Number	LOCATION AND NAME	GEOLOGIC OCCURRENCE		Date, 1928	Flow (gallons a minute)	Temperatures (Degrees Fahrenheit) Water	Air	Approximate Partial Analysis (Parts per Million) Dissolved solids (calculated)	Iron (Fe)	Calcium (Ca) (by turbidity)	Sodium (Na) (calculated)	Bicarbonate (HCO_3)	Sulphate (SO_4) (by turbidity)	Chloride (Cl)	Nitrate (NO_3)	Total hardness (as $CaCO_3$)
450	E. ... Rexrode Spring—2 miles northeast of Hightown	Beekmantown, Conococheague and Elbrook limestone series on east limb of anticline		3-16-28	100	46	37	122	.....	48	b	132	5	.6	3.2	111
451	W. D. Eye Spring—.6 mile north of Hightown	Beekmantown, Conococheague and Elbrook limestone series on anticline		3-15-28	5	43	45	211	.....	56	b	240	2	.7	5.0	202
452	H. C. Heavener Spring—1 mile east of Hightown, at head of Crab Bottom Creek and ½ mile north of Highway, 300 feet west of house	Beekmantown, Conococheague and Elbrook limestone series on southeast limb of anticline	z	3-16-28	320	48.5	37	147	.....	56	.....	165	3	.7	2.9	141
453	Spring—.4 mile south of Hightown	Beekmantown, Conococheague and Elbrook limestone series on or near axis of anticline		3-16-28	60	49	34	.....	.....	.....	.....	.....	.....	.....	.....	.....
454	Spring—1.2 miles southwest of Hightown, 500 feet southwest of No. 455	Beekmantown, Conococheague and Elbrook limestone series on or near axis of anticline		3-16-28	30	47	34	.....	.....	.....	.....	.....	.....	.....	.....	.....
455	Spring—1.2 miles southwest of Hightown, on east side of road to Mill Gap, 500 feet east of No. 454	Beekmantown, Conococheague and Elbrook limestone series on or near axis of anticline		3-16-28	60	49.9	34	136	.....	48	b	156	1	.5	3.0	126
456	Spring—1.2 miles southeast of Hightown	Beekmantown, Conococheague and Elbrook limestone series on southeast limb of anticline		3-17-28	40	47	33	.....	.....	.....	.....	.....	.....	.....	.....	.....
457	Spring—1.4 miles southeast of Hightown, 2.3 miles north of cross roads	Beekmantown, Conococheague and Elbrook limestone series on southeast limb of anticline		3-16-28	60	46	34	.....	.....	.....	.....	.....	.....	.....	.....	.....
458	Spring—1.6 miles southeast of Hightown	Beekmantown, Conococheague and Elbrook limestone series on southeast limb of anticline	z	3-16-28	30	42	35	65	.....	24	b	71	4	.2	.10	57
459	Monterey Spring—Water supply for Monterey, .8 mile northwest of Monterey, at base of high ridge	Helderberg limestone in syncline		2-24-28	300	45	43	79	.....	24	b	86	2	.6	2.4	66
460	Spring—1.2 miles southeast of Monterey, at base of high ridge	Probably fed by stream		2-24-28	80	41.5	44	.....	.....	.....	.....	.....	.....	.....	.....	.....
461	William Jones Spring—1.4 miles south of Hightown	Beekmantown, Conococheague and Elbrook limestone series on southeast limb of anticline		3-16-28	50	47	34	90	.....	40	b	94	5	.7	2.3	79
462	Spring—3.8 miles southwest of Hightown	Beekmantown, Conococheague and Elbrook limestone series on or near axis of anticline		3-16-28	60	47	36	.....	.....	.....	.....	.....	.....	.....	.....	.....
463	Spring at Old Mill—3½ miles southwest of Hightown	Beekmantown, Conococheague and Elbrook limestone series on southeast limb of anticline	t	3-16-28	200	45	35	127	.....	48	8	141	3	1.0	2.7	106
464	Spring—4.4 miles southwest of Hightown, 2½ miles northwest of Vanderpool, near fork of road at Meadowdale	Beekmantown, Conococheague and Elbrook limestone series near axis of anticline		2-23-28	50	48	51	.....	.....	.....	.....	.....	.....	.....	.....	.....
465	Spring—4 miles south of Hightown, 2 miles northwest of Vanderpool, at base of hill, 300 feet north of road	Beekmantown, Conococheague and Elbrook limestone series on southeast limb of anticline	t	2-23-28	660	45	41	159	.....	60	6	177	3	.9	4.0	140
466	Mackey Spring—1 miles southwest of Vanderpool and 3 miles northeast of Mustoe, on Jackson River	Spring probably fed by Jackson River	t	2-23-28	5,200	46.5	46	67	.....	24	b	76	2	.5	.33	58
467	Stonacher Mills Spring—2 miles south of Vanderpool and 2 miles north of Mustoe, on Jackson River	Oriskany sandstone in syncline	t	2-23-28	100	46	46	68	.....	24	b	75	3	.7	.10	57
468	Corbett Spring—4 miles south of Vanderpool and 1 mile southwest of Mustoe, on Jackson River in creek bottom at base of high hill	Helderberg limestone in syncline	t	2-23-28	260	47	45	41	.....	13	b	42	2	.7	1.2	30

b Less than 5 parts per million.
t Sample for analysis collected May 17, 1929.
z Sample for analysis collected May 18, 1929.

Number	LOCATION AND NAME	GEOLOGIC OCCURRENCE		Date, 1928	Flow (gallons a minute)	Temperatures (Degrees Fahrenheit) Water	Air	Approximate Partial Analysis (Parts per Million) Dissolved solids (calculated)	Iron (Fe)	Calcium (Ca) (by turbidity)	Sodium (Na) (calculated)	Bicarbonate (HCO_3)	Sulphate (SO_4) (by turbidity)	Chloride (Cl)	Nitrate (NO_3)	Total hardness (as $CaCO_3$)
469	Spring—6 miles northeast of Bolar, at Trimble Postoffice, on Dry Branch, at base of hill....	Probably fed by stream.....	t	2-23-28	50	47	42	94	.....	36	b	107	2	.4	1.2	88
	Buzzard Spring—4½ miles northeast of Bolar and 2½ miles below Trimble Postoffice, in creek bottom at base of mountain.....															
471	Bragg Spring—2.2 miles northeast of Bolar, up creek from Bolar Postoffice.....	Probably fed by stream.....		2-23-28	30	46.5	41	.....	.....	.....	.....	.....	.....	.....	.....	.....
472	Spring—1 mile northeast of Bolar, on west side of road, ½ mile northwest of No. 473.....	Lowville limestone on northwest limb of anticline.....		2-23-28	60	74	32	168	.....	48	10	189	7	.5	.21	141
473	Bolar Springs—.3 mile northeast of Bolar, at base of hill.....	Lowville limestone on northwest limb of anticline.....	t	2-23-28	180	49	32	142	.....	52	6	155	6	.6	2.3	124
474	Spring—3.2 miles southeast of Monterey, on Crab Run.....	Lowville limestone on northwest limb of anticline.....		2-23-28	3,500	66	32	174	.....	26	14	180	15	.5	1.5	134
475	J. L. Leckridge Spring—6½ miles southeast of Monterey, 1.8 miles west of McDowell, on Crab Run, at base of mountain.....	Helderberg limestone in syncline.....	aa	2-24-28	300	41	45	44	.....	15	b	47	3	.3	.05	40
476	Chalybeate Spring—7 miles southeast of Monterey, on Crab Run, 1 mile west of McDowell	Helderberg limestone in syncline.....	aa	2-24-28	1,170	47	36	65	.....	20	b	71	3	.5	.58	54
477	Spring—1 mile east of McDowell.....	Romney shale in syncline.....		2-24-28	5	46.5	46	.....	.....	.....	.....	.....	.....	.....	.....	.....
478	Stuart Spring—2.6 miles east of McDowell and 2 miles northwest of Headwaters Postoffice, on Cowpasture River at base of high ridge....	Oriskany sandstone on syncline.....		2-24-28	60	49	42	.....	.....	.....	.....	.....	.....	.....	.....	.....
479	Spout Spring—5 miles southeast of McDowell and 2½ miles southeast of Headwaters Postoffice, on Staunton Highway on northeast side of road.....	Oriskany sandstone on southeast limb of anticline.....		2-24-28	4,500	55	47	117	.....	36	5	127	6	.5	1.4	102
480	Craig Spring—At Deerfield, at southeast edge of town.....	Hampshire formation in syncline.....		3-15-28	5	42	46	16	.....	2	b	14	2	.8	.40	9.5
481	Craig Spring—1.2 miles south of Deerfield.....	Probably fed by stream.....	bb	2-24-28	500	46	46	35	.....	12	b	35	3	.6	.42	26
		Oriskany sandstone on nose of anticline.....	bb	2-24-28	350	51.5	46	73	.....	26	5	79	4	.6	.18	60

AUGUSTA

Springs not included on SWI but ≥ 100 gpm are highlighted

Number	LOCATION AND NAME	GEOLOGIC OCCURRENCE		Date, 1928	Flow (gallons a minute)	Temperatures (Degrees Fahrenheit) Water	Air	Approximate Partial Analysis (Parts per Million) Dissolved solids (calculated)	Iron (Fe)	Calcium (Ca) (by turbidity)	Sodium (Na) (calculated)	Bicarbonate (HCO_3)	Sulphate (SO_4) (by turbidity)	Chloride (Cl)	Nitrate (NO_3)	Total hardness (as $CaCO_3$)
482	Spring—4 miles southwest of Deerfield, on Calf-Pasture River.....	Oriskany sandstone on nose of anticline.....	bb	2-24-28	50	55	45	84	.....	30	b	96	2	.5	.42	80
483	Stream fed by spring along Ramsey Draft—5 miles southwest of Craigsville.....	Romney shale in syncline.....		2-25-28	50	41	39	.....	.....	.....	.....	.....	.....	.....	.....	.....
484	Williams Baahaw Spring—2.2 miles southwest of Craigsville, ½ mile west of Wallace Mill school.....															
485	Spring—5 miles east of West Augusta, at Buckhorn Tavern, 4 miles west of Jennings Gap...	Helderberg limestone on southeast limb of anticline..		3-23-28	200	50	45	131	.....	.....	2.4	144	4	1.6	2.1	121
486	Stribling Spring—3.8 miles west of Parnassus, on Moffats Run.....	Jennings formation in syncline		3-15-28	30	43	46	.....	.....	.....	.....	.....	.....	.....	.....	.....
487	Springdale Springs—4.4 miles southwest of Parnassus, 5 miles northwest of Churchville, 1 miles northwest of Jennings Gap, in creek bank.....	Jennings formation.....		2-13-28	1	43	42	316	.....	48	81	370	1	4.0	.....	133
488	Spring—2½ miles northwest of Churchville and ¼ mile northwest of Lone Fountain.....	Jennings formation.....		2-13-28	1	46.5	41	.....	.....	.....	.....	.....	.....	.....	.....	.....
489	Lone Fountain Spring—2.2 miles northwest of Churchville and 1 mile southwest of Lone Fountain Postoffice, at base of high ridge....	Beekmantown, Conococheague and Elbrook limestone series.....		3-15-28	30	52	51	.....	.....	.....	.....	.....	.....	.....	.....	.....
490	Spring—2.8 miles northwest of Swoope, in Buffalo Gap, ½ mile east of Buffalo Gap Church and 400 feet north of highway.....	Tuscarora sandstone near fault		2-13-28	10	52.7	41	221	.....	80	9.5	252	7	.5	.26	194
491	Spring—3 miles northwest of Swoope, in Buffalo Gap, 600 feet southeast of Buffalo Gap Church, 1,000 feet southwest of No. 490.....	Helderberg limestone near thrust fault.....		3-23-28	10	52	75	.....	.....	.....	.....	.....	.....	.....	.....	.....
492	Spring—2.8 miles northwest of Swoope, in Buffalo Gap, 500 feet southwest of No. 490.....	Helderberg limestone near thrust fault.....	bb	3-23-28	80	54.5	65	103	.....	36	6	113	5	.5	.42	87
493	Iron Spring—At Mt. Elliot.....	Helderberg limestone near thrust fault.....	bb	3-23-28	10	52	64	114	.....	48	b	129	3	.9	.38	102
494	Augusta White Lithia Spring, ¼ mile north of Augusta Springs, at hotel.....	Romney shale in syncline.....		3-23-28	2	47	50	259	.....	60	14	30	n 165	2.0	.....	169
495	Big Spring—.6 mile south of Augusta Springs..	Helderberg limestone on northeast limb of anticline.		3-23-28	300	44	59	14	.....	4	.6	11	2	.5	.55	11
496	Cochran Spring—2 miles northwest of Middlebrook and ½ mile southeast of Summerdean, at base of steep hill.....	Helderberg limestone on northeast limb of anticline.		3-23-28	1,000	48	60	30	.....	10	.4	28	4	.5	.20	27
		Beekmantown, Conococheague and Elbrook limestone series.....	y	2-28-28	1,180	54.5	40	175	.....	60	b	193	4	.8	5.2	164

Note: not same as Big Spring in Swift Run Basin (Mt. Solon)

than 5 parts per million.
ample for analysis collected May 17, 1929.
n Determined gravimetrically.

y Sample for analysis collected May 22, 1929.
aa Sample for analysis collected May 19, 1929.
bb Sample for analysis collected May 25, 1929.

Number	LOCATION AND NAME	GEOLOGIC OCCURRENCE		Date, 1928	Flow (gallons a minute)	Temperatures (Degrees Fahrenheit) Water	Air	Approximate Partial Analysis (Parts per Million) Dissolved solids (calculated)	Iron (Fe)	Calcium (Ca) (by turbidity)	Sodium (Na) (calculated)	Bicarbonate (HCO_3)	Sulphate (SO_4) (by turbidity)	Chloride (Cl)	Nitrate (NO_3)	Total hardness (as $CaCO_3$)
497	Spring—3½ miles northeast of Moffatt's Creek Postoffice, 1 mile northeast of No. 498, 100 feet south of old house	Beekmantown, Conococheague and Elbrook limestone series	y	2-25-28	100	48	39	192	.....	64	b	215	3	.8	5.3	182
498	Spring—2 miles northeast of Moffatt's Creek Postoffice	Beekmantown, Conococheague and Elbrook limestone series		2-25-28	30	51	40	.....	.....	.....	.....	.....	.....	.....	.....	.....
499	Cave Spring—1.6 miles south of Churchville, on Middle River, at base of hill	Beekmantown, Conococheague and Elbrook limestone series		2-13-28	2,000	48.1	42	65	.....	18	2.9	69	4	.6	1.0	56
500	Frank Kennedy Spring—2 miles northeast of Swoope and ½ mile north of West View, on bank of Middle River	Beekmantown, Conococheague and Elbrook limestone series	bb	2-28-28	1,500	54.4	36	221	.....	80	b	247	3	1.3	6.5	210
501	J. J. Bowman's Spring—3.3 miles northeast of Middlebrook and 2 miles southwest of Arbor Hill	Beekmantown, Conococheague and Elbrook limestone series	y	2-28-28	500	53	49	101	.....	64	b	217	2	1.0	4.1	177
502	Spring—1 mile northeast of Middlebrook	Beekmantown, Conococheague and Elbrook limestone series		2-25-28	350	52	33	175	.....	32	.9	192	2	1.0	7.7	165
503	J. L. Mohler Spring—1 mile southwest of Mossy Creek	Beekmantown, Conococheague and Elbrook limestone series		3-15-28	60	53	47	.....	.....	.....	.....	.....	.....	.....	.....	.....
504	Blue Hole Spring—At Mt. Solon, issuing from hill	Beekmantown, Conococheague and Elbrook limestone series		2-13-28	2,000	52.2	38	36	.....	7	3.0	40	1	.3	.40	28
505	Spring—6 miles southeast of Parnassus and ½ mile south of Spring Hill, on Spring Hill road	Beekmantown, Conococheague and Elbrook limestone series		2-28-28	30	53	49	.....	.....	.....	.....	.....	.....	.....	.....	.....
506	C. O. Fitzgerald Spring, 2.2 miles southwest of Fort Defiance and 4 miles southeast of Spring Hill, at Middle River bridge	Copper Ridge dolomite		3-28-28	60	61.2	60	.....	.....	.....	.....	.....	.....	.....	.....	.....
507	Harry Bowling's Spring—2½ miles southwest of Fort Defiance and 1 mile north of Verona, up side road ¼ mile from Middle River bridge	Beekmantown limestone		2-8-28	20	55	61	301	.....	95	5	310	18	2.0	10	272
508	J. W. Quick's Spring—4 miles northeast of Staunton, in springhouse	Near base of Copper Ridge dolomite		2-8-28	1,000	58.3	59	310	.....	c 75	Trace	360	3	.6	3.6	339
509	B. M. Weller's Spring—4 miles northeast of Staunton and 1 mile southwest of Verona, ¼ mile west of Lee Highway	Lenoir limestone		2-8-28	60	55	59	297	.....	85	11	314	7	3.0	15	257
510	Spring—1 mile southwest of Staunton, on Hebron road	Beekmantown limestone		2-8-28	10	54	59	236	.....	50	b	268	2	.8	6.0	225
511	Buttermilk Spring—1½ miles southwest of Staunton	Beekmantown limestone	aa	2-28-28	240	53	37	253	.....	80	b	286	2	1.5	6.5	234
512	Spring, ½ mile southeast of Staunton, near Betsy Bell Hill	Beekmantown limestone		2-27-28	10	32	35	.....	.....	.....	.....	.....	.....	.....	.....	.....
513	Spring—2.8 miles southwest of Staunton	Copper Ridge dolomite	aa	2-27-28	200	49	33	246	.....	80	b	269	7	2.5	5.7	231
514	Spring—2 miles southwest of Staunton, 500 feet north of Arbor Hill road, at dairy farm	Elbrook limestone	y	3-20-28	200	56	58	204	.....	48	b	228	2	1.3	6.7	195
515	Spring—2 miles southeast of Staunton, ¼ mile southeast of Mary Gray Hill	Lenoir limestone		2-27-28	60	54	37	.....	.....	.....	.....	.....	.....	.....	.....	.....
516	Spring—2½ miles southeast of Staunton	Lenoir limestone		2-27-28	20	53.2	37	.....	.....	.....	.....	.....	.....	.....	.....	.....
517	Mint Spring—At Mint Spring Postoffice, on west side of Lee Highway, near schoolhouse	Lenoir limestone		2-14-28	20	55	48	286	.....	90	15	326	3	2.0	5.0	245
518	Spring—2 miles southwest of Mint Spring Postoffice—500 feet west of Lee Highway	Lenoir limestone		2-14-28	50	51.6	45	260	.....	100	20	290	5	.8	7.1	206
519	W. H. Agnor Spring (Gillon Spring)—At Greenville, at east end of town on bank of creek	Beekmantown limestone		2-11-28	60	53.6	40	277	.....	75	8	296	3	3.0	15	245
520	W. B. Speck Spring—2 miles southwest of Greenville, 100 feet west of creek	Beekmantown limestone		2-11-28	100	52.6	34	231	.....	72	9	250	7	1.2	8.0	200
521	Broadhead Spring—2.3 miles southwest of Greenville, 1,000 feet west of Broadhead schoolhouse in bank of creek at head of South River	Beekmantown limestone		2-11-28	150	54.1	34	237	.....	68	13	249	4	.9	8.0	187
522	Cold Spring—2 miles southwest of Greenville, on Lee Highway, at head of small stream	Beekmantown limestone		2-11-28	30	50.9	36	.....	.....	.....	.....	.....	.....	.....	.....	.....
523	Lacey Black Spring—4 miles east of Greenville, 3 miles west of Stuarts Draft	Beekmantown, Conococheague and Elbrook limestone series		2-10-28	15	54	43	192	.....	40	5	206	9	.8	4.7	172

Less than 5 parts per million.
c Sample for analysis collected April 25, 1929.
y Sample for analysis collected May 22, 1929.

aa Sample for analysis collected May 19, 1929.
bb Sample for analysis collected May 25, 1929.

Number	LOCATION AND NAME	GEOLOGIC OCCURRENCE		Date, 1928	Flow (gallons a minute)	Temperatures (Degrees Fahrenheit) Water	Air	Approximate Partial Analysis (Parts per Million) Dissolved solids (calculated)	Iron (Fe)	Calcium (Ca) (by turbidity)	Sodium (Na) (calculated)	Bicarbonate (HCO_3)	Sulphate (SO_4) (by turbidity)	Chloride (Cl)	Nitrate (NO_3)	Total hardness (as $CaCO_3$)
5	Barterbrook Spring—2½ miles northeast of Stuarts Draft and ½ mile south of Barterbrook Postoffice, issues from bank along valley road	Beekmantown, Conococheague and Elbrook limestone series		2-10-28	400	55	35	237	.....	76	12	260	6	1.2	7.5	200
525	Dodge Spring—2.2 miles south of Stuarts Draft, between Johns River and Coles River	In alluvial fan of stream flowing out of Blue Ridge		2-10-28	{2,000 3,000}	49.1	44	4.7	.....	1	b	3.0	1	.4	.10	1.8
526	Oscar Cohron Spring—1.6 miles east of Stuarts Draft	Elbrook limestone		2-10-28	80	53.1	39	188	.....	46	8	200	4	1.3	10	160
527	Payne Spring—1 mile northwest of Lipscomb	Elbrook limestone		2-10-28	100	47	39	171	.....	32	b	176	6	2.0	9.1	160
528	Spring—3 miles south of Bridgewater	Beekmantown, Conococheague and Elbrook limestone series		2-28-28	30	54	49	.....	.....	.....	.....	.....	.....	.....	.....	.....
529	Seawright Spring—3.6 miles southwest of Burketown and 3 miles northwest of Mt. Sidney, forms head of creek	Copper Ridge dolomite		2-8-28	1,200	59	56	305	.....	45	b	344	6	.8	5.0	292
530	Willow Spout Spring—At Fort Defiance	Lenoir limestone		5-1-28	20	54.5	58	294	.....	96	30	297	6	6.0	20	208
531	Dice's Spring—1 mile southeast of Burketown, at head of small creek	Copper Ridge dolomite		2-8-28	2,000	63.2	48	330	.....	50	b	334	32	.9	4.0	306
532	Spring—1 mile east of Fishersville, on south side of Jefferson Highway, on property of Elm Spring Orchard Corporation	Beekmantown limestone		2-8-28	5	51.5	56	225	.....	36	10	238	8	2.0	8.7	192
533	S. G. Koiner Spring—3 miles southwest of Waynesboro, 1,000 feet west of house, at end of lane	Shady dolomite	x	2-11-28	1,800	54.2	40	95	.....	24	b	d 99	8	.6	.42	88
534	Jolliff Spring—.5 mile south of Harriston, in flood plain of stream issuing from Blue Ridge Mountains	Elbrook limestone		2-9-28	125	55.4	45	87	.....	18	b	d108	5	.2	.....	87
535	C. A. Koiner Spring—1 mile northwest of Crimora	Beekmantown, Conococheague and Elbrook limestone series		2-9-28	90	53.4	46	251	.....	80	12	250	5	4.6	20	206

Number	LOCATION AND NAME	GEOLOGIC OCCURRENCE		Date, 1928	Flow (gallons a minute)	Temperatures (Degrees Fahrenheit) Water	Air	Approximate Partial Analysis (Parts per Million) Dissolved solids (calculated)	Iron (Fe)	Calcium (Ca) (by turbidity)	Sodium (Na) (calculated)	Bicarbonate (HCO_3)	Sulphate (SO_4) (by turbidity)	Chloride (Cl)	Nitrate (NO_3)	Total hardness (as $CaCO_3$)
536	Russell Barger Spring—1 mile southwest of Crimora and 4 miles southwest of Harriston	Beekmantown, Conococheague and Elbrook limestone series		2-9-28	40	52.9	47	254	.....	60	6	262	7	3.0	15	225
537	Loth Spring—At Waynesboro		bb	2-9-28	350	.....	.....	59	.....	15	b	d 65	2	.7	.55	52
538	Baker Spring—At Waynesboro, southeast edge of town, 1,000 feet below South River bridge	Watauga shale and Shady dolomite		2-9-28	5,300	54.2	43	47	.....	10	b	d 58	2	.5	.25	50
539	Lithia Springs—At Waynesboro, eastern edge of town, 1,000 feet east of South River, in flood plain, water supply for Waynesboro	Watauga shale and Shady dolomite		2-9-28	100	54.5	44	68	.....	15	b	d 90	1	.2	.....	66
540	Spring—14 miles northwest of Harrisonburg and 3 miles west of Rawley Springs, 3 miles up Dry Run on north bank of run	Pocono sandstone in syncline		2-7-28	10	39	36	11	.....	1	b	4.0	5	.3	.....	1.6
541	Rawley Spring—11 miles northwest of Harrisonburg, at base of high ridge	Pocono sandstone in syncline		2-7-28	1	48	33	28	13.78	1	.....	17	6	.2	.....	33
542	Roy Aery Spring—10¾ miles northwest of Harrisonburg and ¼ mile east of Rawley Springs, at house, at foot of mountain	Jennings formation		2-7-28	1	44.2	37	15	.....	1	b	6.0	5	.8	1.5	6.0
543	Patterson Spring—1 mile northwest of Spring Creek Postoffice, at head of Spring Creek	Beekmantown, Conococheague and Elbrook limestone series		2-14-28	4,000	52.3	36	164	.....	32	9	186	1	.7	4.5	138
544	Mill Pond Spring—At Dayton, northwest edge of town, 2 miles southeast of Mole Hill, at west end of Mill Pond, water supply for Dayton	Beekmantown, Conococheague and Elbrook limestone series		2-8-28	{3,000 4,000}	50.5	39	266	.....	45	b	298	6	.8	5.5	251
545	Warm Spring—½ mile south of Bridgewater on bank of Long Glade Creek, water supply for Bridgewater	Beekmantown, Conococheague and Elbrook limestone series		2-8-28	500	63.5	40	296	.....	40	6	330	9	1.0	4.7	272
546	Spring—3 miles south of Bridgewater	Beekmantown, Conococheague and Elbrook limestone series		2-28-28	60	54	50	.....	.....	.....	.....	.....	.....	.....	.....	.....
547	Spring—½ mile west of Harrisonburg, on south side of Rawley Spring road, in bed of creek	Fed by stream		2-7-28	120	38.7	32	11	.....	1	b	4.0	5	.3	.....	5.2
548	Spring—2.3 miles southwest of Harrisonburg, on west side of Valley Pike	Stones River limestone		2-6-28	40	54	47	358	.....	90	15	306	40	12	20	292
549	[illegible]'s Spring—5 miles south of Harrisonburg 1 mile east of Rockingham, on bank of [illegible]ek	Copper Ridge dolomite		5-1-28	300	54	60	277	.....	80	b	306	5	1.0	9.3	264
550	E. D. Pence Spring—2 miles east of Burketown and 2 miles northeast of Cave Station, on North River	Lenoir limestone		5-1-28	200	56	60	285	.....	70	16	308	8	.8	11	236

b Less than 5 parts per million.
d Includes equivalent of small mount of carbonate.

x Sample for analysis collected May 24, 1929.
bb Sample for analysis collected May 25, 1929.

Number	LOCATION AND NAME	GEOLOGIC OCCURRENCE		Date, 1928	Flow (gallons a minute)	Temperatures (Degrees Fahrenheit) Water	Air	Approximate Partial Analysis (Parts per Million) Dissolved solids (calculated)	Iron (Fe)	Calcium (Ca) (by turbidity)	Sodium (Na) (calculated)	Bicarbonate (HCO_3)	Sulphate (SO_4) (by turbidity)	Chloride (Cl)	Nitrate (NO_3)	Total hardness (as $CaCO_3$)
[illegible]	[illegible]sanetta Spring (Principal Spring)—4 miles [illegible]utheast of Harrisonburg	Stones River limestone near fault		5-1-28	400	59	64	296	.....	.....	17	342	3	.5	4.4	250
552	Massanetta Spring (Cold Spring by Hotel)—4 miles southeast of Harrisonburg	Stones River limestone near fault		5-1-28	20	51	64	.....	.....	.....	.....	.....	.....	.....	.....	.....
553	Massanetta Spring (spring feeding bath)—4 miles southeast of Harrisonburg	Stones River limestone near fault		5-1-28	30	54	64	.....	.....	.....	.....	.....	.....	.....	.....	.....
554	Lacey Spring—At Lacey Springs	Chambersburg limestone	y	2-29-28	4,000	55	50	270	.....	100	7	292	10	1.7	6.9	243
555	Bear Lithia Spring—2 miles north of Elkton	Elbrook limestone		5-1-28	1,000	55	70	80	.....	24	6	d 86	5	.3	.5	63
556	Samuel Spring—1 mile south of Elkton	Water comes out of rock talus at base of Blue Ridge		5-1-28	800	55.5	72	123	.....	32	6	d 143	2	.3	.10	106
557	C. E. Fristoe Spring—4 miles northeast of Rileyville and at Overall	Elbrook limestone		5-1-28	20	55.5	62	252	.....	80	16	278	10	1.0	3.2	208
558	Dr. S. G. Davis Spring—4 miles northeast of Rileyville and at Overall, on North bank of Overall Creek, 200 feet east of South Fork of Shenandoah River	Elbrook limestone		5-1-28	10	64	62	168	.....	48	12	d 190	5	.5	1.2	137
559	William Knupp Spring—[illegible] Timberville	Beckmantown, Conococheague and Elbrook limestone series		2-29-28	30	53.5	52	.....	.....	.....	.....	.....	.....	.....	.....	.....
560	W. L. Hammond Spring—4 miles southwest of Strasburg and 2 miles west of Fisher's Hill	Beckmantown limestone	y	3-14-28	100	50	57	220	.....	80	6	225	15	2.0	6.0	195
561	Funkhauser Spring—3 miles southwest of Strasburg and 1 mile west of Fisher's Hill	Beckmantown limestone group		3-15-28	50	54	58	.....	.....	.....	.....	.....	.....	.....	.....	.....
562	W. A. Kenan Spring—2 miles southwest of Strasburg and ¼ mile west of Fisher's Hill	Beckmantown limestone	y	3-14-28	210	54.5	52	326	.....	100	8	341	16	3.0	10	291
563	Hupp Spring—¼ mile north of Strasburg	Chambersburg limestone on anticline	cc	3-14-28	270	57.5	58	371	.....	120	b	377	25	3.2	12	342
564	Limeton Lime Co. Plant Spring—5½ miles southwest of Front Royal, at Karo Station, on South Fork of Shenandoah River, on southeast bank	Beckmantown limestone	cc	5-2-28	80	54	62	191	.....	70	b	209	3	2.3	6.7	174
565	Wm. Ramsey Spring—4 miles southwest of Front Royal and 1 mile northeast of Karo Station, on east bank of South Fork of Shenandoah River	Beckmantown limestone		5-2-28	100	53	64	223	.....	56	12	228	10	2.0	11	182
566	J. R. Baldwin Spring—2 miles southwest of Front Royal, on east bank of South Fork of Shenandoah River	Beckmantown limestone		5-2-28	200	50	65	154	.....	32	11	152	10	1.2	7.9	120

b Less than 5 parts per million.
d Includes equivalent of small amount of carbonate.
y Sample for analysis collected May 22, 1929.
cc Sample for analysis collected May 21, 1929.