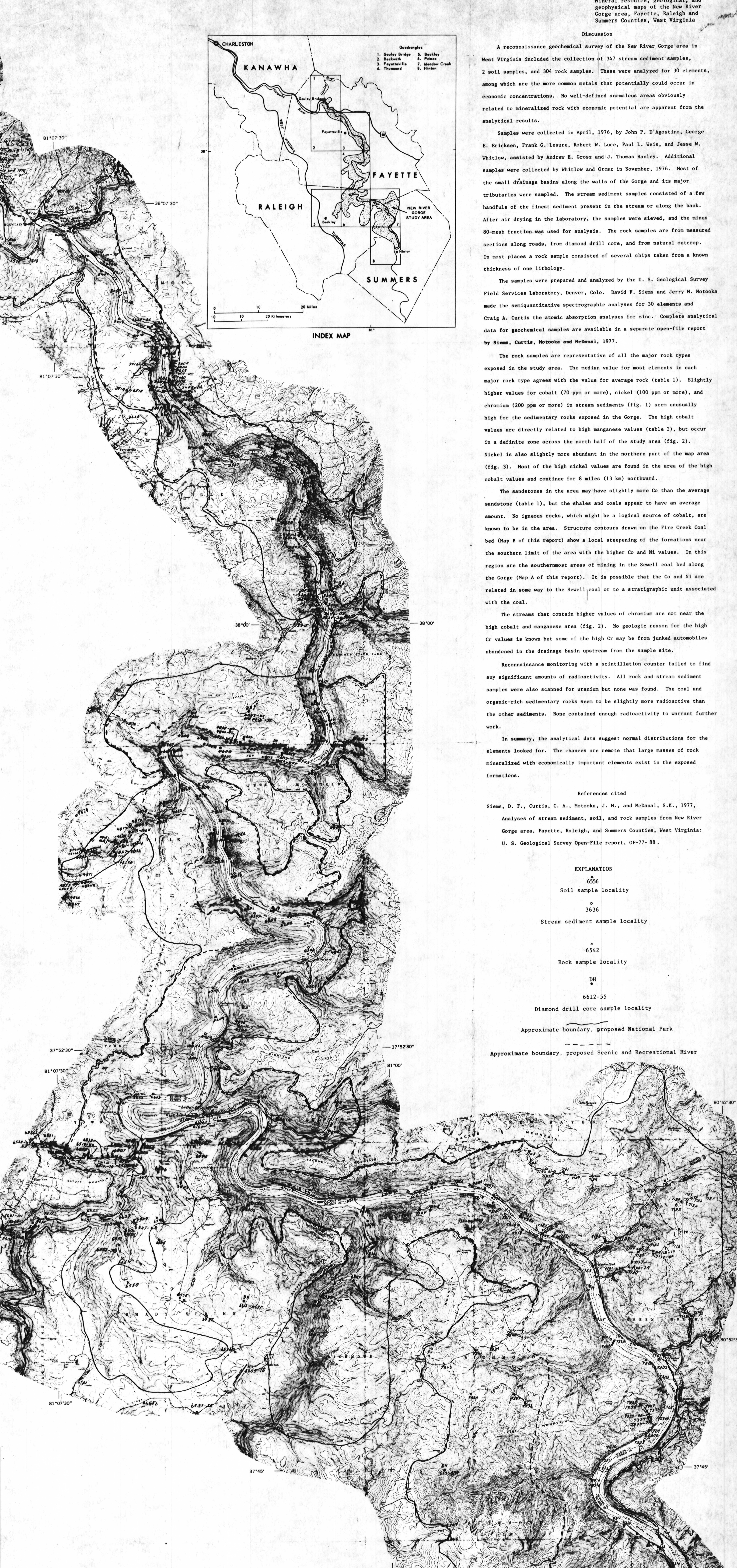
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

OPEN-FILE REPORT OF 77-76 MAP--I
Mineral resource, geological, and geophysical maps of the New River Gorge area, Fayette, Raleigh and Summers Counties, West Virginia



Discussion

A reconnaissance geochemical survey of the New River Gorge area in West Virginia included the collection of 347 stream sediment samples, 2 soil samples, and 304 rock samples. These were analyzed for 30 elements, among which are the more common metals that potentially could occur in economic concentrations. No well-defined anomalous areas obviously related to mineralized rock with economic potential are apparent from the analytical results.

Samples were collected in April, 1976, by John P. D'Agostino, George E. Ericksen, Frank G. Lesure, Robert W. Luce, Paul L. Weis, and Jesse W. Whitlow, assisted by Andrew E. Grosz and J. Thomas Hanley. Additional samples were collected by Whitlow and Grosz in November, 1976. Most of the small drainage basins along the walls of the Gorge and its major tributaries were sampled. The stream sediment samples consisted of a few handfuls of the finest sediment present in the stream or along the bank. After air drying in the laboratory, the samples were sieved, and the minus 80-mesh fraction was used for analysis. The rock samples are from measured sections along roads, from diamond drill core, and from natural outcrop. In most places a rock sample consisted of several chips taken from a known thickness of one lithology.

The samples were prepared and analyzed by the U. S. Geological Survey Field Services Laboratory, Denver, Colo. David F. Siems and Jerry M. Motooka made the semiquantitative spectrographic analyses for 30 elements and Craig A. Curtis the atomic absorption analyses for zinc. Complete analytical data for geochemical samples are available in a separate open-file report by Siems, Curtis, Motooka and McDanal, 1977.

The rock samples are representative of all the major rock types exposed in the study area. The median value for most elements in each major rock type agrees with the value for average rock (table 1). Slightly higher values for cobalt (70 ppm or more), nickel (100 ppm or more), and chromium (200 ppm or more) in stream sediments (fig. 1) seem unusually high for the sedimentary rocks exposed in the Gorge. The high cobalt values are directly related to high manganese values (table 2), but occur in a definite zone across the north half of the study area (fig. 2). Nickel is also slightly more abundant in the northern part of the map area (fig. 3). Most of the high nickel values are found in the area of the high cobalt values and continue for 8 miles (13 km) northward.

The sandstones in the area may have slightly more Co than the average sandstone (table 1), but the shales and coals appear to have an average amount. No igneous rocks, which might be a logical source of cobalt, are known to be in the area. Structure contours drawn on the Fire Creek Coal bed (Map B of this report) show a local steepening of the formations near the southern limit of the area with the higher Co and Ni values. In this region are the southernmost areas of mining in the Sewell coal bed along the Gorge (Map A of this report). It is possible that the Co and Ni are related in some way to the Sewell coal or to a stratigraphic unit associated with the coal.

The streams that contain higher values of chromium are not near the high cobalt and manganese area (fig. 2). No geologic reason for the high Cr values is known but some of the high Cr may be from junked automobiles abandoned in the drainage basin upstream from the sample site.

Reconnaissance monitoring with a scintillation counter failed to find any significant amounts of radioactivity. All rock and stream sediment samples were also scanned for uranium but none was found. The coal and organic-rich sedimentary rocks seem to be slightly more radioactive than the other sediments. None contained enough radioactivity to warrant further work.

In summary, the analytical data suggest normal distributions for the elements looked for. The chances are remote that large masses of rock mineralized with economically important elements exist in the exposed formations.

References cited

Siems, D. F., Curtis, C. A., Motooka, J. M., and McDanal, S.K., 1977, Analyses of stream sediment, soil, and rock samples from New River Gorge area, Fayette, Raleigh, and Summers Counties, West Virginia: U. S. Geological Survey Open-File report, OF-77-88.

EXPLANATION

▲ 6556 Soil sample locality

o 3636 Stream sediment sample locality

× 6542 Rock sample locality

DH • 6612-55 Diamond drill core sample locality

Approximate boundary, proposed National Park

Approximate boundary, proposed Scenic and Recreational River

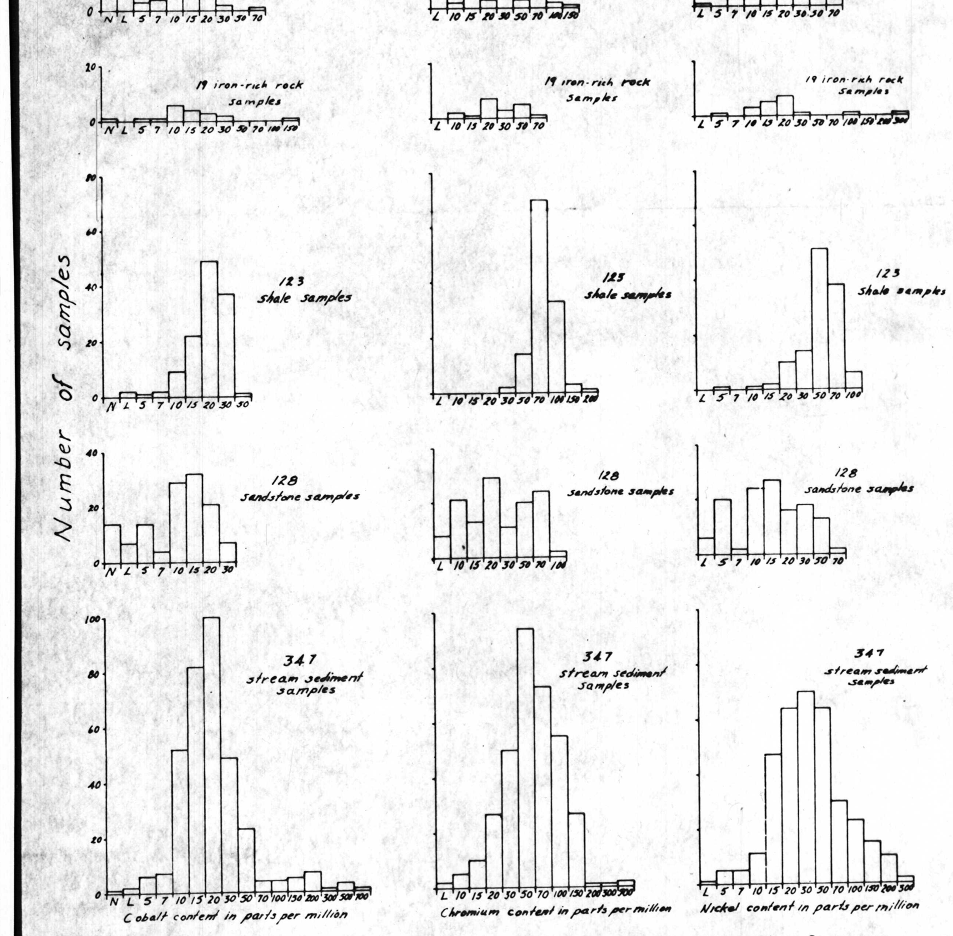


Figure 1.--Distribution of cobalt, chromium, and nickel by sample type in New River Gorge area. Letter symbols: N, not detected; L, detected but below limit of determination.

Figure 2.--Distribution of cobalt and chromium values in stream sediments.

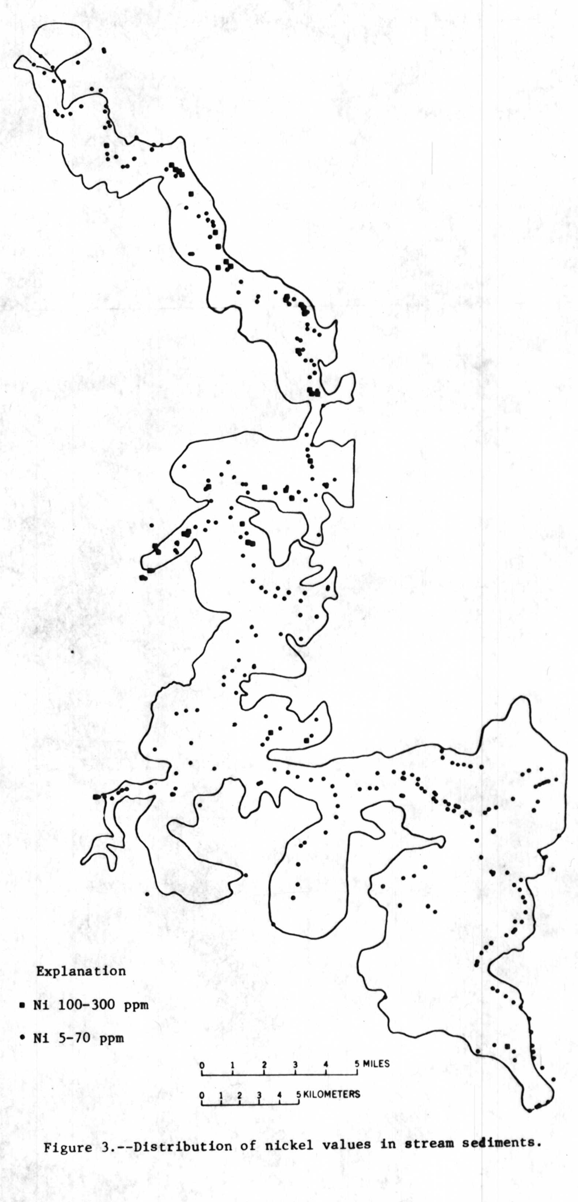


Figure 3.--Distribution of nickel values in stream sediments.

Table 1.--Range and median values for 25 elements in rock and stream sediment samples from the New River Gorge Study area, Fayette, Raleigh, and Summers Counties, W. Va. All analyses by semiquantitative spectrographic methods except zinc in sandstone, shale, ironstone concretions, and stream sediments which is by atomic absorption. Spectrographic analyses are reported to the nearest number in the series 1, 1.5, 2, 3, 5, 7, and 10, which represent approximate midpoints of group data on a geometric scale. The assigned groups for the series will include the quantitative value about 30 percent of the time. Letter symbols: L, detected but below limit of determination (value shown in parenthesis after element symbol); N, not detected; G, greater than. Limits do not apply to coal and carbonaceous shale which were ashed before analysis and results recalculated to bulk composition. Elements looked for but not found and their lower limits of determination: Au(20), Bi(10), Cd(20), Sb(100), and W(50).

Elements	Sandstone 128 samples				Shale 123 samples				Ironstone concretions, limonitic sandstone and limonite 19 samples			Coal and carbonaceous shale 34 samples				Stream sediments 347 samples		
	Low	High	Median	average in sandstone 1,2/	Low	High	Median	average in shale 2/	Low	High	Median	Low	High	Median	average in coal 3/	Low	High	Median
Percent																		
Ca (0.05)	N	20	.07	3.9	L	10	0.1	2.21	L	15	0.7	0.015	0.5	0.050	0.33	N	1.0	0.1
Fe (0.05)	L	7	2	.98	1.5	10	5	4.72	7	G20	15	.15	7	1.75	2.2	0.3	7	2
Mg (0.02)	.02	1.0	.2	.7	.2	1.0	.7	1.5	0.02	0.7	0.5	.007	1.0	.175	.08	.02	1	.2
Ti (0.002)	.015	.7	.3	.15	.15	.7	.5	.46	0.05	0.3	0.15	.003	.5	.085	.08	.1	.7	.3
Parts per Million																		
Ag (0.5)	N	1.5	N	0.0X 4/	N	1.5	N	0.07	N	N	N	N	0.3	0.01	0.6	N	1	N
As (200)	N	N	N	1	N	N	N	13	N	N	N	N	3000	N	25	N	N	N
B (10)	L	150	30	20-30	L	150	70	100	L	30	10	L	100	12	50	10	150	70
Ba (20)	L	700	200	300	200	1500	700	580	50	700	300	L	700	150	300	50	1000	300
Be (1)	L	7	1.5	2	L	10	5	3	1	10	5	L	30	5	2	L	10	2
Co (5)	N	30	10	0.3	L	50	20	19	5	150	15	L	70	10	7	N	700	20
Cr (10)	L	100	20	10-20	30	200	70	90	10	70	20	L	150	20	15	L	500	50
Cu (5)	N	70	5	10-20	N	200	30	45	5	30	10	5	100	30	22	N	100	15
La (20)	N	100	30	30	20	150	70	92	L	50	20	L	150	20	82	N	150	30
Mn (10)	L	2000	300	500	50	3000	500	850	30	G5000	3000	L	1000	50	100	50	G5000	700
Mo (5)	N	N	L	0.2	N	20	N	2.6	N	N	N	N	70	3	3	N	7	N
Nb (20)	N	20	L	0.0X 4/	N	20	L	11	N	L	L	L	10	L	3	N	20	L
Ni (5)	L	70	15	2	5	100	50	68	5	300	20	L	70	20-25	20	L	300	30
Pb (10)	N	20	10	9	L	70	15	20	N	20	10	L	50	10	22	N	150	10
Sc (5)	L	20	7	1	5	20	15	13	5	15	10	L	20	5	3	5	20	10
Sn (10)	N	N	N	0.X 4/	L	10	N	6	N	N	N	N	1.5	N	15	N	200	N
Sr (100)	N	700	L	20	N	500	100	300	N	100	100	L	500	50	100	N	700	L
V (10)	10	150	150	10-20	10	300	100	130	20	150	50	L	300	50	20	15	200	70
Y (10)	N	50	20	40	10	70	30	26	L	50	30	L	50	20	10	10	100	30
Zn (5)	N	240	40	16	5	160	85	95	10	75	40	L	500	15	53	15	300	70
Zr (10)	20	G1000	200	200-250	100	G1000	200	160	20	200	70	L	700	50	30	70	1000	300

1/ Pettijohn, F. J., 1963, Chapter 5, Chemical composition of sandstone excluding carbonate and volcanic sands, in Fleischer, Michael, Tech. Ed., Data of Geochemistry: U. S. Geol. Survey Prof. Paper 440-S, p. S11.

2/ Turekian, K.K., and Wedepohl, K. H., 1961, Distribution of elements in some major units of the earths crust: Geol. Soc. America Bull., v. 72, no. 2, p. 175-192, tables.

3/ Swanson, V.E., and others, 1976, Collection, chemical analysis and evaluation of coal samples in 1975: U. S. Geol. Survey Open-File Report 76-468, 503 p.

4/ Order of magnitude estimated by Turekian and Wedepohl (1961).

Table 2.--Manganese, cobalt, chromium, and nickel content of selected stream sediment samples from the New River Gorge area. Analyses are by semi-quantitative spectrographic methods and are reported to the nearest number in the series 1, 1.5, 2, 3, 5, 7, and 10, which represent approximate midpoints of group data on a geometric scale. The assigned groups for the series will include the quantitative value about 30 percent of the time. Letter symbol: G, greater than. All data in parts per million.

Sample No.	Mn	Co	Cr	Ni
1511	500	20	150	200
1601	700	15	500	20
3413	1000	20	50	100
3515	700	15	300	20
3524	2000	50	30	100
3524A	5000	50	50	200
3601	1500	30	100	150
3602	700	20	100	100
3606	700	20	30	100
3612	1500	30	100	150
3615	1500	30	150	150
3616	2000	50	150	200
3617	1000	30	150	100
3618	1500	30	70	150
3619	1000	30	500	70
3624	1000	30	150	100
3626	3000	100	70	100
3626A	5000	50	50	200
3627	1000	30	50	150
3631	1000	30	100	150
3634	1500	70	150	150
3634A	1000	30	100	100
3634B	1000	30	70	150
3635	1000	20	100	150
3636	1500	100	150	300
3703	500	30	100	100
4603	3000	70	100	150
4607	G5000	150	70	300
4607A	G5000	100	100	100
4607B	5000	100	100	50
4610	150	50	70	100
4610A	2000	50	50	100
4613	5000	200	100	70
4613A	G5000	200	50	70
4618	5000	70	70	150
4619	3000	50	70	150
4621	3000	50	150	100
4704	1500	30	150	100
4804	1000	50	30	100
4806	G5000	200	70	70
4813	1500	30	50	100
4815	G5000	200	50	100
4815A	G5000	150	70	100
4825	3000	150	10	100
4825A	G5000	150	30	200
4826	G5000	300	50	200
4826A	G5000	500	50	200
4827	2000	200	100	30
4827B	5000	200	50	30
4864	G5000	500	70	200
4864A	G5000	200	70	150
4867	5000	50	50	200
4872	G5000	700	70	150
4873	2000	30	70	100
4874	G5000	500	70	200
4875	5000	150	50	70
5210	1500	50	50	100
6111	1500	50	70	100
6322	1000	30	50	100
7111	300	10	200	15
8332	2000	50	150	150

U.S. Geological Survey

OPEN FILE REPORT OF-77-76-I

GEOCHEMICAL SAMPLE LOCALITIES MAP AND DISTRIBUTION OF COBALT, CHROMIUM, AND NICKEL, NEW RIVER GORGE STUDY AREA, FAYETTE, RALEIGH, AND SUMMERS COUNTIES, WEST VIRGINIA

By
F. G. Lesure and J. W. Whitlow

1977

Interior—Geological Survey, Reston, Va.—1977