

(200)

R290

no. 78-470-B

UNITED STATES (DEPARTMENT OF THE INTERIOR)

GEOLOGICAL SURVEY

[Reports - Open file
series]

Spectrographic and chemical analyses
of whole-rock and insoluble-residue samples,

Rolla 1° x 2° quadrangle, Missouri:

Drill hole No. 6



by

J. G. Viets, E. L. Mosier, D. F. Siems, and S. K. McDanal

Open-File Report 78-470-B

1978

Prepared in cooperation with the
Missouri Department of Natural Resources,
Division of Geology and Land Survey

289049

Contents

	Page
Introduction-----	1
Preparation and analysis of samples-----	2
Description of samples-----	4
Explanation of data-----	5
References cited-----	6

Tables

Table 1.--Spectrographic and atomic-absorption analyses of whole-rock samples from drill hole No. 6, Rolla 1° x 2° quadrangle, Missouri.

Table 2.--Spectrographic and atomic-absorption analyses of insoluble residue samples from drill hole No. 6, Rolla 1° x 2° quadrangle, Missouri.

Introduction

Geochemical studies of the Rolla, Mo., $1^{\circ} \times 2^{\circ}$ quadrangle were begun in 1977 as part of a joint multidisciplinary study of the quadrangle by the U.S. Geological Survey and the Division of Geology and Land Survey, Missouri Department of Natural Resources. The study is to access the mineral resource potential of the area by integrated geologic, geochemical, and geophysical studies.

The geochemical work to date has been directed at the characterization of the sedimentary and igneous rocks in the quadrangle through spectrographic and chemical analyses of whole-rock samples and dilute-hydrochloric-acid insoluble-residue samples of whole rock from widely spaced drill holes. Sixty-two drill holes have been selected for study from the sample library of the Missouri Division of Geology and Land Survey. None of the holes are company-confidential, none intersect economically significant mineralized ground, and only a few are located in known ore-bearing trends.

The analytical results for drill hole No. 6, Missouri log number 21597, are given in this report. The drill hole is located in sec. 28, T. 29 N., R. 1 E., in Reynolds County. Data for the whole-rock samples are listed in table 1, and data for the insoluble-residue samples are listed in table 2. Missouri log number, county, and location allow correlation with the stratigraphic logs on file at the Missouri Division of Geology and Land Survey in Rolla, Mo.

Preparation and analysis of samples

The samples were pulverized to minus-140-mesh (0.105 mm) in a vertical grinder with ceramic plates. Some insoluble-residue samples contained only a few milligrams of material, and these were hand-ground in an agate mortar and pestle. A hand magnet was passed over the insoluble residue samples before grinding to remove filings or chips of drill bit that might be present.

Each sample was analyzed semiquantitatively for 31 elements using a six-step, D.C.-arc, optical-emission spectrographic method (Grimes and Marranzino, 1968). In addition, where sufficient sample was available, each sample was analyzed for zinc by an atomic-absorption technique using deuterium background correction (Ward and others, 1969, p. 33).

The semiquantitative spectrographic values are reported as six steps per order of magnitude (1, 0.7, 0.5, 0.3, 0.2, 0.15, and multiples of 10 of these numbers) and are approximate geometric midpoints of the concentration ranges. The precision is shown to be within one adjoining reporting interval on each side of the reported values 83 percent of the time and within two adjoining intervals on each side of the reported value 96 percent of the time (Motooka and Grimes, 1976).

The visual lower limits of determination for the 31 elements that were determined spectrographically and are included in this report are as follows:

For those given in percent:

Calcium	0.05
Iron	0.05
Magnesium	0.02
Titanium	0.002

For those given in ppm:

Antimony	100	Nickel	5
Arsenic	200	Niobium	20
Barium	20	Scandium	5
Beryllium	1	Silver	0.5
Bismuth	10	Strontium	100
Boron	10	Thorium	100
Cadmium	20	Tin	10
Chromium	10	Tungsten	50
Cobalt	5	Vanadium	10
Copper	5	Yttrium	10
Gold	10	Zinc	200
Lanthanum	20	Zirconium	10
Lead	10		
Manganese	10		
Molybdenum	5		

Description of samples

Each sample is identified by an eight-character code. The first three numbers signify the USGS hole number (for example, 001=hole 1, 002=hole 2, and so forth). These three numbers are followed by a capital letter (W, U, or I), which indicates washed (W) or unwashed (U) whole rock in table 1 and insoluble residue (I) in table 2. The last four digits identify the depth of the sample from the drill-hole collar. Each sample is a composite of 10 feet of drill core from above the depth indicated.

The stratigraphic unit of the sample is identified by a coded number in the first column (tables 1 and 2) following the sample number. The code and formation names are as follows:

<u>code</u>	<u>formation</u>
1	Precambrian rocks
2	Lamotte Sandstone
3	Bonneterre Formation
4	Davis Formation
5	Derby-Doe Run* Formation
6	Potosi Dolomite
7	Eminence Dolomite
8	Gunter Sandstone Member of Gasconade Dolomite
9	Gasconade Dolomite (part)
10	Roubidoux Formation
11	Residuum
13	Basal conglomerate
14	Derby-Doe Run and Davis Formations, undifferentiated
16	Van Buren Formation

*As used by McCracken, 1961.

Explanation of data

The columns in tables 1 and 2 have headings of sample, formation, and elements. Columns in which the element heading is preceded by an S contain the emission-spectrographic data. The prefix AA in the zinc column heading indicates that the results were determined by atomic absorption.

Iron, magnesium, calcium, and titanium are reported in percent (%); all other elements are in parts per million. Other symbols shown on the tables are:

N = Not detected at the level of detection;

-- = Not determined;

< = Detected, but below the lowest limit of detection, which is value shown; and

> = Greater than value shown.

Elements that were not detected in any of the samples of a sample set (whole rock or insoluble residue) are not reported in the tables.

References cited

- Grimes, D. J., and Marranzino, A. P., 1968, Direct-current arc and alternating-current spark emission spectrographic field methods for the semiquantitative analyses of geologic materials: U.S. Geol. Survey Circ. 591, 6 p.
- Motooka, J. M., and Grimes, D. J., 1976, Analytical precision of one-sixth order semiquantitative spectrographic analyses: U.S. Geol. Survey Circ. 738, 25 p.
- Ward, F. N., Nakagawa, H. M., Harms, T. F., and Van Sickle, G. H., 1969, Atomic absorption methods of analysis useful in geochemical exploration: U.S. Geol. Survey Bull. 1289, 45 p.

Table 1.--Spectrographic and atomic absorption analyses of whole rock samples from drill hole No. 6, Rolla 1° X 2° quadrangle, Missouri.

Sample	FORM	S-FEX	S-MGX	S-CAX	S-TIX	S-MN	S-AG	S-B	S-BA	S-SE	S-CO	S-CR	S-CU	S-LA	S-MO	S-NB	S-NI
006W0010	11	.05	.03	.05	.010	100	N	15	100	N	V	N	N	N	N	N	N
006W0020	11	.15	.03	.05	.010	2,000	N	15	300	N	30	N	15	N	N	N	20
006W0030	11	.10	.05	.05	.015	500	N	15	70	N	7	N	<5	N	N	N	7
006W0040	11	.50	.07	.05	.070	1,000	N	15	70	1.0	5	<10	7	V	N	N	10
006W0050	11	.50	.07	.07	.070	2,000	N	15	100	1.0	10	<10	15	N	N	N	20
006W0060	11	.50	.07	.07	.100	5,000	N	15	100	1.5	50	<10	70	N	N	N	70
006W0070	11	.10	.03	.07	.015	1,500	N	20	100	N	10	N	15	N	N	N	15
006W0080	11	.07	.02	.05	.010	500	N	15	500	1.0	N	N	5	N	N	V	7
006W0090	11	.07	.10	.20	.010	300	N	20	50	N	V	N	<5	N	N	N	5
006W0100	11	.15	5.00	7.00	.007	150	N	15	20	N	V	N	<5	N	N	N	N
006W0110	11	.07	5.00	7.00	.007	150	N	20	300	N	N	N	<5	N	N	N	N
006W0120	11	.15	5.00	10.00	.007	100	N	15	20	N	V	N	<5	N	N	N	N
006W0130	11	.10	5.00	7.00	.007	150	N	15	20	N	V	N	5	N	N	N	5
006W0140	11	.10	5.00	10.00	.007	200	N	20	20	N	N	N	5	N	N	N	5
006W0150	11	.15	3.00	7.00	.010	500	N	20	30	N	N	N	10	N	N	N	7
006W0160	11	.10	3.00	5.00	.007	100	N	20	30	N	V	N	<5	N	N	V	N
006W0170	11	.07	1.50	2.00	.007	70	N	20	30	N	N	N	<5	N	N	N	N
006W0180	11	.07	2.00	5.00	.007	100	N	20	30	N	V	N	<5	N	N	N	N
006W0190	11	.10	2.00	3.00	.007	100	N	20	50	N	N	N	<5	N	N	N	N
006W0200	11	.10	1.50	3.00	.010	200	N	20	50	N	N	N	<5	N	N	N	N
006W0210	11	.15	1.50	3.00	.010	1,000	N	20	50	N	N	N	7	N	N	N	7
006W0220	11	.15	2.00	5.00	.010	300	N	20	30	N	N	N	5	N	N	N	5
006W0230	11	.15	2.00	5.00	.010	300	N	20	30	N	N	N	5	N	N	N	N
006W0240	11	.30	2.00	5.00	.010	700	N	20	30	N	V	N	7	N	N	N	N
006W0250	11	.07	2.00	5.00	.007	70	N	20	20	N	N	N	<5	N	N	N	N
006W0260	11	.10	2.00	5.00	.007	100	N	20	20	N	N	N	<5	N	N	N	N
006W0270	11	.07	2.00	3.00	.007	100	N	30	20	N	N	N	<5	N	N	N	N
006W0280	11	.10	3.00	10.00	.010	200	N	20	20	N	V	N	<5	V	N	N	N
006W0290	11	.07	5.00	10.00	.010	100	N	20	30	N	V	N	<5	N	N	N	N
006W0300	6	.10	5.00	10.00	.007	150	N	20	20	N	V	N	5	N	N	N	N
006W0310	6	.10	7.00	15.00	.007	300	N	10	20	N	N	N	5	N	N	N	N
006W0320	5	.15	7.00	15.00	.007	150	N	15	20	N	V	N	<5	N	N	N	N
006W0330	6	.15	7.00	15.00	.007	150	N	15	20	V	V	N	<5	N	N	N	N
006W0340	6	.15	5.00	10.00	.007	100	N	15	20	N	N	N	7	N	N	N	N
006W0350	6	.15	7.00	15.00	.007	150	N	15	30	N	N	N	5	N	N	N	N
006W0360	6	.15	5.00	15.00	.005	100	N	15	20	N	V	N	<5	V	N	N	N
006W0370	6	.10	7.00	15.00	.007	150	N	15	20	N	N	N	<5	N	N	N	N
006W0380	6	.10	7.00	20.00	.005	150	N	10	20	N	V	N	<5	N	N	N	N
006W0390	6	.10	7.00	15.00	.007	150	N	15	20	N	V	N	5	N	N	N	N
006W0400	6	.15	5.00	10.00	.005	100	N	10	20	N	V	N	<5	V	N	V	N
006W0410	6	.15	7.00	15.00	.007	150	N	10	20	V	N	N	<5	N	N	N	N
006W0420	6	.15	5.00	15.00	.007	100	N	15	20	N	N	N	<5	V	N	N	N
006W0430	6	.10	7.00	15.00	.005	150	N	10	20	N	N	N	<5	N	N	N	N
006W0440	6	.15	3.00	7.00	.005	100	N	20	20	V	V	N	<5	N	N	N	N
006W0450	6	.10	5.00	7.00	.007	150	N	15	20	V	V	N	<5	N	N	N	N

Table 1.--Spectrographic and atomic absorption analyses of whole rock samples from drill hole No. 6, Rolla 1° X 2° quadrangle, Missouri.--continued

sample	S-PB	S-SC	S-SR	S-V	S-Y	S-ZR	AA-ZN-P
006W0010	N	N	N	15	N	N	<5
006W0020	N	S	N	20	N	10	20
006W0030	N	N	N	15	<10	20	10
006W0040	N	S	N	50	20	50	25
006W0050	N	S	N	50	15	30	40
006W0060	N	S	N	50	15	30	70
006W0070	N	<5	N	20	<10	15	25
006W0080	N	N	N	15	N	N	10
006W0090	N	N	N	15	N	N	10
006W0100	N	N	N	15	N	N	5
006W0110	N	N	N	15	N	N	<5
006W0120	N	N	N	20	N	N	<5
006W0130	N	N	N	15	N	N	5
006W0140	N	N	N	20	N	N	10
006W0150	N	N	N	20	N	N	10
006W0160	N	N	N	20	N	N	5
006W0170	N	N	N	15	N	N	<5
006W0180	N	N	N	15	N	N	5
006W0190	N	N	N	15	N	N	<5
006W0200	N	N	N	15	N	N	5
006W0210	N	N	N	20	N	N	10
006W0220	N	N	N	20	N	N	5
006W0230	N	N	N	20	N	N	5
006W0240	N	N	N	20	N	N	5
006W0250	N	N	N	20	N	N	<5
006W0260	N	N	N	20	N	N	<5
006W0270	N	N	N	20	N	N	5
006W0280	N	N	N	20	N	N	<5
006W0290	N	N	N	15	N	N	<5
006W0300	N	N	N	10	N	N	<5
006W0310	N	N	N	15	N	N	<5
006W0320	N	N	N	15	N	N	10
006W0330	N	N	N	15	N	N	5
006W0340	N	N	N	15	N	N	<5
006W0350	N	N	N	15	N	N	5
006W0360	N	N	N	10	N	N	<5
006W0370	N	N	N	15	N	N	5
006W0380	15	N	N	15	N	N	<5
006W0390	N	N	N	15	N	N	10
006W0400	10	N	N	10	N	N	5
006W0410	N	N	N	15	N	N	15
006W0420	N	N	N	15	N	N	10
006W0430	N	N	N	15	N	N	10
006W0440	N	N	N	10	N	N	5
006W0450	N	N	N	10	N	N	5

Table 1.--Spectrographic and atomic absorption analyses of whole rock samples from drill hole No. 6, Rolla 1° X 2° quadrangle, Missouri.--
continued.

sample	FORM	S-FEX	S-MG%	S-CA%	S-TIX	S-MN	S-AG	S-B	S-BA	S-BE	S-CO	S-CR	S-CU	S-LA	S-MO	S-NB	S-NI
006W0460	6	.10	5.00	10.00	.007	150	N	15	20	N	N	N	<5	N	N	N	N
006W0470	6	.10	5.00	7.00	.007	100	N	20	20	N	N	N	<5	N	N	N	C
006W0480	6	.15	5.00	10.00	.007	100	N	15	20	N	N	N	<5	N	N	N	C
006W0490	5	.15	5.00	7.00	.010	150	N	20	20	N	N	N	<5	N	N	N	C
006W0500	6	.20	5.00	10.00	.007	150	N	15	20	N	N	N	<5	N	N	N	C
006W0510	6	.20	5.00	15.00	.005	150	N	10	N	N	N	N	<5	N	N	N	C
006W0520	6	.15	5.00	10.00	.005	150	N	15	20	N	N	N	<5	N	N	N	C
006W0530	6	.10	7.00	15.00	.007	150	N	10	20	N	N	N	<5	N	N	N	C
006W0540	6	.15	5.00	10.00	.007	150	N	15	20	N	N	N	<5	N	N	N	C
006W0550	6	.15	7.00	10.00	.015	300	N	10	30	<1.0	N	N	5	N	N	N	C
006W0560	6	.10	7.00	15.00	.007	200	N	<10	20	N	N	N	<5	N	N	N	C
006W0570	6	.10	7.00	15.00	.007	150	N	10	N	N	N	N	<5	N	N	N	C
006W0580	6	.10	7.00	15.00	.010	200	N	10	20	N	N	N	<5	N	N	N	C
006W0590	6	.10	5.00	20.00	.010	300	N	<10	N	N	N	N	<5	N	N	N	C
006W0600	6	.10	7.00	15.00	.007	200	N	<10	N	N	N	N	<5	N	N	N	C
006W0610	6	.07	5.00	15.00	.007	100	N	<10	N	N	N	N	<5	N	N	N	C
006W0620	6	.10	5.00	15.00	.007	150	N	<10	N	N	N	N	<5	N	N	N	C
006W0630	6	<.05	2.00	10.00	.002	20	N	N	N	N	N	N	<5	N	N	N	C
006W0640	6	.07	3.00	15.00	.003	70	N	<10	N	N	N	N	<5	N	N	N	C
006W0650	6	.07	5.00	15.00	.007	150	N	<10	20	N	N	N	<5	N	N	N	C
006W0660	6	.07	3.00	15.00	.005	70	N	N	N	N	N	N	<5	N	N	N	C
006W0670	6	.10	5.00	15.00	.005	70	N	N	N	N	N	N	5	N	N	N	C
006W0680	6	.10	5.00	15.00	.005	100	N	N	N	N	N	N	5	N	N	N	C
006W0690	6	.10	5.00	10.00	.007	150	N	10	20	N	N	N	5	N	N	N	C
006W0700	6	.20	5.00	15.00	.020	300	N	10	30	1.0	N	10	5	N	N	S	C
006W0710	6	.20	3.00	5.00	.007	200	N	10	30	N	5	<10	7	N	N	S	C
006W0720	6	.15	5.00	10.00	.010	100	N	<10	20	N	N	10	<5	N	N	N	C
006W0730	6	.20	5.00	10.00	.010	200	N	10	20	N	N	10	7	N	N	S	C
006W0740	6	.20	5.00	15.00	.010	300	N	N	50	N	N	10	5	N	N	N	C
006W0750	6	.15	5.00	15.00	.007	300	N	N	50	N	N	10	5	N	N	N	C
006W0760	5	.20	7.00	20.00	.015	500	N	<10	20	N	N	15	5	N	S	N	C
006W0770	5	.20	7.00	15.00	.020	150	N	<10	20	N	N	15	5	N	S	N	C
006W0780	5	.20	7.00	15.00	.015	300	N	<10	20	N	N	10	<5	N	S	N	C
006W0790	5	.10	7.00	15.00	.007	150	N	<10	<20	N	N	<10	5	N	N	N	C
006W0800	5	.15	7.00	15.00	.007	150	N	<10	<20	N	N	10	<5	N	N	N	C
006W0810	5	.15	7.00	15.00	.007	200	N	<10	<20	N	N	<10	5	N	N	N	C
006W0820	5	.15	7.00	15.00	.007	200	N	<10	N	N	N	<10	<5	N	N	N	C
006W0830	4	.30	7.00	15.00	.050	300	N	20	30	N	N	20	<5	N	N	N	C
006W0840	4	.20	7.00	15.00	.030	200	N	15	20	1.0	N	20	5	N	N	S	C
006W0850	4	.30	7.00	15.00	.030	500	N	15	20	1.0	N	15	5	N	S	S	C
006W0860	4	.50	7.00	15.00	.070	300	N	50	30	1.5	N	20	5	N	<5	7	
006W0870	4	.50	7.00	15.00	.070	300	N	50	20	1.5	S	20	7	S	N	10	
006W0880	4	.30	7.00	20.00	.030	300	N	15	<20	1.0	N	15	5	S	N	5	
006W0890	4	.30	7.00	20.00	.010	500	N	10	N	N	N	7	N	N	N	N	
006W0900	4	.70	7.00	20.00	.020	300	N	15	20	1.0	N	10	5	N	N	5	

Table 1.--Spectrographic and atomic absorption analyses of whole rock samples from drill hole No. 6, Rolla 1° X 2° quadrangle, Missouri.--
continued.

sample	S-PB	S-SC	S-SR	S-V	S-Y	S-ZR	AA-ZN-P
006W0460	N	N	N	10	N	N	5
006W0470	N	N	N	10	N	N	5
006W0480	N	N	N	10	N	N	5
006W0490	N	N	N	15	N	N	5
006W0500	N	N	N	10	N	N	5
006W0510	N	N	N	10	N	N	5
006W0520	N	N	N	10	N	N	<5
006W0530	N	N	N	10	N	N	10
006W0540	N	N	N	10	N	N	5
006W0550	N	N	N	20	<10	N	10
006W0560	N	N	N	<10	N	N	5
006W0570	N	N	N	10	N	N	5
006W0580	N	N	N	10	N	N	5
006W0590	N	N	N	15	N	N	5
006W0600	N	N	N	10	N	N	<5
006W0610	N	N	N	10	N	N	5
006W0620	N	N	N	10	N	N	5
006W0630	N	N	N	10	N	N	5
006W0640	N	N	N	10	N	N	5
006W0650	N	N	N	10	N	N	10
006W0660	N	N	N	10	N	N	<5
006W0670	N	N	N	<10	N	N	<5
006W0680	N	N	N	<10	N	N	<5
006W0690	N	N	N	10	N	N	10
006W0700	N	N	N	15	<10	15	10
006W0710	N	N	N	10	N	N	10
006W0720	N	N	100	<10	N	N	<5
006W0730	N	N	100	<10	N	N	10
006W0740	10	N	N	<10	N	N	10
006W0750	10	N	N	<10	N	N	15
006W0760	10	N	150	<10	N	10	10
006W0770	30	N	150	15	N	10	10
006W0780	20	N	100	15	N	10	10
006W0790	N	N	100	10	N	N	<5
006W0800	N	N	100	10	N	N	<5
006W0810	10	N	100	10	N	N	<5
006W0820	30	N	100	<10	N	N	<5
006W0830	70	N	100	10	<10	30	10
006W0840	30	N	150	10	<10	20	<5
006W0850	50	N	150	10	<10	30	<5
006W0860	50	N	100	15	10	50	<5
006W0870	70	N	150	15	10	50	<5
006W0880	50	N	150	10	<10	15	<5
006W0890	50	N	N	<10	N	N	<5
006W0900	100	N	100	<10	N	20	5

Table 1.--Spectrographic and atomic absorption analyses of whole rock samples from drill hole No. 6, Rolla 1° X 2° quadrangle, Missouri.--
continued.

sample	FORM	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AG	S-B	S-BA	S-BE	S-CO	S-CR	S-CU	S-LA	S-MO	S-NB	S-NI
006W0910	4	.50	7.00	20.00	.020	500	N	15	<20	<1.0	N	10	5	N	N	5	
006W0920	4	.70	7.00	20.00	.020	500	N	10	<20	1.0	N	<10	<5	N	N	<5	
006W0930	4	.70	7.00	20.00	.015	500	1.0	10	<20	1.0	5	<10	7	N	N	5	
006W0940	4	.50	7.00	20.00	.020	500	.5	10	20	1.0	V	<10	<5	N	N	<5	
006W0950	4	.70	7.00	15.00	.030	300	.5	10	30	1.0	V	15	<5	N	N	5	
006W0960	4	1.00	7.00	15.00	.020	500	.7	10	50	1.0	5	N	5	\$5	N	7	
006W0970	4	.70	7.00	20.00	.015	1,000	.5	<10	20	1.0	5	N	5	N	N	5	
006W0980	4	.70	7.00	20.00	.020	500	.5	10	20	1.5	5	10	5	V	V	5	
006W0990	13	2.00	3.00	7.00	.150	300	1.0	70	200	3.0	20	20	10	30	10	<20	20
006W1000	1	.30	.30	1.00	.100	100	N	10	700	3.0	N	N	<5	50	N	N	N

Table 1.--Spectrographic and atomic absorption analyses of whole rock samples from drill hole No. 6, Rolla 1° X 2° quadrangle, Missouri.--
continued.

sample	S-PB	S-SC	S-SR	S-V	S-Y	S-ZR	AA-ZN-P
006W0910	70	N	150	<10	N	20	10
006W0920	100	N	150	<10	N	15	<5
006W0930	150	N	100	<10	N	15	20
006W0940	50	N	150	<10	10	20	<5
006W0950	70	N	150	10	15	70	<5
006W0960	150	N	100	<10	15	70	<5
006W0970	70	N	100	<10	10	50	<5
006W0980	70	N	100	20	10	50	<5
006W0990	300	5	100	30	50	300	5
006W1000	10	7	N	10	50	300	5

Table 2.--Spectrographic and atomic absorption analyses of insoluble residue samples from drill hole No. 6, Rolla 1° X 2° quadrangle, Missouri.--continued.

sample	FORM	S-FEX	S-MGX	S-CAX	S-TIX	S-MN	S-AG	S-AS	S-B	S-3A	S-BE	S-CO	S-CR	S-CU	S-LA	S-MO	S-NI
00610010	11	.07	.03	.07	.010	100	N	N	10	70	V	N	N	<5	N	V	N
00610020	11	.10	<.02	<.05	.007	200	N	N	10	100	V	7	N	<5	N	N	<5
00610030	11	.10	.02	<.05	.010	300	N	N	10	70	N	5	N	<5	N	N	S
00610040	11	.10	.02	<.05	.010	300	N	N	<10	30	V	5	N	<5	N	N	S
00610050	11	.30	.03	<.05	.030	1,500	N	N	10	50	V	10	<10	15	N	N	20
00610060	11	.70	.05	.05	.070	5,000	N	N	10	150	1.0	70	10	70	N	N	70
00610070	11	.07	.02	.05	.007	500	N	N	15	30	V	N	N	5	N	N	S
00610080	11	.05	<.02	.05	.007	1,000	N	N	15	50	V	10	N	7	N	N	10
00610090	11	.07	.03	.07	.007	150	N	N	20	30	N	N	N	<5	N	V	<5
00610100	11	.05	.02	.05	.003	30	N	N	15	20	V	N	N	N	N	N	N
00610110	11	.05	.05	.10	.005	10	N	N	20	30	N	N	N	N	N	N	N
00610120	11	.05	.02	.07	.007	20	N	N	10	30	N	N	N	N	N	V	N
00610130	11	.05	.02	.05	.005	20	N	N	10	20	N	N	N	N	N	N	N
00610140	11	.05	.03	.07	.005	20	N	N	15	30	V	N	N	V	N	N	N
00610150	11	.07	.02	.05	.005	50	N	N	10	20	V	N	N	<5	N	N	N
00610160	11	.07	.02	.05	.005	200	N	N	15	30	N	N	N	<5	N	N	S
00610170	11	<.05	.02	.05	.005	10	N	N	15	30	V	N	N	<5	N	N	N
00610180	11	.05	.02	.05	.005	10	N	N	15	20	N	N	N	<5	N	N	N
00610190	11	.05	.02	.05	.005	150	N	N	15	30	V	N	N	<5	N	V	S
00610200	11	.05	.02	.05	.005	100	N	N	15	30	N	N	N	<5	N	N	N
00610210	11	.05	.02	.05	.007	150	N	N	15	20	N	N	N	<5	N	N	N
00610220	11	.10	.02	.05	.005	2,000	N	N	15	30	N	50	N	20	N	N	50
00610230	11	.10	.05	.10	.007	1,000	N	N	20	70	V	5	N	<5	N	N	15
00610240	11	.05	.03	.07	.007	150	N	N	20	50	N	N	N	<5	N	N	<5
00610250	11	.07	.03	.05	.005	20	N	N	20	20	N	N	N	N	N	N	N
00610260	11	.05	.03	.15	.007	70	N	N	30	30	V	N	N	<5	N	V	N
00610270	11	.05	.10	.07	.005	30	N	N	20	30	N	N	N	N	N	V	N
00610280	11	<.05	.05	.07	.007	15	N	N	20	20	N	N	N	N	N	N	N
00610290	11	<.05	.05	.10	.005	20	N	N	20	20	V	N	N	N	N	N	N
00610300	6	.05	.10	.07	.005	20	N	N	20	20	N	N	N	V	N	N	N
00610310	6	.07	.05	<.05	.007	50	N	N	20	30	N	N	N	<5	N	N	N
00610320	6	.10	<.02	<.05	.002	150	N	N	20	20	V	N	N	<5	N	N	S
00610330	6	.05	.02	<.05	.005	30	N	N	20	30	V	N	N	N	N	V	N
00610340	6	.07	<.02	<.05	.002	15	N	N	20	20	N	N	N	<5	N	N	N
00610350	6	.05	<.02	<.05	<.002	20	N	N	20	20	V	N	N	N	N	N	N
00610360	6	.05	<.02	<.05	<.002	20	N	N	20	20	N	N	N	N	N	N	N
00610370	6	.05	.02	<.05	.002	150	N	N	20	30	N	N	N	<5	N	N	N
00610380	6	.07	.02	<.05	<.002	30	N	N	20	30	N	N	N	N	N	N	N
00610390	6	.10	<.02	<.05	<.002	50	N	N	20	30	V	N	N	<5	N	N	N
00610400	6	.07	<.02	<.05	<.002	20	N	N	20	20	N	N	N	<5	N	N	N
00610410	6	.07	<.02	<.05	<.002	50	N	N	20	<20	N	N	N	<5	N	N	N
00610420	6	.05	.02	<.05	.002	30	N	N	20	20	N	N	N	<5	N	N	N
00610430	6	.05	<.02	<.05	<.002	30	N	N	20	20	V	N	N	<5	N	V	N
00610440	6	<.05	.02	.05	.002	50	N	N	20	30	N	N	N	N	N	N	N
00610450	6	.07	.03	.05	.007	150	N	N	20	70	N	N	N	<5	N	V	<5

Table 2.--Spectrographic and atomic absorption analyses of insoluble residue samples from drill hole No. 6, Rolla 1° X 2° quadrangle, Missouri.--continued.

sample	S-PB	S-SC	S-V	S-Y	S-ZN	S-ZR	AA-ZN-P
00610010	N	N	<10	N	N	N	<5
00610020	N	N	<10	N	N	N	--
00610030	N	N	<10	<10	N	30	5
00610040	N	N	<10	<10	N	20	5
00610050	N	S	20	10	N	20	35
00610060	N	7	30	15	200	30	50
00610070	N	N	N	N	N	N	10
00610080	N	N	N	N	N	N	15
00610090	N	N	<10	N	N	N	5
00610100	N	N	N	N	N	N	5
00610110	N	N	<10	N	N	N	5
00610120	N	N	10	N	N	N	5
00610130	N	N	<10	N	N	N	5
00610140	N	N	<10	N	N	N	5
00610150	N	N	<10	N	N	N	5
00610160	N	N	<10	N	N	N	5
00610170	N	N	<10	N	N	N	<5
00610180	N	N	<10	N	N	N	<5
00610190	N	N	<10	N	N	N	5
00610200	N	N	<10	N	N	N	<5
00610210	N	N	<10	N	N	N	5
00610220	N	N	<10	N	N	10	85
00610230	N	N	10	N	N	N	20
00610240	N	N	10	N	N	N	5
00610250	N	N	10	N	N	N	<5
00610260	N	N	10	N	N	N	<5
00610270	N	N	15	N	N	N	<5
00610280	N	N	15	N	N	N	<5
00610290	N	N	10	N	N	N	<5
00610300	N	N	10	N	N	N	<5
00610310	N	N	10	N	N	N	<5
00610320	N	N	10	N	N	N	<5
00610330	N	N	10	N	N	N	<5
00610340	N	N	10	N	N	N	<5
00610350	N	N	10	N	N	N	<5
00610360	N	N	10	N	N	N	<5
00610370	N	N	10	N	N	N	5
00610380	N	N	10	N	N	N	<5
00610390	N	N	10	N	N	N	<5
00610400	N	N	10	N	N	N	<5
00610410	N	N	<10	N	N	N	<5
00610420	N	N	10	N	N	N	<5
00610430	N	N	<10	N	N	N	<5
00610440	N	N	10	N	N	N	<5
00610450	N	N	<10	N	N	N	<5

Table 2.--Spectrographic and atomic absorption analyses of insoluble residue samples from drill hole No. 6, Rolla 1° X 2° quadrangle, Missouri.--continued.

sample	FORM	S-FEZ	S-MGX	S-CAX	S-TIX	S-MN	S-AG	S-AS	S-B	S-3A	S-BE	S-CO	S-CR	S-CU	S-LA	S-MO	S-NI
00610460	6	.05	.02	<.05	.002	30	N	N	20	20	V	N	N	N	N	N	N
00610470	6	<.05	.02	<.05	<.002	20	N	N	20	20	V	N	N	N	N	N	N
00610480	6	<.05	.02	<.05	<.002	50	N	N	20	20	N	N	N	V	N	N	N
00610490	6	.05	.03	.05	.003	30	N	N	30	20	V	N	N	<5	N	N	N
00610500	6	.10	.03	.05	.002	100	N	N	20	30	V	N	N	<5	N	N	N
00610510	6	.07	<.02	<.05	<.002	20	N	N	20	<20	N	N	N	N	N	N	N
00610520	6	.05	<.02	<.05	<.002	15	N	N	30	20	N	N	N	N	N	N	N
00610530	6	<.05	.02	.05	.002	70	N	N	20	30	N	N	N	V	N	N	N
00610540	6	<.05	<.02	<.05	<.002	15	N	N	30	20	N	N	N	V	N	N	N
00610550	6	.07	.03	.07	.007	300	N	N	20	50	N	N	N	<5	N	N	N
00610560	6	.07	.03	.07	.005	150	N	N	20	70	V	N	N	<5	N	V	5
00610570	6	.07	.02	<.05	.005	150	N	N	20	20	N	N	N	<5	N	N	<5
00610580	6	.05	.02	<.05	.005	300	N	N	20	50	N	N	N	<5	N	N	<5
00610590	6	.15	.05	.05	.020	500	N	N	20	50	N	S	N	7	N	N	5
00610600	6	.10	.05	.07	.015	200	N	N	20	50	N	N	N	<5	N	N	10
00610610	6	.20	.02	<.05	.005	100	N	N	20	30	N	N	N	<5	N	N	5
00610620	6	.15	.02	<.05	.005	50	N	N	20	<20	V	N	N	<5	N	N	<5
00610630	6	.07	.02	<.05	.005	100	N	N	20	30	N	N	N	<5	N	N	N
00610640	6	.07	.02	.05	.003	100	N	N	20	20	N	N	N	<5	N	N	N
00610650	6	.07	.02	.05	.002	300	N	N	20	70	V	S	N	<5	N	N	N
00610660	6	.10	.02	.05	.003	150	N	N	20	20	V	N	N	<5	N	V	N
00610670	6	.07	.03	.05	.005	150	N	N	20	50	V	N	N	<5	N	N	<5
00610680	6	.15	.03	.05	.003	150	N	N	20	50	V	N	N	<5	N	N	5
00610690	6	.20	.03	.05	.007	150	N	N	20	30	N	N	N	<5	N	V	<5
00610700	6	.20	.05	.07	.010	300	N	N	20	30	N	10	N	<5	N	V	7
00610710	6	.30	.02	.05	.005	150	N	N	10	50	V	N	N	<5	N	N	5
00610720	6	.20	.02	.05	.003	70	N	N	10	30	N	N	N	<5	N	N	<5
00610730	6	.20	.02	.05	.002	100	N	N	10	20	V	N	N	<5	N	V	<5
00610740	6	1.50	.05	.05	.020	500	N	N	10	150	2.0	10	10	5	N	V	15
00610750	6	1.50	.05	.05	.030	1,500	N	N	10	500	2.0	10	10	5	N	V	15
00610760	5	1.00	1.00	.50	.150	50	3.0	N	50	100	1.5	15	50	50	N	N	20
00610765	5	2.00	.70	.05	.150	30	N	N	30	150	1.5	20	70	20	N	15	70
00610770	5	.50	.30	.07	.150	10	.7	N	30	200	N	N	50	<5	N	N	<5
00610775	5	.70	.50	.20	.100	10	N	N	50	100	2.0	5	50	5	N	N	10
00610780	5	.07	.07	.07	.020	<10	N	N	20	70	V	N	<10	<5	N	V	N
00610790	5	<.05	.10	.20	.003	<10	N	N	15	30	N	N	N	<5	N	N	N
00610800	5	.05	2.00	1.50	.010	<10	.5	N	10	100	N	N	5	N	N	N	N
00610810	5	.10	.20	.05	.030	N	N	N	20	300	V	N	<10	<5	N	N	N
00610820	5	.20	.20	<.05	.100	N	.5	N	20	200	1.0	N	30	<5	N	V	5
00610830	4	.20	.20	<.05	.100	N	N	N	20	150	1.5	N	20	<5	N	N	5
00610840	4	1.50	.70	<.05	.200	10	.5	N	50	150	2.0	10	70	7	N	5	30
00610850	4	1.50	.30	.05	.150	30	.7	N	30	100	2.0	10	50	20	20	20	20
00610860	4	2.00	.70	<.05	.300	10	N	N	100	70	3.0	10	100	15	30	5	30
00610870	4	5.00	1.00	.10	.200	30	.7	N	100	50	2.0	20	70	30	20	20	70
00610880	4	10.00	1.00	.10	.300	50	.5	N	100	50	5.0	50	100	100	N	50	150

Table 2.--Spectrographic and atomic absorption analyses of insoluble residue samples from drill hole No. 6, Rolla 1° X 2° quadrangle, Missouri.--continued

sample	S-PB	S-SC	S-V	S-Y	S-ZN	S-ZR	AA-ZN-P
00610460	N	N	<10	N	N	N	<5
00610470	N	N	<10	N	N	N	<5
00610480	N	N	<10	N	N	N	<5
00610490	N	N	<10	N	N	N	<5
00610500	N	N	<10	N	N	N	<5
00610510	N	N	<10	N	N	N	<5
00610520	N	N	<10	N	N	N	<5
00610530	N	N	<10	N	N	N	<5
00610540	N	N	<10	N	N	N	<5
00610550	N	N	<10	N	N	N	5
00610560	50	N	<10	N	N	N	<5
00610570	N	N	<10	N	N	N	<5
00610580	N	N	<10	N	N	N	10
00610590	N	N	10	N	N	10	20
00610600	N	N	10	N	N	10	10
00610610	N	N	10	N	N	N	<5
00610620	N	N	<10	N	N	N	<5
00610630	N	N	<10	N	N	N	<5
00610640	N	N	<10	N	N	N	<5
00610650	N	N	<10	N	N	N	5
00610660	N	N	<10	N	N	N	5
00610670	N	N	<10	N	N	N	5
00610680	N	N	<10	N	N	N	5
00610690	N	N	<10	N	N	N	5
00610700	N	N	<10	N	N	N	10
00610710	N	N	<10	N	N	N	<5
00610720	N	N	<10	N	N	N	<5
00610730	N	N	<10	N	N	N	<5
00610740	N	N	20	N	N	10	30
00610750	N	N	20	N	N	20	30
00610760	50	N	20	N	N	30	--
00610765	100	N	50	N	N	50	10
00610770	N	N	30	N	N	70	--
00610775	10	N	50	N	N	50	<10
00610780	N	N	10	N	N	15	<10
00610790	N	N	<10	N	N	N	<10
00610800	10	N	<10	N	N	N	<50
00610810	20	N	10	N	N	70	<50
00610820	N	N	20	N	N	70	<50
00610830	N	N	20	N	N	70	<10
00610840	30	5	50	N	N	100	5
00610850	100	N	20	N	N	70	60
00610860	50	7	30	10	N	100	10
00610870	200	7	30	10	N	100	5
00610880	1,000	N	50	30	N	300	<50

Table 2.--Spectrographic and atomic absorption analyses of insoluble residue samples from drill hole No. 6, Rolla $1^{\circ} \times 2^{\circ}$ quadrangle, Missouri.--continued.

sample	FORM	S-FEX	S-MG%	S-CAX%	S-TIX%	S-MN	S-AG	S-AS	S-B	S-BA	S-BE	S-CO	S-CR	S-CU	S-LA	S-MO	S-NI
00610890	4	1.50	.07	.05	.030	10	.5	N	20	<20	1.5	7	N	15	N	N	30
00610900	4	3.00	.50	<.05	.200	20	.7	N	50	150	2.0	20	50	20	20	15	70
00610910	4	5.00	.70	.05	.200	20	.5	N	100	70	3.0	15	70	50	N	20	70
00610920	4	7.00	.30	<.05	.150	20	3.0	N	70	50	3.0	20	30	30	N	20	70
00610930	4	15.00	.15	.05	.100	70	15.0	200	20	150	2.0	100	20	70	N	20	150
00610940	4	2.00	.15	<.05	.070	15	2.0	N	20	150	1.5	10	10	20	N	5	30
00610950	4	2.00	.15	<.05	.100	15	2.0	N	20	200	1.5	20	15	20	N	7	50
00610960	4	1.50	.20	.20	.030	10	.7	N	10	150	N	10	N	7	N	5	20
00610970	4	1.00	.05	<.05	.020	<10	N	N	10	100	N	10	N	5	N	7	15
00610980	4	3.00	.20	.05	.100	15	1.5	N	20	200	3.0	20	15	15	N	N	30
00610990	13	1.50	.30	.10	.150	15	<.5	N	30	150	2.0	15	15	15	30	5	30

Table 2.--Spectrographic and atomic absorption analyses of insoluble residue samples from drill hole No. 6, Rolla 1° X 2° quadrangle, Missouri.--continued.

sample	S-PB	S-SC	S-V	S-Y	S-ZN	S-ZR	AA-ZN-P
00610890	100	N	<10	10	N	100	<100
00610900	200	5	30	10	N	100	10
00610910	300	5	30	15	200	150	100
00610920	700	5	20	15	<200	150	140
00610930	1,500	N	10	20	<200	150	50
00610940	300	N	<10	15	N	100	20
00610950	300	N	<10	<10	N	70	<10
00610960	100	N	<10	15	N	100	10
00610970	30	N	<10	<10	N	70	20
00610980	300	N	30	20	N	200	10
00610990	70	5	20	30	N	200	5

