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Spectrographic analyses of insoluble-residue samples, Joplin 1° x 2° quadrangle, Kansas and Missouri: Drill hole nos. 16, 17, and 18

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INTRODUCTION

Geochemical studies of the Joplin 1° x 2° quadrangle, Missouri and Kansas, were begun in 1983 as part of a multidisciplinary study of the quadrangle by the U.S. Geological Survey, the Missouri Division of Geology and Land Survey, and the Kansas Geological Survey. The purpose of the study was to assess the mineral resource potential of the area by integrated geologic, geochemical, and geophysical studies.

The geochemical work has been directed at the characterization of the sedimentary rocks in the quadrangle through spectrographic analyses of dilute-hydrochloric-acid insoluble-residue samples of whole rock from widely-spaced drill holes. Drill holes have been selected for study from the sample libraries of the Missouri Division of Geology and Land Survey and the Kansas Geological Survey (KGS). None of the holes are company confidential and none intersect economically significant mineralized ground.

The analytical results for drill hole no. 16 (#10 Lauber "A" - KGS), drill hole no. 17 (#1 J.Dowling - KGS),and drill hole no. 18 (#1 Froelich - KGS) are given in this report. Drill hole no. 16 is located in sec. 19, T. 26 S., R. 15 E. in Woodson County, Kansas; drill hole no. 17 is located in sec. 8, T. 28 S., R. 22 E. in Crawford County, Kansas; drill hole no. 18 is located in sec. 13, T. 29 S., R. 13 E. in Wilson County, Kansas (fig.1). Data for the insoluble-residue samples from drill holes 16, 17, and 18 are listed in tables 1, 2, and 3 respectively. Well name, well number, township, range, and county allow for identification and location of files at the Kansas Geological Survey.

PREPARATION AND ANALYSIS OF SAMPLES

Insoluble residues were prepared by dissolving approximately 80 grams of crushed carbonate rock in repeated applications of 1:5 hydrochloric acid until the carbonate was removed. The samples were then filtered and dried overnight at 50 °C.

The samples were pulverized to minus 140 mesh (0.105 mm) in a vertical grinder equipped with ceramic plates. Some insoluble-residue samples contained only a few milligrams of material, and these were hand ground with 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 have been present.

Each sample was analyzed semiquantitatively for 31 elements using a six-step D.C.-arc optical-emission spectrographic method (Grimes and Marranzino, 1968).

The semiquantitative spectrographic values are reported as six steps per order of magnitude (1, 0.7, 0.5, 0.3, 0.2, and 0.15) 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 value 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 for this report are as follows:

<u>For those given in percent</u>:

Calcium	0.05
Iron	0.05
Magnesium	0.02
Titanium	0.002

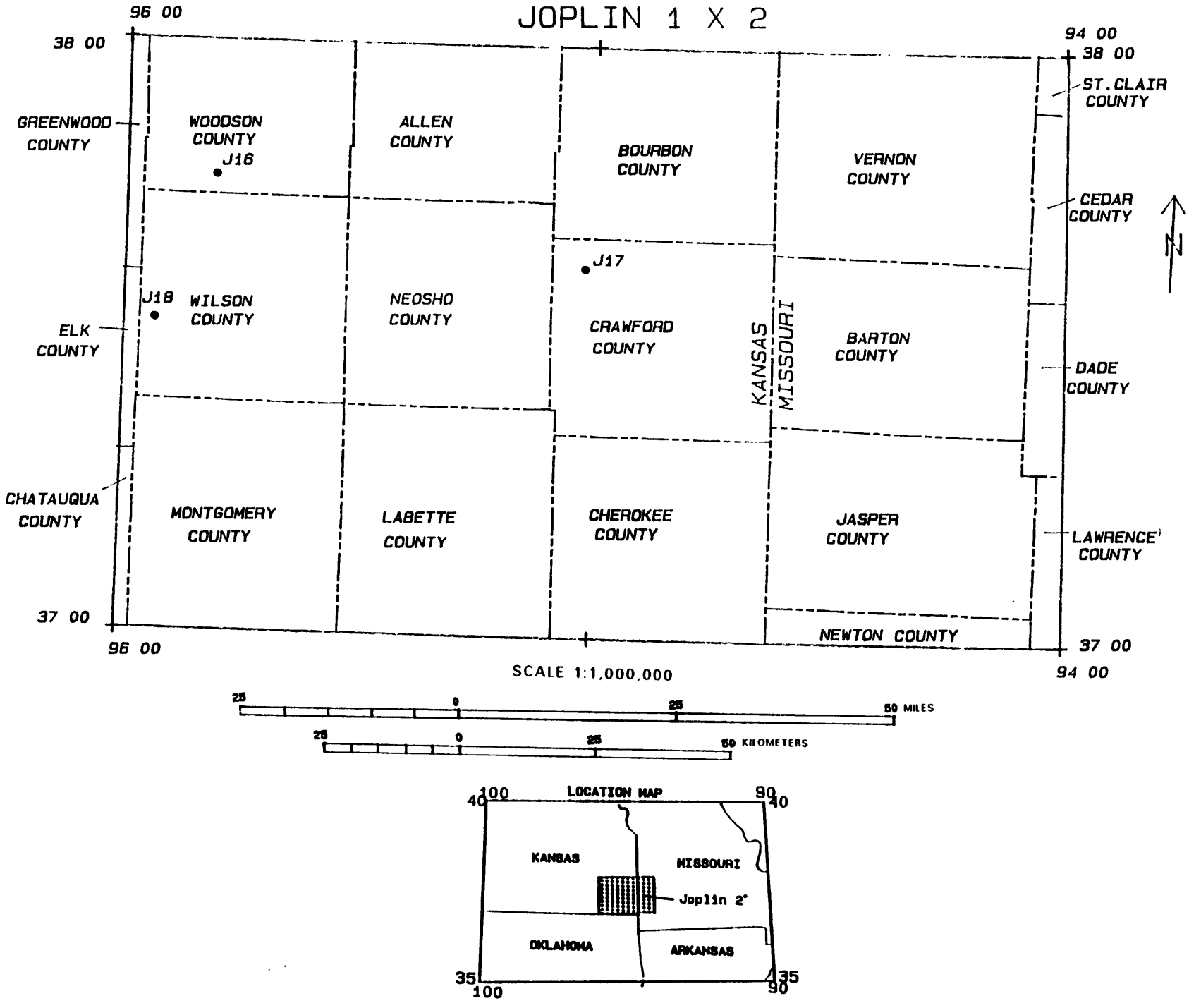

Figure 1. Locations of drill holes 16, 17, and 18, Joplin 1° x 2° quadrangle, Missouri and Kansas.

For those given in ppm:

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

DESCRIPTION OF DATA TABLES

Each sample is identified by an eight-character code beginning with the letter J, signifying Joplin. The next number signifies the USGS drill-hole number. The letter R appears after the drill hole number and signifies insoluble residue. The next four digits identify the depth of the sample from the drill-hole collar. Most samples are composites of approximate 10-foot intervals, dependent upon the original sample intervals and upon the amount of sample material available for analysis.

The stratigraphic unit of the sample is identified by a coded number in the last column of tables 1 through 3. The code and formation names are as follows:

Code	Formation
60	Ordovician Undifferentiated
78	Cambro - Ordovician Undifferentiated
80	Cambrian Undifferentiated
90	Precambrian Undifferentiated

EXPLANATION OF DATA

The columns in tables 1 through 3 have headings of sample, elements, and formation. The letter S over the columns signifies emission-spectrographic data.

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

N = Not detected at the limit of determination;
< = Detected, but below the limit of determination shown; and
> = Greater than the limit of determination shown.

Because of the formatting used in the computer program that produced tables 1-3, some of the elements listed in these tables (Fe, Mg, Ca, Ti, Ag, and Be) carry one or more nonsignificant zeros to the right of the significant digits.

The analyst did not determine these elements to the accuracy suggested by the extra zeros.

RASS

Upon completion of all analytical work, the information from the samples is entered into a computer-based file called RASS (Rock Analysis Storage System). This RASS file contains both descriptive geological information and analytical data. Any or all of this information may be retrieved and placed in a standard form (STATPAC) for computerized statistical manipulation or publication (VanTrump and Miesch, 1977).

ACKNOWLEDGMENTS

The authors wish to thank the Kansas Geological Survey, Dr. Lee C. Gerhart, State Geologist, and his staff, for making the drill-hole samples available from their sample libraries.

REFERENCES

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Motooka, J.M., and Grimes, D.J., 1976, Analytical precision of one-sixth order semiquantitative spectrographic analyses: U.S. Geological Survey Circular 738, 25 p.

VanTrump, George, Jr., and Miesch, A.T., 1977, The U.S. Geological Survey RASS-STATPAC system for management and statistical reduction of Geochemical data: Computers and Geosciences, v. 3, p. 475-488.

TABLE 1--SPECTROGRAPHIC ANALYSES OF INSOLUBLE RESIDUE SAMPLES FROM DRILL HOLE NO. 16, JOPLIN 1 x 2 QUADRANGLE, MISSOURI AND KANSAS.

[N, not detected; <, detected but below the limit of determination shown; >, determined to be greater than the value shown.]

Sample	Latitude	Longitude	Fe-pct. s	Mg-pct. s	Ca-pct. s	Ti-pct. s	Mn-ppm s	Ag-ppm s	As-ppm s	Au-ppm s
J16R1960	37 46 13	95 48 43	.5	.15	<.05	.100	15	N	N	N
J16R2000	37 46 13	95 48 43	2.0	.70	<.05	.300	70	N	N	N
J16R2035	37 46 13	95 48 43	1.5	.50	.05	.300	70	N	N	N
J16R2080	37 46 13	95 48 43	1.0	.30	.05	.200	50	N	N	N
J16R2120	37 46 13	95 48 43	2.0	.70	<.05	.300	70	N	N	N
J16R2140	37 46 13	95 48 43	1.5	.50	.05	.300	50	N	N	N
J16R2170	37 46 13	95 48 43	1.0	.15	.05	.150	150	N	N	N
J16R2200	37 46 13	95 48 43	.1	.10	.10	.020	<10	N	N	N
J16R2230	37 46 13	95 48 43	.5	.07	.05	.010	10	N	N	N
J16R2260	37 46 13	95 48 43	.7	.05	.05	.015	10	N	N	N
J16R2290	37 46 13	95 48 43	1.5	2.00	5.00	.015	70	N	N	N
J16R2320	37 46 13	95 48 43	.2	.02	<.05	.002	<10	N	N	N
J16R2340	37 46 13	95 48 43	.5	.02	.10	.005	15	N	N	N
J16R2360	37 46 13	95 48 43	2.0	.70	.30	.300	300	N	N	N
J16R2380	37 46 13	95 48 43	.7	.05	<.05	.030	30	N	N	N
J16R2400	37 46 13	95 48 43	.3	.10	.10	.050	20	N	N	N
J16R2420	37 46 13	95 48 43	2.0	10.00	20.00	.005	150	N	N	N
J16R2450	37 46 13	95 48 43	1.0	>10.00	<.05	.003	200	N	N	N
J16R2495	37 46 13	95 48 43	5.0	.20	.07	.100	100	N	N	N
J16R2530	37 46 13	95 48 43	2.0	.07	.05	.015	70	N	N	N
J16R2550	37 46 13	95 48 43	.2	.03	<.05	.010	10	N	N	N
J16R2570	37 46 13	95 48 43	5.0	.20	<.05	.100	50	N	N	N
J16R2590	37 46 13	95 48 43	3.0	.30	<.05	.150	70	N	N	N
J16R2610	37 46 13	95 48 43	5.0	.70	<.05	.150	70	1.5	N	N
J16R2630	37 46 13	95 48 43	1.0	.10	<.05	.070	15	N	N	N
J16R2650	37 46 13	95 48 43	.5	.03	<.05	.020	10	N	N	N
J16R2655	37 46 13	95 48 43	1.0	.20	.20	.100	50	<.5	N	N

TABLE 1--SPECTROGRAPHIC ANALYSES OF INSOLUBLE RESIDUE SAMPLES FROM DRILL HOLE NO. 16, JOPLIN 1 x 2 QUADRANGLE, MISSOURI AND KANSAS.--Continued

Sample	B-ppm s	Ba-ppm s	Be-ppm s	Bi-ppm s	Cd-ppm s	Co-ppm s	Cr-ppm s	Cu-ppm s	La-ppm s	Mo-ppm s	Nb-ppm s	Ni-ppm s
J16R1960	100	100	1.0	N	N	N	20	<5	N	N	N	5
J16R2000	200	150	2.0	N	N	10	100	15	30	N	N	50
J16R2035	150	200	2.0	N	N	7	70	15	50	N	N	30
J16R2080	150	150	1.5	N	N	N	70	10	20	N	N	20
J16R2120	200	150	2.0	N	N	15	150	20	30	N	N	50
J16R2140	200	200	2.0	N	N	10	100	1,000	20	N	N	50
J16R2170	70	1,000	<1.0	N	N	N	10	150	N	N	N	7
J16R2200	70	300	N	N	N	N	N	5	N	N	N	5
J16R2230	30	2,000	N	N	N	N	N	150	N	N	N	N
J16R2260	50	100	N	N	N	N	N	<5	N	N	N	N
J16R2290	30	50	N	N	N	N	N	10	N	N	N	5
J16R2320	20	20	N	N	N	N	N	15	N	N	N	5
J16R2340	70	150	N	N	N	N	30	20	N	N	N	N
J16R2360	100	300	2.0	N	N	20	50	15	20	N	N	50
J16R2380	50	30	<1.0	N	N	N	N	<5	N	N	N	5
J16R2400	70	30	<1.0	N	N	N	N	5	N	N	N	5
J16R2420	50	70	N	N	N	N	N	7	N	7	N	N
J16R2450	30	<20	N	N	N	N	N	5	N	5	N	N
J16R2495	100	50	2.0	N	N	7	15	30	N	30	N	50
J16R2530	50	150	<1.0	N	N	10	30	30	N	7	N	20
J16R2550	10	30	N	N	N	70	50	<5	N	N	N	N
J16R2570	20	200	2.0	N	N	50	200	30	N	10	N	30
J16R2590	70	200	2.0	N	N	20	70	50	20	10	N	30
J16R2610	150	500	2.0	N	N	20	30	30	20	10	N	15
J16R2630	50	70	1.0	N	N	N	N	5	N	N	N	N
J16R2650	10	70	<1.0	N	N	N	N	<5	N	N	N	N
J16R2655	30	1,000	2.0	N	N	N	N	5	N	N	N	5

TABLE 1--SPECTROGRAPHIC ANALYSES OF INSOLUBLE RESIDUE SAMPLES FROM DRILL HOLE NO. 16, JOPLIN 1 x 2 QUADRANGLE, MISSOURI AND KANSAS.--Continued

Sample	Pb-ppm s	Sb-ppm s	Sc-ppm s	Sn-ppm s	Sr-ppm s	V-ppm s	W-ppm s	Y-ppm s	Zn-ppm s	Zr-ppm s	Th-ppm s	Form.#
J16R1960	N	N	N	N	N	30	N	N	N	70	N	60
J16R2000	10	N	15	N	N	200	N	15	N	100	N	60
J16R2035	15	N	7	N	N	150	N	30	N	100	N	60
J16R2080	15	N	5	N	N	100	N	10	N	100	N	60
J16R2120	20	N	15	N	N	200	N	20	N	150	N	60
J16R2140	20	N	10	N	5,000	150	N	20	700	150	N	60
J16R2170	N	N	N	N	>5,000	20	N	N	<200	100	N	60
J16R2200	N	N	N	N	>5,000	N	N	N	N	20	N	60
J16R2230	N	N	N	N	>5,000	N	N	N	N	15	N	60
J16R2260	N	N	N	N	5,000	N	N	N	N	15	N	60
J16R2290	N	N	N	N	700	10	N	N	N	70	N	60
J16R2320	N	N	N	N	N	N	N	N	N	10	N	80
J16R2340	N	N	10	N	3,000	N	N	N	N	50	N	80
J16R2360	10	N	N	N	200	100	50	20	N	150	N	80
J16R2380	N	N	N	N	N	N	N	N	N	70	N	80
J16R2400	N	N	N	N	N	N	N	N	N	20	N	80
J16R2420	30	N	N	N	300	20	N	N	N	N	N	80
J16R2450	15	N	N	N	100	30	N	N	N	N	N	80
J16R2495	30	N	N	N	N	70	N	N	N	100	N	80
J16R2530	20	N	N	N	1,000	10	N	N	N	50	N	80
J16R2550	N	N	N	N	N	N	N	N	N	10	N	80
J16R2570	200	N	N	N	500	10	<50	N	200	100	N	80
J16R2590	100	N	N	N	N	30	N	15	N	100	N	80
J16R2610	70	N	N	N	N	50	N	20	N	100	N	80
J16R2630	N	N	N	N	N	N	N	10	N	700	N	86
J16R2650	N	N	N	N	N	N	N	10	N	200	N	86
J16R2655	15	N	5	15	200	20	N	N	N	100	N	90

TABLF 2--SPECTROGRAPHIC ANALYSES OF INSOLUBLE RESIDUE SAMPLES FROM DRILL HOLE NO. 17, JOPLIN 1 x 2 QUADRANGLE, MISSOURI AND KANSAS.

[N, not detected; <, detected but below the limit of determination shown; >, determined to be greater than the value shown.]

Sample	Latitude	Longitude	Fe-pct. s	Mg-pct. s	Ca-pct. s	Ti-pct. s	Mn-ppm s	Ag-ppm s	As-ppm s	Au-ppm s
J17R1380	37 37 20	95 1 30	2.0	.02	<.05	.005	20	<.5	N	N
J17R1417	37 37 20	95 1 30	.7	.02	<.05	.005	15	N	N	N
J17R1515	37 37 20	95 1 30	.1	.10	.07	.003	N	N	N	N
J17R1540	37 37 20	95 1 30	1.0	.07	.05	.007	15	N	N	N
J17R1560	37 37 20	95 1 30	1.0	.03	<.05	.005	10	N	N	N
J17R1588	37 37 20	95 1 30	1.5	.05	.05	.010	30	N	N	N
J17R1612	37 37 20	95 1 30	.2	.02	<.05	.005	10	N	N	N
J17R1637	37 37 20	95 1 30	1.0	.03	<.05	.005	20	N	N	N
J17R1690	37 37 20	95 1 30	3.0	.20	<.05	.150	30	N	N	N
J17R1740	37 37 20	95 1 30	15.0	.15	<.05	.070	70	1.0	500	N
J17R1859	37 37 20	95 1 30	10.0	.50	<.05	.200	100	1.5	300	N

Sample	B-ppm s	Ba-ppm s	Be-ppm s	Bi-ppm s	Cd-ppm s	Co-ppm s	Cr-ppm s	Cu-ppm s	La-ppm s	Mo-ppm s	Nb-ppm s	Ni-ppm s
J17R1380	20	20	N	N	N	N	N	10	N	N	N	15
J17R1417	10	20	N	N	N	N	N	<5	N	N	N	7
J17R1515	20	100	N	N	N	N	N	7	N	N	N	N
J17R1540	15	50	N	N	N	N	N	<5	N	N	N	5
J17R1560	30	70	N	N	N	N	N	<5	N	N	N	5
J17R1588	50	50	N	N	N	N	N	7	N	N	N	20
J17R1612	50	20	N	N	N	N	N	<5	N	N	N	5
J17R1637	30	20	N	N	N	N	N	<5	N	N	N	5
J17R1690	70	50	1.5	N	N	N	50	20	N	7	N	30
J17R1740	20	30	1.0	N	N	5	15	50	N	30	N	50
J17R1859	50	500	1.5	N	N	7	20	150	20	20	N	30

Sample	Pb-ppm s	Sb-ppm s	Sc-ppm s	Sn-ppm s	Sr-ppm s	V-ppm s	W-ppm s	Y-ppm s	Zn-ppm s	Zr-ppm s	Th-ppm s	Form.#
J17R1380	N	N	N	N	N	N	N	N	N	N	N	60
J17R1417	150	N	N	N	N	N	N	N	N	20	N	60
J17R1515	10	N	N	N	N	N	N	N	N	20	N	60
J17R1540	<10	N	N	N	N	N	N	N	N	20	N	60
J17R1560	N	N	N	N	N	N	N	N	N	10	N	60
J17R1588	<10	N	N	N	100	N	N	N	N	20	N	60
J17R1612	N	N	N	N	N	N	N	N	N	10	N	60
J17R1637	N	N	N	N	N	N	N	N	N	N	N	60
J17R1690	<10	N	5	N	N	100	N	N	N	50	N	80
J17R1740	100	N	N	N	N	30	N	N	N	30	N	80
J17R1859	200	N	N	N	N	50	N	15	N	150	N	80

TABLE 3--SPECTROGRAPHIC ANALYSES OF INSOLUBLE RESIDUE SAMPLES FROM DRILL HOLE NO. 18, JOPLIN 1 x 2 QUADRANGLE, MISSOURI AND KANSAS.

[N, not detected; <, detected but below the limit of determination shown; >, determined to be greater than the value shown.]

Sample	Latitude	Longitude	Fe-pct. s	Mg-pct. s	Ca-pct. s	Ti-pct. s	Mn-ppm s	Ag-ppm s	As-ppm s	Au-ppm s
J18R2330	37 31 30	95 56 0	7	.5	<.05	.30	150	N	N	N
J18R2360	37 31 30	95 56 0	20	.3	.05	.20	300	.5	N	N
J18R2390	37 31 30	95 56 0	7	.2	<.05	.15	70	.7	N	N
J18R2430	37 31 30	95 56 0	2	.2	<.05	.15	70	N	N	N
J18R2460	37 31 30	95 56 0	7	1.0	<.05	.30	100	<.5	N	N
J18R2480	37 31 30	95 56 0	7	1.0	<.05	.30	100	N	N	N
J18R2500	37 31 30	95 56 0	7	.5	<.05	.20	100	N	N	N
J18R2520	37 31 30	95 56 0	5	.7	<.05	.30	70	N	N	N
J18R2530	37 31 30	95 56 0	5	.5	.20	.20	150	N	N	N

Sample	B-ppm s	Ba-ppm s	Be-ppm s	Bi-ppm s	Cd-ppm s	Co-ppm s	Cr-ppm s	Cu-ppm s	La-ppm s	Mo-ppm s	Nb-ppm s	Ni-ppm s
J18R2330	70	200	2.0	N	N	15	100	20	50	N	N	70
J18R2360	50	500	1.5	N	N	30	70	30	20	5	N	100
J18R2390	50	300	1.0	N	N	20	50	200	N	5	N	70
J18R2430	70	200	1.0	N	N	10	30	20	20	N	N	50
J18R2460	150	200	2.0	N	N	30	100	150	30	N	N	70
J18R2480	150	300	2.0	N	N	20	150	50	50	N	N	50
J18R2500	150	200	1.5	N	N	20	100	100	20	N	N	70
J18R2520	150	300	1.5	N	N	50	150	100	30	N	N	100
J18R2530	100	1,500	1.0	N	N	10	50	20	N	N	N	50

Sample	Pb-ppm s	Sb-ppm s	Sc-ppm s	Sn-ppm s	Sr-ppm s	V-ppm s	W-ppm s	Y-ppm s	Zn-ppm s	Zr-ppm s	Th-ppm s	Form.#
J18R2330	50	N	15	N	200	150	N	20	N	100	N	78
J18R2360	100	N	10	N	300	150	N	50	N	150	N	78
J18R2390	70	N	5	N	100	100	N	15	N	200	N	90
J18R2430	N	N	5	N	200	70	N	15	N	150	N	90
J18R2460	50	N	15	N	300	200	N	20	N	150	N	90
J18R2480	70	N	15	N	200	200	N	20	<200	150	N	90
J18R2500	70	N	7	N	150	100	N	15	200	100	N	90
J18R2520	30	N	15	N	150	150	N	30	N	300	N	90
J18R2530	20	N	7	N	200	100	N	15	1,000	200	N	90