

FC
USGS
OFR
79-1440

GL00086

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Geochemical analyses of copper-silver-bearing rocks in
the Spokane Formation (Belt Supergroup),
Lewis and Clark County, Montana

By

UNIVERSITY OF UTAH
RESEARCH INSTITUTE
EARTH SCIENCE LAB.

J. J. Connor, J. M. McNeal, and J. G. Crock

Open-File Report 79-1440
1979

Geochemical analyses of copper-silver-bearing rocks in
the Spokane Formation (Belt Supergroup),
Lewis and Clark County, Montana

By

J. J. Connor, J. M. McNeal, and J. G. Crock

The Spokane Formation (Belt Supergroup) in the Rogers Pass area of western Montana (fig. 1) contains widely scattered deposits of quartzitic copper-silver-bearing rocks, one of which (in Alice Creek) has been mined for its silver content. In 1977-78, 30 samples were collected from seven of these deposits in outcrop (table 1), and 37 more were collected from the Alice Creek mine (table 2). All were analyzed for a large number of elements as part of a general survey of the mineral potential of the Rogers Pass area. In addition to the quartzitic occurrences, three samples of copper-silver-bearing siltite from the transition zone between the Spokane and overlying Empire Formation and four samples of a Proterozoic Z diabasic sill were also collected and analyzed. A geologic map of the Alice Creek mine is given in figure 2, and sampling localities in the mine are shown in figure 3. We thank the operator of the mine, Mr. Leonard Orr, Lincoln, Montana, for permission to publish the map and the mine data.

Many of the samples were split into two parts prior to chemical analysis. In table 1, duplicate analyses are noted by an R instead of a Q in the fourth character of the sample identifier; in table 2, the duplicate analyses are noted by an X added to the sample identifier or, for the last nine samples, an R instead of a Q in the fourth character. In table 1, the fifth character (first number) in the sample identifier is the locality number which appears in figure 1. Most of the tabled data contain no more than two significant figures.

The analytical methods used in the analysis of these materials are listed in table 3. The analysis for "soluble" copper was adapted from an unpublished procedure developed by G. M. Chaplin, a student metallurgist at Duval Corporation, Tucson, Arizona, in 1967; Sloan (1934) discussed in detail various methods used in such determinations. The procedure adapted here follows:

- 1) Solution (1): Add 100 ml concentrated HCl to 700 ml distilled water. Add 25 g hydroxylamine hydrochloride and mix. Bring to a volume of 1000 ml with distilled water.
- 2) Prewarm shaking water bath to 96 degrees C.
- 3) Weigh 1.000 g of 100-mesh ground sample and 10.0 g of 100-mesh ground, copper-free sand in 125-ml plastic Erlenmeyer flask. Mix by swirling.
- 4) Add 40 ml of solution (1); cap tightly with a plastic thimble.
- 5) Place in shaking water bath. Heat and mix for 40 minutes at 96 degrees C.
- 6) Transfer with water to a 25 X 200-mm culture tube; centrifuge at 2500 rpm for 5 minutes.

- 7) Filter through 40 Whatman filter paper into a 100-ml volumetric flask and bring to volume with water.
- 8) Determine percent acid-soluble copper by atomic absorption. Turn 10-cm burner 30 degrees away from straight alignment; use 30 and 50 parts per million set to 0.300 and 0.500 percent copper, respectively. (1 ppm in solution equals 0.01 percent acid-soluble copper).

The geochemical data in tables 1 and 2 are listed under the standard symbols for the chemical element or compound in percent (%) or parts per million (ppm). Column headings not readily interpretable are:

LONGITUD = Longitude
 Cu-Sol = Acid-soluble copper
 T-C = Total carbon
 Org-C = Organic carbon
 CO3-C = Carbonate carbon
 T-Fe2O3 = Total iron as ferric oxide

A geochemical label ending in "-S" means the element concentration was measured by emission spectrography; a geochemical label ending in "-A" means the element concentration was measured by atomic absorption. Special letters affixed to the concentration data in these tables mean:

N = Constituent not detected at lower limit of determination
 L = Constituent less than given value
 G = Constituent greater than given value
 B = Blank, no data.

The sample locality is given by north latitude and west longitude in degrees, minutes, and seconds.

The analysts who performed the work are (in alphabetical order): J. W. Baker, A. Barthel, C. Bliss, P. Briggs, G. Burro, M. F. Coughlin, J. G. Crocker, C. M. Ellis, K. E. Horan, J. McDade, C. McFee, V. Merritt, H. T. Millard, Jr., F. Perez, S. Prelipp, G. Riddle, V. Shaw, M. W. Solt, J. A. Thomas, M. L. Tuttle, R. B. Vaughn, J. S. Wahlberg, and B. Walz.

References cited

- Huffman, Claude, Jr., 1975, Analysis of rocks and soils for total content of sodium, magnesium, lithium, rubidium, zinc, cadmium, mercury, fluorine, and carbon, in Geochemical survey of the western coal regions, July 1975: U.S. Geological Survey Open-File Report 75-436, p. 71-73.
- Huffman, Claude, Jr., and Dinnen, J. I., 1976, Analysis of rocks and soils by atomic absorption spectrometry and other methods, in Geochemical survey of Missouri--Methods of sampling, laboratory analysis, and statistical reduction of data: U.S. Geological Survey Professional Paper 954-A, p. 12-13.
- Millard, H. T., Jr., 1975, Determinations of uranium and thorium in rocks and soils by the delayed neutron technique, in Geochemical survey of the

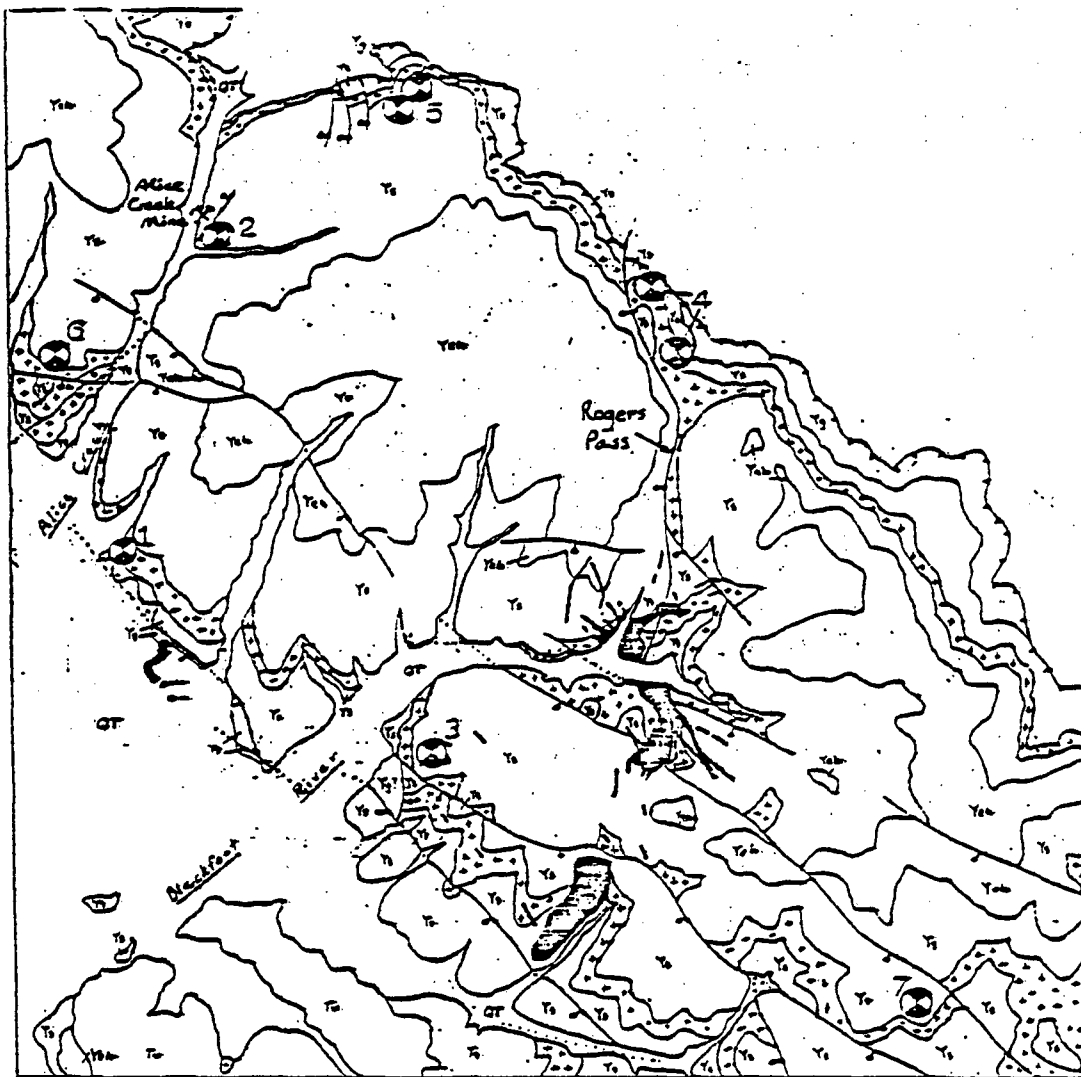
western coal regions, July 1975: U.S. Geological Survey Open-File Report 75-436, p. 79-81.

Sloan, W. A., 1934, Comparison of western methods for the determination of oxidized copper in ores, in Progress Reports--Metallurgical Division, 3. Studies in the metallurgy of copper: U.S. Bureau of Mines Report of Investigations 3228, p. 57-63.

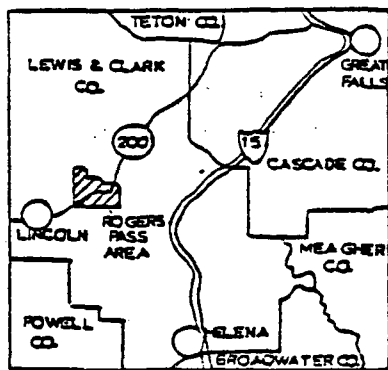
Sutton, A. L., Jr., 1976, Spectrochemical computer analysis, in Geochemical survey of the western energy regions, July 1976: U.S. Geological Survey Open-File Report 76-729, p. 131-132.

Wahlberg, J. S., 1975, Analysis of rocks and soils by X-ray fluorescence, in Geochemical survey of the western coal regions, July 1975: U.S. Geological Survey Open-File Report 75-436, p. 59-70.

Whipple, J. W., 1979, Preliminary geologic map of the Rogers Pass area, Lewis and Clark County, Montana: U.S. Geological Survey Open-File Report 79-719, 2 sheets.



0 5 10 KM
SCALE



EXPLANATION

Quaternary-Tertiary

QT UNCONSOLIDATED SEDIMENTS

Tertiary

Tv VOLCANICS

MONZONITE

Proterozoic Y

Yn EMPIRE, HELENA FMS

Ys SPOKANE FM
(PATTERN: DIABASIC SILL OF
PROTEROZOIC Z AGE)

Yg GREYSON FM

Geologic contact

Fault

(DOTTED WHERE CONCEALED;
BAR & BALL ON DOWNTOWN
SIDE)

Thrust fault
(TEETH ON UPTHROWN SIDE)

Sampling locality

Figure 1.--Index map showing location of Rogers Pass area (patterned), western Montana, and geologic map showing distribution of the Spokane Formation (Belt Supergroup) and sampling localities in the Rogers Pass area, western Montana. (Geologic base from Whipple, 1979.)

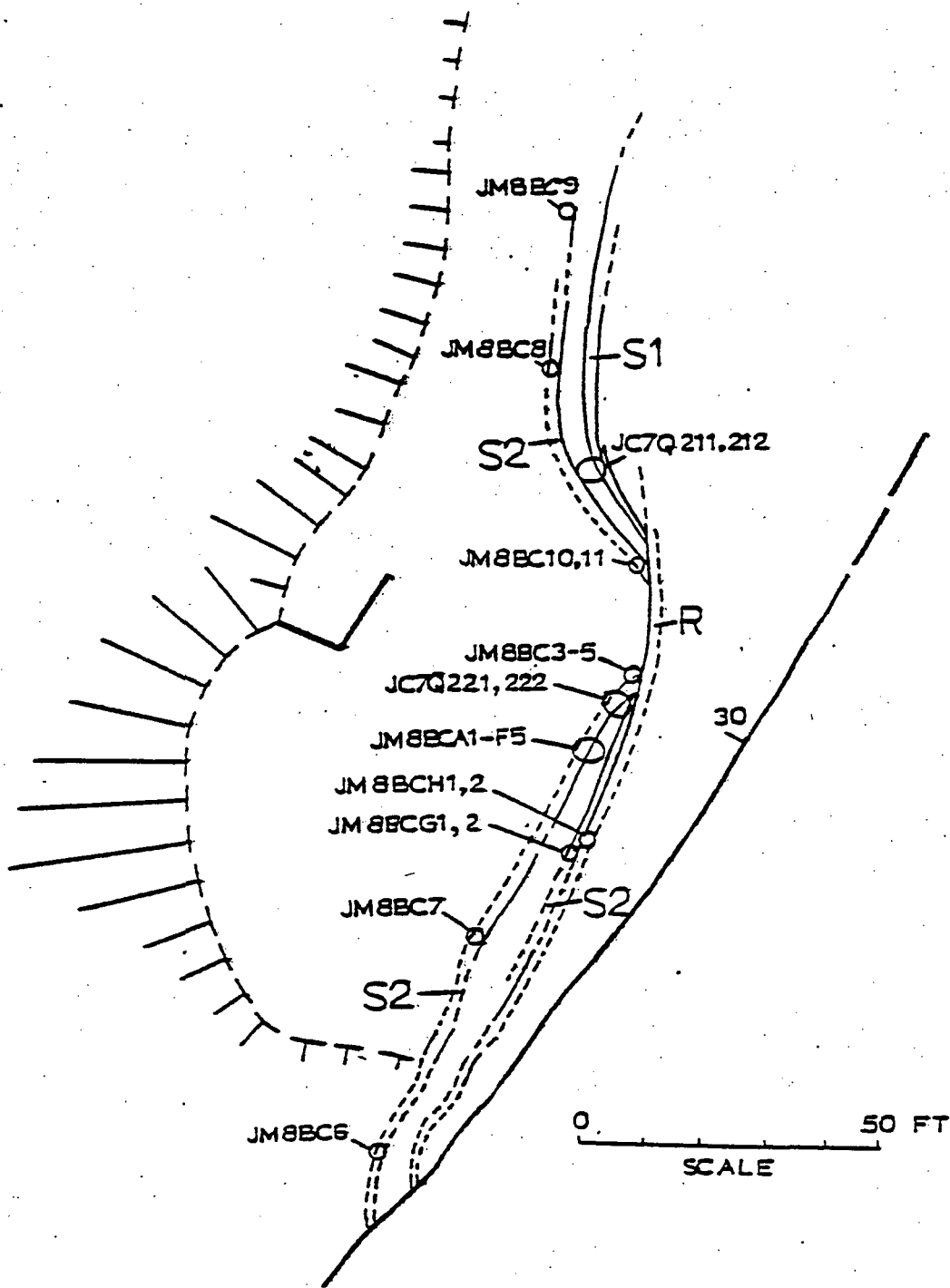


Figure 3.--Sampling localities in the Alice Creek Mine.
 (Geology from fig. 2).

Table 3.--List of analytical methods used in study of the Rogers Pass area 1/

Constituent	Method	Reference
Aluminum (Al)		
As Al ₂ O ₃	X-ray fluorescence	Wahlberg, 1975
As Al	Emission spectrography	Sutton, 1976
Antimony (Sb)	X-ray fluorescence	Wahlberg, 1975
Arsenic (As)	do	do
Barium (Ba)	Emission spectrography	Sutton, 1976
Beryllium (Be)	do	do
Boron (B)	do	do
Cadmium (Cd)	do	do
Calcium (Ca)		
As CaO	X-ray fluorescence	Wahlberg, 1975
As Ca	Emission spectrography	Sutton, 1976
Carbon (C)		
Total	Leco gasometric	Huffman and Dinnen, 1976
As carbonate	Gasometric	do
As organic	Difference	do
Cerium (Ce)	Emission spectrography	Sutton, 1976
Chromium (Cr)	do	do
Cobalt (Co)	do	do
Copper (Cu)		
Soluble	Atomic absorption	See text
Total	Atomic absorption	Unpublished
	Emission spectrography	Sutton, 1976
Dysprosium (Dy)	Emission spectrography	Sutton, 1976
Erbium (Er)	do	do
Europium (Eu)	do	do
Gadolinium (Gd)	do	do
Gallium (Ga)	do	do
Germanium (Ge)	X-ray fluorescence	Wahlberg, 1975
	Emission spectrographic	Sutton, 1976
Iron (Fe)		
As Fe ₂ O ₃	X-ray fluorescence	Wahlberg, 1975
As FeO	Titration	
As Fe	Emission spectrographic	Sutton, 1976
Lanthanum (La)	do	do
Lead (Pb)	do	do
Lithium (Li)	do	do
Magnesium (Mg)	do	do
Manganese (Mn)	do	do
Mercury (Hg)	Atomic absorption (flameless)	Huffman, 1975
Molybdenum (Mo)	Emission spectrography	Sutton, 1976
Neodymium (Nd)	do	do
Nickel (Ni)	do	do
Niobium (Nb)	do	do

Table 3.--Cont.

Constituent	Method	Reference
Phosphorus (P) As P2O5	X-ray fluorescence	Wahlberg, 1975
Potassium (K) As K2O As K	do Emission spectrography	do Sutton, 1976
Praesodymium (Pr)	do	do
Samarium (Sm)	do	do
Scandium (Sc)	do	do
Selenium (Se)	X-ray fluorescence	Wahlberg, 1975
Silicon (Si) As SiO2 As Si	do Emission spectrography	do Sutton, 1976
Silver (Ag)	Atomic absorption Emission spectrography	Unpublished Sutton, 1976
Sodium (Na)	do	do
Strontium (Sr)	do	do
Sulfur (S) Total As sulfide	X-ray fluorescence	Wahlberg, 1975
Terbium (Tb)	Emission spectrography	Sutton, 1976
Thorium (Th)	Neutron activation	Millard, 1975
Thulium (Tm)	Emission spectrography	Sutton, 1976
Tin (Sn)	X-ray fluorescence	Wahlberg, 1975
Titanium (Ti) As TiO2 As Ti	do Emission spectrography	do Sutton, 1976
Uranium (U)	Neutron activation	Millard, 1975
Vanadium (V)	Emission spectrography	Sutton, 1976
Ytterbium (Yb)	do	do
Yttrium (Y)	do	do
Zinc (Zn)	do	do
Zirconium (Zr)	do	do

1/ Elements looked for by emission spectrography but not found are listed here along with their approximate limits of determination (in ppm):

Arsenic (As)	220	Palladium (Pd)	1
Bismuth (Bi)	10	Platinum (Pt)	10
Gold (Au)	4.6	Rhenium (Re)	20
Hafnium (Hf)	100	Rhodium (Rh)	2.2
Holmium (Ho)	10	Ruthenium (Ru)	10
Indium (In)	50	Tantalum (Ta)	500
Iridium (Ir)	46	Thallium (Tl)	4.6
Lutetium (Lu)	10	Tungsten (W)	46
Osmium (Os)	22		

Table 2.--Samples from mine (terminal X in sample number indicates duplicate analysis)-continued

LAB. NO.	SAMPLE	Tb ppm-S	Tb ppm	Tm-S	U ppm	V ppm-S	Y ppm-S	Yb ppm-S
205884	JM80C9	22.0000L	5.1700	2.2000L	1.3500	5.8000	19.0000	1.2000
205852	JM80C9X	22.0000L	4.8800	2.3000	1.3900	4.4000	15.0000	1.2000
205880	JM80C8	22.0000L	4.3000	2.5000	2.5200	5.9000	13.0000	1.1000
205875	JM80C10	22.0000L	7.5900	2.6000	2.0400	5.9000	15.0000	1.1000
205859	JM80C10X	22.0000L	5.0600	2.3000	2.2900	5.2000	15.0000	1.2000
205840	JM80C11	22.0000L	5.9000	3.7000	3.0000	8.3000	19.0000	1.3000
205854	JM80C3	22.0000L	4.7000	2.2000	2.2700	9.2000	13.0000	1.0000
205847	JM80C4	22.0000L	4.7000	3.3000	2.2000	4.3000	12.0000	0.8700
205839	JM80C4X	22.0000L	4.9100	3.7000	1.9500	6.7000	14.0000	1.1000
205834	JM80C5	22.0000L	9.0600	3.3000	3.8700	7.3000	22.0000	1.4000
205860	JM80C7	22.0000L	5.7500	2.2000L	1.2800	5.3000	10.0000	0.9800
205841	JM80C6	22.0000L	5.6600	4.2000	1.5300	6.2000	16.0000	1.1000
205861	JM80C6X	22.0000L	5.1200	3.3000	1.6200	5.5000	18.0000	1.4000
205848	JM80C2	22.0000L	18.3000	2.2000L	4.5100	54.0000	39.0000	2.8000
205858	JM80C1X	22.0000L	21.6000	2.2000L	4.0400	59.0000	34.0000	2.8000
205876	JM80C1	22.0000L	19.9000	2.2000L	4.2400	52.0000	36.0000	3.1000
205857	JM80C2	22.0000L	3.9000	2.6000	1.3700	8.0000	15.0000	1.2000
205842	JM80C61X	22.0000L	8.4100	5.0000	1.8300	13.0000	30.0000	2.0000
205864	JM80C61	22.0000L	8.6300	3.4000	1.8200	12.0000	25.0000	1.6000
205865	JM80CF5	22.0000L	9.9400	2.2000L	2.9200	33.0000	29.0000	2.2000
205870	JM80CF4	22.0000L	8.6900	3.9000	2.7900	30.0000	34.0000	2.3000
205863	JM80CF3	22.0000L	13.5000	2.2000L	3.2900	38.0000	24.0000	1.9000
205843	JM80CF2	22.0000L	7.3600	2.2000L	2.3200	30.0000	40.0000	2.5000
205844	JM80CF2X	22.0000L	9.5900	2.2000L	2.0700	22.0000	39.0000	2.2000
205877	JM80CF1	22.0000L	17.0000	2.2000L	4.5300	52.0000	37.0000	3.2000
205856	JM80CE2	22.0000L	9.9500	1.9000	2.2300	19.0000	29.0000	1.9000
205883	JM80CE1	22.0000L	9.9400	3.7000	2.1900	18.0000	20.0000	1.5000
205873	JM80CD1	22.0000L	7.7300	2.2000L	2.1500	29.0000	26.0000	1.8000
205853	JM80CD1X	22.0000L	9.5000	2.2000L	2.1000	27.0000	31.0000	2.1000
205869	JM80CC1	22.0000L	14.6000	2.2000L	5.0800	73.0000	33.0000	2.6000
205837	JM80CB3	22.0000L	4.1000	3.6000	2.7200	14.0000	13.0000	1.1000
205855	JM80CB2	22.0000L	5.4800	3.9000	2.2200	5.3000	11.0000	1.0000
205836	JM80CB1	22.0000L	12.5000	4.8000	4.4700	9.7000	37.0000	2.8000
205872	JM80CB1X	22.0000L	11.4000	2.9000	3.8300	8.2000	28.0000	1.9000
205838	JM80CA2	22.0000L	13.3000	2.2000L	3.4200	49.0000	40.0000	2.9000
205881	JM80CA1	22.0000L	8.8400	2.2000L	2.1600	21.0000	26.0000	2.0000
205867	JM80CA1X	22.0000L	9.6100	3.2000	2.0400	23.0000	26.0000	1.9000
205874	JM80C1	22.0000L	13.2000	2.2000L	3.5900	49.0000	36.0000	2.4000
205879	JM80CX1	22.0000L	5.6300	2.8000	2.6300	6.1000	19.0000	1.2000
194002	JC70211P	22.0000L	9.7500	2.2000L	2.9200	45.0000	42.0000	2.6000
193969	JC70212P	22.0000L	11.4000	2.2000L	2.5800	29.0000	43.0000	2.4000
193979	JC70221P	22.0000L	13.2000	2.2000L	3.3900	61.0000	46.0000	2.5000
193962	JC70222P	22.0000L	7.7000	2.2000L	1.9400	21.0000	32.0000	1.8000
193973	JC70231P	56.0000	4.5000	2.2000L	1.8900	5.3000	9.6000	0.6100
193974	JC7R231P	22.0000L	5.4200	2.2000L	1.6000	5.1000	14.0000	0.8600
193964	JC70232P	22.0000L	13.2000	2.2000L	2.7900	36.0000	35.0000	2.2000
196921	JC70241P	0.0000B	0.0000B	2.2000L	0.0000B	0.0000B	0.0000B	0.0000B
196922	JC70242P	0.0000B	0.0000B	2.2000L	0.0000B	0.0000B	0.0000B	0.0000B

Table 2.--Samples from Mine [Terminal X in sample number indicates duplicate analysis]-continued

LAB. NO.	SAMPLE	La ppm-S	Li-S	Nb ppm-S	Nd ppm-S	Pr ppm-S	Sc ppm-S	Sm-S	Sn ppm-S	Sn ppm
205884	JM8BC9	26.0000	103.0000L	6.2000	46.0000L	60.0000L	2.8000	46.0000L	5.5000	0.2000L
205852	JM8BC9X	14.0000	103.0000L	6.5000	46.0000L	60.0000L	2.7000	46.0000L	4.6000L	0.2000L
205880	JM8BC8	17.0000	103.0000L	9.4000	46.0000L	60.0000L	2.1000	46.0000L	4.8000	2.8000
205875	JM8BC10	16.0000	103.0000L	8.5000	82.0000	60.0000L	2.5000	46.0000L	4.8300	0.2000L
205859	JM8BC10X	22.0000	103.0000L	6.0000	46.0000L	60.0000L	2.4000	52.0000	4.6000L	0.4000
205840	JM8BC11	24.0000	103.0000L	6.8000	73.0000	60.0000L	3.2000	46.0000L	7.3300	2.8000
205856	JM8BC3	17.0000	103.0000L	2.2000L	46.0000L	60.0000L	2.7000	46.0000L	4.6000L	0.2000L
205847	JM8BC4	11.0000	103.0000L	13.0000	46.0000L	60.0000L	2.3000	46.0000L	4.6000L	0.2000L
205839	JM8BC4X	23.0000	103.0000L	8.4000	48.0000	60.0000L	3.0000	46.0000L	7.3000	0.6000
205834	JM8BC5	24.0000	103.0000L	12.0000	43.0000	60.0000L	2.8000	47.0000	5.7000	8.4000
205860	JM8BC7	17.0000	103.0000L	8.5000	46.0000L	60.0000L	2.5000	46.0000L	4.6000L	0.2000L
205841	JM8BC6	20.0000	103.0000L	15.0000	68.0000	60.0000L	3.1000	46.0000L	6.7000	3.3000
205861	JM8BC6X	20.0000	103.0000L	11.0000	46.0000L	60.0000L	2.4000	46.0000L	4.9300	0.4000
205848	JM8BC12	52.0000	103.0000L	22.0000	78.0000	60.0000L	12.0000	46.0000L	4.6000L	1.0000
205858	JM8BC11X	43.0000	103.0000L	17.0000	46.0000L	60.0000L	12.0000	46.0000L	4.6000L	3.8000
205876	JM8BC11	52.0000	103.0000L	20.0000	92.0000	60.0000L	14.0000	46.0000L	4.6000L	2.8000
205857	JM8BCG2	17.0000	103.0000L	12.0000	46.0000L	60.0000L	3.6000	46.0000L	4.6000L	0.2000L
205842	JM8BCG1X	29.0000	103.0000L	16.0000	46.0000L	60.0000L	5.8000	46.0000L	7.1000	2.4000
205864	JM8BCG1	20.0000	103.0000L	17.0000	46.0000L	60.0000L	4.4000	46.0000L	4.6000L	7.4000
205865	JM8BCF5	45.0000	103.0000L	9.8000	63.0000	60.0000L	11.0000	46.0000L	4.6000L	15.3000
205870	JM8BCF4	45.0000	103.0000L	19.0000	63.0000	60.0000L	11.0000	46.0000L	4.6000L	3.6000
205863	JM8BCF3	35.0000	143.0000	11.0000	61.0000	60.0000L	7.6000	46.0000L	4.6000L	14.0000
205843	JM8BCF2	45.0000	103.0000L	21.0000	75.0000	60.0000L	9.6000	46.0000L	6.0000	0.7000
205844	JM8BCF2X	41.0000	103.0000L	18.0000	49.0000	60.0000L	8.6000	46.0000L	4.3300	1.3000
205877	JM8BCF1	63.0000	103.0000L	22.0000	53.0000	60.0000L	17.0000	46.0000L	4.6000L	1.7000
205856	JM8BCF2	36.0000	103.0000L	19.0000	46.0000L	60.0000L	6.5000	46.0000L	4.6000L	0.5000
205883	JM8BCF1	25.0000	103.0000L	20.0000	46.0000L	60.0000L	4.9000	46.0000L	4.6000L	0.8000
205873	JM8BCD1	35.0000	113.0000	8.4000	88.0000	60.0000L	6.4000	46.0000L	4.6000L	0.7000
205853	JM8BCD1X	48.0000	120.0000	17.0000	46.0000L	60.0000L	7.3000	46.0000L	4.6000L	0.2000
205869	JM8BCD1	65.0000	113.0000	12.0000	46.0000L	60.0000L	17.0000	46.0000L	4.6000L	7.1000
205837	JM8BCB3	23.0000	103.0000L	7.9000	46.0000L	60.0000L	3.4000	46.0000L	4.6000L	3.8000
205855	JM8BCB2	12.0000	103.0000L	14.0000	64.0000	60.0000L	1.8000	52.0000	4.6000L	3.2000L
205836	JM8BCB1	36.0000	103.0000L	20.0000	65.0000	60.0000L	4.2000	46.0000L	6.8000	0.3000
205872	JM8BCB1X	29.0000	103.0000L	8.8000	46.0000L	60.0000L	3.4000	46.0000L	4.6300L	0.2000L
205838	JM8BCA2	68.0000	223.0000	15.0000	59.0000	60.0000L	16.0000	46.0000L	5.4000	0.7000
205881	JM8BCA1	39.0000	103.0000L	2.2000L	79.0000	60.0000L	7.1000	46.0000L	4.6000L	0.3000
205867	JM8BCA1X	40.0000	103.0000L	19.0000	48.0000	60.0000L	8.1000	46.0000L	4.3000	0.5000
205874	JM8BC1	48.0000	103.0000L	19.0000	66.0000	60.0000L	14.0000	46.0000L	4.6000L	0.5000
205879	JM8BC1	21.0000	103.0000L	7.4000	46.0000L	60.0000L	2.5000	46.0000L	4.6000L	3.3000
194002	JC7Q211P	28.0000	103.0000L	13.0000	46.0000L	46.0000L	5.5000	46.0000L	4.6300L	3.2000L
193969	JC7Q212P	37.0000	103.0000L	7.2000	46.0000L	50.0000	5.4000	46.0000L	4.6000L	0.2000L
193979	JC7Q221P	27.0000	103.0000L	7.7000	46.0000L	46.0000L	5.9000	46.0000L	4.6000L	0.2000
193962	JC7Q222P	24.0000	103.0000L	13.0000	46.0000L	46.0000L	3.4000	46.0000L	4.6000L	0.2000L
193973	JC7Q231P	4.6000L	103.0000L	6.1000	46.0000L	56.0000	1.4000	46.0000L	4.6000L	0.2000L
193974	JC7R231P	7.7000	103.0000L	4.6000L	46.0000L	46.0000L	1.4000	46.0000L	4.6000L	0.2000L
193964	JC7Q232P	31.0000	103.0000L	6.5000	63.0000	46.0000L	4.6000	46.0000L	4.6000L	0.4000
196921	JC7Q241P	0.0000B	103.0000L	0.0000B	0.0000B	0.0000B	0.0000B	46.0000L	0.0000B	1.8000
196922	JC7Q242P	0.0000B	103.0000L	0.0000B	0.0000B	0.0000B	0.0000B	46.0000L	0.0000B	0.8000

Table 2.--SAMPLES FROM WIDE (Terminal X in sample number indicates duplicate analysis)-continued

LAB. NO.	SAMPLE	Hg ppm	As ppm	Ge ppm	Ge ppm-S	Sb ppm	Sb ppm-S	Se ppm	Cd ppm-S	Mo ppm-S
205884	JM8BC9	0.1600	3.4000	0.6000	0.4600L	0.2000L	46.0000L	0.2000L	10.0000L	1.3000L
205852	JM8BC9X	0.1300	3.3000	0.5000	0.4600L	0.2000L	46.0000L	0.2000L	10.0000L	1.0000L
205880	JM8BC8	0.2100	1.1000	1.3000	2.4000	0.2000L	46.0000L	0.2000L	10.0000L	1.0000L
205875	JM8BC10	0.3200	3.0000	0.4000	0.4600L	0.2000L	46.0000L	0.2000L	10.0000L	1.0000L
205859	JM8BC10X	0.3300	3.2000	0.5000	2.3000	0.2000L	46.0000L	0.2000L	10.0000L	1.3000L
205840	JM8BC11	0.3000	2.7000	1.6000	2.9000	1.4000	46.0000L	0.2000L	10.0000L	1.3000L
205854	JM8BC3	3.2000	3.4000	0.3000	1.8000	0.2000L	46.0000L	0.2000L	10.0000L	1.3000L
205847	JM8BC4	397.0000	3.2000L	1.8000	0.8400	0.2000L	46.0000L	0.2000L	10.0000L	1.3000L
205839	JM8BC4X	155.0000	3.2000L	4.4000	2.5000	0.7000	46.0000L	0.2000L	10.0000L	1.3000
205834	JM8BC5	427.0000	3.2000L	55.0000	0.4600L	0.2000L	46.0000L	0.2000L	10.0000L	1.2000
205860	JM8BC7	0.1400	3.7000	0.4000	2.4000	0.2000L	46.0000L	0.2000L	10.0000L	1.0000L
205841	JM8BC6	0.1800	3.7000	0.8000	2.8000	0.2000L	46.0000L	0.2000L	10.0000L	1.3000L
205861	JM8BC6X	0.1400	3.9000	0.6000	2.1000	0.3000	46.0000L	0.2000L	10.0000L	1.3000L
205848	JM8BC2	0.0800	2.2000	1.3000	1.5000	0.3000	46.0000L	0.2000L	10.0000L	1.9000
205858	JM8BC11X	0.0300	2.1000	1.9000	2.1000	0.7000	46.0000L	0.2000L	10.0000L	2.3000
205876	JM8BC11	0.0300	1.6000	1.7000	1.3000	0.4000	46.0000L	0.3000	10.0000L	1.7000
205857	JM8BC2	0.3340	3.3000	0.5000	0.4600L	0.2000L	46.0000L	0.2000L	10.0000L	1.0000L
205842	JM8BC11X	0.5300	3.6000	1.0000	2.7000	0.2000L	46.0000L	0.2000L	10.0000L	1.0000L
205864	JM8BC1	0.5200	1.6000	1.8000	1.3000	0.2000L	46.0000L	0.2000L	10.0000L	1.3000L
205865	JM8BCF5	0.6000	3.6000	0.2000L	1.9000	0.2000L	46.0000L	0.2000L	10.0000L	1.4000
205870	JM8BCF4	0.3700	1.4000	1.8000	1.1000	0.2000L	46.0000L	0.2000L	10.0000L	1.2000
205863	JM8BCF3	0.2900	2.6000	2.4000	1.7000	3.2000	46.0000L	0.2000L	10.0000L	1.2000
205843	JM8BCF2	0.2000	3.5000	0.9000	0.4600L	0.4000	46.0000L	0.2000L	10.0000L	1.0000L
205844	JM8BCF2X	0.1700	3.5000	0.9000	0.4600L	0.2000L	46.0000L	0.2000L	10.0000L	1.1000
205877	JM8BCF1	0.2300	3.7000	1.0000	0.5200	0.2000L	46.0000L	0.2000L	10.0000L	1.2000
205856	JM8BC2	0.2800	3.6000	0.9000	1.3000	0.2000L	46.0000L	0.2000L	10.0000L	1.3000
205883	JM8BC1	0.1600	3.5000	0.9000	2.1000	0.2000L	46.0000L	0.2000L	10.0000L	1.3000L
205873	JM8BC01	0.1900	3.4000	0.6000	0.4600L	0.4000	46.0000L	0.2000L	10.0000L	1.0000L
205853	JM8BC01X	0.1900	3.2000	0.7000	1.7000	0.2000L	46.0000L	0.2000L	10.0000L	1.4000
205869	JM8BC1	0.5700	3.2000L	2.0000	0.4600L	0.2000L	46.0000L	0.2000L	10.0000L	1.0000L
205837	JM8BC3	0.1300	3.9000	1.9000	1.8000	0.2000L	46.0000L	0.2000L	10.0000L	1.0000L
205855	JM8BC2	0.2000	1.3000	0.4000	0.9200	0.2000L	46.0000L	0.2000L	10.0000L	1.0000L
205836	JM8BC01	0.3300	1.5000	0.7000	2.7000	0.2000L	46.0000L	0.2000L	10.0000L	1.3000L
205872	JM8BC01X	0.2500	1.0000	0.5000	0.4600L	0.2000L	46.0000L	0.2000L	10.0000L	1.3000L
205838	JM8BCA2	0.2400	3.5000	0.9000	1.9000	0.2000L	46.0000L	0.2000L	10.0000L	1.1000
205881	JM8BCA1	0.2200	3.6000	0.8000	1.7000	0.2000L	46.0000L	0.2000L	10.0000L	1.0000L
205867	JM8BCA1X	0.2100	3.4000	0.7000	1.5000	0.2000L	46.0000L	0.2000L	10.0000L	1.1000
205874	JM8BC1	0.4500	3.2000	0.6000	1.2000	0.2000L	46.0000L	0.2000L	10.0000L	1.1000
205879	JM8BCX1	1.3000	2.5000	1.7000	2.2000	4.9000	46.0000L	0.2000L	10.0000L	1.0000
194002	JC7Q211P	0.7400	0.9000	0.9000	0.4700	0.3000	22.0000L	0.2000L	10.0000L	1.0000L
193969	JC7Q212P	0.3200	3.7000	0.7000	0.4600L	0.2000L	22.0000L	0.2000L	10.0000L	1.3000L
193979	JC7Q221P	0.2400	1.2000	1.1000	0.7600	0.2000	22.0000L	0.2000L	10.0000L	1.1000
193962	JC7Q222P	0.1800	1.0000	0.9000	0.8600	0.2000L	22.0000L	0.2000L	10.0000L	1.0000L
193973	JC7Q231P	440.0000	3.7000	0.8000	0.9800	0.2000L	22.0000L	0.2000L	10.0000L	1.3000L
193974	JC7R231P	316.0000	3.7000	1.0000	1.4000	0.2000L	22.0000L	0.2000L	10.0000L	1.3000L
193964	JC7Q232P	0.1800	1.7000	1.2000	0.4600L	0.3000	22.0000L	0.2000	10.0000L	1.6000
196921	JC7Q241P	1.0000	1.5000	1.1000	0.0000B	1.6000	0.0000B	0.2000L	0.0000B	0.0000B
196922	JC7Q242P	0.5000	3.8000	0.9000	0.0000B	1.7000	0.0000B	0.2000L	0.0000B	0.3000B

Table 2.--Samples from mine (terminal x in sample number indicates duplicate analysis)-continued

LAB. NO.	SAMPLE	Cu ppm-S	CuX-A	CuX-Sol	Ag ppm-S	Ag ppm-A	SulfurX	SulfideX	Pb ppm-S	Zn ppm-S
205884	JM80C9	3500.0000	0.3750	0.3150	55.0000	26.0000	0.1000L	0.0200	6.1000	19.0000
205852	JM80C9X	2900.0000	0.3530	0.2930	37.0000	25.0000	0.1000L	0.0100L	4.8000	17.0000
205880	JM80C8	4600.0000G	0.5150	0.3930	82.0000	49.0000	0.1000L	0.0400	8.8000	14.0000
205875	JM80C10	3700.0000	0.4600	0.3850	57.0000	50.0000	0.1000L	0.0100L	8.8000	14.0000
205859	JM80C10X	4600.0000G	0.5500	0.4730	110.0000	55.0000	0.1000L	0.0100L	7.9000	13.0000
205840	JM80C11	2900.0000	0.4000	0.3070	100.0000	62.0000	0.1000L	0.0200	26.0000	16.0000
205854	JM80C3	4600.0000G	0.8000	0.4880	580.0000	166.0000 1/	0.1000L	0.0400	14.0000	16.0000
205847	JM80C4	4600.0000G	0.6450	0.4860	4600.0000G	111.0000 1/	0.1000L	0.0100	59.0000	11.0000
205839	JM80C4X	4600.0000G	0.5750	0.4090	4600.0000G	126.0000 1/	0.1000L	0.0300	71.0000	16.0000
205834	JM80C5	4600.0000G	0.5830	0.4340	4600.0000G	147.0000 1/	0.1000L	0.0100L	83.0000	17.0000
205860	JM80C7	1600.0000	0.1830	0.1640	19.0000	12.0000	0.1000L	0.0100L	5.2000	16.0000
205841	JM80C6	1600.0000	0.1620	0.1330	18.0000	14.0000	0.1000L	0.0200	7.1000	19.0000
205861	JM80C6X	1300.0000	0.1540	0.1390	16.0000	9.0000	0.1000L	0.0100L	5.3000	15.0000
205848	JM80C2	2600.0000	0.3150	0.2550	54.0000	21.0000	0.1000L	0.0100L	21.0000	190.0000
205858	JM80C11X	1100.0000	0.1020	0.0830	31.0000	11.0000	0.1000L	0.0200	17.0000	210.0000
205876	JM80C11	1100.0000	0.0960	0.0840	19.0000	16.0000	0.1000L	0.0100L	18.0000	220.0000
205857	JM80C2	4600.0000G	0.4600	0.3560	53.0000	30.0000	0.1000L	0.0100L	6.2000	19.0000
205842	JM80C61X	4600.0000G	0.6650	0.4950	75.0000	50.0000	0.1000L	0.0500	11.0000	25.0000
205864	JM80C61	4600.0000G	0.6650	0.5330	79.0000	44.0000	0.1000L	0.0500	6.7000	21.0000
205865	JM80C65	4600.0000G	1.0800	0.8700	170.0000	104.0000	0.1000L	0.0100	14.0000	160.0000
205870	JM80C64	4600.0000G	0.5600	0.4940	100.0000	76.0000	0.1000L	0.0100	11.0000	130.0000
205863	JM80C63	4600.0000G	0.6100	0.5060	110.0000	73.0000	0.1000L	0.0100L	9.4000	180.0000
205843	JM80C62	2600.0000	0.3450	0.2760	72.0000	35.0000	0.1000L	0.0100	15.0000	110.0000
205844	JM80C62X	2700.0000	0.2690	0.2350	52.0000	30.0000	0.1000L	0.0100	11.0000	73.0000
205877	JM80C61	3000.0000	0.3950	0.3340	53.0000	37.0000	0.1100	0.0200	12.0000	110.0000
205856	JM80C62	3200.0000	0.3550	0.3030	54.0000	28.0000	0.1000L	0.0100L	9.0000	83.0000
205883	JM80C61	2500.0000	0.3050	0.2550	55.0000	29.0000	0.1000L	0.0100	7.9000	71.0000
205873	JM80C61	3500.0000	0.4430	0.3890	56.0000	40.0000	0.1000L	0.0100L	9.8000	230.0000
205853	JM80C61X	4100.0000	0.4330	0.3710	55.0000	42.0000	0.1000L	0.0200	6.7000	190.0000
205869	JM80C61	4600.0000G	1.9700	1.6000	210.0000	117.0000	0.1000L	0.0100	12.0000	140.0000
205837	JM80C63	4600.0000G	0.7900	0.4730	130.0000	72.0000	0.1000L	0.0900	16.0000	23.0000
205855	JM80C62	4600.0000G	0.5300	0.4010	57.0000	40.0000	0.1000L	0.0100	7.3000	15.0000
205836	JM80C61	2700.0000	0.3950	0.3090	73.0000	51.0000	0.1000L	0.0200	11.0000	24.0000
205872	JM80C61X	3000.0000	0.3850	0.3300	79.0000	50.0000	0.1000L	0.0200	8.9000	21.0000
205838	JM80C62	3300.0000	0.4450	0.3780	97.0000	48.0000	0.1000	0.0100L	12.0000	290.0000
205881	JM80C61	2900.0000	0.3750	0.3040	54.0000	37.0000	0.1000L	0.0100	7.8000	130.0000
205867	JM80C61X	3000.0000	0.3580	0.3010	53.0000	36.0000	0.1000L	0.0300	11.0000	140.0000
205874	JM80C61	4600.0000G	0.6600	0.5350	170.0000	105.0000	0.1000L	0.0400	15.0000	210.0000
205879	JM80C61	4600.0000G	0.6000	0.3670	270.0000	94.0000	0.1000L	0.0300	9.5000	18.0000
194002	JC70211P	4600.0000G	0.9360	0.6500	22.0000G	19.0000	0.3061	0.0500	11.0000	160.0000
193969	JC70212P	4600.0000G	0.4600	0.4190	22.0000G	15.0000	0.2000	0.0100L	8.9000	85.0000
193979	JC70221P	4600.0000	0.4230	0.3700	22.0000G	20.0000	0.2000	0.0100L	10.0000	110.0000
193962	JC70222P	2200.0000	0.2500	0.2070	22.0000G	18.0000	0.1000	0.0100L	11.0000	63.0000
193973	JC70231P	4600.0000G	0.4600	0.3540	22.0000G	49.0000	0.3000	0.0100L	51.0000	6.7000
193974	JC70231P	3800.0000	0.4320	0.3330	22.0000G	36.0000	0.3000	0.0100L	51.0000	5.1000
193964	JC70232P	3600.0000	0.3370	0.2860	22.0000G	18.0000	0.2000	0.0100L	11.0000	190.0000
196921	JC70241P	0.0000B	0.0000B	0.0000B	0.0000B	0.0000B	0.0000B	0.0000B	0.0000B	0.0000B
196922	JC70242P	0.0000B	0.0000B	0.0000B	0.0000B	0.0000B	0.0000B	0.0000B	0.0000B	0.0000B

1/ Ag by fire assay for these samples yielded: JM80C3 = 420 ppm; JM80C4 = 8400 ppm; JM80C4X = 6500 ppm; JM80C5 = 8100 ppm.

Table 1.--Samples from Quartzite (R in fourth character of sample number indicates duplicate analysis)-continued

LAB. NO.	SAMPLE	LATITUDE	LONGITUDE	SiO ₂ X	SiX-S	Al ₂ O ₃ X	AlX-S	NaX-S	K ₂ OX	KX-S
Samples from Proterozoic 2 sill										
193991	JC701S	47 02 00N	112 25 30W	48.0000	18.0000	12.0000	7.1000	1.5000	0.6000	0.5600
193967	JC704S	47 06 00N	112 22 30W	50.0000	18.0000	12.0000	6.8000	0.9900	0.5000	0.3600
194003	JC706S	47 05 00N	112 22 30W	46.3500	16.0000	9.8820	5.7000	1.6000	0.2451	0.3000
193984	JC707S	47 05 00N	112 22 30W	49.0000	18.0000	12.0000	5.3000	1.3000	0.5000	0.4200
LAB. NO.	SAMPLE	Cu ppm-S	CuX-A	CuX-Sol	Ag ppm-S	Ag ppm-A	SulfurX	SulfideX	Pb ppm-S	Zn ppm-S
Samples from Proterozoic 2 sill-continued										
193991	JC701S	370.0000	0.0000B	0.0000B	0.4600L	0.0000B	0.3000	0.0000B	8.1000	160.0000
193967	JC704S	240.0000	0.0000B	0.0000B	0.4600L	0.0000B	0.2000	0.0000B	5.4000	140.0000
194003	JC706S	290.0000	0.0000B	0.0000B	1.6000	0.0000B	0.1306	0.0000B	8.1000	110.0000
193984	JC707S	360.0000	0.0000B	0.0000B	0.4600L	0.0000B	0.2000	0.0000B	19.0000	130.0000
LAB. NO.	SAMPLE	Hg ppm	As ppm	Ge ppm	Ge ppm-S	Sb ppm	Sb ppm-S	Se ppm	Cd ppm-S	Mo ppm-S
Samples from Proterozoic 2 sill-continued										
193991	JC701S	0.0000B	0.0000B	0.0000B	0.4600L	0.0000B	22.0000L	0.0000B	10.0000L	9.9000
193967	JC704S	0.0000B	0.0000B	0.0000B	0.4600L	0.0000B	22.0000L	0.0000B	10.0000L	8.5000
194003	JC706S	0.0000B	0.0000B	0.0000B	0.5400	0.0000B	22.0000L	0.0000B	10.0000L	11.0000
193984	JC707S	0.0000B	0.0000B	0.0000B	0.4600L	0.0000B	22.0000L	0.0000B	10.0000L	12.0000
LAB. NO.	SAMPLE	T-t %	Org-C %	CO ₃ -C %	CaO%	CaX-S	MgX-S	St ppm-S	Ba ppm-S	P ₂ O ₅ %
Samples from Proterozoic 2 sill-continued										
193991	JC701S	0.0000B	0.0000B	0.0000B	6.8000	5.9000	3.0000	120.0000	120.0000	0.0000B
193967	JC704S	0.0000B	0.0000B	0.0000B	7.2000	5.5000	2.8000	120.0000	92.0000	0.0000B
194003	JC706S	0.0000B	0.0000B	0.0000B	6.6140	5.4000	3.2000	110.0000	2.2000L	0.0000B
193984	JC707S	0.0000B	0.0000B	0.0000B	6.2000	4.0000	2.9000	130.0000	65.0000	0.0000B

Table 1.--Samples from quartzite (R in fourth character of sample number indicates duplicate analysis)-continued

LAB. NO.	SAMPLE	T-Fe2O3%	FeX-S	FeOX	Mn ppm-S	TiO2%	TiX-S	Zr ppm-S	Ni ppm-S	Cr ppm-S
Samples from Proterozoic 2 sill-continued										
193991	JC7Q1S	13.0000	9.5000	0.0000B	1700.0000	2.4000	2.2000G	190.0000	55.0000	49.0000
193967	JC7Q4S	13.0000	9.5000	0.0000B	1400.0000	2.2000	1.1000	110.0000	54.0000	84.0000
194003	JC7Q6S	13.2700	6.1000	13.9000	1900.0000	2.1890	2.2000G	170.0000	56.0000	71.0000
193984	JC7Q7S	13.0000	11.0000	0.0000B	1700.0000	2.3000	2.2000G	190.0000	54.0000	83.0000
LAB. NO.	SAMPLE	B ppm-S	Be ppm-S	Ce ppm-S	Co ppm-S	Ga ppm-S	Er ppm-S	Eu ppm-S	Dy ppm-S	Gd ppm-S
Samples from Proterozoic 2 sill-continued										
193991	JC7Q1S	24.0000	1.0000L	46.0000L	49.0000	11.0000	5.3000	2.8000	10.0000L	14.0000
193967	JC7Q4S	18.0000	1.0000L	46.0000L	37.0000	8.4000	4.6000L	3.0000	10.0000L	2.2000L
194003	JC7Q6S	16.0000	1.0000L	46.0000L	44.0000	11.0000	9.3000	1.0000L	10.0000L	4.1000
193984	JC7Q7S	32.0000	1.0000L	46.0000L	37.0000	8.6000	4.6000L	2.9000	10.0000L	2.2000L
LAB. NO.	SAMPLE	La ppm-S	Li-S	Nb ppm-S	Nd ppm-S	Pr ppm-S	Sr ppm-S	Sm-S	Sn ppm-S	Sr ppm
Samples from Proterozoic 2 sill-continued										
193991	JC7Q1S	16.0000	103.0000L	5.2000	46.0000L	46.0000L	4.6000L	46.0000L	4.6000L	0.0000B
193967	JC7Q4S	10.0000L	103.0000L	4.6000L	46.0000L	46.0000L	4.6000L	46.0000L	4.6000L	0.0000B
194003	JC7Q6S	10.0000L	103.0000L	5.5000	46.0000L	46.0000L	39.0000	46.0000L	4.6000L	0.0000B
193984	JC7Q7S	10.0000L	103.0000L	4.6000L	46.0000L	46.0000L	4.6000L	46.0000L	4.6000L	0.0000B
LAB. NO.	SAMPLE	Tb ppm-S	Th ppm	Tm-S	U ppm	V ppm-S	Y ppm-S	Yb ppm-S		
Samples from Proterozoic 2 sill-continued										
193991	JC7Q1S	22.0000L	0.0000B	2.2000L	0.0000B	390.0000	40.0000	2.9000		
193967	JC7Q4S	22.0000L	0.0000B	2.2000L	0.0000B	310.0000	33.0000	2.2000		
194003	JC7Q6S	22.0000L	0.0000B	2.2000L	0.0000B	280.0000	43.0000	2.7000		
193984	JC7Q7S	22.0000L	0.0000B	2.2000L	0.0000B	370.0000	29.0000	2.0000		

Table 1.--Samples from quartzite (R in fourth character of sample number indicates duplicate analysis)-continued

LAB. NO.	SAMPLE	La ppm-S	Li-S	Nb ppm-S	Nd ppm-S	Pr ppm-S	Sc ppm-S	Sm-S	Sn ppm-S	Sn ppm
Samples of quartzitic rocks in Spokane formation-continued										
193986	JC70111	43.0000	103.0000L	17.0000	46.0000L	46.0000L	4.6000	46.0000L	4.6000L	0.3000B
193971	JC70112	26.0000	103.0000L	16.0000	47.0000	46.0000L	3.3000	46.0000L	4.6000L	0.0000B
193999	JC7R112	38.0000	103.0000L	22.0000	46.0000L	46.0000L	5.3000	46.0000L	4.6000L	0.3000B
193960	JC70121	20.0000	103.0000L	15.0000	56.0000	46.0000L	3.8000	46.0000L	4.6000L	0.3000
193963	JC7R121	19.0000	103.0000L	11.0000	46.0000L	46.0000L	3.4000	46.0000L	4.6000L	0.5000
193995	JC70122	13.0000	103.0000L	13.0000	46.0000L	46.0000L	2.6000	46.0000L	4.6000L	0.7000
193994	JC70211	20.0000	103.0000L	14.0000	67.0000	46.0000L	2.9000	46.0000L	4.6000L	0.4000
193998	JC7R211	33.0000	103.0000L	11.0000	63.0000	46.0000L	3.3000	46.0000L	4.6000L	0.4000
193961	JC70212	25.0000	103.0000L	12.0000	73.0000	46.0000L	3.8000	46.0000L	4.6000L	0.6000
193985	JC70221	12.0000	103.0000L	5.7000	46.0000L	46.0000L	2.0000	46.0000L	4.6000L	0.2000
193966	JC7R221	18.0000	103.0000L	9.6000	46.0000L	46.0000L	2.2000	46.0000L	4.6000L	0.2000L
193968	JC70222	27.0000	103.0000L	12.0000	46.0000L	46.0000L	4.2000	46.0000L	4.6000L	0.8000
193993	JC70311	19.0000	103.0000L	18.0000	50.0000	51.0000	2.7000	46.0000L	4.6000L	0.2000
193970	JC70312	10.0000	103.0000L	5.5000	46.0000L	46.0000L	1.6000	46.0000L	4.6000L	0.2000L
193992	JC70321	12.0000	103.0000L	9.9000	46.0000L	46.0000L	2.6000	46.0000L	4.6000L	4.9000
193980	JC70322	12.0000	103.0000L	7.1000	46.0000L	46.0000L	1.6000	46.0000L	4.6000L	0.2000
194001	JC7R322	14.0000	103.0000L	6.6000	46.0000L	46.0000L	2.5000	46.0000L	4.6000L	0.7000
193975	JC70411	30.0000	103.0000L	13.0000	46.0000L	68.0000L	5.1000	46.0000L	4.6000L	0.8000
193990	JC70412	12.0000	103.0000L	11.0000	46.0000L	46.0000L	1.9000	46.0000L	4.6000L	0.3000
193988	JC7R412	23.0000	103.0000L	12.0000	46.0000L	46.0000L	1.9000	46.0000L	4.6000L	0.5000
193989	JC70421	20.0000	103.0000L	5.5000	46.0000L	46.0000L	3.6000	46.0000L	4.6000L	1.3000
193965	JC70422	21.0000	103.0000L	9.2000	46.0000L	46.0000L	2.2000	46.0000L	4.6000L	0.7000
193982	JC7R422	23.0000	103.0000L	7.5000	46.0000L	46.0000L	2.0000	46.0000L	4.6000L	1.3000
193976	JC70511	11.0000	103.0000L	7.1000	87.0000	53.0000	3.4000	46.0000L	4.6000L	1.3000
193972	JC70512	4.6000L	103.0000L	7.2000	46.0000L	46.0000L	1.8000	46.0000L	4.6000L	0.5000
193996	JC7R512	5.5000	103.0000L	6.6000	46.0000L	46.0000L	1.8000	46.0000L	4.6000L	0.6000
193981	JC70521	17.0000	103.0000L	6.7000	46.0000L	46.0000L	3.0000	46.0000L	4.6000L	0.5000
194000	JC70522	6.9000	103.0000L	7.5000	46.0000L	46.0000L	1.6000	46.0000L	4.6000L	0.2000L
205862	JC80611	35.0000	103.0000	18.0000	77.0000	60.0000L	8.7000	46.0000L	4.6000L	1.9000
205885	JC80612	37.0000	103.0000L	12.0000	67.0000	60.0000L	8.7000	46.0000L	6.3000	1.1000
205851	JC80621	17.0000	103.0000L	14.0000	61.0000	60.0000L	3.8000	46.0000L	4.6000L	0.2000L
205850	JC8R621	21.0000	103.0000L	12.0000	63.0000	60.0000L	4.0000	46.0000L	5.1000	0.4000
205878	JC80622	35.0000	103.0000L	19.0000	46.0000L	60.0000L	9.4000	46.0000L	4.6000L	1.1000
205846	JC80711	22.0000	103.0000L	12.0000	46.0000L	60.0000L	5.5000	46.0000L	4.6000L	0.2000L
205871	JC8R711	29.0000	103.0000L	17.0000	46.0000L	60.0000L	8.2000	46.0000L	4.6000L	15.0000
205835	JC80712	39.0000	103.0000L	20.0000	46.0000L	60.0000L	5.7000	47.0000	5.9000	1.4000
205882	JC80721	38.0000	103.0000L	22.0000	48.0000	60.0000L	8.6000	46.0000L	4.3000	2.5000
205868	JC80722	21.0000	103.0000L	16.0000	46.0000L	60.0000L	5.7000	46.0000L	4.6000L	1.0000
193987	JC70421X	65.0000	103.0000L	7.4000	46.0000L	46.0000L	10.0000	46.0000L	4.6000L	0.3000B
193959	JC70521X	13.0000	103.0000L	6.4000	79.0000	46.0000L	2.4000	46.0000L	4.6000L	0.3000B
193983	JC7R521X	31.0000	103.0000L	15.0000	46.0000L	59.0000	5.5000	46.0000L	4.6000L	0.3000B
Samples from Spokane-Empire transition-continued										
193977	JC70611	13.0000	103.0000L	5.7000	46.0000L	46.0000L	3.2000	46.0000L	2.2000L	0.3000B
193997	JC70612	33.0000	103.0000L	9.8000	46.0000L	46.0000L	7.9000	46.0000L	4.6000L	0.3000B
193978	JC70611X	4.6000L	103.0000L	4.6000L	46.0000L	46.0000L	1.3000	46.0000L	4.7000	0.3000B

Table 1.--Samples from quartzite (R in fourth character of sample number indicates duplicate analysis)-continued

LAB. NO.	SAMPLE	Tb ppm-S	Th ppm	Tm-S	U ppm	V ppm-S	Y ppm-S	Yb ppm-S
Samples of quartzitic rocks in Spokane Formation-continued								
193986	JC7Q111	26.0000	3.0000B	2.2000L	0.0000B	25.0000	46.0000	2.6000
193971	JC7Q142	22.0000L	3.0000B	2.2000L	0.0000B	24.0000	28.0000	2.5000
193999	JC7R112	22.0000L	3.0000B	2.2000L	0.0000B	32.0000	48.0000	3.3000
193960	JC7Q121	22.0000L	8.6500	2.2000L	2.7500	40.0000	21.0000	1.3000
193963	JC7R121	22.0000L	13.4000	2.2000L	2.6900	37.0000	24.0000	1.3000
193995	JC7Q122	22.0000L	7.9200	2.2000L	2.1500	23.0000	22.0000	1.4000
193994	JC7Q211	22.0000L	7.0400	2.2000L	1.8600	18.0000	30.0000	1.8000
193998	JC7R211	22.0000L	8.9300	2.2000L	1.8000	20.0000	37.0000	2.0000
193961	JC7Q212	22.0000L	8.4900	2.2000L	2.2500	22.0000	33.0000	1.9000
193985	JC7Q221	22.0000L	5.9700	2.2000L	1.5400	12.0000	21.0000	1.3000
193966	JC7R221	22.0000L	6.4600	2.2000L	1.6100	12.0000	30.0000	1.5000
193968	JC7Q222	22.0000L	8.4900	2.2000L	2.0000	20.0000	35.0000	1.8000
193993	JC7Q311	22.0000L	8.0200	2.2000L	1.9000	11.0000	29.0000	1.7000
193970	JC7Q312	22.0000L	4.3700	2.2000L	1.3600	4.9000	14.0000	0.9400
193992	JC7Q321	22.0000L	6.4100	2.2000L	1.7500	18.0000	24.0000	1.4000
193980	JC7Q322	22.0000L	5.8900	2.2000L	1.5900	8.1000	21.0000	1.2000
194001	JC7R322	25.0000	7.0400	2.2000L	1.6200	13.0000	27.0000	1.6000
193975	JC7Q411	22.0000L	8.9300	2.2000L	1.7000	17.0000	23.0000	1.6000
193990	JC7Q412	23.0000	11.1000	2.2000L	4.0400	8.0000	85.0000	4.2000
193988	JC7R412	27.0000	7.2100	2.2000L	3.0500	8.4000	50.0000	2.1000
193989	JC7Q421	22.0000L	8.6800	2.2000L	1.6900	15.0000	23.0000	1.7000
193965	JC7Q422	22.0000L	7.8300	2.2000L	1.5900	6.1000	20.0000	1.4000
193982	JC7R422	22.0000L	7.6500	2.2000L	1.6300	5.9000	23.0000	1.2000
193976	JC7Q511	22.0000L	6.3300	2.2000L	1.6500	19.0000	23.0000	1.4000
193972	JC7Q512	22.0000L	8.7000	2.2000L	1.6300	8.2000	17.0000	1.4000
193996	JC7R512	22.0000L	7.8800	2.2000L	1.4800	8.9000	17.0000	1.2000
193981	JC7Q521	22.0000L	5.0700	2.2000L	1.6700	20.0000	25.0000	1.5000
194000	JC7Q522	22.0000L	5.0500	2.2000L	1.9700	11.0000	17.0000	1.0000
205862	JC8Q611	22.0000L	9.2300	2.7000	2.3200	22.0000	17.0000	1.7000
205885	JC8Q612	22.0000L	9.6100	2.2000L	2.0300	20.0000	22.0000	1.9000
205851	JC8Q621	22.0000L	7.5200	3.7000	1.8400	11.0000	17.0000	1.2000
205850	JC8R621	22.0000L	7.3300	2.8000	2.1900	13.0000	14.0000	1.4000
205878	JC8Q622	22.0000L	13.3000	2.2000L	3.2100	27.0000	23.0000	1.8000
205846	JC8Q711	22.0000L	13.4000	2.2000L	2.5900	20.0000	15.0000	1.5000
205871	JC8R711	22.0000L	9.0500	2.2000L	2.7400	27.0000	22.0000	1.9000
205835	JC8Q712	22.0000L	5.1000L	3.6000	14.9000	19.0000	25.0000	1.6000
205882	JC8Q721	22.0000L	11.1000	2.2000L	2.7400	24.0000	21.0000	2.0000
205868	JC8Q722	22.0000L	7.5500	3.8000	1.9500	17.0000	17.0000	1.4000
193987	JC7Q421x	22.0000L	3.0000B	2.2000L	0.0000B	93.0000	51.0000	3.2000
193959	JC7Q521x	53.0000	3.0000B	2.2000L	0.0000B	18.0000	29.0000	1.6000
193983	JC7R521x	22.0000L	3.0000B	2.2000L	0.0000B	32.0000	30.0000	2.0000

Samples from Spokane-Empire transition-continued

193977	JC7Q611	22.0000L	3.0000B	2.2000L	0.0000B	16.0000	16.0000	0.6700
193997	JC7Q612	22.0000L	3.0000B	2.2000L	0.0000B	52.0000	41.0000	2.5000
193978	JC7Q611x	22.0000L	3.0000B	2.2000L	0.0000B	3.1000	8.4000	0.4600L

Table 1.--Samples from quartzite (R in fourth character of sample number indicates duplicate analysis)-continued

LAB. NO.	SAMPLE	T-Fe2O3%	Fe-S	FeO%	Mn ppm-S	TiO2%	Ti-S	Zr ppm-S	Ni ppm-S	Cr ppm-S
Samples of quartzitic rocks in Spokane Formation-continued										
193986	JC7Q111	0.7000	3.7400	0.00008	41.0000	0.5000	0.3100	920.0000	4.3000	25.0000
193971	JC7Q112	0.9000	3.9500	0.00008	69.0000	0.5000	0.2500	410.0000	5.6000	25.0000
193999	JC7R112	1.1620	3.9300	0.00008	89.0000	0.5760	0.6800	1000.00006	6.1000	15.0000
193960	JC7Q121	1.7000	1.6000	0.00008	97.0000	0.3000	0.2200	360.0000	7.1000	22.0000
193963	JC7R121	2.1000	1.9000	0.00008	110.0000	0.3000	0.2200	430.0000	11.0000	21.0000
193995	JC7Q122	0.7000	3.8600	0.00008	61.0000	0.3000	0.1800	340.0000	3.3000	13.0000
193994	JC7Q211	1.0000	3.7900	0.00008	79.0000	0.3000	0.1600	280.0000	5.4000	13.0000
193998	JC7R211	0.9000	3.9900	0.00008	70.0000	0.3000	0.2100	320.0000	5.2000	27.0000
193961	JC7Q212	1.5000	1.3000	0.00008	120.0000	0.4000	0.1800	320.0000	11.0000	10.0000
193985	JC7Q221	0.7000	3.6000	0.00008	83.0000	0.3000	0.1300	200.0000	1.5000	18.0000
193966	JC7R221	0.8000	0.7000	0.00008	47.0000	0.3000	0.1300	210.0000	1.9000	16.0000
193968	JC7Q222	1.2000	3.9100	0.00008	70.0000	0.4000	0.2200	380.0000	5.6000	35.0000
193993	JC7Q311	0.6000	3.6300	0.00008	28.0000	0.5000	0.1800	410.0000	2.8000	19.0000
193970	JC7Q312	0.3000	3.2800	0.00008	19.0000	0.3000	0.0640	160.0000	3.9000	8.1000
193992	JC7Q321	0.9000	3.8900	0.00008	68.0000	0.4000	0.1700	220.0000	7.2000	22.0000
193980	JC7Q322	0.5000	3.4400	0.00008	52.0000	0.4000	0.0910	260.0000	2.3000	10.0000
194001	JC7R322	0.5082	3.6100	0.00008	82.0000	0.3552	0.1500	400.0000	3.7000	16.0000
193975	JC7Q411	1.2000	1.2000	0.00008	110.0000	0.3000	0.2400	300.0000	6.6000	17.0000
193990	JC7Q412	0.3000	3.2600	0.00008	36.0000	0.3000	0.0950	370.0000	1.5000	13.0000
193988	JC7R412	0.3000	3.3300	0.00008	53.0000	0.3000	0.1200	440.0000	1.6000	16.0000
193989	JC7Q421	0.9000	3.9400	0.00008	85.0000	0.3000	0.1600	250.0000	8.9000	11.0000
193965	JC7Q422	0.4000	3.3600	0.00008	61.0000	0.2000	0.1200	280.0000	4.3000	23.0000
193982	JC7R422	0.4000	3.3400	0.00008	72.0000	0.2000	0.1200	300.0000	2.4000	14.0000
193976	JC7Q511	1.1000	1.0000	0.00008	120.0000	0.3000	0.1900	200.0000	7.2000	11.0000
193972	JC7Q512	0.5000	3.4600	0.00008	20.0000	0.2000	0.1100	380.0000	1.5000	14.0000
193996	JC7R512	0.5000	3.4800	0.00008	26.0000	0.2000	0.1300	260.0000	2.2000	13.0000
193981	JC7Q521	1.0000	3.9900	0.00008	71.0000	0.3000	0.1500	150.0000	4.7000	27.0000
194000	JC7Q522	0.4321	3.4600	0.00008	57.0000	0.2283	0.0980	89.0000	3.0000	16.0000
205862	JC8Q611	1.3100	3.9300	0.5100	170.0000	0.4000	0.2200	220.0000	8.0000	23.0000
205885	JC8Q612	2.0900	1.1000	1.2700	660.0000	0.3200	0.2000	240.0000	14.0000	20.0000
205851	JC8Q621	0.4100	3.4000	0.2800	80.0000	0.2500	0.1300	180.0000	3.5000	6.9000
205850	JC8R621	0.7600	3.5500	0.5300	120.0000	0.2800	0.1300	140.0000	4.6000	9.9000
205878	JC8Q622	2.2500	1.2000	1.3600	140.0000	0.4400	0.2500	280.0000	15.0000	26.0000
205846	JC8Q714	2.5500	1.2000	1.5300	260.0000	0.4200	0.1300	180.0000	12.0000	20.0000
205871	JC8R711	2.5200	1.4000	1.3400	320.0000	0.4200	0.2200	250.0000	16.0000	28.0000
205835	JC8Q712	1.0700	3.8300	0.5300	360.0000	0.3100	0.1900	240.0000	10.0000	19.0000
205882	JC8Q721	2.9100	1.5000	1.8400	230.0000	0.4400	0.2800	230.0000	17.0000	28.0000
205868	JC8Q722	1.7600	3.9200	1.3100	310.0000	0.3100	0.1600	170.0000	15.0000	24.0000
193987	JC7Q421X	3.5000	2.7000	0.00008	170.0000	0.7000	0.4500	320.0000	21.0000	43.0000
193959	JC7Q521X	1.3000	1.1000	0.00008	130.0000	0.2000	0.1200	290.0000	14.0000	16.0000
193983	JC7R521X	2.1000	1.5000	0.00008	210.0000	0.4000	0.2300	370.0000	19.0000	19.0000
Samples from Spokane-Empire transition-continued										
193977	JC7Q611	3.2000	2.6000	0.00008	3600.0000	0.1000	0.0220L	110.0000	7.3000	7.1000
193997	JC7Q612	2.2000	1.6000	0.00008	1800.0000	0.4000	0.2500	320.0000	15.0000	25.0000
193978	JC7Q611X	0.3000	3.3000	0.00008	1000.0000	0.2000	0.0063	54.0000	2.5000	1.5000

Table 1.--Samples from quartzite [R in fourth character of sample number indicates duplicate analysis]-continued

LAB. NO.	SAMPLE	B ppm-S	Be ppm-S	Ce ppm-S	Co ppm-S	Ga ppm-S	Er ppm-S	Eu ppm-S	Dy ppm-S	Gd ppm-S
Samples of quartzitic rocks in Spokane formation-continued										
193986	JC7Q111	48.0000	1.2000	61.0000	2.0000	2.2000L	6.2000	2.2000	10.0000L	17.0000
193971	JC7Q112	46.0000	1.3000	46.0000L	1.9000	2.2000L	4.6000L	1.5000	10.0000L	2.2000L
193999	JC7R112	50.0000	1.4000	58.0000	2.9000	2.2000L	6.7000	1.0000L	11.0000	10.0000
193960	JC7Q121	34.0000	1.3000	46.0000L	4.2000	2.2000L	5.1000	1.2000	10.0000L	11.0000
193963	JC7R121	32.0000	1.6000	46.0000L	4.6000	2.2000L	5.6000	1.0000L	10.0000L	2.2000L
193995	JC7Q122	18.0000	1.2000	46.0000L	2.9000	2.2000L	4.8000	1.5000	10.0000L	10.0000
193994	JC7Q211	11.0000	1.6000	46.0000L	3.2000	2.2000L	6.2000	1.5000	10.0000	2.2000L
193998	JC7R211	15.0000	1.4000	46.0000L	2.8000	2.2000L	6.0000	2.1000	11.0000	3.6000
193961	JC7Q212	18.0000	1.2000	46.0000L	7.0000	2.2000L	6.4000	2.2000	10.0000L	5.7000
193985	JC7Q221	5.0000L	1.0000L	46.0000L	1.4000	2.2000L	5.9000	2.1000	10.0000L	5.7000
193966	JC7R221	5.0000L	1.2000	46.0000L	1.2000	2.2000L	4.6000L	2.2000	10.0000L	2.8000
193968	JC7Q222	13.0000	1.1000	46.0000L	3.5000	2.2000L	5.8000	1.0000L	11.0000	13.0000
193993	JC7Q311	5.0000L	1.2000	46.0000L	0.8100	2.2000L	6.5000	2.0000	10.0000L	14.0000
193970	JC7Q312	5.0000L	1.0000L	46.0000L	0.4600L	2.2000L	4.6000L	2.4000	10.0000L	3.9000
193992	JC7Q321	12.0000	1.9000	46.0000L	3.1000	2.2000L	5.4000	1.9000	10.0000L	11.0000
193980	JC7Q322	5.0000L	1.2000	46.0000L	1.5000	2.2000L	5.5000	2.1000	10.0000L	2.2000L
194001	JC7R322	5.0000L	1.5000	46.0000L	2.5000	2.2000L	5.0000	1.0000L	10.0000L	4.4000
193975	JC7Q411	8.6000	1.7000	63.0000	3.4000	2.2000L	4.6000L	1.0000L	10.0000L	7.4000
193990	JC7Q412	5.0000L	1.0000L	46.0000L	0.6900	2.2000L	7.0000	2.3000	10.0000	2.2000L
193988	JC7R412	5.0000L	1.0000L	46.0000L	0.8700	2.2000L	6.1000	1.0000L	10.0000L	2.2000L
193989	JC7Q421	12.0000	1.2000	46.0000L	5.6000	2.2000L	6.4000	1.9000	10.0000L	2.2000L
193965	JC7Q422	5.0000L	1.0000L	46.0000L	1.4000	2.2000L	4.7000	1.8000	10.0000L	5.7000
193982	JC7R422	5.0000L	1.0000L	46.0000L	1.3000	2.2000L	6.3000	2.1000	10.0000L	2.2000L
193976	JC7Q511	13.0000	1.1000	46.0000L	3.4000	2.2000L	6.2000	1.6000	10.0000L	6.4000
193972	JC7Q512	6.8000	1.0000L	46.0000L	0.7100	2.2000L	4.6000L	2.3000	10.0000L	2.2000L
193996	JC7R512	5.0000L	1.0000L	46.0000L	0.8500	2.2000L	6.1000	1.3000	10.0000L	2.2000L
193981	JC7Q521	11.0000	1.4000	46.0000L	2.8000	2.2000L	4.9000	1.3000	10.0000L	4.6000
194000	JC7Q522	5.0000L	1.0000L	46.0000L	2.2000	2.2000L	5.3000	1.0000L	10.0000L	2.2000L
205862	JC8Q611	29.0000	1.0000L	96.0000	4.7000	4.2000	4.6000L	1.0000L	10.0000L	11.0000
205885	JC8Q612	5.0000L	1.2000	100.0000	12.0000	4.4000	4.6000L	1.8000	10.0000L	5.7000
205851	JC8Q621	5.0000L	1.0000L	58.0000	1.9000	2.2000L	4.6000L	2.4000	10.0000L	21.0000
205850	JC8R621	5.0000L	1.0000L	68.0000	2.7000	2.2000L	4.6000L	2.9000	10.0000L	13.0000
205878	JC8Q622	21.0000	1.0000	99.0000	8.6000	5.0000	4.6000L	1.8000	10.0000L	11.0000
205846	JC8Q711	15.0000	1.0000L	52.0000	6.1000	2.4000	4.6000L	2.7000	10.0000L	15.0000
205871	JC8R711	32.0000	1.1000	110.0000	8.4000	4.9000	4.6000L	1.8000	10.0000L	8.3000
205835	JC8Q712	16.0000	2.3000	120.0000	6.7000	3.4000	4.6000L	4.4000	12.0000	8.0000
205882	JC8Q721	24.0000	1.0000L	100.0000	13.0000	5.0000	4.6000L	1.0000L	10.0000L	10.0000
205868	JC8Q722	9.0000	1.0000L	60.0000	6.3000	2.6000	4.6000L	1.0000L	10.0000L	13.0000
193987	JC7Q421X	30.0000	2.0000	74.0000	9.9000	10.0000	7.8000	2.8000	10.0000L	15.0000
193959	JC7Q521X	5.0000L	1.6000	46.0000L	8.1000	2.2000L	5.1000	1.4000	10.0000L	2.2000L
193983	JC7R521X	36.0000	1.6000	46.0000L	11.0000	4.4000	6.3000	1.7000	10.0000L	2.2000L
Samples from Spokane-Empire transition-continued										
193977	JC7Q611	18.0000	1.1000	46.0000L	11.0000	2.2000L	8.8000	1.4000	10.0000L	2.2000L
193997	JC7Q612	83.0000	1.3000	59.0000	11.0000	4.5000	6.7000	2.4000	10.0000L	2.2000L
193978	JC7Q611X	5.0000L	1.0000L	46.0000L	1.5000	2.2000L	4.7000	2.1000	10.0000L	2.2000L

Table 1.--Samples from quartzite (R in fourth character of sample number indicates duplicate analysis)-continued

LAB. NO.	SAMPLE	T-C %	Org-C %	CO ₃ -C %	CaO%	Ca%-S	Mg%-S	Sr ppm-S	Ba ppm-S	P2O5 %
Samples of quartzitic rocks in Spokane formation-continued										
193986	JC70111	0.0000B	J.0000B	0.0000B	0.1000L	0.1000L	0.1800	310.0000	310.0000	0.3000B
193971	JC70112	0.0000B	J.0000B	0.0000B	0.1000L	0.1000L	0.2200	310.0000	220.0000	0.3000B
193999	JC7R112	0.0000B	J.0000B	0.0000B	0.1000L	0.1000L	0.2600	420.0000	310.0000	0.3000B
193960	JC70121	0.0500	J.0500	0.0100L	0.1000L	0.2300	0.3700	97.0000	200.0000	0.3300
193963	JC7R121	0.0500	J.0500	0.0100L	0.1000L	1.7000	0.3300	190.0000	160.0000	0.1000L
193995	JC70122	0.0300	J.0300	0.0100L	0.1000L	0.2400	0.2400	17.0000	120.0000	0.1000L
193994	JC70211	0.0200	J.0200	0.0100L	0.1000L	0.1000L	0.2300	120.0000	620.0000	0.1000L
193998	JC7R211	0.0300	J.0300	0.0100L	0.1000L	0.1000L	0.3400	200.0000	790.0000	0.1000L
193961	JC70212	0.0200	J.0200	0.0100L	0.1000L	0.1100	0.7100	94.0000	740.0000	0.2300
193985	JC70221	0.0200	J.0200	0.0100L	0.1000L	0.1000L	0.0910	160.0000	1600.0000	0.1000L
193966	JC7R221	0.0300	J.0300	0.0100L	0.1000L	0.1000L	0.1100	190.0000	710.0000	0.1300
193968	JC70222	0.0200	J.0200	0.0100L	0.1000L	0.2400	0.3400	95.0000	970.0000	0.2700
193993	JC70311	0.0200	J.0200	0.0100L	0.1000L	0.1000L	0.0980	150.0000	400.0000	0.1000L
193970	JC70312	0.0500	J.0500	0.0100L	0.1000L	0.1000L	0.0880	110.0000	3100.0000	0.1000L
193992	JC70321	0.0200	J.0200	0.0100L	0.1000L	0.2000	0.4500	110.0000	370.0000	0.1000
193980	JC70322	0.0200	J.0200	0.0100L	0.1000L	0.1000L	0.1900	160.0000	2900.0000	0.1000L
194001	JC7R322	0.0200	J.0200	0.0100L	0.1000L	0.1000L	0.2700	190.0000	3400.0000	0.1000L
193975	JC70411	0.0300	J.0300	0.0100L	0.1000L	0.1600	0.3500	130.0000	310.0000	0.2500
193990	JC70412	0.0200	J.0200	0.0100L	0.1000L	0.1000L	0.0670	110.0000	620.0000	0.1000L
193988	JC7R412	0.0300	J.0300	0.0100L	0.1000L	0.1000L	0.0860	120.0000	660.0000	0.1000L
193989	JC70421	0.0200	J.0200	0.0100L	0.1000L	0.1200	0.5200	120.0000	120.0000	0.1000L
193965	JC70422	0.1600	J.0100L	0.1600	0.5000	0.6700	0.1300	200.0000	110.0000	0.2200
193982	JC7R422	0.1300	J.0100	0.1200	0.4000	0.4600	0.1400	120.0000	83.0000	0.1000L
193976	JC70511	0.0100	J.0100	0.0100L	0.1000	0.1200	0.3700	110.0000	150.0000	0.1200
193972	JC70512	0.2000	J.0200	0.0100L	0.1000L	0.1900	0.0590	93.0000	410.0000	0.1700
193976	JC7R512	0.0200	J.0200	0.0100L	0.1000L	0.0460L	0.0750	110.0000	300.0000	0.1000L
193981	JC70521	0.0200	J.0200	0.0100L	0.1000L	0.0890	0.2600	160.0000	190.0000	0.1000L
194000	JC70522	0.0300	J.0300	0.0100L	0.2141	0.1500	0.1000	140.0000	490.0000	0.6400
205862	JC80611	0.1000	J.0600	0.0400	0.2300	0.1000L	0.5400	140.0000	220.0000	0.1000L
205885	JC80612	0.2100	J.0600	0.1500	1.4000	1.0000	1.3000	240.0000	1400.0000	0.1000L
205851	JC80621	0.0500	J.0500	0.0100L	0.1800	0.1000L	0.3000	120.0000	1500.0000	0.1000L
205850	JC8R621	0.0500	J.0500	0.0100L	0.1900	0.3000	0.3800	120.0000	1330.0000	0.1000L
205878	JC80622	0.0200	J.0200	0.0100L	0.2800	0.2200	0.8300	120.0000	450.0000	0.1000
205846	JC80711	0.0500	J.0500	0.0100L	0.3000	0.3000	0.6300	74.0000	390.0000	0.1000L
205871	JC8R711	0.0500	J.0500	0.0100L	0.3200	0.4000	0.9100	120.0000	590.0000	0.1000L
205835	JC80712	0.1700	J.0300	0.1400	0.9600	0.4800	0.5900	150.0000	980.0000	0.1000L
205882	JC80721	0.0300	J.0300	0.0100L	0.3700	0.2400	1.1000	120.0000	230.0000	0.1000L
205868	JC80722	0.1900	J.0400	0.1500	0.8600	0.7300	0.6300	130.0000	340.0000	0.1000L
193987	JC70421x	0.0000B	J.0000B	0.0000B	0.2000	0.1300	1.4000	190.0000	520.0000	0.3000B
193959	JC70521x	0.0000B	J.0000B	0.0000B	0.1000	0.1200	1.6000	99.0000	320.0000	0.0000B
193983	JC7R521x	0.0000B	J.0000B	0.0000B	0.1000	0.1000	1.5000	120.0000	220.0000	0.3000B

Samples from Spokane-Empire transition-continued

193977	JC70611	0.0000B	J.0000B	0.0000B	9.9000	3.3000	1.8000	150.0000	290.0000	0.3000B
193997	JC70612	0.0000B	J.0000B	0.0000B	4.8000	4.2000	1.6000	130.0000	200.0000	0.0000B
193978	JC70611x	0.0000B	J.0000B	0.0000B	2.1000	0.9700	0.5000	120.0000	1300.0000	0.3000B

Table 1.--Samples from quartzite (R in fourth character of sample number indicates duplicate analysis)-continued

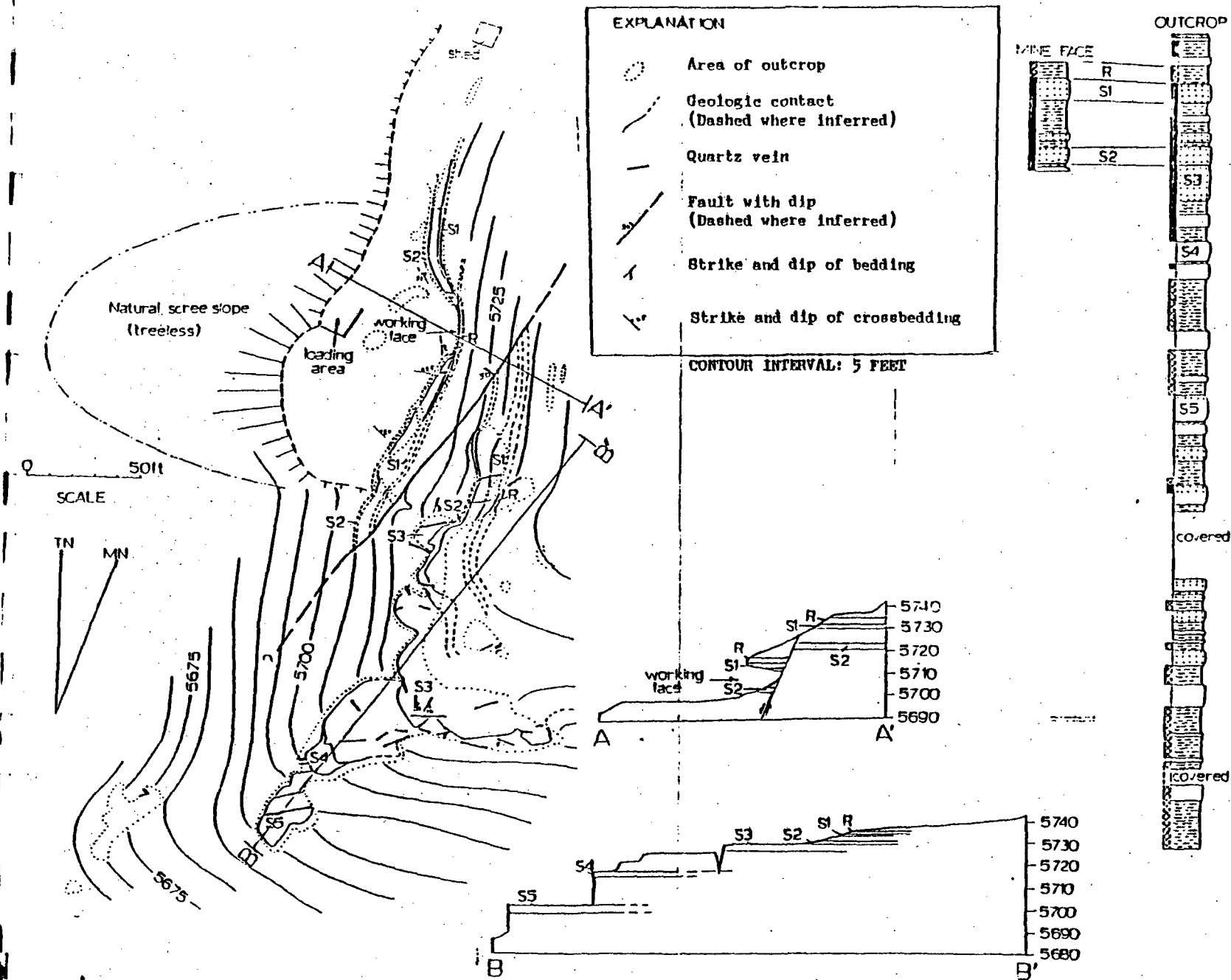
LAB. NO.	SAMPLE	Hg ppm	As ppm	Ge ppm	Ge ppm-S	Sb ppm	Sb ppm-S	Se ppm	Cd ppm-S	Mo ppm-S
Samples of quartzitic rocks in Spokane formation-continued										
193986	JC7Q111	0.0000B	3.0000B	0.0000B	1.5000	0.0000B	22.0000L	0.0000B	10.0000L	1.3000L
193971	JC7Q112	0.0000B	3.0000B	0.0000B	1.3000	0.0000B	22.0000L	0.0000B	10.0000L	1.2000
193999	JC7R112	0.0000B	3.0000B	0.0000B	1.2000	0.0000B	22.0000L	0.0000B	10.0000L	1.1000
193960	JC7Q121	2.6000	13.0000	4.0000	5.2000	24.0000	54.0000	0.2000	10.0000L	1.6000
193963	JC7R121	3.2000	21.0000	4.5000	4.9000	29.0000	58.0000	0.5000	10.0000L	2.2000
193995	JC7Q122	0.9100	4.5000	2.5000	2.1000	6.9000	51.0000	0.2000L	10.0000L	1.3000L
193994	JC7Q211	0.1900	3.7000	0.8000	0.4600L	0.2000L	22.0000L	0.2000L	10.0000L	1.3000L
193998	JC7R211	0.1700	3.9000	0.9000	0.6100	0.2000L	22.0000L	0.2000L	10.0000L	1.3000L
193961	JC7Q212	0.1100	1.1000	1.2000	0.6800	0.3000	22.0000L	0.2000L	10.0000L	1.3000
193985	JC7Q221	0.1300	3.7000	0.9000	1.1000	0.2000L	22.0000L	0.2000L	10.0000L	1.3000L
193966	JC7R221	0.2100	3.9000	0.9000	0.9200	0.2000L	22.0000L	0.2000L	10.0000L	1.3000L
193968	JC7Q222	0.1500	1.1000	0.9000	0.6000	0.4000	22.0000L	0.2000L	10.0000L	1.3000L
193993	JC7Q311	0.6800	1.0000	0.6000	0.9000	0.4000	22.0000L	0.2000L	10.0000L	1.3000L
193970	JC7Q312	0.4100	3.4000	0.3000	1.1000	0.2000L	22.0000L	0.2000L	10.0000L	1.3000L
193992	JC7Q321	1.3500	3.0000	1.5000	1.1000	1.4000	22.0000L	0.2000L	10.0000L	1.9000
193980	JC7Q322	0.1500	2.2000	0.9000	0.9000	0.4000	24.0000	0.2000L	10.0000L	8.4000
194001	JC7R322	0.1000	2.2000	0.9000	0.7100	0.2000L	22.0000L	0.3000	10.0000L	9.6000
193975	JC7Q411	0.3900	3.7000	1.3000	0.4600L	0.2000L	46.0000L	0.2000L	10.0000L	1.0000L
193990	JC7Q412	0.0800	3.4000	0.7000	1.4000	0.2000L	22.0000L	0.2000L	10.0000L	1.3000L
193988	JC7R412	0.0700	3.9000	0.9000	0.9000	0.2000	22.0000L	0.2000L	10.0000L	1.3000L
193989	JC7Q421	0.0300	3.6000	0.9000	1.1000	0.2000L	22.0000L	0.2000L	10.0000L	1.3000L
193965	JC7Q422	0.0400	3.4000	1.2000	0.4600L	0.2000L	22.0000L	0.2000L	10.0000L	1.3000L
193982	JC7R422	0.0400	3.3000	1.0000	1.2000	0.2000L	22.0000L	0.2000L	10.0000L	1.3000L
193976	JC7Q511	0.2200	3.9000	1.1000	1.3000	0.2000L	22.0000L	0.2000L	10.0000L	1.3000L
193972	JC7Q512	0.2400	1.5000	1.3000	0.9200	0.2000L	22.0000L	0.2000L	10.0000L	1.3000L
193996	JC7R512	0.1600	1.5000	1.2000	1.0000	0.2000L	22.0000L	0.2000L	10.0000L	1.3000L
193981	JC7Q521	0.1000	3.8000	0.7000	1.1000	0.2000L	22.0000L	0.2000L	10.0000L	1.3000L
194000	JC7Q522	0.1600	3.9000	0.7000	1.2000	0.2000L	22.0000L	0.2000L	10.0000L	1.3000L
205862	JC8Q611	0.1300	3.8000	1.7000	1.7000	0.2000L	46.0000L	0.2000L	10.0000L	1.3000L
205885	JC8Q612	0.0200	1.2000	1.0000	1.5000	0.2000L	46.0000L	0.2000L	10.0000L	1.3000L
205851	JC8Q621	0.1300	3.2000L	0.8000	1.2000	0.2000L	46.0000L	0.2000L	10.0000L	1.3000L
205850	JC8R621	0.0200L	1.9000	1.1000	1.2000	0.2000L	46.0000L	0.2000L	10.0000L	1.3000L
205878	JC8Q622	0.0200	3.7000	1.1000	0.4600L	0.2000L	46.0000L	0.2000L	10.0000L	1.3000L
205846	JC8Q711	0.0700	3.4000	0.6000	0.8600	0.2000L	46.0000L	0.2000L	10.0000L	1.0000L
205871	JC8R711	0.0400	3.4000	2.5000	0.4600L	4.1000	46.0000L	0.2000L	10.0000L	1.2000
205835	JC8Q712	0.0300	2.5000	1.8000	2.3000	0.3000	46.0000L	0.2000L	10.0000L	1.0000L
205882	JC8Q721	0.0200	3.9000	1.5000	1.9000	0.2000L	46.0000L	0.2000L	10.0000L	1.3000
205868	JC8Q722	0.0700	1.1000	1.4000	0.4600L	0.2000L	46.0000L	0.2000L	10.0000L	1.2000
193987	JC7Q421X	0.0000B	3.0000B	0.0000B	0.5000	0.0000B	22.0000L	0.0000B	10.0000L	1.3000
193959	JC7Q521X	0.0000B	3.0000B	0.0000B	0.8100	0.0000B	22.0000L	0.0000B	10.0000L	1.4000
193983	JC7R521X	0.0000B	3.0000B	0.0000B	0.6500	0.0000B	22.0000L	0.0000B	10.0000L	1.3000L

Samples from Spokane-Empire transition-continued

193977	JC7Q611	0.0000B	3.0000B	0.0000B	0.4600L	0.0000B	22.0000L	0.0000B	24.0000	1.9000
193997	JC7Q612	0.0000B	3.0000B	0.0000B	0.5500	0.0000B	22.0000L	0.0000B	10.0000L	3.8000
193978	JC7Q611X	0.0000B	3.0000B	0.0000B	1.7000	0.0000B	22.0000L	0.0000B	10.0000L	1.3000L

Table 1.--Samples from quartzite [R in fourth character of sample number indicates duplicate analysis]-continued

LAB. NO.	SAMPLE	Cu ppm-S	CuZ-A	CuX-Sol	Ag ppm-S	Ag ppm-A	SulfurZ	SulfideZ	Pb ppm-S	Zn ppm-S
Samples of quartzitic rocks in Spokane formation-continued										
193986	JC70111	11.0000	0.00000	0.00000	0.4600L	0.00000	0.2000	0.00000	8.2000	11.0000
193971	JC70112	26.0000	0.00000	0.00000	0.4600L	0.00000	0.1000	0.00000	6.2000	10.0000
193999	JC7R112	20.0000	0.00000	0.00000	0.4600L	0.00000	0.0652	0.00000	9.9000	13.0000
193960	JC70121	2200.0000	0.2670	0.2260	14.0000	8.0000	0.0600	0.0100L	26.0000	42.0000
193963	JC7R121	2000.0000	0.2460	0.2030	17.0000	9.0000	0.1000	0.0100L	24.0000	61.0000
193995	JC70122	490.0000	0.0520	0.0430	2.9000	3.0000	0.2000	0.0100L	5.4000	20.0000
193994	JC70211	1480.0000	0.1680	0.1330	0.4600	12.0000	0.1000	0.0100L	5.5000	28.0000
193998	JC7R211	1300.0000	0.1420	0.1190	21.0000	6.0000	0.2000	0.0100L	7.5000	26.0000
193961	JC70212	1200.0000	0.1430	0.1200	17.0000	8.0000	0.1000	0.0100L	4.7000	96.0000
193985	JC70221	1400.0000	0.1570	0.1320	9.7000	4.0000	0.2000	0.0100L	4.7000	11.0000
193966	JC7R221	1600.0000	0.1930	0.1600	18.0000	9.0000	0.1000	0.0100L	3.8000	14.0000
193968	JC70222	1500.0000	0.1790	0.1510	8.3000	7.0000	0.2000	0.0100L	4.7000	37.0000
193993	JC70311	4600.0000G	0.7860	0.7000	20.0000	11.0000	0.3000	0.0100L	4.9000	18.0000
193970	JC70312	4600.0000G	0.5840	0.5100	9.8000	6.0000	0.2000	0.0100L	4.5000	7.2000
193992	JC70321	4600.0000G	1.0700	0.7130	22.0000G	16.0000	0.3000	0.0800	4.5000	90.0000
193980	JC70322	870.0000	0.1150	0.0900	2.0000	3.0000L	0.3000	0.0100L	81.0000	23.0000
194001	JC7R322	1300.0000	0.1390	0.1170	1.7000	3.0000L	0.1620	0.0100L	89.0000	39.0000
193975	JC70411	5.1000	0.0020	0.0050L	8.4000	10.0000	0.1000	0.0100L	4.7000	19.0000
193990	JC70412	2300.0000	0.2540	0.2140	22.0000	21.0000	0.2000	0.0100L	2.9000	8.5000
193988	JC7R412	2300.0000	0.2690	0.2270	12.0000	7.0000	0.2000	0.0100L	3.5000	7.5000
193989	JC70421	750.0000	0.0780	0.0600	1.2000	3.0000L	0.1000	0.0100L	4.4000	28.0000
193965	JC70422	540.0000	0.0710	0.0590	1.1000	3.0000L	0.0800	0.0100L	3.0000	12.0000
193982	JC7R422	630.0000	0.0780	0.0660	0.8600	3.0000L	0.2000	0.1000L	3.1000	12.0000
193976	JC70511	1100.0000	0.1290	0.1050	17.0000	9.0000	0.1000	0.0100L	17.0000	30.0000
193972	JC70512	95.0000	0.0160	0.0100	1.4000	3.0000L	0.0800	0.0100L	3.9000	7.9000
193996	JC7R512	120.0000	0.0150	0.0090	1.3000	3.0000L	0.1000	0.0100L	4.8000	8.3000
193981	JC70521	930.0000	0.1090	0.0900	3.3000	3.0000	0.1000	0.0100L	4.7000	32.0000
194000	JC70522	2700.0000	0.2740	0.2430	7.3000	4.0000	0.0996	0.0100L	7.9000	17.0000
205862	JC80611	80.0000	0.0090	0.0080	0.6800	3.0000L	0.1000L	0.0100L	7.1000	36.0000
205885	JC80612	1400.0000	0.1470	0.1150	5.9000	5.0000	0.1000L	0.0200	13.0000	130.0000
205851	JC80621	1200.0000	0.1200	0.1050	7.2000	5.0000	0.1000L	0.0100L	4.4000	30.0000
205850	JC8R621	3200.0000	0.3380	0.2350	15.0000	8.0000	0.1000L	0.0100	5.6000	33.0000
205878	JC80622	2400.0000	0.2630	0.2100	11.0000	8.0000	0.1000L	0.0100	12.0000	120.0000
205846	JC80711	4600.0000G	0.7250	0.5460	15.0000	12.0000	0.1000L	0.0400	5.9000	45.0000
205871	JC8R711	4600.0000G	0.6100	0.5730	14.0000	7.0000	0.1000L	0.0300	7.6000	54.0000
205835	JC80712	100.0000	0.0080	0.0060	28.0000	12.0000	0.1000L	0.0600	11.0000	42.0000
205882	JC80721	130.0000	0.0150	0.0130	0.6300	3.0000L	0.1000L	0.0100L	9.2000	32.0000
205868	JC80722	4600.0000G	0.7500	0.5590	20.0000	10.0000	0.1000L	0.0400	7.4000	52.0000
193987	JC70421x	4600.0000G	0.00000	0.00000	15.0000	0.00000	0.2000	0.00000	4.2000	98.0000
193959	JC70521x	3100.0000	0.00000	0.00000	22.0000G	0.00000	0.1000	0.00000	10.0000	130.0000
193983	JC7R521x	2500.0000	0.00000	0.00000	19.0000	0.00000	0.1000	0.00000	13.0000	130.0000
Samples from Spokane-Empire transition-continued										
193977	JC70611	8.1000	0.00000	0.00000	0.4600L	0.00000	0.1000	0.00000	4.9000	110.0000
193997	JC70612	1500.0000	0.00000	0.00000	5.8000	0.00000	0.2000	0.00000	46.0000	67.0000
193978	JC70611x	1.7000	0.00000	0.00000	0.4600L	0.00000	0.2000	0.00000	2.3000	13.0000



EXPLANATION

- Area of outcrop
- Geologic contact (Dashed where inferred)
- Quartz vein
- Fault with dip (Dashed where inferred)
- Strike and dip of bedding
- Strike and dip of crossbedding

CONTOUR INTERVAL: 5 FEET

MINE FACE

OUTCROP

R
S1
S2
S3
S4
S5
covered
covered

Explanation for measured section

BLOCKY SILTSTONE OR VERY FINE GRAINED SANDSTONE (DOTTED WHERE SILICIOUS, BLACK WHERE COPPER-STAINED)

PLATY SILTSTONE (CROSS HATCHED WHERE RED IN COLOR)

NUMBERS REFER TO MAP UNITS

100 — 10
50 — 5
0 — 0 feet

inches

SCALE

Figure 2.--Geologic map and section of the Alice Creek mine.

Table 1.--Samples from outcrop (R in fourth character of sample number indicates duplicate analysis)

LAB. NO.	SAMPLE	LATITUDE	LONGITUDE	SiO ₂ X	SiO ₂ -S	Al ₂ O ₃ X	Al ₂ O ₃ -S	Na ₂ O-X	K ₂ O-X	K ₂ O-S
Samples of quartzitic rocks in Spokane Formation										
193986	JC7Q111	47 03 30N	112 29 30W	84.0000	37.0000G	9.5000	4.6000	0.1000	1.6000	1.3000
193971	JC7Q112	47 03 30N	112 29 30W	84.0000	37.0000G	8.0000	4.9000	0.0740	1.7000	1.3000
193999	JC7R112	47 03 30N	112 29 30W	85.0900	37.0000G	8.6940	5.1000	0.0860	1.8670	1.4000
193960	JC7Q121	47 03 30N	112 29 30W	70.0000	36.0000	8.5000	5.2000	0.1400	2.1000	1.9000
193963	JC7R121	47 03 30N	112 29 30W	75.0000	36.0000	8.9000	5.0000	0.0820	2.2000	1.5000
193995	JC7Q122	47 03 30N	112 29 30W	84.0000	37.0000G	7.0000	4.9000	0.0540	1.8000	1.3000
193994	JC7Q211	47 06 30N	112 28 00W	80.0000	34.0000	9.8000	5.7000	1.5000	1.1000	1.4000
193998	JC7R211	47 06 30N	112 28 00W	81.0000	36.0000	9.9000	6.3000	1.4000	1.1000	0.9900
193961	JC7Q212	47 06 30N	112 28 00W	79.0000	34.0000	10.0000	6.3000	1.3000	1.4000	1.2000
193985	JC7Q221	47 06 30N	112 28 00W	83.0000	36.0000	7.1000	4.1000	1.2000	0.6000	0.4600
193966	JC7R221	47 06 30N	112 28 00W	82.0000	34.0000	7.0000	4.2000	1.2000	0.8000	0.5100
193968	JC7Q222	47 06 30N	112 28 00W	81.0000	31.0000	9.0000	5.8000	1.4000	1.2000	1.1000
193993	JC7Q311	47 02 00N	112 25 30W	81.0000	37.0000G	7.5000	4.5000	1.2000	0.3000	0.1600
193970	JC7Q312	47 02 00N	112 25 30W	87.0000	37.0000	5.9000	4.0000	1.2000	0.2000	0.1200L
193992	JC7Q321	47 02 00N	112 25 30W	80.0000	37.0000G	8.7000	4.4000	1.1000	0.5000	0.2900
193980	JC7Q322	47 02 00N	112 25 30W	84.0000	37.0000	6.5000	4.0000	1.1000	0.2000	0.1200L
194001	JC7R322	47 02 00N	112 25 30W	79.1100	37.0000G	5.8800	4.9000	1.2000	0.2454	0.1800
193975	JC7Q411	47 06 00N	112 22 30W	83.0000	37.0000G	7.4000	5.0000	2.6000	0.5000	0.3500
193990	JC7Q412	47 06 00N	112 22 30W	86.0000	37.0000G	7.1000	3.8000	1.1000	0.4000	0.2700
193988	JC7R412	47 06 00N	112 22 30W	85.0000	37.0000G	7.2000	4.3000	1.1000	0.5000	0.3700
193989	JC7Q421	47 05 30N	112 22 00W	79.0000	37.0000G	9.5000	6.1000	1.5000	0.6000	0.4600
193965	JC7Q422	47 05 30N	112 22 00W	83.0000	37.0000G	6.4000	4.2000	1.0000	0.1000	0.1200L
193982	JC7R422	47 05 30N	112 22 00W	86.0000	36.0000	6.8000	3.6000	0.9500	0.1300	0.1200L
193976	JC7Q511	47 07 30N	112 25 30W	82.0000	37.0000G	8.6000	5.6000	1.3000	1.0000	0.7600
193972	JC7Q512	47 07 30N	112 25 30W	85.0000	37.0000G	6.9000	3.9000	1.1000	0.8000	0.5300
193996	JC7R512	47 07 30N	112 25 30W	79.0000	37.0000G	6.5000	4.2000	1.1000	0.8000	0.5400
193981	JC7Q521	47 07 28N	112 26 00W	81.0000	37.0000G	8.7000	5.4000	1.3000	1.1000	1.0000
194000	JC7Q522	47 07 28N	112 26 00W	85.9500	37.0000G	6.2740	4.2000	1.4000	0.7738	0.7900
205862	JC8Q611	47 04 57N	112 30 24W	80.4500	29.0000	10.4300	4.9000	2.5000	2.2100	2.1000
205885	JC8Q612	47 04 57N	112 30 24W	75.7300	32.0000	9.6300	5.6000	3.1000	0.7200	0.6200
205851	JC8Q621	47 05 10N	112 30 15W	84.8800	35.0000	7.4200	4.4000	2.3000	0.8200	0.6200
205850	JC8R621	47 05 10N	112 30 15W	85.1500	32.0000	8.3000	3.9000	2.5000	0.9800	0.8900
205878	JC8Q622	47 05 10N	112 30 15W	78.6100	31.0000	11.1000	5.3000	2.5000	2.2500	1.8000
205846	JC8Q711	46 59 29N	112 19 12W	78.4600	25.0000	10.4600	4.8000	2.0000	1.6700	0.9400
205871	JC8R711	46 59 29N	112 19 12W	76.0800	33.0000	10.2900	5.4000	2.5000	1.6400	1.4000
205835	JC8Q712	46 59 29N	112 19 12W	79.3600	37.0000G	8.3900	5.5000	2.9000	1.0300	1.1000
205882	JC8Q721	46 59 26N	112 19 15W	76.2800	30.0000	10.8100	5.9000	3.0000	0.9700	0.9500
205868	JC8Q722	46 59 29N	112 19 15W	80.8500	32.0000	8.6400	4.6000	2.5000	1.0700	0.7600
193987	JC7Q421X	47 05 30N	112 22 00W	60.0000	26.0000	18.0000	7.7000	0.9400	3.5000	2.9000
193959	JC7Q521X	47 07 28N	112 26 00W	75.0000	34.0000	8.4000	4.9000	1.1000	0.8000	0.6500
193983	JC7R521X	47 07 28N	112 26 00W	69.0000	28.0000	13.0000	7.6000	1.4000	2.4000	2.3000
Samples from Spokane-Empire transition										
193977	JC7Q611	47 10 00N	112 29 00W	53.0000	20.0000	3.1000	2.6000	0.5600	0.8000	0.6200
193997	JC7Q612	47 10 00N	112 29 00W	58.0000	24.0000	12.0000	7.1000	1.3000	2.5000	2.0000
193978	JC7Q611X	47 10 00N	112 29 00W	86.0000	37.0000G	1.3000	1.2000	0.2600	0.0300L	0.1200L