

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Analytical results for 56 rock, 46 stream-sediment and soil,
and 22 panned-concentrate samples from the
Welcome Creek Wilderness Study Area, Granite County, Montana

by

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This report is preliminary and has not been reviewed
for conformity with U.S. Geological Survey editorial standards
and stratigraphic nomenclature.

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STUDIES RELATED TO WILDERNESS

The Wilderness Act (Public Law 88-577, September 3, 1964) and related acts require the U.S. Geological Survey and the U.S. Bureau of Mines to survey certain areas on Federal lands to determine their mineral resource potential. Results must be made available to the public and be submitted to the President and the Congress. This report presents the results of a geochemical survey of the Welcome Creek Wilderness Study Area (01806) in the Lolo National Forest, Granite County, Montana. The Welcome Creek Wilderness Study Area was classified as a proposed wilderness during the Second Roadless Area Review and Evaluation (RARE II) by the U.S. Forest Service, January 1979.

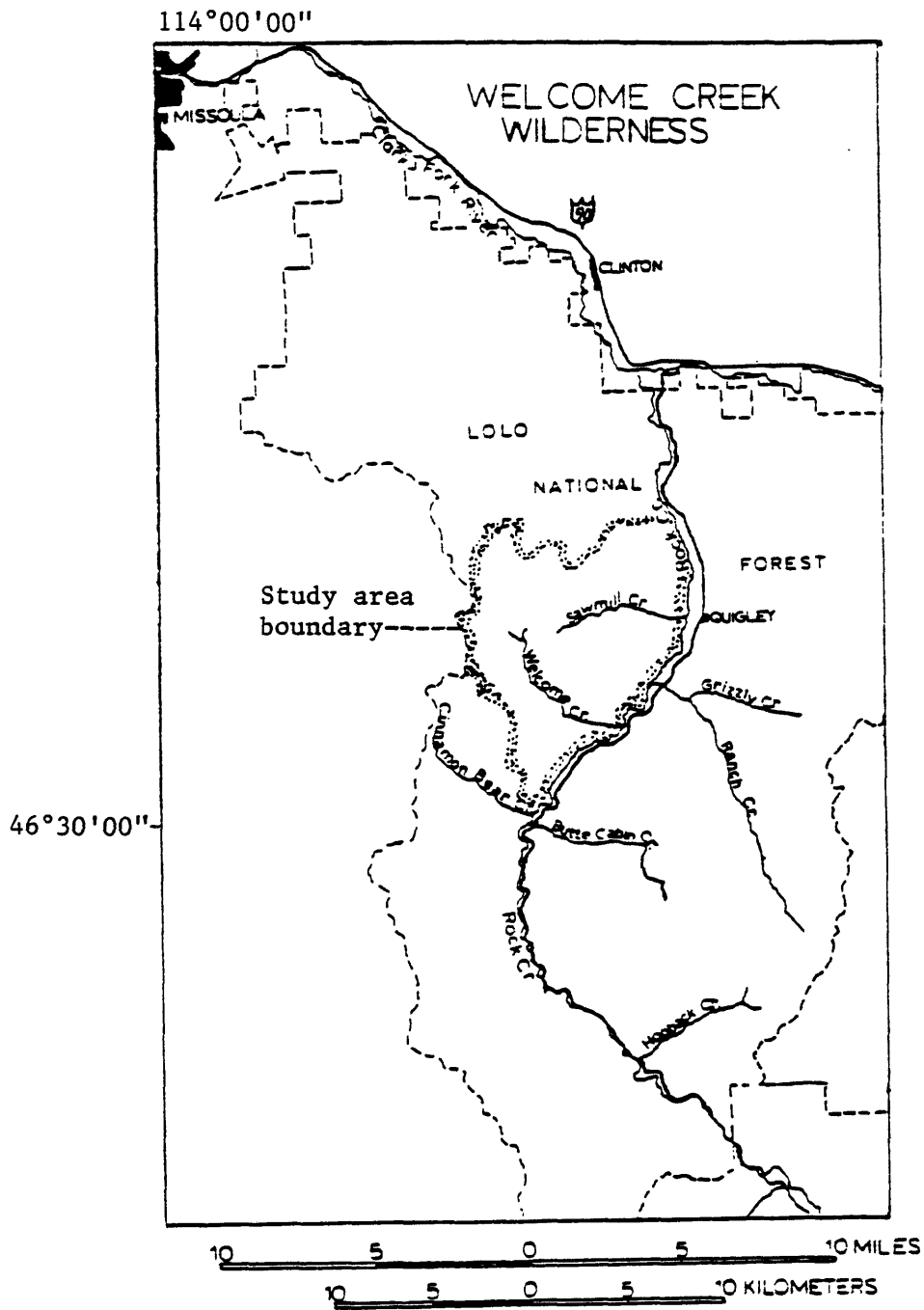


FIGURE 1. Index Map Showing Location of Study Area

SAMPLE LOCATION MAP
WELCOME CREEK WILDERNESS

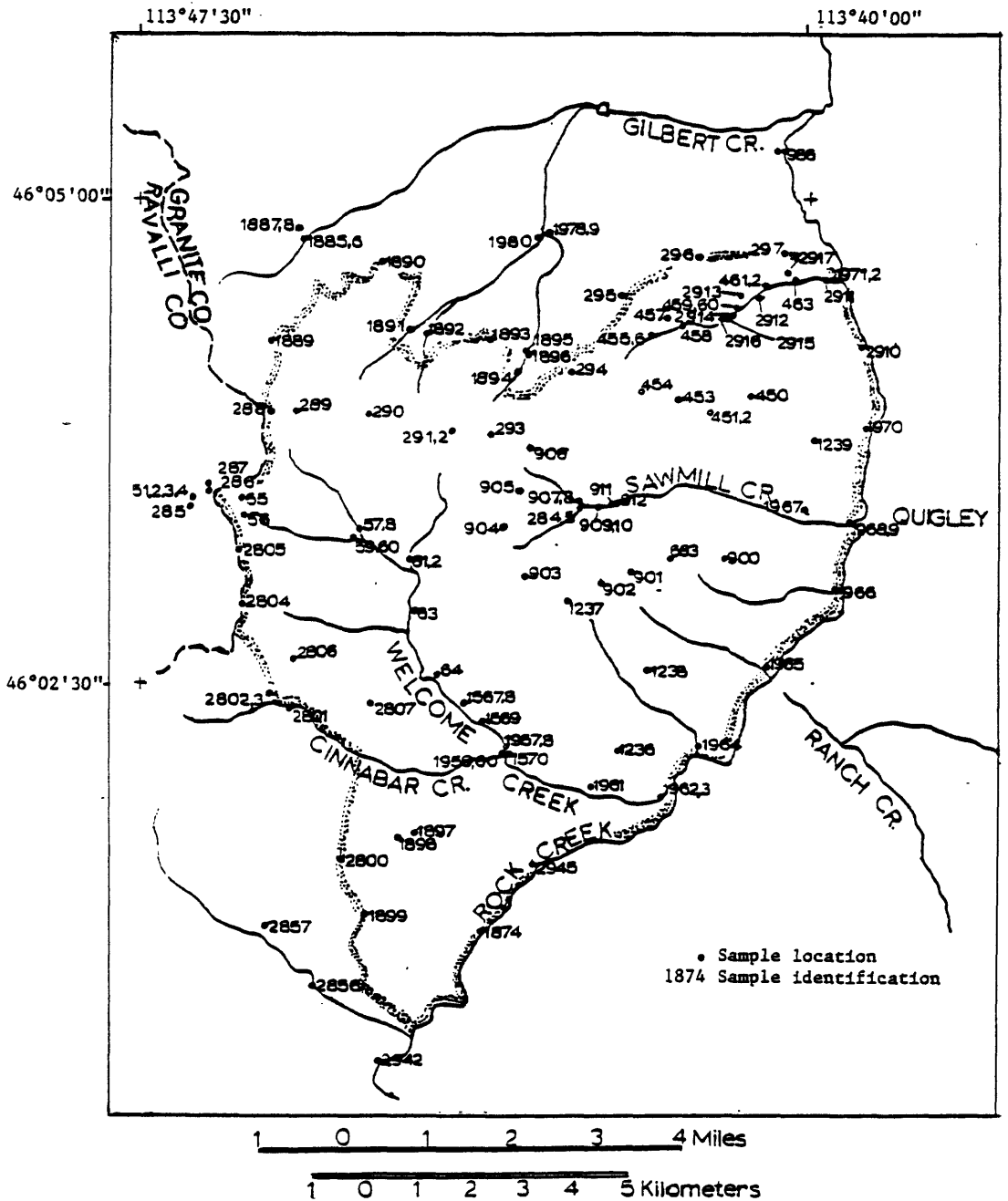


FIGURE 2. Sample Location Map, Welcome Creek Wilderness

Abstract

Fifty-six rock, 46 stream-sediment, and 22 panned-concentrate samples were collected from the Welcome Creek Wilderness, Granite County, Montana, during the summers of 1979 and 1980.

All samples were analyzed for 31 elements by a six-step semiquantitative emission spectrographic method (Grimes and Marranzino, 1968). All panned concentrate and other selected samples were analyzed for gold by an atomic absorption procedure (Thompson and others, 1968). All rock and stream-sediment samples were also analyzed for Ag, Bi, Cd, Cu, Pb, Sb, and Zn by a partial-digestion procedure (Viets and others, 1979). Sample analyses and locations are presented in this report.

Introduction

The geochemical sampling program in the Welcome Creek Wilderness consisted of collecting and analyzing samples to determine potential mineralization (fig. 1). To accomplish this, 58 rock samples, 42 stream-sediment samples, and 21 panned-concentrate samples were collected within the Wilderness Area. Traverses to collect these samples were made along all the ridges and stream drainages of the area (fig. 2).

Sample collection and preparation

Rock samples were taken mostly from outcrop, but mineralized float-rock samples were taken when found. The rocks were then crushed and pulverized to minus-117-micrometer (-80 mesh). The stream-sediment samples consisted of the minus-117-micrometer (-80 mesh) fraction of drainage sediments, the oversized material being discarded. The panned-concentrate samples were usually panned at the collection site, but in some instances, when no water was available, the sample was bagged and concentrated later. The concentrate was then split and analyzed without any further treatment.

Analytical Techniques

The analytical methods for the emission spectrographic analysis are based on the procedure described by Grimes and Marranzino (1968). Gold was determined by an atomic absorption procedure, using the method described by Thompson and others (1968). Ag, Bi, Cd, Cu, Pb, Sb, and Zn were also determined by atomic absorption using the method described by Viets and others (1979).

Results

The analytical data are shown on the accompanying tables. Rock samples are coded with an "R" on table 1, stream-sediment samples are coded with an "S" on table 2, and panned-concentrate samples are coded with a "P" on table 3.

References

- Grimes, D. J., and Marranzino, A. P., 1968, Direct-current arc and alternating-current spark emission spectrographic field method for the semiquantitative analysis of geologic materials: U.S. Geological Survey Circular 591, 6 p.
- Thompson, C. E., Nakagawa, H. M., and VanSickle, G. H., 1968, Rapid analysis for gold in geologic materials, in Geologic Research: U. S. Geological Survey Professional Paper 600-B, p. B130-B132.
- Viets, J. G., Clark, J. R., and Campbell, W. L., 1979, U.S. Geological Survey, A.E.G., Proceedings of Exploration Geochemistry in the Basin and Range Province, Tuscon, Arizona, 1979.
- Ward, F. N., Nakagawa, H. M., Harms, T. F., and VanSickle, G. H., 1969, Atomic absorption methods of Analysis useful in Geochemical Exploration: U.S. Geological Survey Bulletin 1289, p. 33-38.

TABLE 1 -- ROCK SAMPLE LOCALITY AND ANALYSES FROM THE WELCOME CREEK WILDERNESS STUDY AREA, GRANITE COUNTY, MONTANA

Sample	Latitude	Longitude	Fe-pct. s(.05)	Mg-pct. s(.02)	Ca-pct. s(.05)	Ti-pct. s(.002)	Mn-ppm s(10)	Ag-ppm s(.5)	As-ppm s(200)	Cr-ppm s(10)	Ba-ppm s(20)	Be-ppm s(1)
CLE0051R	46 36 56	113 49 9	--	--	--	--	--	--	--	--	--	--
CLE0052R	46 36 56	113 49 9	3.0	.70	.10	.200	100	7.0	N	30	2,000	2.0
CLE0053R	46 36 56	113 49 9	.7	.10	<.05	<.002	50	1.5	N	N	100	<1.0
CLE0054R	46 36 55	113 49 5	5.0	.30	.20	.300	200	N	N	20	700	1.0
CLE0055R	46 36 55	113 48 26	5.0	.70	.30	.500	500	N	N	150	1,000	1.5
CLE0056R	46 36 58	113 48 23	5.0	1.50	.50	.300	200	7.0	N	300	700	1.5
CLE0063R	46 35 48	113 45 56	1.5	.30	.20	.200	70	N	N	300	150	1.5
CLE0285R	46 36 50	113 49 16	1.5	.07	<.05	.020	100	N	N	N	150	N
CLE0286R	46 36 58	113 49 12	2.0	.70	.15	.300	300	N	N	20	700	2.0
CLE0288R	46 37 49	113 48 4	5.0	.70	.20	.300	100	N	N	70	700	2.0
CLE0289R	46 37 53	113 47 39	1.0	.07	<.05	.030	100	N	N	<10	100	N
CLE0290R	46 37 47	113 46 35	7.0	2.00	.30	.500	500	N	N	300	700	2.0
CLE0291R	46 37 36	113 45 20	3.0	1.00	.15	.300	200	N	N	100	700	1.0
CLE0292R	46 37 36	113 45 20	3.0	1.50	.15	.700	200	N	N	200	1,000	1.5
CLE1890R	46 39 22	113 46 26	5.0	1.50	3.00	.500	700	N	N	500	1,500	2.0
CLE1897R	46 33 27	113 45 56	2.0	.50	.30	.200	150	N	N	150	500	1.5
CLE1898R	46 33 24	113 46 11	5.0	.02	<.05	.050	200	N	200	20	200	1.0
CLE1899R	46 32 35	113 46 41	1.0	.50	.10	.200	50	N	N	150	300	2.0
CLE2800R	46 33 10	113 47 2	.3	.15	.07	.070	<10	N	N	50	100	1.5
CLE2804M	46 35 49	113 48 30	1.0	.30	2.00	.150	500	N	N	<10	700	3.0
CLE2805R	46 36 20	113 48 30	2.0	1.00	.30	.200	100	N	N	10	500	2.0
CLE2806R	46 35 16	113 47 42	5.0	1.50	.15	.500	200	N	N	300	1,500	3.0
CLE2807R	46 34 49	113 46 34	3.0	1.00	.20	.300	70	<.5	N	200	500	5.0
RAV0293R	46 37 34	113 44 45	1.5	.70	.10	.150	100	N	N	100	500	1.0
RAV0294R	46 38 11	113 43 32	2.0	.70	.15	.200	150	N	N	150	700	1.5
RAV0295R	46 40 0	113 42 47	.7	.10	.05	.070	200	N	N	30	500	<1.0
RAV0296R	46 39 24	113 41 38	3.0	1.00	.07	.300	300	N	N	70	500	1.5
RAV0297R	46 39 27	113 40 20	5.0	2.00	.10	.500	300	N	N	150	700	1.5
RAV0450R	46 37 57	113 40 53	3.0	.50	.10	.200	100	N	N	30	500	1.5
RAV0451R	46 37 45	113 41 28	1.5	.30	.05	.150	150	N	N	30	200	1.0
RAV0452R	46 37 45	113 41 28	.5	.07	<.05	.070	50	N	N	20	200	<1.0
RAV0453R	46 37 54	113 41 56	3.0	1.50	1.50	.200	500	N	N	30	300	1.5
RAV0454R	46 39 0	113 42 31	3.0	5.00	7.00	.300	1,000	N	N	100	1,000	2.0
RAV0457R	46 38 45	113 42 5	1.0	.30	.10	.100	300	N	N	50	200	1.0
RAV0683R	46 38 39	113 41 53	3.0	1.50	.20	.500	150	N	N	300	1,000	3.0
RAV0900R	46 36 15	113 41 18	5.0	1.50	.15	.500	150	N	N	200	1,000	2.0
RAV0901R	46 36 8	113 42 41	3.0	1.00	.10	.500	70	N	N	100	300	2.0
RAV0902R	46 36 1	113 43 7	3.0	1.00	.50	.300	300	N	N	100	300	2.0
RAV0903R	46 36 6	113 44 15	7.0	1.50	.20	.700	150	N	N	200	1,500	3.0
RAV0904R	46 36 35	113 44 33	3.0	1.50	.20	.700	300	N	N	200	700	3.0
RAV0905R	46 37 59	113 44 18	5.0	1.50	.20	.500	300	N	N	200	700	2.0
RAV0906R	46 37 26	113 44 10	5.0	.50	.70	.300	500	N	N	150	300	1.0
RAV0911R	46 36 50	113 42 56	1.0	.50	.30	.150	100	N	N	70	200	3.0
RAV0912R	46 36 50	113 42 51	.5	.50	1.50	.030	100	N	N	10	50	<1.0
RAV1236R	46 34 17	113 42 54	3.0	1.00	3.00	.300	700	N	N	10	500	2.0

TABLE 1 --- ROCK SAMPLE LOCALITY AND ANALYSES FROM THE WELCOME CREEK WILDERNESS STUDY AREA, GRANITE COUNTY, MONTANA

Sample	Bi-ppm s(10)	Co-ppm s(5)	Cr-ppm s(10)	Cu-ppm s(5)	La-ppm s(20)	Mo-ppm s(5)	Ni-ppm s(5)	Pb-ppm s(10)	Sc-ppm s(5)	Sn-ppm s(10)	Sr-ppm s(100)	V-ppm s(10)
CLE0051R	--	--	--	--	--	--	--	--	--	--	--	--
CLE0052R	N	20	70	10	20	N	20	15	10	N	N	100
CLE0053R	10	N	<10	15	20	N	5	10	N	N	N	<10
CLE0054R	N	N	70	<5	150	N	<5	10	7	N	<100	30
CLE0055R	N	10	100	<5	70	N	15	<10	10	N	<100	50
CLE0056R	N	7	100	<5	70	N	15	<10	10	N	<100	50
CLE0063R	N	5	50	<5	100	N	5	15	7	N	<100	50
CLE0285R	N	7	<10	15	<20	7	5	10	N	N	N	15
CLE0286R	N	7	70	5	20	N	15	10	7	N	N	50
CLE0288R	N	7	70	<5	100	N	50	10	15	N	<100	70
CLE0289R	N	N	10	70	N	N	<5	10	N	N	N	<10
CLE0290R	N	15	100	5	70	N	70	15	15	N	<100	70
CLE0291R	N	7	70	<5	30	N	15	20	7	N	<100	30
CLE0292R	N	7	100	<5	N	N	15	15	20	N	<100	100
CLE1890R	N	7	150	5	30	N	30	10	15	N	<100	100
CLE1897R	N	5	100	<5	150	N	10	10	5	N	N	50
CLE1898R	N	<5	15	10	20	N	5	10	<5	N	N	10
CLE1899R	N	5	50	<5	30	N	10	10	7	N	N	30
CLE2800R	N	N	15	<5	20	N	<5	<10	5	N	N	15
CLE2804M	N	<5	10	<5	30	N	<5	30	7	N	700	30
CLE2805R	N	7	50	<5	30	N	15	<10	7	N	N	50
CLE2806R	N	10	100	<5	50	N	50	<10	10	N	N	70
CLE2807R	N	5	50	500	30	N	20	30	7	30	N	30
RAV0293R	N	5	20	<5	20	N	10	15	7	N	<100	30
RAV0294R	N	7	50	N	30	N	15	15	7	N	N	30
RAV0295R	N	N	15	<5	20	N	5	15	N	N	N	15
RAV0296R	N	15	50	20	50	N	20	15	7	N	N	50
RAV0297R	N	10	70	30	N	N	30	10	15	N	N	70
RAV0450R	N	7	50	<5	30	N	15	<10	7	N	<100	30
RAV0451R	N	5	15	<5	20	N	10	<10	5	N	N	20
RAV0452R	N	N	<10	<5	<20	N	<5	<10	<5	N	N	<10
RAV0453R	N	10	20	20	30	N	20	10	7	N	N	30
RAV0454R	N	10	50	<5	30	N	50	<10	10	N	N	50
RAV0457R	N	<5	15	<5	30	N	7	10	<5	N	N	30
RAV0683R	N	10	150	<5	70	<5	30	10	15	N	N	150
RAV0900R	N	15	150	5	50	<5	50	10	10	N	N	100
RAV0901R	N	7	150	<5	50	N	30	10	10	N	<100	100
RAV0902R	N	5	100	<5	30	N	30	10	10	N	<100	100
RAV0903R	N	10	150	<5	70	N	30	<10	20	N	N	100
RAV0904R	N	15	150	7	50	N	50	<10	15	N	<100	70
RAV0905R	N	15	150	30	50	<5	50	10	15	N	<100	100
RAV0906R	N	15	70	10	70	N	20	<10	7	N	N	50
RAV0911R	N	<5	70	<5	20	N	15	10	5	N	<100	30
RAV0912R	N	N	30	N	20	N	<5	<10	<5	N	<100	10
RAV1236R	N	7	100	<5	50	N	20	10	7	N	<100	50

TABLE 1 -- ROCK SAMPLE LOCALITY AND ANALYSES FROM THE WELCOME CREEK WILDERNESS STUDY AREA, GRANITE COUNTY, MONTANA

Sample	Y-ppm s(10)	Zr-ppm s(10)	Au-ppm aa(.05)	Cu-ppm aa(1)	Pb-ppm aa(1)	Zn-ppm aa(1)	Ag-ppm aa(.05)	Cd-ppm aa(.05)	Bi-ppm aa(1)	Sb-ppm aa(1)
CLE0051R	--	--	--	<1	<1	<1	<.05	<.05	<1	<1
CLE0052R	15	200	--	6	3	1	2.35	<.05	1	<1
CLE0053R	N	N	--	11	2	<1	.60	<.05	12	<1
CLE0054R	70	500	--	<1	2	2	<.05	<.05	<1	<1
CLE0055R	70	700	--	<1	1	6	<.05	.08	<1	<1
CLE0056R	70	700	--	<1	1	<1	<.05	<.05	1	<1
CLE0063R	30	200	--	2	13	5	.10	.06	2	1
CLE0285R	N	N	--	3	1	1	.09	<.05	10	<1
CLE0286R	30	500	--	2	3	1	<.05	.06	4	<1
CLE0288R	70	700	--	1	2	2	<.05	.05	<1	<1
CLE0289R	200	30	--	33	1	1	<.05	<.05	<1	<1
CLE0290R	30	700	--	1	2	3	<.05	<.05	<1	<1
CLE0291R	20	200	--	1	2	2	<.05	.05	<1	<1
CLE0292R	30	500	--	<1	2	2	<.05	.05	<1	<1
CLE1890R	50	300	--	N	N	1	N	.07	N	1
CLE1897R	50	300	--	N	N	1	N	.07	N	N
CLE1898R	<10	100	--	N	N	2	N	.06	N	N
CLE1899R	10	300	--	N	N	1	N	.07	N	N
CLE2800R	<10	70	--	N	N	N	N	.06	N	N
CLE2804M	15	200	.41	N	3	3	<.05	<.05	1	2
CLE2805R	20	100	--	N	N	1	N	.07	N	N
CLE2806R	30	200	--	N	N	1	N	.07	N	N
CLE2807R	30	200	--	N	N	1	N	.37	N	N
RAV0293R	15	100	--	1	1	1	<.05	<.05	<1	<1
RAV0294R	30	300	--	<1	1	2	<.05	<.05	<1	<1
RAV0295R	<10	200	--	1	1	1	<.05	<.05	<1	<1
RAV0296R	50	300	--	3	2	2	<.05	<.05	<1	<1
RAV0297R	50	300	--	7	2	4	<.05	.07	<1	<1
RAV0450R	20	150	--	<1	2	2	<.05	<.05	<1	<1
RAV0451R	30	200	--	<1	1	2	<.05	<.05	<1	<1
RAV0452R	10	100	--	<1	1	1	<.05	<.05	<1	<1
RAV0453R	20	100	--	16	3	7	<.05	.12	<1	<1
RAV0454R	30	150	--	<1	1	4	<.05	<.05	1	<1
RAV0457R	30	200	--	<1	2	5	<.05	.05	<1	<1
RAV0683R	50	700	--	<1	1	3	<.05	<.05	<1	<1
RAV0900R	50	500	--	1	1	3	<.05	<.05	<1	<1
RAV0901R	50	500	--	<1	1	5	<.05	<.05	<1	<1
RAV0902R	30	300	--	1	1	4	<.05	.05	<1	<1
RAV0903R	30	300	--	<1	1	3	<.05	<.05	<1	<1
RAV0904R	50	500	--	1	<1	4	<.05	<.05	<1	<1
RAV0905R	50	500	--	7	1	3	<.05	<.05	<1	<1
RAV0906R	50	500	--	4	1	8	<.05	<.05	<1	<1
RAV0911R	15	300	--	<1	1	7	<.05	<.05	<1	<1
RAV0912R	<10	300	--	<1	<1	1	<.05	<.05	<1	<1
RAV1236R	30	300	--	1	1	2	N	.18	N	N

TABLE 1 -- ROCK SAMPLE LOCALITY AND ANALYSES FROM THE WELCOME CREEK WILDERNESS STUDY AREA, GRANITE COUNTY, MONTANA--continued

Sample	Latitude	Longitude	Fe-pct. s(.05)	Mg-pct. s(.02)	Ca-pct. s(.05)	Ti-pct. s(.002)	Mn-ppm s(10)	Ag-ppm s(.5)	As-ppm s(200)	B-ppm s(10)	Ba-ppm s(20)	Be-ppm s(1)
RAV1237R	46 35 51	113 43 39	5.0	1.50	.20	.500	150	N	N	300	1,000	3.0
RAV1238R	46 35 8	113 42 29	3.0	1.50	.20	.500	150	N	N	200	500	2.0
RAV1239R	46 37 29	113 39 53	2.0	.50	.10	.300	100	N	N	70	300	2.0
RAV1895R	46 38 25	113 44 14	1.5	.30	.10	.150	70	N	N	50	700	3.0
RAV1896M	46 38 25	113 44 15	3.0	.30	.10	.200	300	N	N	100	300	5.0
RAV1896M	46 38 25	113 44 15	5.0	.30	.10	.300	500	N	N	150	500	7.0
RAV2911R	46 39 10	113 39 45	3.0	1.00	.10	.300	70	N	N	300	700	1.5
RAV2912R	46 38 59	113 40 45	3.0	.70	.10	.500	70	N	N	500	1,000	5.0
RAV2913R	46 39 0	113 41 5	3.0	.70	.10	.300	70	N	N	300	1,000	3.0
RAV2914R	46 38 48	113 41 10	3.0	1.00	.10	.500	100	N	N	300	700	2.0
RAV2917R	46 39 16	113 40 21	3.0	.50	.10	.300	100	N	N	500	1,000	3.0

TABLE 1 -- ROCK SAMPLE LOCALITY AND ANALYSES FROM THE WELCOME CREEK WILDERNESS STUDY AREA, GRANITE COUNTY, MONTANA--continued

Sample	Bi-ppm s(10)	Co-ppm s(5)	Cr-ppm s(10)	Cu-ppm s(5)	La-ppm s(20)	Mo-ppm s(5)	Ni-ppm s(5)	Pb-ppm s(10)	Sc-ppm s(5)	Sr-ppm s(10)	Sr-ppm s(100)	V-ppm s(10)
RAV1237R	N	10	100	<5	20	N	30	10	10	N	N	100
RAV1238R	N	10	100	<5	30	N	30	7	7	N	N	70
RAV1239R	N	7	20	10	20	N	20	10	7	N	N	50
RAV1895R	N	5	20	<5	<20	N	7	10	<5	N	N	30
RAV1896M	N	7	20	<5	20	N	15	10	7	N	N	50
RAV1896M	N	7	20	5	20	N	30	10	7	N	N	50
RAV2911R	N	7	70	20	50	N	30	10	10	N	N	70
RAV2912R	N	7	70	7	30	N	15	<10	10	N	N	50
RAV2913R	N	7	100	5	30	N	20	<10	10	N	N	50
RAV2914R	N	7	70	20	20	N	10	<10	7	N	N	50
RAV2917R	N	7	100	20	20	N	30	<10	7	N	N	50

TABLE 1 -- ROCK SAMPLE LOCALITY AND ANALYSES FROM THE WELCOME CREEK WILDERNESS STUDY AREA, GRANITE COUNTY, MONTANA--continued

Sample	Y-ppm s(10)	Zr-ppm s(10)	Au-ppm aa(.05)	Cu-ppm aa(1)	Pb-ppm aa(1)	Zn-ppm aa(1)	Ag-ppm aa(.05)	Cd-ppm aa(.05)	Bi-ppm aa(1)	Sb-ppm aa(1)
RAV1237R	30	200	--	N	2	2	N	.15	N	N
RAV1238R	20	300	--	N	2	7	N	.17	1	N
RAV1239R	20	200	--	1	N	5	N	.12	N	N
RAV1895R	50	150	--	N	N	N	N	<.05	N	1
RAV1896M	20	300	4.00	3	4	2	<.05	.09	1	3
RAV1896M	50	300	.07	2	2	1	<.05	.06	1	2
RAV2911R	50	300	--	8	N	1	N	<.05	N	N
RAV2912R	30	300	--	N	N	1	N	<.05	N	N
RAV2913R	30	300	--	N	N	1	N	<.05	N	N
RAV2914R	20	300	--	7	N	1	N	<.05	1	N
RAV2917R	30	300	--	5	N	2	N	.05	N	N

TABLE 2 --- STREAM SEDIMENT SAMPLE LOCALITY AND ANALYSES FROM THE WELCOME CREEK WILDERNESS STUDY AREA, GRANITE COUNTY, MONTANA

Sample	Latitude	Longitude	Fe-ppm s(.05)	Mg-ppm s(.02)	Ca-ppm s(.05)	Ti-ppm s(.002)	Mn-ppm s(10)	Ag-ppm s(.5)	As-ppm s(200)	B-ppm s(10)	Ba-ppm s(20)	Be-ppm s(1)
CLE00575	46 36 37	113 46 41	5.00	1.00	.7	.50	500	N	N	300	1,000	2.0
CLE0060S	46 36 24	113 46 25	3.00	.70	.7	.30	500	N	N	50	700	2.0
CLE0062S	46 36 18	113 46 59	3.00	.70	.7	.30	300	N	N	300	700	2.0
CLE0064S	46 35 8	113 45 36	5.00	.70	.7	.50	300	N	N	150	500	2.0
CLE1568S	46 34 47	113 45 10	2.00	1.00	1.5	.30	1,000	N	200	200	500	7.0
CLE1886S	46 39 37	113 47 36	3.00	1.00	.7	.30	300	N	N	70	1,000	2.0
CLE1888S	46 39 44	113 47 37	3.00	1.00	.7	.30	300	N	N	70	700	5.0
CLE1889S	46 38 33	113 48 4	3.00	.70	1.0	.30	300	N	N	70	700	2.0
CLE1891S	46 38 41	113 46 2	1.50	.30	1.5	.15	1,000	N	N	70	500	2.0
CLE1892S	46 38 34	113 45 47	.70	.20	2.0	.10	500	N	N	70	300	3.0
CLE2801S	46 34 46	113 47 47	1.50	.30	1.0	.15	300	N	N	70	200	3.0
CLE2803S	46 34 54	113 48 4	2.00	.50	1.0	.30	300	N	N	50	300	2.0
CLE2856S	46 31 51	113 47 27	1.50	.70	.5	.30	300	N	N	100	700	2.0
CLE2857S	46 32 30	113 48 9	1.50	.50	1.0	.20	300	N	N	100	500	5.0
CLE2875S	46 36 10	113 50 59	3.00	.70	1.0	.30	500	N	N	150	700	3.0
CLE2877S	46 36 1	113 50 34	1.50	.50	.7	.30	300	N	N	100	300	3.0
CLE2879S	46 36 7	113 50 24	3.00	.70	1.5	.30	500	N	N	70	700	3.0
CLE3272S	46 30 17	113 47 24	2.00	1.00	1.5	.50	500	N	N	50	300	5.0
RAV0456S	46 38 34	113 42 21	2.00	.50	.7	.20	700	N	N	150	1,000	7.0
RAV0458S	46 38 39	113 41 53	1.00	.30	.5	.10	300	N	N	70	700	7.0
RAV0460S	46 38 52	113 41 4	5.00	.70	.7	.30	1,500	N	N	300	1,000	3.0
RAV0462S	46 39 5	113 40 37	3.00	.70	.7	.20	500	N	N	150	1,000	5.0
RAV0463S	46 39 9	113 40 10	3.00	.70	.7	.30	500	N	N	150	700	5.0
RAV0685S	46 36 47	113 43 25	3.00	.50	1.5	.30	700	N	N	100	700	5.0
RAV0907S	46 36 51	113 43 25	2.00	.30	.7	.15	300	N	N	100	700	3.0
RAV0909S	46 36 47	113 43 9	3.00	.70	.7	.20	300	N	N	70	500	3.0
RAV1874S	46 32 26	113 45 0	3.00	.70	.7	.20	300	N	N	50	500	7.0
RAV1893S	46 38 32	113 44 46	.70	.20	1.0	.10	500	N	N	30	300	2.0
RAV1894S	46 38 12	113 44 20	.50	.20	.7	.03	300	N	N	20	200	3.0
RAV1958S	46 34 19	113 44 32	3.00	1.00	.7	.30	300	N	N	50	700	2.0
RAV1960S	46 34 14	113 44 36	7.00	1.00	1.0	1.00	500	N	N	70	500	2.0
RAV1961S	46 33 53	113 43 15	3.00	1.00	.7	.30	200	<.5	N	50	500	2.0
RAV1963S	46 33 46	113 42 14	3.00	.70	.7	.30	200	<.5	N	70	500	2.0
RAV1964S	46 34 17	113 41 39	3.00	.50	.7	.20	300	<.5	N	70	300	3.0
RAV1965S	46 35 8	113 40 39	2.00	.70	.7	.20	200	N	N	70	300	3.0
RAV1966S	46 35 56	113 39 38	2.00	.30	.7	.15	200	N	N	50	500	3.0
RAV1967S	46 36 45	113 40 5	2.00	.50	1.0	.15	300	N	N	50	500	5.0
RAV1969S	46 36 38	113 39 22	3.00	.70	.5	.30	200	N	N	50	700	2.0
RAV1970S	46 37 37	113 39 7	3.00	.50	.7	.30	500	<.5	N	70	500	7.0
RAV1972S	46 39 10	113 39 36	2.00	.30	.7	.20	300	N	N	70	700	5.0
RAV1979S	46 39 39	113 43 51	1.00	.30	.7	.15	100	N	N	50	700	3.0
RAV1985S	46 40 30	113 40 25	3.00	1.00	.7	.30	300	<.5	N	100	500	2.0
RAV1986S	46 39 59	113 40 16	.15	.07	1.0	.05	300	N	N	50	150	1.0
RAV2910S	46 38 28	113 39 14	3.00	.70	1.5	.50	1,500	N	N	50	3,000	2.0
RAV2915S	46 38 46	113 41 14	2.00	.30	.7	.30	500	.7	N	50	500	1.5

TABLE 2 -- STREAM SEDIMENT SAMPLE LOCALITY AND ANALYSES FROM THE WELCOME CREEK WILDERNESS STUDY AREA, GRANITE COUNTY, MONTANA

Sample	Co-ppm s(5)	Cr-ppm s(10)	Cu-ppm s(5)	La-ppm s(20)	Mo-ppm s(5)	Ni-ppm s(5)	Pb-ppm s(10)	Sc-ppm s(5)	Sn-ppm s(10)	Sr-ppm s(100)	V-ppm s(10)
CLE0057S	7	100	15	30	N	20	15	15	N	N	100
CLE0060S	7	70	15	30	N	20	20	10	N	N	50
CLE0062S	7	70	20	30	<5	30	20	15	N	<100	70
CLE0064S	30	100	20	50	N	30	15	15	N	<100	70
CLE1568S	7	30	30	70	N	30	20	10	N	N	50
CLE1886S	15	70	15	50	N	20	15	10	N	N	70
CLE1888S	7	70	20	30	N	20	15	10	N	<100	50
CLE1889S	7	70	20	30	N	15	20	10	N	<100	70
CLE1891S	<5	50	20	30	N	10	15	5	N	<100	50
CLE1892S	<5	30	30	30	N	5	15	5	N	<100	30
CLE2801S	<5	50	10	30	N	5	10	7	N	N	30
CLE2803S	<5	70	10	30	N	10	10	10	N	N	50
CLE2856S	<5	20	10	20	N	10	15	5	N	<100	50
CLE2857S	N	50	10	30	N	10	15	5	N	<100	50
CLE2875S	7	70	20	30	N	20	20	10	N	100	70
CLE2877S	<5	70	7	20	N	15	15	7	N	<100	50
CLE2879S	7	100	30	50	N	20	20	7	N	100	50
CLE3272S	10	70	50	50	N	50	30	10	N	150	70
RAV0456S	5	50	50	30	N	50	20	10	N	<100	70
RAV0458S	N	20	30	20	N	10	15	5	N	<100	30
RAV0460S	30	70	70	50	N	50	30	15	N	<100	100
RAV0462S	7	50	70	50	N	30	20	10	N	100	100
RAV0463S	7	50	100	70	N	50	20	15	N	100	70
RAV0685S	<5	50	30	30	N	5	20	7	N	<100	50
RAV0907S	5	50	20	30	N	10	15	7	N	<100	50
RAV0909S	7	50	30	70	N	30	20	15	N	<100	70
RAV1874S	7	50	30	150	N	30	15	15	N	100	50
RAV1893S	N	30	10	30	N	5	15	<5	N	<100	30
RAV1894S	N	30	30	30	N	<5	15	<5	N	<100	20
RAV1958S	7	70	15	70	N	15	15	10	N	100	70
RAV1960S	10	70	30	50	N	20	15	15	N	<100	70
RAV1961S	7	70	20	50	<5	20	10	15	N	100	50
RAV1963S	7	70	20	100	<5	20	15	10	N	100	50
RAV1964S	10	50	30	70	N	30	10	10	N	<100	50
RAV1965S	7	30	15	50	N	15	15	10	N	<100	50
RAV1966S	<5	30	50	50	N	10	15	10	N	<100	30
RAV1967S	10	30	100	70	N	30	20	10	N	<100	50
RAV1969S	10	70	30	50	N	20	10	10	N	<100	50
RAV1970S	10	70	200	100	N	50	15	10	N	<100	50
RAV1972S	10	30	70	50	N	15	15	10	N	N	50
RAV1979S	<5	30	15	30	N	5	10	5	N	<100	30
RAV1985S	7	50	50	50	N	20	70	10	N	<100	50
RAV1986S	N	<10	10	20	N	<5	20	<5	N	<100	15
RAV2910S	7	50	30	30	N	30	20	10	N	300	70
RAV2915S	N	20	70	30	5	10	150	7	N	100	100

TABLE 2 -- STREAM SEDIMENT SAMPLE LOCALITY AND ANALYSES FROM THE WELCOME CREEK WILDERNESS STUDY AREA, GRANITE COUNTY, MONTANA

Sample	Y-ppm s(10)	Zn-ppm s(200)	Zr-ppm s(10)	Cu-ppm aa(1)	Pb-ppm aa(1)	Zn-ppm aa(1)	Ag-ppm aa(.05)	Cd-ppm aa(.05)	Bi-ppm aa(1)	Sb-ppm aa(1)
CLE0057S	50	N	700	.4	<1.0	<1.0	<.05	<.05	<1.0	<1.0
CLE0060S	50	N	300	.4	<1.0	<1.0	<.05	<.05	<1.0	<1.0
CLE0062S	50	N	500	1.2	<1.0	<1.0	<.05	<.05	<1.0	<1.0
CLE0064S	50	N	700	.8	<1.0	<1.0	<.05	<.05	<1.0	<1.0
CLE1568S	70	N	200	30.0	8.0	14.0	.14	.27	<1.0	3.0
CLE1886S	30	N	300	.7	<1.0	<1.0	<.05	<.05	<1.0	<1.0
CLE1888S	50	N	200	1.4	<1.0	1.8	<.05	<.05	<1.0	<1.0
CLE1889S	30	N	300	1.5	<1.0	<1.0	<.05	.05	<1.0	<1.0
CLE1891S	20	N	100	2.4	1.3	1.0	<.05	.07	<1.0	<1.0
CLE1892S	20	N	70	5.2	1.4	1.3	<.05	.60	<1.0	<1.0
CLE2801S	30	N	200	.5	<1.0	<1.0	<.05	<.05	<1.0	<1.0
CLE2803S	70	N	200	.5	<1.0	<1.0	<.05	<.05	<1.0	<1.0
CLE2856S	10	N	300	2.0	3.0	6.0	<.05	<.05	<1.0	N
CLE2857S	100	N	300	5.0	5.0	5.0	.07	<.05	<1.0	N
CLE2875S	50	N	300	11.0	5.0	4.0	.07	<.05	<1.0	N
CLE2877S	30	N	300	3.0	4.0	3.0	<.05	<.05	<1.0	N
CLE2879S	50	N	300	21.0	5.0	19.0	.09	<.05	<1.0	N
CLE3272S	70	N	200	51.0	10.0	1.0	.40	.30	3.0	2.0
RAV0456S	70	N	150	2.5	1.0	<1.0	<.05	<.05	<1.0	<1.0
RAV0458S	50	N	100	7.2	1.6	1.6	<.05	<.05	<1.0	<1.0
RAV0460S	70	N	200	4.0	2.2	1.3	<.05	<.05	<1.0	<1.0
RAV0462S	70	N	150	14.0	1.7	1.6	<.05	<.05	<1.0	<1.0
RAV0463S	100	N	150	17.5	1.9	2.0	<.05	<.05	<1.0	<1.0
RAV0685S	30	N	200	3.5	1.0	2.0	<.05	<.05	<1.0	<1.0
RAV0907S	30	200	200	1.2	<1.0	<1.0	<.05	<.05	<1.0	<1.0
RAV0909S	70	300	300	1.8	<1.0	<1.0	<.05	<.05	<1.0	<1.0
RAV1874S	150	N	150	5.2	1.0	<1.0	<.05	<.05	<1.0	<1.0
RAV1893S	20	N	70	.9	2.1	2.0	<.05	.06	<1.0	<1.0
RAV1894S	30	N	20	9.4	2.2	1.3	<.05	.45	<1.0	<1.0
RAV1958S	30	N	300	.4	<1.0	<1.0	<.05	<.05	<1.0	<1.0
RAV1960S	70	N	300	1.7	<1.0	<1.0	<.05	<.05	<1.0	<1.0
RAV1961S	50	N	300	.6	<1.0	<1.0	<.05	<.05	<1.0	<1.0
RAV1963S	50	N	300	.4	<1.0	<1.0	<.05	<.05	<1.0	<1.0
RAV1964S	70	N	150	2.2	<1.0	<1.0	<.05	<.05	<1.0	<1.0
RAV1965S	50	N	200	.9	<1.0	<1.0	<.05	<.05	<1.0	<1.0
RAV1966S	30	N	100	6.0	<1.0	1.0	<.05	<.05	<1.0	<1.0
RAV1967S	100	N	150	16.0	<1.0	<1.0	<.05	<.05	<1.0	<1.0
RAV1969S	30	N	300	2.5	<1.0	<1.0	<.05	<.05	<1.0	<1.0
RAV1970S	150	N	200	35.0	<1.0	1.0	<.05	.05	<1.0	<1.0
RAV1972S	70	N	150	9.5	<1.0	<1.0	<.05	<.05	<1.0	<1.0
RAV1979S	20	N	150	.9	<1.0	<1.0	<.05	<.05	<1.0	<1.0
RAV1985S	30	N	150	2.8	7.7	1.5	<.05	<.05	<1.0	<1.0
RAV1986S	10	N	30	2.1	4.3	5.0	<.05	.06	<1.0	<1.0
RAV2910S	30	N	200	6.0	7.0	20.0	<.05	.39	<1.0	<1.0
RAV2915S	20	N	150	48.0	150.0	40.0	.35	.83	5.5	1.5

TABLE 2 -- STREAM SEDIMENT SAMPLE LOCALITY AND ANALYSES FROM THE WELCOME CREEK WILDERNESS STUDY AREA, GRANITE COUNTY, MONTANA--continued

Sample	Latitude	Longitude	Fe-pct. s(.05)	Mg-pct. s(.02)	Ca-pct. s(.05)	Ti-pct. s(.002)	Mn-ppm s(10)	Ag-ppm s(.5)	As-ppm s(200)	B-ppm s(10)	Ba-ppm s(20)	Be-ppm s(1)
RAV2916S	46 38 46	113 41 20	3.00	.50	.7	.30	700	N	N	100	700	5.0
RAV2945S	46 33 9	113 44 10	2.00	.70	1.5	.30	500	N	N	100	500	10.0

TABLE 2 -- STREAM SEDIMENT SAMPLE LOCALITY AND ANALYSES FROM THE WELCOME CREEK WILDERNESS STUDY AREA, GRANITE COUNTY, MONTANA--continued

Sample	Co-ppm s(5)	Cr-ppm s(10)	Cu-ppm s(5)	La-ppm s(20)	Mo-ppm s(5)	Ni-ppm s(5)	Pb-ppm s(10)	Sc-ppm s(5)	Sn-ppm s(10)	Sr-ppm s(100)	V-ppm s(10)
RAV2916S	7	50	70	30	<5	50	20	15	N	N	50
RAV2945S	7	50	50	150	N	50	20	15	N	<100	70

TABLE 2 -- STREAM SEDIMENT SAMPLE LOCALITY AND ANALYSES FROM THE WELCOME CREEK WILDERNESS STUDY AREA, GRANITE COUNTY, MONTANA--continued

Sample	Y-ppm s(10)	Zn-ppm s(200)	Zr-ppm s(10)	Cu-ppm aa(1)	Pb-ppm aa(1)	Zn-ppm aa(1)	Ag-ppm aa(.05)	Cd-ppm aa(.05)	Bi-ppm aa(1)	Sb-ppm aa(1)
RAV2916S	70	N	150	45.0	3.0	4.0	<.05	.08	<1.0	<1.0
RAV2945S	200	N	200	59.0	10.0	9.0	.18	<.05	<1.0	N

TABLE 3 -- PANNED CONCENTRATE SAMPLE LOCALITY AND ANALYSES FROM THE WELCOME CREEK WILDERNESS STUDY AREA, GRANITE COUNTY, MONTANA

Sample	Latitude	Longitude	Fe-ppt. s(.05)	Mg-pct. s(.02)	Ca-pct. s(.05)	Ti-pct. s(.002)	Mn-ppm s(10)	B-ppm s(10)	Ba-ppm s(20)	Be-ppm s(2)	Bi-ppm s(20)	Co-ppm s(10)	Cr-ppm s(10)
CLE0058P	46 36 37	113 46 41	10.0	.7	1.50	.5	300	150	700	3	N	70	50
CLE0059P	46 36 30	113 46 50	7.0	.7	1.00	.5	500	100	500	3	N	<10	30
CLE0061P	46 36 18	113 46 59	10.0	.7	.70	.7	300	300	700	3	N	70	70
CLE1567P	46 34 47	113 45 10	5.0	1.0	.20	.7	300	300	700	5	N	10	150
CLE1885P	46 39 37	113 47 36	3.0	.7	.20	.7	200	300	500	3	N	20	50
CLE1887P	46 39 44	113 47 37	5.0	.7	.15	.7	150	300	500	3	N	10	30
CLE2802P	46 34 54	113 48 4	3.0	3.0	2.00	.7	300	100	100	<2	N	10	70
RAV0455P	46 38 34	113 42 21	3.0	.7	.10	.5	500	150	1,000	5	N	<10	50
RAV0459P	46 38 52	113 41 4	7.0	1.0	.10	.7	700	200	1,000	5	N	15	70
RAV0461P	46 39 5	113 40 37	5.0	.7	.15	.7	300	300	1,000	5	N	10	50
RAV0684P	46 36 47	113 43 25	7.0	1.0	.20	.5	300	500	1,000	3	N	15	100
RAV0908P	46 36 51	113 43 25	7.0	1.0	.15	.5	300	500	1,000	5	N	15	150
RAV0910P	46 36 47	113 43 9	5.0	.7	.15	.3	200	300	700	5	N	15	70
RAV1569P	46 34 35	113 44 53	15.0	1.0	2.00	>2.0	1,500	150	700	3	50	50	100
RAV1570P	46 34 14	113 44 30	20.0	1.5	2.00	>2.0	2,000	300	300	<2	20	50	200
RAV1957P	46 34 19	113 44 32	7.0	1.5	2.00	2.0	1,000	100	700	3	50	30	70
RAV1959P	46 34 14	113 44 36	1.5	2.0	3.00	>2.0	3,000	200	300	2	N	100	300
RAV1962P	46 33 46	113 42 14	7.0	1.5	3.00	2.0	1,500	150	700	2	N	30	200
RAV1968P	46 36 38	113 39 22	5.0	1.5	.15	1.0	300	300	1,000	5	N	15	100
RAV1971P	46 39 10	113 39 36	5.0	1.5	.15	.7	300	300	1,000	5	N	15	100
RAV1978P	46 39 39	113 43 51	3.0	.7	.15	.7	150	200	700	3	N	10	100
RAV1980P	46 39 35	113 44 2	5.0	1.0	.15	.7	300	300	1,000	5	N	15	150

TABLE 3 -- PANNED CONCENTRATE SAMPLE LOCALITY AND ANALYSES FROM THE WELCOME CREEK WILDERNESS STUDY AREA, GRANITE COUNTY, MONTANA

Sample	Cu-ppm s(10)	La-ppm s(20)	Mo-ppm s(10)	Ni-ppm s(5)	Pb-ppm s(20)	Sc-ppm s(5)	Sr-ppm s(200)	V-ppm s(10)	Y-ppm s(10)	Zr-ppm s(10)	Au-ppm aa(.05)
CLE0058P	20	500	N	30	20	20	<200	150	150	1,000	.43
CLE0059P	<10	100	N	15	<20	15	<200	100	70	300	.40
CLE0061P	50	200	N	20	20	15	<200	100	100	1,000	10.40
CLE1567P	10	70	N	20	20	10	N	100	50	700	.06
CLE1885P	10	100	10	30	<20	15	N	100	50	700	<.05
CLE1887P	15	70	N	20	N	10	N	100	30	1,000	<.05
CLE2802P	<10	100	N	30	<20	20	N	100	50	700	<.05
RAV0455P	10	70	N	20	<20	15	N	70	50	300	<.05
RAV0459P	30	70	N	30	50	20	<200	100	50	500	<.05
RAV0461P	20	70	N	30	20	20	N	100	70	500	<.05
RAV0684P	10	70	N	30	<20	20	<200	100	50	500	<.05
RAV0908P	<10	70	N	30	<20	20	N	100	50	500	<.05
RAV0910P	<10	150	N	20	<20	10	N	70	50	500	<.05
RAV1569P	50	500	N	30	20	15	N	150	200	700	.60
RAV1570P	70	500	N	50	3,000	15	N	200	200	500	.30
RAV1957P	30	150	N	70	20	15	200	150	70	500	1.85
RAV1959P	70	200	N	100	<20	20	<200	300	70	500	<.05
RAV1962P	20	200	N	70	20	20	300	200	70	500	.06
RAV1968P	15	70	N	30	20	15	N	150	70	700	<.05
RAV1971P	20	70	N	30	20	15	N	150	50	700	<.05
RAV1978P	<10	70	N	30	20	10	N	100	70	500	<.05
RAV1980P	<10	70	N	50	<20	15	N	150	50	500	<.05