UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

Geochemical Analyses of Rock, Stream-Sediment, and Heavy-Mineral Concentrate Samples Collected from the Spanish Peaks Wilderness Study Area, Huerfano and Las Animas Counties, Colorado

By

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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 Spanish Peaks Wilderness Study Area in the San Isabel National Forest, Huerfano and Las Animas Counties, Colorado. The Spanish Peaks Wilderness Study Area was established by Public Law 96-560, December 22, 1980.

INTRODUCTION

The Spanish Peaks Wilderness Study Area covers approximately 19,570 acres (7,920 hectometers^2) of the San Isabel National Forest in south-central Colorado (fig. 1). The area lies in the westernmost part of the Great Plains, bordering the eastern foothills of the Sangre de Cristo Mountains. Elevations range from 13,626 ft (4,153 m) on the summit of West Spanish Peak to about 8,400 ft (2,560 m) in the western portion near Cuchara. The eastern half of the wilderness is characterized by rugged terrain; the land and drainages slope radially away from East and West Spanish Peaks. The principal drainages are Wahatoya and Trujillo Creeks. The physiography in the western half of the area is less severe; the major drainages are the north-trending Chaparral and Echo Creeks. North, Middle, and South White Peaks (elevation 10,446 ft; 3,184 m) are located near the western boundary of the study area.

Colorado Highway 12 and the Cucharas River parallel the wilderness on the west. Forest Service Route 415 and the Apishapa River run along the southern margin. Secondary roads are sparsely located near the boundary of the study area.

This report tabulates the geochemical data from the rock, stream sediment, and heavy-mineral (panned) concentrate samples collected to assist in the assessment of the mineral resource potential of the Spanish Peaks Wilderness Study Area, Colorado. In a separate series of Miscellaneous Field Studies Maps, Budding and Lawrence discuss geochemical results and identify the sample localities referenced in this report (1983a), show a geologic map (1983b), and Budding and Kluender (1983) evaluate the mineral resource potential of this study area.

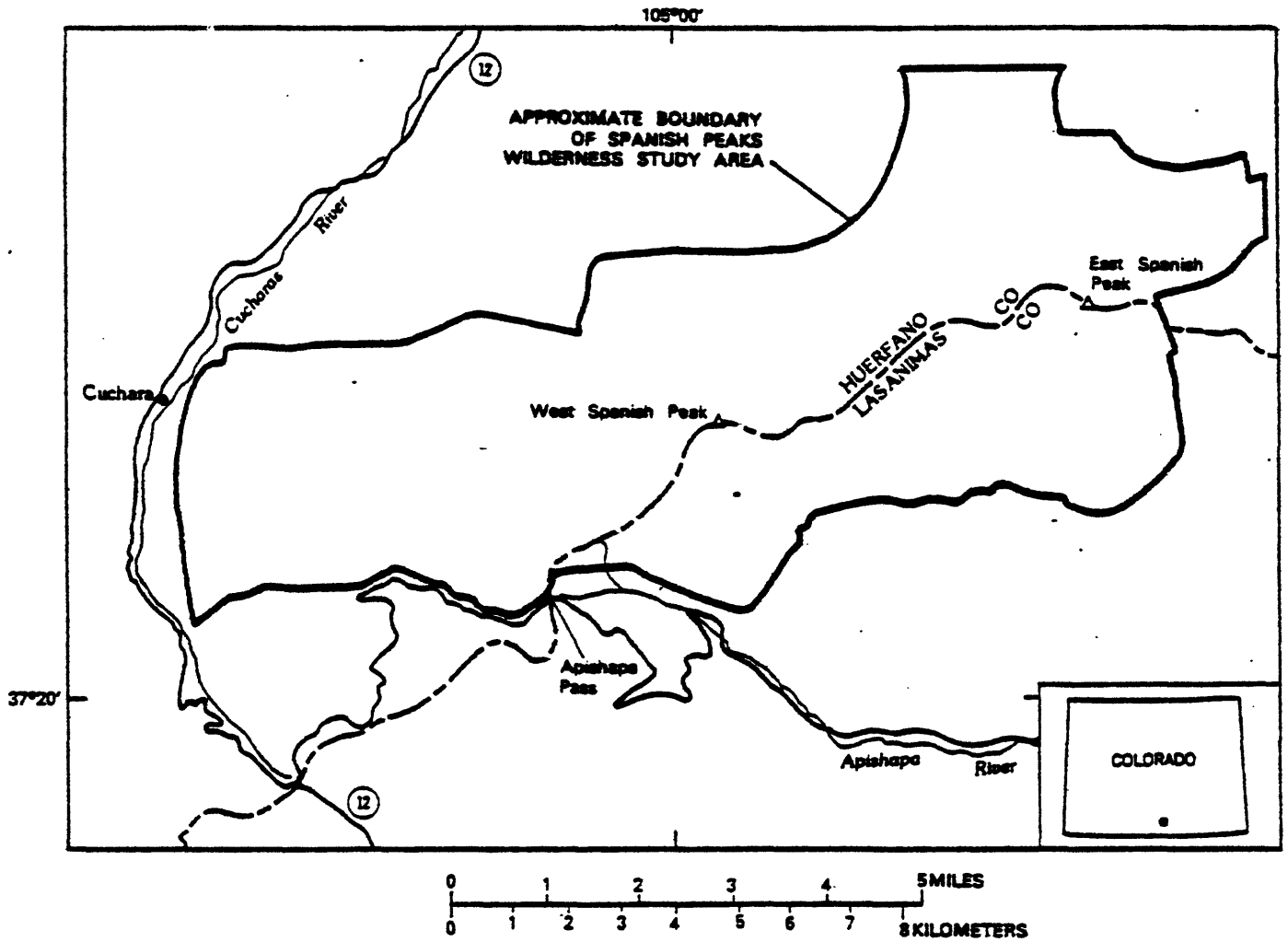

Figure 1.—Index map showing location of the Spanish Peaks Wilderness Study Area.

Table 1.--Lower limits of detection for semiquantitative emission spectrographic analyses of samples of rock, stream sediment, and heavy-mineral concentrate

[Limits calculated in percent for Fe, Mg, Ca, Ti, and in parts per million for all other elements]

Element	Rock and stream sediment	Heavy-mineral concentrate
Fe	0.05	0.1
Mg	.02	.05
Ca	.05	.1
Ti	.002	.005
Mn	10	20
Ag	.5	1
As	200	500
Au	10	20
B	10	20
Ba	20	50
Be	1	2
Bi	10	20
Cd	20	50
Co	5	10
Cr	10	20
Cu	5	10
La	20	50
Mo	5	10
Nb	20	50
Ni	5	10
Pb	10	20
Sb	100	200
Sc	5	10
Sn	10	20
Sr	100	200
V	10	20
W	50	100
Y	10	20
Zn	200	500
Zr	10	20
Th	100	200

Table 2.--Data for rock samples

[Concentrations in percent for Fe, Mg, Ca, Ti, and in parts per million for all other elements; analyses where the column is headed by the letter s were by semiquantitative emission spectrometry; analyses where the column is headed by the letters aa were by atomic absorption; and U analyses were by fluorimetry; N, not detected; leaders (--), not analyzed]

Table 2.--Continued

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	B-ppm s	Ba-ppm s	Be-ppm s
SP4R	37 21 10	105 2 5	5.00	3.00	3.00	1.000	700	N	N	N	<10	1,500	1.0
SP9R	37 24 35	104 57 40	5.00	3.00	3.00	1.000	700	N	N	N	10	1,500	1.0
SP12R	37 24 10	104 57 40	2.00	.70	1.00	.300	700	N	N	N	10	1,000	1.5
SP13R	37 24 10	104 57 40	2.00	.70	.15	.200	200	N	N	N	20	700	1.0
SP17RA	37 24 0	104 56 50	5.00	1.00	.50	.500	1,000	N	N	N	50	700	1.0
SP17RB	37 24 0	104 56 50	1.00	.10	.05	.100	200	N	N	N	30	1,000	5.0
SP17RC	37 24 0	104 56 50	1.50	.15	.20	.500	1,000	N	N	N	20	700	7.0
SP21R	37 20 55	105 3 50	2.00	1.50	1.50	.500	500	N	N	N	<10	1,500	<1.0
SP23R	37 21 35	105 4 45	2.00	1.00	1.50	.200	300	N	N	N	15	1,500	<1.0
SP24R	37 21 55	105 4 55	2.00	.50	1.00	.200	150	N	N	N	10	1,500	<1.0
SP26R	37 23 10	104 58 40	5.00	1.50	2.00	1.000	700	<.5	N	N	10	1,000	1.0
SP27R	37 23 5	104 58 45	3.00	2.00	2.00	1.000	200	N	N	N	10	70	1.0
SP28R	37 23 0	104 58 40	3.00	.30	.10	.700	1,000	10.0	300	N	70	500	1.5
SP30R	37 22 45	104 58 50	2.00	1.00	1.00	.500	500	<.5	N	N	10	1,500	1.5
SP31R	37 22 35	104 58 50	3.00	2.00	2.00	1.000	700	N	N	N	<10	1,000	1.5
SP32R	37 22 35	104 58 50	2.00	2.00	1.50	.500	500	N	N	N	10	1,500	1.0
SP33R	37 22 35	104 58 45	3.00	2.00	2.00	1.000	500	N	N	N	10	1,500	1.0
SP34R	37 22 40	104 58 40	5.00	3.00	3.00	1.000	700	N	N	N	<10	1,500	1.0
SP36R	37 23 15	104 58 40	5.00	.70	.05	.200	70	.5	N	N	20	1,000	1.5
SP39R	37 21 40	105 0 25	1.50	.70	.15	.150	150	N	N	N	20	700	1.0
SP42R	37 22 0	104 59 35	3.00	1.50	2.00	1.000	500	N	N	N	<10	1,000	1.5
SP43R	37 22 35	104 59 20	2.00	.20	.30	.200	500	N	N	N	50	1,500	1.0
SP44R	37 22 35	104 59 20	5.00	2.00	2.00	1.000	500	N	N	N	10	1,500	1.0
SP45R	37 22 30	104 59 45	5.00	2.00	2.00	.700	700	N	N	N	<10	700	1.5
SP46R	37 22 25	104 59 55	7.00	1.50	.15	.500	150	N	N	N	50	700	1.5
SP57R	37 25 15	104 57 0	1.00	.20	.20	.100	700	N	N	N	10	500	2.0
SP59R	37 24 40	104 56 15	1.50	.20	7.00	.100	700	N	N	N	20	700	1.0
SP60R	37 24 35	104 56 5	5.00	3.00	3.00	1.000	500	N	N	N	<10	1,000	1.0
SP61R	37 24 30	104 56 0	1.00	.10	.15	.100	700	<.5	N	N	20	500	2.0
SP79RA	37 22 45	104 56 35	5.00	2.00	2.00	.700	500	N	N	N	<10	1,000	1.5
SP79RB	37 22 45	104 56 35	5.00	1.50	.05	1.000	200	N	N	N	30	1,000	1.5
SP80R	37 22 35	104 56 35	2.00	.50	.07	.150	500	N	N	N	20	1,000	1.0
SP81R	37 22 30	104 56 25	1.00	.10	<.05	.050	1,000	N	N	N	20	200	1.5
SP101R	37 21 40	105 3 30	5.00	2.00	3.00	1.000	500	N	N	N	<10	1,500	1.0
SP103R	37 22 10	105 3 50	5.00	3.00	3.00	1.000	500	N	N	N	<10	1,000	1.0
SP104R	37 22 35	105 4 35	1.50	.70	1.00	.150	150	N	N	N	10	1,500	<1.0
SP106R	37 23 25	105 5 5	1.00	.50	>20.00	.030	1,000	N	N	N	N	100	N
SP107R	37 22 55	105 5 20	.70	.50	>20.00	.030	300	N	N	N	N	150	N
SP108R	37 22 55	105 5 15	3.00	1.50	.50	.300	200	N	N	N	100	300	1.5
SP110R	37 23 45	104 57 55	2.00	1.00	.20	.150	700	N	N	N	30	300	1.5
SP113R	37 23 20	104 57 30	1.00	.30	.20	.100	150	N	N	N	30	700	1.0
SP114R	37 23 25	104 57 0	5.00	3.00	2.00	1.000	500	N	N	N	10	1,500	<1.0
SP115R	37 22 34	104 59 19	5.00	2.00	2.00	1.000	500	N	N	N	<10	1,000	1.5
SP116R	37 22 32	104 59 17	1.00	.50	.20	.700	20	.5	N	N	20	1,000	1.0
SP120R	37 22 25	104 58 54	5.00	3.00	3.00	1.000	1,000	N	N	N	<10	1,000	1.0

Table 2.--Continued

Sample	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	Pb-ppm s	Sb-ppm s	Sc-ppm s	Sn-ppm s	Sr-ppm s
SP4R	N	N	30	150	50	100	N	30	30	50	N	20	N	1,000
SP9R	N	N	50	30	50	100	<5	30	20	50	N	20	N	1,000
SP12R	N	N	5	N	<5	100	7	50	5	50	N	5	N	500
SP13R	N	N	10	15	5	<20	N	N	10	50	N	7	N	<100
SP17RA	N	N	20	150	50	70	N	20	20	20	N	20	N	100
SP17RB	N	N	5	<10	<5	50	10	100	5	70	N	7	N	150
SP17RC	N	N	5	N	N	100	7	50	5	70	N	5	N	200
SP21R	N	N	15	20	10	100	N	20	15	50	N	7	N	1,000
SP23R	N	N	10	15	15	N	N	N	10	50	N	7	N	1,000
SP24R	N	N	7	10	<5	<20	N	N	10	30	N	5	N	700
SP26R	N	N	20	30	70	100	7	20	7	100	N	10	N	700
SP27R	N	N	15	30	50	70	N	50	20	20	N	10	15	700
SP28R	<10	N	20	10	200	70	N	50	10	2,000	N	7	N	100
SP30R	N	N	15	N	20	70	15	20	5	100	N	5	N	500
SP31R	N	N	20	10	20	100	7	50	15	50	N	10	N	700
SP32R	N	N	15	30	20	50	N	<20	20	50	N	15	N	500
SP33R	N	N	20	<10	5	70	7	30	10	70	N	10	N	1,000
SP34R	N	N	50	10	50	100	<5	50	15	30	N	15	N	1,000
SP36R	N	N	5	15	70	50	N	<20	5	50	N	7	N	150
SP39R	N	N	7	10	7	70	N	N	10	20	N	5	N	100
SP42R	N	N	20	15	15	70	7	30	20	50	N	10	N	700
SP43R	N	N	7	<10	10	<20	N	<20	10	200	N	5	N	500
SP44R	N	N	50	20	20	70	5	20	20	50	N	15	N	700
SP45R	N	N	30	20	15	70	<5	30	20	70	N	10	N	1,000
SP46R	N	N	20	50	<5	70	N	<20	20	15	N	15	N	100
SP57R	N	N	<5	<10	<5	<20	N	50	5	70	N	<5	N	150
SP59R	N	N	5	10	<5	<20	N	N	7	30	N	5	N	150
SP60R	N	N	50	150	50	70	N	20	100	30	N	15	N	1,000
SP61R	N	N	5	N	<5	50	<5	50	<5	100	N	<5	N	100
SP79RA	N	N	20	30	30	70	5	30	20	50	N	15	N	700
SP79RB	N	N	15	150	50	50	N	30	15	50	N	30	N	100
SP80R	N	N	10	20	<5	<20	N	N	10	50	N	5	N	100
SP81R	N	N	N	N	<5	N	10	70	<5	15	N	<5	N	<100
SP101R	N	N	30	20	20	100	N	50	20	50	N	15	N	1,000
SP103R	N	N	30	70	30	70	N	30	50	30	N	10	N	1,000
SP104R	N	N	10	<10	5	N	N	N	10	50	N	5	N	1,000
SP106R	N	N	10	<10	<5	N	N	N	10	<10	N	<5	N	1,000
SP107R	N	N	7	<10	<5	N	N	N	10	10	N	<5	N	700
SP108R	N	N	15	70	20	50	N	<20	30	70	N	10	N	150
SP110R	N	N	10	10	50	<20	N	N	15	30	N	5	N	<100
SP113R	N	N	5	<10	20	N	N	N	5	70	N	5	N	100
SP114R	N	N	30	150	50	50	N	20	100	50	N	15	N	1,500
SP115R	N	N	20	30	70	70	10	30	15	100	N	15	N	1,000
SP116R	N	N	<5	<10	<5	100	<5	50	<5	150	N	5	N	500
SP120R	N	N	20	<10	20	100	<5	30	10	50	N	10	N	1,000

Table 2.--Continued

Sample	V-ppm s	W-ppm s	Y-ppm s	Zn-ppm s	Zr-ppm s	Th-ppm s	Au-ppm aa	As-ppm aa	Zn-ppm aa	Cd-ppm aa	Bi-ppm aa	Sb-ppm aa	U-ppm f
SP4R	100	N	50	N	200	N	--	N	100	N	N	N	.80
SP9R	100	N	50	N	200	N	--	N	90	N	N	N	1.50
SP12R	30	N	30	N	200	N	--	N	55	N	N	N	1.10
SP13R	50	N	20	N	100	N	--	N	45	N	N	N	.50
SP17RA	70	N	50	N	500	N	--	N	75	N	N	1	.50
SP17RB	<10	N	50	N	100	N	--	N	70	.1	N	N	1.50
SP17RC	30	N	50	N	200	N	--	N	25	N	N	N	1.50
SP21R	50	N	20	N	150	N	--	N	45	<.1	N	N	.45
SP23R	50	N	10	N	70	N	--	N	45	N	N	N	.10
SP24R	30	N	<10	N	50	N	--	N	28	N	N	N	.10
SP26R	100	N	30	N	300	N	N	N	45	N	N	N	1.10
SP27R	100	N	30	N	300	N	--	N	55	.1	N	N	.80
SP28R	70	N	50	2,000	300	N	.10	300	3,400	14.0	2	6	1.60
SP30R	50	N	30	N	200	N	N	N	55	.1	N	N	4.40
SP31R	100	N	30	N	200	N	N	N	60	N	N	N	1.50
SP32R	100	N	50	N	300	N	N	N	50	N	N	N	.75
SP33R	100	N	30	N	200	N	N	N	65	.2	N	N	1.70
SP34R	150	N	30	N	200	N	N	N	70	N	N	N	1.30
SP36R	50	N	30	N	200	N	N	N	10	N	2	N	.30
SP39R	50	N	20	N	200	N	--	N	30	N	N	N	.70
SP42R	100	N	30	N	70	N	--	N	55	.1	N	N	3.00
SP43R	30	N	10	200	70	N	--	N	280	.2	N	N	1.70
SP44R	100	N	30	N	70	N	--	N	55	N	N	N	1.90
SP45R	100	N	30	N	200	N	--	N	65	.1	N	N	3.00
SP46R	100	N	50	N	200	N	--	N	25	N	N	N	.80
SP57R	15	N	30	N	100	N	--	N	40	N	N	N	3.00
SP59R	30	N	20	N	70	N	--	N	15	.1	N	N	.40
SP60R	100	N	30	N	200	N	--	N	80	N	N	N	.90
SP61R	10	N	30	N	70	N	--	N	40	.1	N	N	1.60
SP79RA	100	N	30	N	200	N	N	N	110	.1	N	N	.70
SP79RB	100	N	50	N	200	N	N	N	60	.1	N	N	.80
SP80R	30	N	15	N	70	N	--	N	45	.1	N	N	.35
SP81R	<10	N	30	N	70	N	--	N	10	N	N	N	1.80
SP101R	100	N	30	N	200	N	--	N	90	.1	N	N	.35
SP103R	100	N	30	N	150	N	--	N	85	.1	N	N	1.10
SP104R	20	N	10	N	50	N	--	N	40	.1	N	N	.20
SP106R	15	N	20	N	<10	N	--	N	15	N	N	N	.40
SP107R	20	N	10	N	20	N	--	<10	20	N	N	N	1.20
SP108R	100	N	30	N	100	N	--	N	110	.1	N	N	.40
SP110R	50	N	30	N	50	N	--	N	40	.2	N	N	1.20
SP113R	30	N	15	N	50	N	--	N	35	.1	N	N	.45
SP114R	100	N	20	N	100	N	--	N	80	N	N	N	.85
SP115R	100	N	30	N	200	N	--	N	35	N	N	N	3.40
SP116R	30	N	15	N	200	N	--	N	30	.2	N	N	3.50
SP120R	100	N	50	N	100	N	--	N	85	N	N	N	2.30

Table 2.--Continued

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	B-ppm s	Ba-ppm s	Be-ppm s
SP122R	37 22 34	104 58 35	2.00	1.50	1.00	.700	150	.5	N	N	10	1,500	1.0
SP124R	37 23 36	104 55 10	2.00	.70	1.00	.300	700	N	N	N	<10	1,000	1.5
SP125R	37 23 40	104 55 18	5.00	2.00	2.00	.700	500	N	N	N	<10	700	1.0
SP128R	37 23 48	104 55 32	1.00	.20	.30	.100	500	N	N	N	10	500	2.0
SP129R	37 23 45	104 55 45	1.50	.50	1.00	.200	1,000	N	N	N	<10	700	1.0
SP131R	37 23 56	104 56 4	.20	.05	<.05	.030	70	N	N	N	30	100	1.5
SP132R	37 23 55	104 56 7	2.00	.70	.10	.300	200	N	N	N	70	300	1.5
SP133R	37 24 0	104 56 12	.70	.07	<.05	.100	70	N	N	N	50	500	<1.0
SP134R	37 23 25	104 55 8	3.00	1.50	3.00	.500	700	N	N	N	<10	700	1.0
SP136R	37 23 14	104 55 12	3.00	.50	2.00	.500	700	N	N	N	<10	1,000	1.0
SP138R	37 23 8	104 55 16	2.00	.70	1.00	.300	700	N	N	N	10	1,000	1.5
SP139R	37 23 4	104 55 24	3.00	1.00	1.00	.300	700	N	N	N	<10	1,000	1.5
SP140R	37 23 5	104 55 29	1.00	.10	.20	.100	700	N	N	N	<10	500	2.0
SP141R	37 23 5	104 55 31	3.00	.70	.30	.300	300	N	N	N	10	150	1.0
SP142R	37 23 0	104 55 47	.70	.02	<.05	.050	50	N	N	N	10	70	3.0
SP143R	37 22 55	104 55 58	.50	.10	<.05	.070	70	N	N	N	30	700	1.0
SP144R	37 22 58	104 58 19	5.00	2.00	1.00	.300	1,000	N	N	N	10	700	1.5
SP146R	37 22 43	104 58 28	20.00	<.02	<.05	.003	>5,000	10.0	500	N	N	1,000	N
SP147R	37 22 42	104 58 28	2.00	1.50	1.50	.500	2,000	N	N	N	<10	700	1.5
SP148R	37 22 35	104 58 18	3.00	1.50	1.00	.500	700	N	N	N	<10	1,000	1.5
SP150R	37 22 46	104 57 55	3.00	1.50	.70	.300	300	N	N	N	10	1,000	1.5
SP152R	37 22 46	104 57 47	1.50	.30	.10	.070	500	N	N	N	20	500	1.0
SP154R	37 22 48	104 57 22	3.00	1.00	.70	.300	700	N	N	N	10	1,000	1.5
SP155R	37 22 50	104 57 21	1.00	.30	.70	.070	200	N	N	N	10	300	1.0
SP156R	37 22 47	104 57 26	.50	.05	<.05	.070	500	<.5	N	N	10	150	1.0
SP158R	37 22 26	104 57 17	1.50	.50	.10	.150	2,000	N	N	N	100	500	2.0
SP159R	37 22 24	104 57 16	3.00	1.50	5.00	.500	5,000	2.0	N	N	10	1,000	1.5
SP160R	37 22 26	104 57 21	5.00	2.00	2.00	.500	700	N	N	N	<10	1,000	1.0
SP161R	37 22 24	104 57 19	3.00	1.50	2.00	.500	3,000	1.5	N	N	20	500	1.5
SP162R	37 22 10	104 58 7	10.00	.50	<.05	.300	100	7.0	N	N	30	300	2.0
SP163R	37 22 11	104 58 6	2.00	1.00	1.00	.500	700	.5	N	N	<10	1,000	1.0
SP164R	37 22 9	104 58 6	7.00	.30	<.05	.100	500	2.0	N	N	10	300	1.0
SP165R	37 22 13	104 58 7	3.00	1.00	.50	.300	700	N	N	N	30	700	1.5
SP509R	37 21 0	105 4 55	2.00	1.00	1.00	.200	500	N	N	N	10	1,000	<1.0
SP512R	37 23 40	105 1 5	3.00	1.50	2.00	.500	500	<.5	N	N	<10	1,000	1.0
SP513R	37 23 40	105 1 5	5.00	2.00	3.00	1.000	700	N	N	N	<10	1,500	1.0
SP537RA	37 23 15	104 59 20	3.00	.70	.05	.300	100	N	N	N	20	700	2.0
SP537RB	37 23 15	104 59 20	1.00	.30	.50	.150	150	N	N	N	30	500	1.0
SP537RC	37 23 15	104 59 20	2.00	.70	2.00	.500	500	N	N	N	20	1,000	2.0
SP539RA	37 22 59	104 59 17	2.00	1.00	1.50	.500	700	N	N	N	10	1,000	1.5
SP539RB	37 22 59	104 59 17	20.00	.10	.05	.300	100	100.0	300	N	20	200	1.5
SP542R	37 22 39	104 59 18	5.00	2.00	2.00	1.000	500	.5	N	N	20	1,000	1.0
SP543R	37 22 35	104 59 20	5.00	2.00	1.50	1.000	500	N	N	N	20	1,000	1.5
SP544R	37 23 38	104 55 6	2.00	1.00	1.50	.500	1,000	N	N	N	<10	1,000	1.5
SP545R	37 23 35	104 54 46	1.50	.50	.70	.200	700	N	N	N	10	700	2.0

Table 2.--Continued

Sample	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	Pb-ppm s	Sb-ppm s	Sc-ppm s	Sn-ppm s	Sr-ppm s
SP122R	N	N	5	10	30	70	20	30	<5	100	N	5	N	700
SP124R	N	N	10	<10	<5	70	N	50	5	50	N	5	N	500
SP125R	N	N	30	150	50	70	<5	30	70	20	N	15	N	1,000
SP128R	N	N	5	<10	N	50	<5	50	<5	50	N	<5	N	200
SP129R	N	N	10	10	7	<20	N	N	10	70	N	7	N	700
SP131R	N	N	5	N	5	N	N	100	<5	30	N	<5	N	N
SP132R	N	N	10	10	50	50	N	<20	10	10	N	10	N	200
SP133R	N	N	5	<10	<5	<20	N	N	5	10	N	<5	N	<100
SP134R	N	N	20	100	50	50	<5	20	100	30	N	10	N	1,000
SP136R	N	N	15	N	10	70	5	50	5	30	N	5	N	1,000
SP138R	N	N	10	N	<5	70	N	50	5	50	N	5	N	500
SP139R	N	N	10	N	<5	70	<5	30	5	50	N	5	N	500
SP140R	N	N	<5	N	N	<20	<5	30	<5	50	N	<5	N	100
SP141R	N	N	7	10	<5	<20	N	<20	5	30	N	5	N	150
SP142R	N	N	<5	N	<5	N	5	70	<5	50	N	<5	N	N
SP143R	N	N	5	<10	10	N	N	N	7	20	N	<5	N	100
SP144R	N	N	20	50	10	50	N	20	20	50	N	15	N	150
SP146R	N	N	10	N	70	N	<5	N	15	500	<100	N	N	N
SP147R	N	N	20	<10	70	70	<5	30	10	100	N	7	N	1,000
SP148R	N	N	20	30	15	100	<5	30	15	70	N	7	N	700
SP150R	N	N	20	50	70	70	N	20	15	15	N	15	N	200
SP152R	N	N	5	<10	<5	N	N	N	5	30	N	5	N	<100
SP154R	N	N	10	<10	5	70	N	50	7	50	N	5	N	500
SP155R	N	N	5	<10	<5	N	N	N	5	10	N	<5	N	150
SP156R	N	N	<5	N	<5	<20	<5	70	5	100	N	<5	N	<100
SP158R	N	N	<5	10	7	<20	N	30	5	700	N	5	20	<100
SP159R	N	150	20	10	300	50	N	20	15	200	N	10	N	500
SP160R	N	N	20	70	20	50	N	30	70	10	N	10	N	1,000
SP161R	N	N	20	30	300	50	N	20	20	1,000	N	10	N	300
SP162R	<10	N	7	50	200	70	N	<20	10	500	N	15	N	N
SP163R	N	N	<5	<10	<5	100	5	50	<5	100	N	5	N	700
SP164R	N	N	10	<10	100	<20	N	N	5	150	N	5	N	N
SP165R	N	N	10	30	<5	50	N	<20	20	10	N	10	N	100
SP509R	N	N	7	10	10	50	N	N	15	50	N	5	N	1,000
SP512R	N	N	20	10	50	70	N	30	15	50	N	7	N	1,000
SP513R	N	N	30	30	70	100	N	20	20	50	N	15	N	1,000
SP537RA	N	N	7	20	N	70	N	20	15	15	N	10	N	<100
SP537RB	N	N	5	<10	<5	50	N	20	<5	N	N	5	N	<100
SP537RC	N	N	5	N	<5	50	<5	30	<5	30	N	<5	N	700
SP539RA	N	N	15	<10	5	70	<5	30	15	50	N	7	N	1,000
SP539RB	10	N	5	<10	70	50	N	<20	10	700	N	5	N	N
SP542R	N	N	30	20	30	70	10	30	30	50	N	10	N	1,000
SP543R	N	N	15	50	10	70	7	30	20	70	N	10	N	1,000
SP544R	N	N	7	<10	<5	70	<5	30	5	30	N	5	N	700
SP545R	N	N	5	N	N	70	<5	70	<5	50	N	<5	N	200

Table 2.--Continued

Sample	V-ppm s	W-ppm s	Y-ppm s	Zn-ppm s	Zr-ppm s	Th-ppm s	Au-ppm aa	As-ppm aa	Zn-ppm aa	Cd-ppm aa	Bi-ppm aa	Sb-ppm aa	U-ppm f
SP122R	50	N	10	N	100	N	--	N	20	N	N	N	1.00
SP124R	50	N	30	N	100	N	--	N	60	N	N	N	1.90
SP125R	100	N	30	N	150	N	--	N	90	.1	N	N	.75
SP128R	10	N	20	N	100	N	--	N	40	N	N	N	2.20
SP129R	50	N	20	N	50	N	--	N	90	.2	N	N	.35
SP131R	<10	N	30	N	70	N	--	N	15	N	N	N	.35
SP132R	100	N	20	N	100	N	--	N	50	N	N	N	.85
SP133R	20	N	10	N	100	N	--	<10	25	N	N	N	.35
SP134R	70	N	15	N	100	N	--	N	90	N	N	N	.45
SP136R	50	N	20	N	200	N	--	N	95	.1	N	N	1.60
SP138R	50	N	30	N	200	N	--	N	60	.1	N	N	1.20
SP139R	50	N	30	N	150	N	--	N	50	N	N	N	1.70
SP140R	10	N	20	N	70	N	--	N	35	.1	N	N	1.90
SP141R	50	N	30	N	500	N	--	N	50	N	N	N	.75
SP142R	<10	N	20	N	50	N	--	N	15	.1	N	N	2.20
SP143R	20	N	<10	N	100	N	--	N	30	N	N	N	.30
SP144R	70	N	50	<200	300	N	N	N	120	.2	9	N	2.10
SP146R	10	N	<10	1,000	N	N	.25	600	1,800	1.5	N	46	3.90
SP147R	70	N	50	<200	300	N	N	N	190	.4	N	N	1.20
SP148R	70	N	20	N	200	N	N	N	70	.4	N	N	1.10
SP150R	70	N	50	N	200	N	.05	N	30	N	N	N	.85
SP152R	20	N	20	N	100	N	--	N	55	.2	N	N	.30
SP154R	50	N	20	N	200	N	--	N	85	.2	N	N	1.10
SP155R	15	N	10	N	50	N	--	N	15	.1	N	N	.45
SP156R	<10	N	30	200	70	N	--	N	240	1.3	N	N	2.40
SP158R	50	N	20	N	200	N	N	N	50	N	N	N	1.40
SP159R	70	N	30	10,000	70	N	N	55	12,000	90.0	N	N	1.10
SP160R	100	N	20	N	200	N	N	N	90	.1	N	N	.55
SP161R	100	N	30	200	100	N	N	40	470	2.0	N	N	1.40
SP162R	100	N	50	500	100	N	N	100	750	1.1	7	N	.75
SP163R	50	N	30	N	300	N	N	N	40	.2	N	N	.40
SP164R	50	N	10	300	100	N	N	30	80	.8	2	N	.25
SP165R	70	N	50	N	100	N	N	N	50	N	N	N	.50
SP509R	50	N	10	N	70	N	--	N	55	N	N	N	.20
SP512R	100	N	20	N	200	N	--	N	75	.1	N	N	1.00
SP513R	150	N	30	N	100	N	--	N	85	.2	N	N	.75
SP537RA	70	N	50	N	200	N	--	N	25	N	N	N	.80
SP537RB	50	N	30	N	200	N	--	N	10	.1	N	N	.65
SP537RC	30	N	20	N	500	N	--	N	60	.1	N	N	.35
SP539RA	70	N	20	N	200	N	--	N	55	.1	N	N	2.50
SP539RB	50	N	10	2,000	150	N	2.00	300	110	1.1	9	2	4.20
SP542R	100	N	30	N	200	N	--	N	70	.1	N	N	1.50
SP543R	100	N	20	N	200	N	N	N	75	.1	N	N	.90
SP544R	50	N	30	N	200	N	--	N	60	N	N	N	1.40
SP545R	20	N	30	N	200	N	--	N	40	N	N	N	1.20

Table 2.--Continued

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	B-ppm s	Ba-ppm s	Be-ppm s
SP547R	37 23 34	104 54 28	.70	.10	.10	.070	500	N	N	N	10	300	3.0
SP550R	37 22 24	105 5 27	.15	.05	.05	.020	50	N	N	N	30	20	<1.0
SP551R	37 23 42	104 55 5	5.00	1.50	1.50	.500	500	N	N	N	15	1,500	1.5
SP552R	37 23 52	104 55 0	3.00	1.00	1.50	.500	500	N	N	N	10	1,000	1.0
SP553R	37 24 2	104 55 0	1.00	.20	.30	.150	1,000	<.5	N	N	15	700	2.0
SP554RA	37 24 10	104 55 3	2.00	.30	.70	.200	500	<.5	N	N	20	700	1.5
SP554RB	37 24 10	104 55 3	5.00	.70	.50	.500	300	N	N	N	30	1,000	2.0
SP558R	37 22 43	104 59 43	3.00	1.50	2.00	.700	700	N	N	N	20	1,000	1.5
SP559R	37 22 46	104 59 46	5.00	2.00	3.00	1.000	1,000	<.5	N	N	20	700	1.0
SP560R	37 22 48	104 59 47	5.00	1.50	1.50	.700	500	N	N	N	10	1,000	1.0
SP562R	37 22 59	104 59 58	3.00	1.00	2.00	.500	500	N	N	N	10	1,000	1.5
SP563R	37 23 18	105 0 13	2.00	1.00	.50	.200	500	N	N	N	50	500	1.5
SP534R	37 20 40	105 5 10	1.50	.70	20.00	.150	100	<.5	N	N	100	200	1.0

Sample	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	Pb-ppm s	Sb-ppm s	Sc-ppm s	Sn-ppm s	Sr-ppm s
SP547R	N	N	N	N	N	N	<5	50	<5	50	N	N	N	<100
SP550R	N	N	N	<10	N	N	N	N	5	N	N	N	N	N
SP551R	N	N	20	<10	10	100	<5	30	10	50	N	7	N	500
SP552R	N	N	15	<10	5	70	<5	30	7	50	N	7	N	700
SP553R	N	N	5	N	7	70	5	50	<5	100	N	<5	N	150
SP554RA	N	N	10	10	N	50	N	N	10	100	N	5	N	100
SP554RB	N	N	20	50	20	50	N	<20	20	50	N	15	N	200
SP558R	N	N	20	15	20	100	7	30	15	50	N	7	N	700
SP559R	N	N	20	<10	300	100	7	20	15	50	N	10	N	1,000
SP560R	N	N	20	15	20	100	N	30	15	50	N	10	N	1,000
SP562R	N	N	10	N	10	100	<5	30	<5	70	N	5	N	1,000
SP563R	N	N	15	20	7	50	N	20	15	20	N	10	N	150
SP534R	N	N	7	70	20	<20	20	N	20	30	N	10	N	1,000

Sample	V-ppm s	W-ppm s	Y-ppm s	Zn-ppm s	Zr-ppm s	Th-ppm s	Au-ppm aa	As-ppm aa	Zn-ppm aa	Cd-ppm aa	Bi-ppm aa	Sb-ppm aa	U-ppm f
SP547R	<10	N	15	N	50	N	--	N	5	.1	N	N	1.50
SP550R	<10	N	<10	N	30	N	--	N	35	N	N	N	.40
SP551R	70	N	30	N	200	N	--	N	70	.1	N	N	.35
SP552R	70	N	30	N	100	N	--	N	55	.1	N	N	.90
SP553R	10	N	30	N	100	N	--	N	90	.3	N	N	1.30
SP554RA	50	N	20	N	200	N	--	N	55	.1	N	N	1.00
SP554RB	100	N	30	N	200	N	--	N	70	N	N	N	2.40
SP558R	100	N	30	<200	300	N	N	N	110	.1	N	N	.40
SP559R	150	N	30	<200	100	N	N	20	120	.5	N	N	.75
SP560R	100	N	30	N	200	N	N	N	100	N	N	N	.40
SP562R	50	N	30	<200	300	N	--	N	150	.5	N	N	.35
SP563R	50	N	30	N	200	N	--	N	70	N	N	N	.70
SP534R	200	N	20	N	30	N	--	<10	100	2.8	N	2	.60

Table 3.--Data for stream-sediment samples

[Concentrations in percent for Fe, Mg, Ca, Ti, and in parts per million for all other elements; analyses where the column is headed by the letter s were by semiquantitative emission spectrometry; analyses where the column is headed by the letters aa were by atomic absorption; and U analyses were by fluorimetry; N, not detected; leaders (--), not analyzed]

Table 3.--Continued

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	B-ppm s	Ba-ppm s
SP1SS	37 25 10	104 55 25	2.0	.5	.5	.2	300	N	N	N	50	700
SP2SS	37 21 10	105 2 5	3.0	.7	.5	.3	500	2.0	N	N	30	700
SP3SS	37 21 10	105 2 5	3.0	.7	.7	.2	500	N	N	N	20	700
SP5SS	37 21 35	105 2 25	3.0	.5	.5	.3	300	<.5	N	N	20	500
SP6SS	37 21 35	105 2 25	2.0	.7	.7	.3	300	N	N	N	30	700
SP7SS	37 22 15	105 2 55	3.0	.7	.7	.3	500	N	N	N	20	700
SP8SS	37 22 15	105 2 55	3.0	.7	.7	.3	500	<.5	N	N	20	700
SP9SS	37 24 35	104 57 40	2.0	.7	.3	.3	500	N	N	N	20	700
SP10SS	37 24 25	104 57 30	3.0	.7	.5	.2	500	<.5	N	N	20	700
SP11SS	37 24 10	104 57 40	3.0	1.0	.5	.5	700	N	N	N	20	700
SP15SS	37 24 0	104 57 0	3.0	.7	.3	.5	500	N	N	N	30	700
SP17SS	37 24 0	104 56 50	2.0	.7	.2	.5	700	<.5	N	N	50	700
SP18SS	37 24 0	104 56 50	2.0	.5	.5	.3	500	<.5	N	N	50	500
SP19SS	37 24 0	104 56 50	3.0	.7	.3	.5	500	N	N	N	20	700
SP20SS	37 24 45	104 57 50	3.0	.7	.3	.5	500	N	N	N	20	700
SP35SS	37 23 15	104 58 40	3.0	1.0	.7	.7	1,000	30.0	N	N	20	700
SP37SS	37 23 45	104 58 25	5.0	1.0	1.0	1.0	1,000	1.0	N	N	10	700
SP48SS	37 20 55	105 0 25	3.0	.7	.5	.3	500	N	N	N	20	500
SP49SS	37 20 50	105 0 5	3.0	1.0	.3	.5	500	N	N	N	30	500
SP50SS	37 20 40	104 59 25	3.0	.7	.5	.3	300	N	N	N	30	500
SP51SS	37 20 40	104 59 25	5.0	.7	.3	.2	300	N	N	N	20	500
SP52SS	37 21 40	104 57 55	7.0	1.0	.5	.7	700	N	N	N	20	700
SP53SS	37 21 40	104 57 55	3.0	.7	.2	.5	300	.5	N	N	30	700
SP54SS	37 20 55	104 58 15	3.0	1.0	.5	.3	500	N	N	N	20	700
SP55SS	37 21 0	104 58 30	2.0	.7	.5	.5	300	N	N	N	20	500
SP56SS	37 21 0	104 58 30	3.0	.7	.5	.3	700	N	N	N	20	700
SP63SS	37 22 10	105 1 25	3.0	1.0	.5	.5	500	N	N	N	50	700
SP64SS	37 22 20	105 1 20	2.0	.5	.3	.5	500	N	N	N	20	700
SP66SS	37 22 40	105 1 20	2.0	.7	.3	.5	500	<.5	N	N	50	700
SP67SS	37 23 0	105 1 25	3.0	.7	.5	.5	500	N	N	N	20	500
SP68SS	37 23 20	105 3 45	1.5	.5	.5	.3	500	N	N	N	30	1,000
SP70SS	37 23 15	105 3 35	3.0	1.0	1.0	.5	500	N	N	N	30	700
SP71SS	37 23 5	105 3 25	2.0	.5	.7	.5	500	N	N	N	20	700
SP72SS	37 20 45	104 53 5	2.0	.3	.2	.5	500	N	N	N	20	500
SP74SS	37 22 35	104 53 15	3.0	.5	.2	.5	700	N	N	N	15	700
SP75SS	37 22 45	104 53 5	2.0	.5	.2	.3	200	N	N	N	20	700
SP76SS	37 21 25	104 54 40	3.0	.5	.2	.3	500	N	N	N	30	700
SP78SS	37 22 45	104 56 35	2.0	.5	.3	.3	500	.5	N	N	30	700
SP79SS	37 22 45	104 56 35	5.0	1.0	.7	.5	700	N	N	N	20	700
SP80SS	37 22 35	104 56 35	2.0	.7	.5	.3	300	1.0	N	N	30	500
SP82SS	37 22 25	104 56 15	2.0	.5	.2	.3	700	N	N	N	50	500
SP83SS	37 22 5	104 56 10	5.0	1.0	.7	1.0	1,000	N	N	N	10	700
SP84SS	37 24 50	104 57 50	2.0	1.0	.5	.5	200	N	N	N	30	1,000
SP85SS	37 24 10	104 59 0	2.0	.7	.5	.2	500	<.5	N	N	30	500
SP86SS	37 23 15	105 1 35	3.0	.7	.3	.3	500	N	N	N	20	500

Table 3.--Continued

Sample	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	Pb-ppm s	Sb-ppm s	Sc-ppm s
SP1SS	1.0	N	N	5	10	5	50	N	<20	10	30	N	7
SP2SS	1.5	N	N	10	20	15	50	N	20	15	50	N	10
SP3SS	1.5	N	N	10	20	20	50	N	<20	10	50	N	10
SP5SS	1.5	N	N	10	15	15	50	N	<20	10	50	N	10
SP6SS	1.0	N	N	10	20	15	50	N	<20	10	50	N	7
SP7SS	1.5	N	N	10	20	20	50	N	<20	10	50	N	10
SP8SS	1.5	N	N	10	20	15	50	N	<20	10	50	N	7
SP9SS	1.5	N	N	10	30	15	50	<5	20	15	70	N	10
SP10SS	1.5	N	N	10	20	20	50	N	<20	15	70	N	10
SP11SS	1.5	N	N	20	30	30	70	<5	30	20	100	N	10
SP15SS	1.0	N	N	20	50	20	50	N	20	15	50	N	10
SP17SS	5.0	N	N	20	50	20	70	5	20	15	150	N	10
SP18SS	2.0	N	N	20	30	20	100	<5	20	15	100	N	10
SP19SS	1.5	N	N	15	50	15	50	<5	<20	20	50	N	10
SP20SS	1.0	N	N	15	30	15	50	<5	20	15	50	N	10
SP35SS	1.5	30	N	30	20	300	50	10	30	15	5,000	N	7
SP37SS	1.0	N	N	20	30	70	70	<5	30	20	300	N	10
SP48SS	1.5	N	N	7	20	20	50	N	20	10	50	N	10
SP49SS	1.5	N	N	10	20	20	50	N	20	10	50	N	10
SP50SS	1.5	N	N	10	15	15	50	N	<20	15	50	N	10
SP51SS	1.5	N	N	7	20	20	50	N	<20	10	50	N	10
SP52SS	1.5	N	N	30	50	20	70	N	30	20	100	N	15
SP53SS	1.5	N	N	10	20	20	50	N	<20	15	70	N	10
SP54SS	1.0	N	N	15	20	10	50	N	30	15	50	N	10
SP55SS	1.5	N	N	7	10	15	50	N	<20	10	50	N	10
SP56SS	1.5	N	N	10	20	10	50	N	<20	15	70	N	10
SP63SS	1.5	N	N	15	20	20	50	N	20	15	50	N	10
SP64SS	1.5	N	N	10	20	15	50	N	20	10	70	N	10
SP66SS	1.5	N	N	15	20	20	50	N	20	10	200	N	10
SP67SS	1.5	N	N	15	20	15	50	N	20	10	50	N	10
SP68SS	1.5	N	N	10	15	20	50	N	<20	10	50	N	10
SP70SS	1.5	N	N	10	20	10	50	N	<20	10	50	N	10
SP71SS	1.5	N	N	7	15	10	50	N	20	10	50	N	7
SP72SS	1.5	N	N	10	10	10	50	N	20	10	50	N	7
SP74SS	1.5	N	N	15	20	10	50	<5	30	15	70	N	10
SP75SS	1.0	N	N	15	15	7	<20	N	<20	10	50	N	7
SP76SS	1.5	N	N	20	30	15	50	N	<20	15	50	N	10
SP78SS	1.5	N	N	15	20	20	50	N	20	15	70	N	10
SP79SS	1.5	N	N	30	50	30	100	<5	30	15	100	N	10
SP80SS	2.0	N	N	10	15	20	70	N	<20	15	100	N	10
SP82SS	1.5	N	N	10	20	15	50	5	20	10	70	N	10
SP83SS	1.5	N	N	20	70	30	70	<5	50	15	70	N	15
SP84SS	1.5	N	N	15	30	15	<20	N	<20	15	70	N	10
SP85SS	2.0	N	N	15	20	50	50	N	<20	15	100	N	10
SP86SS	1.5	N	N	10	20	10	<20	N	<20	10	50	N	10

Table 3.--Continued

Sample	Sn-ppm s	Sr-ppm s	V-ppm s	W-ppm s	Y-ppm s	Zn-ppm s	Zr-ppm s	Th-ppm s	Au-ppm aa	As-ppm aa	Zn-ppm aa	Cd-ppm aa	Bi-ppm aa
SP1SS	N	200	70	N	30	N	70	N	--	N	25	N	N
SP2SS	N	150	100	N	70	N	200	N	N	N	60	.2	N
SP3SS	N	150	100	N	50	N	100	N	--	N	50	.1	N
SP5SS	N	150	70	N	50	N	300	N	--	N	50	N	N
SP6SS	N	150	50	N	30	N	200	N	--	N	50	.1	N
SP7SS	N	150	70	N	50	N	100	N	--	N	60	.2	N
SP8SS	N	150	70	N	30	N	300	N	--	N	70	.3	N
SP9SS	N	150	70	N	30	N	300	N	--	N	80	.2	N
SP10SS	N	150	70	N	50	N	200	N	--	N	70	.2	N
SP11SS	N	200	100	N	30	N	150	N	--	N	100	.2	N
SP15SS	N	150	70	N	30	N	100	N	--	N	100	.2	N
SP17SS	N	150	100	N	30	N	200	N	--	N	150	.2	N
SP18SS	N	200	100	N	50	N	200	N	--	N	130	.3	N
SP19SS	N	150	100	N	30	N	100	N	--	N	110	.1	N
SP20SS	N	150	100	N	50	N	300	N	--	N	80	.1	N
SP35SS	N	500	100	N	30	500	100	N	.15	150	720	2.4	46
SP37SS	N	700	200	N	50	200	100	N	N	20	220	.8	<2
SP48SS	N	150	70	N	50	N	150	N	--	N	50	.1	N
SP49SS	N	150	70	N	50	N	200	N	--	N	60	N	N
SP50SS	N	100	70	N	50	N	200	N	--	N	50	N	N
SP51SS	N	100	70	N	50	N	100	N	--	N	65	N	N
SP52SS	N	200	100	N	30	N	500	N	N	N	170	.4	N
SP53SS	N	100	50	N	50	N	100	N	--	N	90	.2	N
SP54SS	N	150	70	N	50	N	100	N	--	N	65	N	N
SP55SS	N	100	50	N	50	N	150	N	--	N	50	N	N
SP56SS	N	100	70	N	50	N	300	N	--	N	70	N	N
SP63SS	N	100	50	N	50	N	200	N	--	N	65	N	N
SP64SS	N	100	70	N	50	N	300	N	--	N	100	.2	N
SP66SS	N	100	70	N	30	<200	300	N	--	N	240	.6	N
SP67SS	N	100	70	N	70	N	200	N	--	N	85	N	N
SP68SS	N	300	70	N	20	N	150	N	--	N	85	N	N
SP70SS	N	100	70	N	50	N	300	N	--	N	60	N	N
SP71SS	N	150	100	N	50	N	200	N	--	N	60	N	N
SP72SS	N	150	70	N	30	N	100	N	--	N	65	N	N
SP74SS	N	150	70	N	30	N	100	N	--	N	100	N	N
SP75SS	N	150	50	N	30	N	300	N	--	N	70	N	N
SP76SS	N	100	70	N	30	N	200	N	--	N	80	N	N
SP78SS	N	150	70	N	50	N	500	N	--	N	150	.4	N
SP79SS	N	300	100	N	50	N	300	N	--	N	150	.1	N
SP80SS	N	200	70	N	50	N	70	N	N	N	220	.7	N
SP82SS	N	200	70	N	30	N	200	N	--	N	130	.2	N
SP83SS	N	300	150	N	50	N	200	N	--	N	130	.2	N
SP84SS	N	150	70	N	50	N	200	N	--	N	50	.1	N
SP85SS	N	100	70	N	50	N	100	N	--	N	140	.5	N
SP86SS	N	100	70	N	50	N	150	N	--	N	70	.1	N

Table 3.--Continued

Sample	Sb-ppm aa	U-ppm f
SP1SS	N	2.00
SP2SS	N	3.10
SP3SS	N	1.80
SP5SS	N	2.80
SP6SS	N	1.80
SP7SS	N	4.20
SP8SS	N	3.20
SP9SS	N	5.20
SP10SS	N	2.10
SP11SS	N	2.00
SP15SS	N	4.70
SP17SS	N	4.40
SP18SS	N	19.00
SP19SS	N	1.90
SP20SS	N	3.80
SP35SS	28	6.00
SP37SS	2	2.40
SP48SS	N	2.50
SP49SS	N	1.70
SP50SS	N	1.10
SP51SS	N	2.20
SP52SS	N	2.20
SP53SS	N	2.60
SP54SS	N	1.80
SP55SS	N	2.30
SP56SS	N	1.20
SP63SS	N	1.80
SP64SS	N	10.00
SP66SS	N	2.60
SP67SS	N	.70
SP68SS	N	.50
SP70SS	N	.95
SP71SS	N	1.20
SP72SS	N	1.00
SP74SS	N	1.30
SP75SS	N	1.00
SP76SS	2	.75
SP78SS	N	6.40
SP79SS	N	3.30
SP80SS	N	4.00
SP82SS	N	41.00
SP83SS	N	8.50
SP84SS	N	2.10
SP85SS	N	3.30
SP86SS	N	9.60

Table 3.--Continued

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	B-ppm s	Ba-ppm s
SP87SS	37 23 15	105 1 35	5.0	1.0	.5	.7	500	N	N	N	20	700
SP88SS	37 24 50	104 53 45	2.0	.7	.2	.3	300	N	N	N	30	700
SP89SS	37 24 50	104 53 55	1.0	.3	.5	.2	300	N	N	N	30	500
SP94SS	37 25 35	104 55 5	3.0	.7	.5	.3	300	N	N	N	30	1,000
SP95SS	37 25 35	104 55 5	2.0	1.0	.7	.3	300	N	N	N	20	700
SP96SS	37 25 45	104 53 5	2.0	.5	.5	.5	500	N	N	N	30	1,000
SP97SS	37 25 15	104 55 15	2.0	.5	.5	.3	300	N	N	N	20	700
SP98SS	37 24 15	104 59 35	5.0	.7	.7	.5	500	N	N	N	20	500
SP502SS	37 21 45	105 5 35	2.0	.7	1.0	.2	500	N	N	N	50	700
SP503SS	37 21 45	105 5 35	5.0	1.0	3.0	.2	500	<.5	N	N	100	700
SP506SS	37 22 30	105 5 30	2.0	.5	.7	.3	300	N	N	N	50	1,000
SP507SS	37 22 55	105 5 15	3.0	1.0	5.0	.3	300	N	N	N	100	500
SP510SS	37 23 35	105 1 0	5.0	1.0	.5	.3	500	N	N	N	20	700
SP511SS	37 23 35	105 1 0	3.0	1.0	.5	.5	500	N	N	N	20	700
SP515SS	37 23 50	105 1 0	5.0	1.0	.5	.5	500	N	N	N	20	700
SP519SS	37 24 5	105 0 55	7.0	.7	.3	.5	1,000	N	N	N	30	700
SP520SS	37 24 5	105 0 55	5.0	.7	.5	.5	500	N	N	N	20	700
SP521SS	37 24 5	105 4 15	3.0	.7	.7	.5	300	N	N	N	70	500
SP522SS	37 23 35	105 2 25	5.0	.7	.7	.5	500	N	N	N	20	700
SP524SS	37 22 0	104 56 55	3.0	.5	.7	.5	700	<.5	N	N	20	1,000
SP525SS	37 22 0	104 56 55	3.0	.7	.3	.5	700	N	N	N	50	1,000
SP526SS	37 22 5	104 56 10	3.0	.7	.5	.7	500	N	N	N	30	1,000
SP527SS	37 21 55	104 55 40	3.0	.7	.3	.5	500	N	N	N	20	1,000
SP528SS	37 23 50	104 58 15	2.0	.5	1.0	.3	300	.5	N	N	50	500
SP529SS	37 23 55	104 58 45	3.0	.7	.7	.5	500	N	N	N	50	500
SP530SS	37 25 35	104 54 5	1.0	.3	.5	.5	700	N	N	N	30	700
SP531SS	37 24 45	104 54 10	2.0	.5	1.0	.3	700	<.5	N	N	70	700
SP532SS	37 24 20	105 0 5	3.0	1.5	1.5	.5	700	.7	N	N	50	700

Table 3.--Continued

Sample	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	Pb-ppm s	Sb-ppm s	Sc-ppm s
SP87SS	1.5	N	N	15	50	20	50	N	20	15	100	N	15
SP88SS	1.5	N	N	15	20	10	50	N	<20	10	50	N	7
SP89SS	2.0	N	N	5	10	7	70	N	<20	5	50	N	5
SP94SS	1.5	N	N	10	30	10	50	N	<20	10	50	N	10
SP95SS	1.5	N	N	10	20	20	50	N	20	15	70	N	10
SP96SS	1.0	N	N	7	10	5	50	N	<20	7	50	N	7
SP97SS	1.0	N	N	7	10	10	50	N	20	10	70	N	7
SP98SS	1.5	N	N	10	20	20	50	<5	20	10	70	N	10
SP502SS	1.5	N	N	10	30	20	50	<5	<20	15	50	N	7
SP503SS	1.0	N	N	15	70	20	50	5	<20	20	70	N	10
SP506SS	1.5	N	N	10	20	10	<20	N	<20	15	50	N	5
SP507SS	1.0	N	N	15	50	15	50	5	<20	20	50	N	10
SP510SS	1.5	N	N	20	50	15	70	N	20	20	70	N	15
SP511SS	1.5	N	N	15	50	15	50	N	20	15	70	N	10
SP515SS	1.5	N	N	10	30	15	50	N	<20	10	100	N	10
SP519SS	1.5	N	N	15	50	15	50	N	20	10	100	N	15
SP520SS	1.5	N	N	15	30	20	50	N	20	15	70	N	15
SP521SS	1.5	N	N	15	20	20	50	N	<20	15	50	N	10
SP522SS	1.5	N	N	10	50	15	50	N	<20	10	50	N	10
SP524SS	1.5	N	N	15	15	20	50	N	<20	15	100	N	10
SP525SS	1.5	N	N	15	30	20	50	N	<20	15	100	N	10
SP526SS	1.5	N	N	15	20	15	50	N	20	15	100	N	10
SP527SS	1.5	N	N	15	50	20	50	N	<20	15	50	N	15
SP528SS	1.5	N	N	15	15	15	50	N	<20	10	100	N	7
SP529SS	1.5	N	N	10	20	20	50	N	<20	15	70	N	10
SP530SS	1.0	N	N	7	10	5	50	N	30	7	50	N	7
SP531SS	2.0	N	N	10	20	10	100	<5	<20	10	70	N	10
SP532SS	1.5	N	N	20	20	50	50	<5	20	15	200	N	10

Table 3.--Continued

Sample	Sn-ppm s	Sr-ppm s	V-ppm s	W-ppm s	Y-ppm s	Zn-ppm s	Zr-ppm s	Th-ppm s	Au-ppm aa	As-ppm aa	Zn-ppm aa	Cd-ppm aa	Bi-ppm aa
SP87SS	N	100	100	N	70	N	200	N	--	N	75	.1	N
SP88SS	N	100	70	N	30	N	200	N	--	N	80	.1	N
SP89SS	N	150	50	N	50	N	150	N	--	N	70	.3	N
SP94SS	N	150	70	N	50	N	100	N	--	N	55	.2	N
SP95SS	N	150	70	N	50	N	200	N	--	N	65	.2	N
SP96SS	N	150	70	N	50	N	300	N	--	N	40	N	N
SP97SS	N	150	70	N	30	N	300	N	--	N	50	.2	N
SP98SS	N	150	100	N	50	N	100	N	--	N	90	.6	N
SP502SS	N	200	70	N	30	N	300	N	--	N	90	.5	N
SP503SS	N	300	100	N	50	N	300	N	--	N	100	1.5	N
SP506SS	N	300	70	N	20	N	150	N	--	N	60	.2	N
SP507SS	N	200	100	N	50	N	200	N	--	N	120	1.7	N
SP510SS	N	100	70	N	50	N	200	N	--	N	70	N	N
SP511SS	N	100	70	N	50	N	200	N	--	N	65	.1	N
SP515SS	N	100	100	N	50	N	200	N	--	N	100	.1	N
SP519SS	N	100	150	N	70	N	300	N	--	N	60	N	N
SP520SS	N	100	100	N	50	N	200	N	--	N	65	N	N
SP521SS	N	200	70	N	20	N	200	N	--	N	90	.1	N
SP522SS	N	150	70	N	50	N	200	N	--	N	40	N	N
SP524SS	N	150	70	N	50	<200	100	N	N	N	170	.7	N
SP525SS	N	100	70	N	50	N	200	N	--	N	110	.1	N
SP526SS	N	150	100	N	50	N	200	N	--	N	90	.1	N
SP527SS	N	150	100	N	70	N	200	N	--	N	90	.1	N
SP528SS	N	150	70	N	30	N	200	N	--	N	140	1.1	N
SP529SS	N	100	70	N	50	N	100	N	--	N	80	.1	N
SP530SS	N	150	50	N	50	N	200	N	--	N	40	N	N
SP531SS	N	200	70	N	70	N	150	N	--	N	75	.4	N
SP532SS	N	500	70	N	30	200	200	N	--	N	250	.7	N

Table 3.--Continued

Sample	Sb-ppm aa	U-ppm f
SP87SS	N	1.80
SP88SS	N	.95
SP89SS	N	9.80
SP94SS	N	4.70
SP95SS	N	9.30
SP96SS	N	1.00
SP97SS	N	4.40
SP98SS	N	19.00
SP502SS	N	2.10
SP503SS	N	1.40
SP506SS	N	1.10
SP507SS	N	1.80
SP510SS	N	1.40
SP511SS	N	3.30
SP515SS	N	1.70
SP519SS	N	.90
SP520SS	N	.85
SP521SS	N	.60
SP522SS	N	1.30
SP524SS	N	3.60
SP525SS	N	1.40
SP526SS	N	.80
SP527SS	N	1.10
SP528SS	N	.70
SP529SS	N	1.60
SP530SS	N	1.60
SP531SS	N	9.30
SP532SS	N	2.80

Table 4.--Data for heavy-mineral concentrate samples

[Concentrations in percent for Fe, Mg, Ca, Ti, and in parts per million for all other elements; analyses where the column is headed by the letter s were by semiquantitative emission spectrometry; N, not detected]

Table 4.--Continued

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	B-ppm s	Ba-ppm s
SP1PC	37 25 10	104 55 25	1.0	.10	7	>2	700	N	N	N	50	200
SP2PC	37 21 10	105 2 5	.7	.15	10	>2	700	N	N	N	50	<50
SP5PC	37 21 35	105 2 25	1.0	.30	10	>2	700	N	N	N	50	50
SP6PC	37 21 35	105 2 25	1.0	.20	10	>2	700	N	N	N	50	50
SP9PC	37 24 35	104 57 40	.7	.15	10	>2	700	N	N	N	50	7,000
SP10PC	37 24 25	104 57 30	.7	.10	10	>2	500	N	N	N	50	5,000
SP11PC	37 24 10	104 57 40	1.0	.20	7	>2	500	N	N	N	100	700
SP15PC	37 24 0	104 57 0	.7	.30	5	>2	700	N	N	N	50	700
SP18PC	37 24 0	104 56 50	.5	.20	3	>2	500	N	N	N	100	5,000
SP19PC	37 24 0	104 56 50	.7	.20	10	>2	500	N	N	N	20	>10,000
SP20PC	37 24 45	104 57 50	.7	.15	7	>2	500	N	N	N	50	10,000
SP37PC	37 23 45	104 58 25	7.0	.10	7	2	200	30	1,500	N	20	>10,000
SP48PC	37 20 55	105 0 25	.7	.10	5	>2	300	N	N	N	50	100
SP51PC	37 20 40	104 59 25	1.5	.15	5	>2	300	N	N	N	70	150
SP52PC	37 21 40	104 57 55	1.0	.10	5	>2	300	N	N	N	30	100
SP54PC	37 20 55	104 58 15	2.0	.10	3	>2	300	N	N	N	30	50
SP55PC	37 21 0	104 58 30	1.5	.10	3	>2	300	N	N	N	50	100
SP63PC	37 22 10	105 1 25	.7	.20	7	>2	500	N	N	N	50	70
SP64PC	37 22 20	105 1 20	1.5	.15	7	>2	500	N	N	N	50	100
SP66PC	37 22 40	105 1 20	1.0	.15	10	>2	500	N	N	N	50	70
SP70PC	37 23 15	105 3 35	.7	.15	10	>2	500	N	N	N	20	>10,000
SP72PC	37 20 45	104 53 5	1.0	.05	2	>2	300	N	N	N	50	10,000
SP74PC	37 22 35	104 53 15	.7	.15	5	>2	500	N	N	N	30	700
SP79PC	37 22 45	104 56 35	1.5	.20	3	>2	500	N	N	N	50	700
SP82PC	37 22 25	104 56 15	1.0	.15	3	>2	300	N	N	N	50	500
SP84PC	37 24 50	104 57 50	.7	.10	5	>2	300	N	N	N	50	>10,000
SP85PC	37 24 10	104 59 0	1.0	.30	10	>2	1,000	N	N	N	100	1,500
SP87PC	37 23 15	105 1 35	1.0	.20	5	>2	500	N	N	N	50	700
SP94PC	37 25 35	104 55 5	.5	.07	7	>2	700	N	N	N	50	10,000
SP95PC	37 25 35	104 55 5	1.5	<.05	5	>2	500	N	N	N	50	>10,000
SP97PC	37 25 15	104 55 15	1.0	.10	5	>2	1,000	N	N	N	50	150
SP502PC	37 21 45	105 5 35	1.0	.20	10	>2	500	N	N	N	20	>10,000
SP503PC	37 21 45	105 5 35	.7	.07	3	>2	300	N	N	N	20	>10,000
SP506PC	37 22 30	105 5 30	.5	.15	7	>2	500	N	N	N	70	10,000
SP507PC	37 22 55	105 5 15	.3	.07	5	>2	300	N	N	N	20	>10,000
SP510PC	37 23 35	105 1 0	1.0	.10	3	>2	300	N	N	N	50	1,000
SP511PC	37 23 35	105 1 0	1.0	.10	3	>2	500	N	N	N	50	300
SP519PC	37 24 5	105 0 55	1.0	.07	2	>2	300	N	N	N	50	500
SP522PC	37 23 35	105 2 25	1.0	.15	5	>2	700	N	N	N	50	200
SP524PC	37 22 0	104 56 55	.5	.10	5	>2	300	N	N	N	50	5,000
SP525PC	37 22 0	104 56 55	.3	.05	2	>2	150	N	N	N	50	>10,000
SP530PC	37 25 35	104 54 5	.2	.05	3	>2	300	N	N	N	50	100
SP532PC	37 24 20	105 0 5	.7	.15	10	>2	300	N	N	N	30	70

Table 4.--Continued

Sample	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	Pb-ppm s	Sb-ppm s	Sc-ppm s
SP1PC	7	N	N	N	20	<10	200	<10	50	N	70	N	70
SP2PC	5	N	N	N	20	<10	150	10	100	<10	100	N	50
SP5PC	3	N	N	N	30	<10	200	10	100	<10	100	N	50
SP6PC	2	N	N	N	20	<10	150	10	150	<10	100	N	30
SP9PC	3	70	N	N	20	<10	300	N	70	<10	100	N	70
SP10PC	2	N	N	N	20	<10	200	N	100	<10	100	N	50
SP11PC	5	20	N	<10	20	<10	300	N	70	<10	100	N	70
SP15PC	3	N	N	N	150	<10	300	N	50	10	150	N	150
SP18PC	2	N	N	N	150	<10	200	<10	100	10	500	N	70
SP19PC	<2	30	N	N	<20	10	500	10	50	<10	200	N	20
SP20PC	3	N	N	N	20	<10	200	100	70	<10	300	N	50
SP37PC	N	100	N	300	<20	100	1,000	10	50	50	5,000	N	15
SP48PC	5	N	N	N	<20	<10	100	30	70	N	100	N	50
SP51PC	7	N	N	N	<20	<10	100	30	50	N	300	N	50
SP52PC	7	N	N	N	<20	<10	300	N	50	<10	100	N	50
SP54PC	10	N	N	N	<20	<10	150	N	50	N	100	N	70
SP55PC	15	N	N	N	<20	<10	<50	N	50	N	150	N	100
SP63PC	7	N	N	N	<20	<10	100	N	100	N	150	N	70
SP64PC	10	N	N	N	<20	<10	100	10	50	N	200	N	50
SP66PC	5	N	N	N	<20	<10	300	N	50	N	150	N	50
SP70PC	3	N	N	N	<20	<10	200	N	70	N	50	N	50
SP72PC	10	N	N	N	<20	<10	150	N	50	<10	100	N	150
SP74PC	5	100	N	N	<20	<10	150	N	50	<10	100	N	150
SP79PC	<2	50	N	15	<20	<10	500	N	50	<10	70	N	70
SP82PC	<2	N	N	N	<20	<10	300	500	200	<10	1,000	N	100
SP84PC	5	N	N	N	<20	<10	150	<10	70	N	500	N	70
SP85PC	10	N	N	N	<20	30	200	N	150	<10	200	N	150
SP87PC	10	N	N	N	<20	10	100	N	<50	<10	200	N	100
SP94PC	7	30	N	N	<20	<10	150	N	50	N	100	N	150
SP95PC	7	N	N	N	N	<10	<50	N	100	N	50	N	50
SP97PC	5	N	N	N	20	<10	150	N	<50	<10	100	N	150
SP502PC	2	N	N	N	<20	30	700	N	70	<10	70	N	50
SP503PC	2	N	N	N	<20	<10	<50	N	50	<10	50	N	20
SP506PC	<2	N	N	N	<20	20	1,000	N	150	N	70	N	100
SP507PC	3	N	N	N	<20	<10	300	N	50	<10	70	N	50
SP510PC	10	N	N	N	20	<10	<50	N	<50	<10	150	N	100
SP511PC	7	N	N	N	20	<10	<50	N	50	<10	100	N	70
SP519PC	10	N	N	N	20	<10	N	N	<50	<10	100	N	100
SP522PC	7	N	N	N	20	<10	300	<10	50	<10	100	N	70
SP524PC	<2	50	N	N	<20	<10	500	N	<50	<10	200	N	70
SP525PC	5	N	N	N	<20	<10	150	N	<50	<10	70	N	70
SP530PC	7	N	N	N	<20	<10	150	N	<50	N	70	N	150
SP532PC	N	N	N	N	<20	<10	700	N	50	<10	50	N	20

Table 4.--Continued

Sample	Sn-ppm s	Sr-ppm s	V-ppm s	W-ppm s	Y-ppm s	Zn-ppm s	Zr-ppm s	Th-ppm s
SP1PC	30	N	150	N	2,000	N	>2,000	N
SP2PC	150	N	200	N	1,500	N	>2,000	N
SP5PC	50	N	150	N	1,000	N	>2,000	N
SP6PC	70	N	150	N	1,000	N	>2,000	N
SP9PC	30	N	150	N	1,500	N	>2,000	N
SP10PC	30	N	150	N	1,500	N	>2,000	N
SP11PC	20	N	150	N	1,500	N	>2,000	N
SP15PC	30	N	150	N	1,500	N	>2,000	N
SP18PC	50	300	200	N	700	N	>2,000	N
SP19PC	N	1,000	50	N	1,000	N	>2,000	N
SP20PC	N	N	100	N	1,000	N	>2,000	N
SP37PC	N	500	50	N	700	1,000	>2,000	N
SP48PC	70	N	150	N	1,500	N	>2,000	N
SP51PC	50	N	150	N	1,500	500	>2,000	N
SP52PC	<20	N	100	N	1,500	500	>2,000	N
SP54PC	100	N	200	N	2,000	N	>2,000	N
SP55PC	N	N	150	N	2,000	N	>2,000	N
SP63PC	50	N	200	N	2,000	N	>2,000	N
SP64PC	50	N	150	N	1,500	N	>2,000	N
SP66PC	N	N	100	N	1,500	N	>2,000	N
SP70PC	50	N	150	N	1,500	N	>2,000	N
SP72PC	100	N	100	N	2,000	2,000	>2,000	N
SP74PC	70	N	100	N	3,000	N	>2,000	N
SP79PC	N	N	70	N	1,500	N	>2,000	<200
SP82PC	N	N	200	N	1,500	N	>2,000	N
SP84PC	N	<200	150	N	1,000	N	>2,000	N
SP85PC	<20	N	300	N	2,000	N	>2,000	N
SP87PC	200	N	150	N	2,000	N	>2,000	N
SP94PC	N	N	200	N	5,000	N	>2,000	N
SP95PC	N	N	200	N	2,000	N	>2,000	N
SP97PC	N	N	200	N	3,000	N	>2,000	N
SP502PC	N	300	150	N	1,500	N	>2,000	N
SP503PC	200	7,000	100	N	1,000	<500	>2,000	N
SP506PC	N	N	200	N	1,500	N	>2,000	N
SP507PC	N	2,000	100	N	1,000	N	>2,000	N
SP510PC	N	N	200	N	3,000	N	>2,000	N
SP511PC	N	N	200	N	2,000	1,000	>2,000	N
SP519PC	N	N	200	N	3,000	500	>2,000	N
SP522PC	100	N	200	N	2,000	N	>2,000	N
SP524PC	N	N	100	N	1,500	1,000	>2,000	N
SP525PC	N	<200	100	N	2,000	N	>2,000	N
SP530PC	N	N	150	N	3,000	N	>2,000	N
SP532PC	N	N	100	N	700	N	>2,000	N

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