UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

Analytical results and sample locality map of heavy-mineral-concentrate and rock samples from the Cinder Cones Wilderness Study Area (CDCA-239), San Bernardino County, California

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Open-File Report 86-403

1986

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STUDIES RELATED TO WILDERNESS

Bureau of Land Management Wilderness Study Areas

The Federal Land Policy and Management Act (Public Law 94-579, October 21, 1976) requires the U.S. Geological Survey and the U.S. Bureau of Mines to conduct mineral surveys on certain areas to determine their mineral values, if any. 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 Cinder Cones Wilderness Study Area (CDCA-239), California Desert Conservation Area, San Bernardino County, California.

INTRODUCTION

In April 1984, the U.S. Geological Survey conducted a reconnaissance geochemical survey of the Cinder Cones Wilderness Study Area, San Bernardino County, California.

The Cinder Cones Wilderness Study Area comprises about 69 mi^2 (179 km^2) (44,160 acres) of northeastern Mojave Desert. The area is 14 miles east of Baker, California, and 50 miles west of Searchlight, Nevada (fig. 1). All of the area has low relief; the only inaccessible places are west- and east-facing cliffs with vertical relief of no more than about 200 feet. The lowest point in the wilderness study area is 2,000 feet above sea level and the highest is 4,955 feet above sea level.

The Cinder Cones Wilderness Study Area is in northeastern San Bernardino County, and encloses part of a north-trending assemblage of Tertiary and Quaternary basaltic volcanos. The area of volcanic rocks and underlying granitic rocks forms an inconspicuous highland called the Ivanpah upland (Hewett, 1956), between the Kelso and Old Dad Mountains to the south and the Shadow Mountains to the north. Within the wilderness study area, the older lavas form an east-sloping mesa with about 1,000 feet of relief on the west side and 150 feet on the east side. West of the mesa is a low dome about 5 miles in diameter with a total relief of about 1,000 feet formed by erosion of granitic and younger sedimentary rocks. A smaller dome, partially exposed from beneath Tertiary sedimentary rocks, occurs at the south edge of the wilderness study area (Wilshire and others, 1986).

METHODS OF STUDY

Sample Media

Heavy-mineral-concentrate samples provide information about the chemistry of certain minerals in rock material eroded from the drainage basin upstream from each sample site. The selective concentration of minerals, many of which may be ore related, permits determination of some elements that are not easily detected in stream-sediment samples.

Analyses of unaltered or unmineralized rock samples provide background geochemical data for individual rock units. On the other hand, analyses of altered or mineralized rocks, where present, may provide useful geochemical information about the major- and trace-element assemblages associated with a mineralizing system.

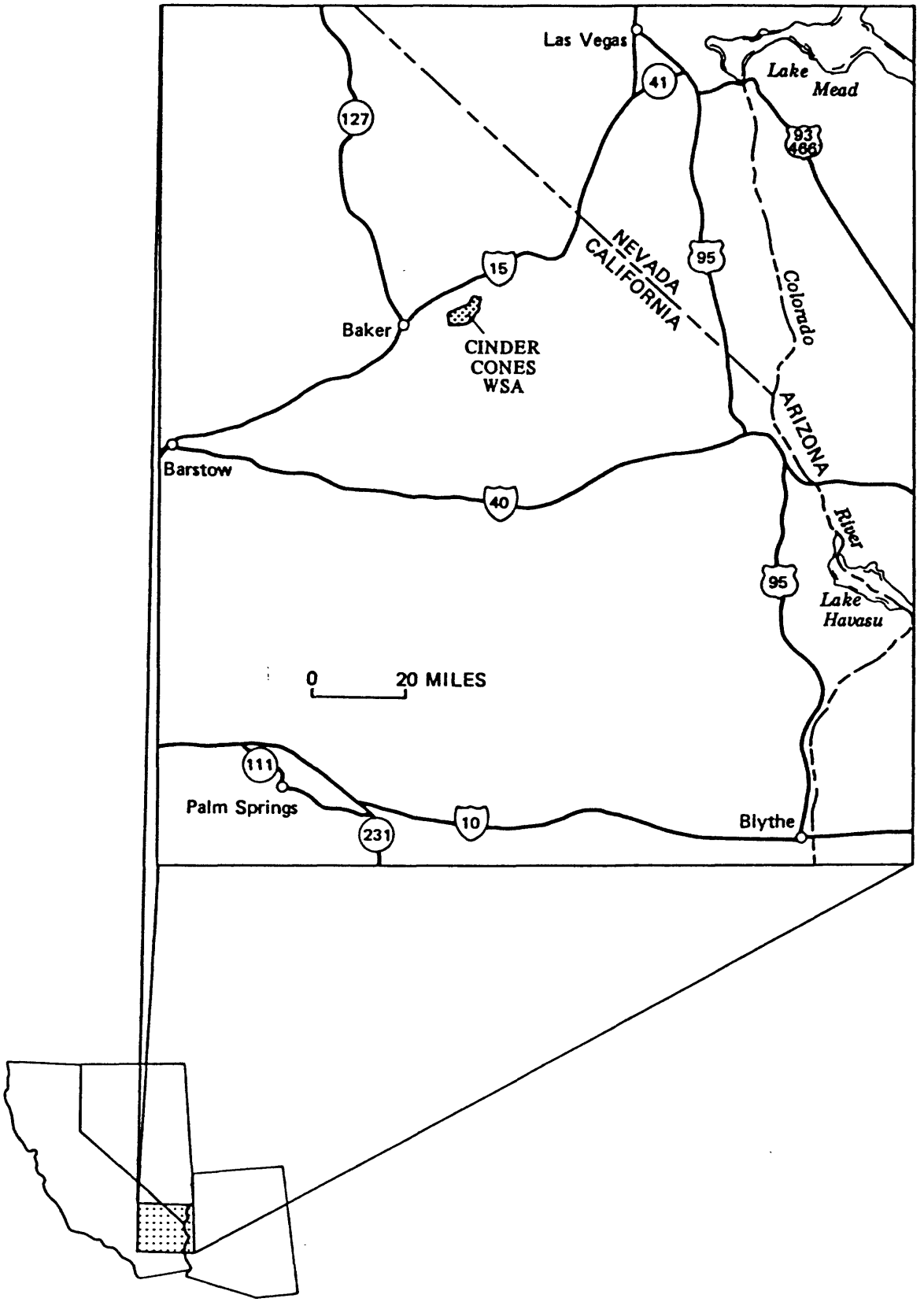

Figure 1. Location map of the Cinder Cones Wilderness Study Area (CDCA-239), San Bernardino County, California.

Sample Collection

Heavy-mineral-concentrate samples were collected at 32 sites; rock samples were collected at 17 sites (plate 1). Sampling density was about one sample site per 2.2 mi^2 for the heavy-mineral concentrates. The area of the drainage basins sampled ranged from approximately 0.5 mi^2 to 5 mi^2.

Heavy-mineral-concentrate samples

Heavy-mineral-concentrate samples were collected from active alluvium primarily from first-order (unbranched) and second-order (below the junction of two first-order) streams. Each bulk sample was screened with a 2.0-mm (10-mesh) screen to remove the coarse material. The less than 2.0-mm fraction was panned until most of the quartz, feldspar, organic material, and clay-sized material were removed.

Rock samples

Rock samples were collected in the vicinity of the plotted site location. Samples were collected from unaltered, altered, and mineralized rocks. Altered and/or mineralized rocks were collected either from various types of occurrences (see table 5) or from nearby mines and prospects.

Sample Preparation

After air drying, bromoform (specific gravity 2.8) was used to remove the remaining quartz and feldspar from the heavy-mineral-concentrate samples that had been panned in the field. The resultant heavy-mineral sample was separated into three fractions using a large electromagnet (in this case a modified Frantz Isodynamic Separator). The most magnetic material, primarily magnetite, was not analyzed. The second fraction, largely ferromagnesian silicates and iron oxides, was saved for archival storage. The third fraction (the least magnetic material which may include the nonmagnetic ore minerals, zircon, sphene, etc.) was split using a Jones splitter. One split was hand-ground for spectrographic analysis; the other split was saved for mineralogical analysis. These magnetic separates are the same separates that would be produced by using a Frantz Isodynamic Separator set at a slope of 15^{o} and a tilt of 10^{o} with a current of 0.1 ampere to remove the magnetite and ilmenite, and a current of 1.0 ampere to split the remainder of the sample into paramagnetic and nonmagnetic fractions.

Rock samples were crushed and then pulverized to minus 0.15 mm with ceramic plates.

Sample Analysis

Spectrographic method

The heavy-mineral-concentrate and rock samples were analyzed for 31 elements using a semiquantitative, direct-current arc emission spectrographic method. The analyses for heavy-mineral-concentrate samples were performed by the Branch of Exploration Geochemistry (Grimes and Marranzino, 1968); analyses for rock samples were performed by the Branch of Analytical Chemistry (Myers and others, 1961). The elements analyzed and their lower limits of determination are listed in table 1. For arsenic (As), gold (Au), cadmium

(Cd), and thorium (Th), the lower limit of determination of the two analytical methods varies. The values in the parentheses are the limits of determination for Myers and others (1961). Spectrographic results were obtained by visual comparison of spectra derived from the sample against spectra obtained from standards made from pure oxides and carbonates. Standard concentrations are geometrically spaced over any given order of magnitude of concentration as follows: 100, 50, 20, 10, and so forth. Samples whose concentrations are estimated to fall between those values are assigned values of 70, 30, 15, and so forth. The precision of the analytical method is approximately plus or minus one reporting interval at the 83 percent confidence level and plus or minus two reporting intervals at the 96 percent confidence level (Motooka and Grimes, 1976). Values determined for the major elements (iron, magnesium, calcium, and titanium) are given in weight percent; all others are given in parts per million (micrograms/gram). Analytical data for samples from the Cinder Cones Wilderness Study Area are listed in tables 3 and 4.

Chemical methods

Other methods of analysis used on samples from the Cinder Cones Wilderness Study Area are summarized in table 2.

Analytical results for heavy-mineral-concentrate and rock samples are listed in tables 3 and 4, respectively.

ROCK ANALYSIS STORAGE SYSTEM

Upon completion of all analytical work, the analytical results were entered into a computer-based file called Rock Analysis Storage System (RASS). This data base contains both descriptive geological information and analytical data. Any or all of this information may be retrieved and converted to a binary form (STATPAC) for computerized statistical analysis or publication (VanTrump and Miesch, 1977).

DESCRIPTION OF DATA TABLES

Tables 3 and 4 list the results of analyses for the samples of heavy-mineral concentrate and rock, respectively. For the two tables, the data are arranged so that column 1 contains the USGS-assigned sample numbers. These numbers correspond to the numbers shown on the site location maps (plate 1). Columns in which the element headings show the letter "s" below the element symbol are emission spectrographic analyses; "aa" indicates atomic absorption analyses; and "icp" indicates inductively coupled plasma-atomic emission spectroscopy. A letter "N" in the tables indicates that a given element was looked for but not detected at the lower limit of determination shown for that element in table 1. A letter "H" in the tables indicates that a given element was looked for but due to elemental interferences a value was not reported. If an element was observed but was below the lowest reporting value, a "less than" symbol (<) was entered in the tables in front of the lower limit of determination. If an element was observed but was above the highest reporting value, a "greater than" symbol (>) was entered in the tables in front of the upper limit of determination. If an element was not looked for in a sample, two dashes (--) are entered in tables 3 and 4 in place of an analytical value. Because of the formatting used in the computer program that produced tables 3 and 4, some of the elements listed in these tables (Fe, Mg, Ca, Ti, Ag, and Be) carry one or more

nonsignificant digits to the right of the significant digits. The analysts did not determine these elements to the accuracy suggested by the extra zeros.

Descriptions of rock samples are found in table 5. The table is arranged so that column 1 contains the USGS-assigned sample numbers. An "O" in column 2 indicates the rock was collected from an outcrop; "F" indicates float; "S" indicates stream cobble; and "D" indicates mine dump or prospect.

ACKNOWLEDGMENTS

A number of our colleagues also participated in the collection, preparation, analyses, and data retrieval of these samples: collection, J. C. Gray, K. R. Greene, M. A. Mast, and A. D. McCollaum; preparation, R. W. Baker and G. L. Thurston; analyses, N. M. Conklin, J. G. Crock and H. W. Groeneboer; and data retrieval, J. L. Jones.

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TABLE 1.--Limits of determination for the spectrographic analysis of rocks based on a 10-mg sample

[The values shown are the lower limits of determination assigned by the Grimes and Marranzino method, except for those values in parentheses, which are the lower values assigned by the Myers and others method. The spectrographic limits of determination for heavy-mineral-concentrate samples are based on a 5-mg sample, and are therefore two reporting intervals higher than the limits given for rocks.]

Elements	Lower determination limit	Upper determination limit
	Percent	
Iron (Fe)	0.05	20
Magnesium (Mg)	.02	10
Calcium (Ca)	.05	20
Titanium (Ti)	.002	1
	Parts per million	
Manganese (Mn)	10	5,000
Silver (Ag)	0.5	5,000
Arsenic (As)	200 (700)	10,000
Gold (Au)	10 (15)	500
Boron (B)	10	2,000
Barium (Ba)	20	5,000
Beryllium (Be)	1	1,000
Bismuth (Bi)	10	1,000
Cadmium (Cd)	20 (30)	500
Cobalt (Co)	5	2,000
Chromium (Cr)	10	5,000
Copper (Cu)	5	20,000
Lanthanum (La)	20 (30)	1,000
Molybdenum (Mo)	5	2,000
Niobium (Nb)	20	2,000
Nickel (Ni)	5	5,000
Lead (Pb)	10	20,000
Antimony (Sb)	100	10,000
Scandium (Sc)	5	100
Tin (Sn)	10	1,000
Strontium (Sr)	100	5,000
Vanadium (V)	10	10,000
Tungsten (W)	50	10,000
Yttrium (Y)	10	2,000
Zinc (Zn)	200	10,000
Zirconium (Zr)	10	1,000
Thorium (Th)	100 (200)	2,000

TABLE 2.--Chemical methods used

[AA = atomic absorption and ICP = inductively coupled plasma spectroscopy]

Element or constituent determined	Sample Type	Method	Determination limit (micrograms/ gram or ppm)	Reference
Gold (Au)	rock	AA	.1	Modification of Thompson and others, 1968.
Mercury (Hg)	rock	AA	.02	Koirtyohann and Khalil, 1976.
Arsenic (As)	rock	ICP	5	Crock and others, 1983, and modification of O'Leary and Viets, 1986.
Antimony (Sb)	rock	ICP	2	
Zinc (Zn)	rock	ICP	2	
Bismuth (Bi)	rock	ICP	2	
Cadmium (Cd)	rock	ICP	0.1	

TABLE 3. RESULTS OF ANALYSES OF HEAVY-MINERAL-CONCENTRATE SAMPLES FROM THE CINDER CONES WILDERNESS STUDY AREA, SAN BERNARDINO COUNTY, CALIFORNIA.

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

Sample	Latitude	Longitude	Fe-pct. s	Mg-pct. s	Ca-pct. s	Ti-pct. s	Mn-ppm s	Ag-ppm s	As-ppm s	Au-ppm s	B-ppm s	Ba-ppm s
CC002	35 22 54	115 50 45	1.5	.30	10	2.0	700	N	N	N	50	500
CC006	35 21 19	115 43 18	.7	.50	10	>2.0	1,000	N	N	N	50	700
CC008	35 11 54	115 53 50	.3	1.00	7	>2.0	1,000	5	N	N	20	1,500
CC010	35 12 7	115 53 10	1.0	1.00	7	>2.0	700	7	N	N	50	700
CC100	35 13 11	115 45 51	1.0	.30	10	>2.0	500	N	N	N	50	700
CC101	35 13 20	115 46 15	1.0	.30	10	>2.0	500	N	N	N	50	700
CC102	35 12 18	115 52 10	.3	1.00	15	>2.0	1,000	N	N	N	20	500
CC104	35 14 7	115 48 41	1.0	.20	20	>2.0	1,000	N	N	N	30	500
CC105	35 13 58	115 48 32	.7	.15	15	>2.0	700	N	N	N	20	500
CC106	35 13 14	115 50 30	.7	.20	7	>2.0	300	N	N	N	20	500
CC107	35 12 46	115 50 13	1.0	.20	15	>2.0	700	N	N	N	20	300
CC109	35 13 46	115 50 10	.5	.20	15	>2.0	700	N	N	N	20	150
CC110	35 15 41	115 53 40	.5	.10	50	>2.0	1,000	N	N	N	20	<50
CC111	35 16 28	115 51 10	.5	.15	20	>2.0	700	N	N	N	20	N
CC112	35 16 16	115 50 50	.5	.15	20	>2.0	700	N	N	N	20	N
CC113	35 16 20	115 48 39	.7	.20	30	>2.0	1,000	N	N	N	20	200
CC114	35 16 3	115 48 44	1.5	.50	20	>2.0	1,500	N	N	N	50	500
CC115	35 17 18	115 47 45	.5	.15	50	1.5	2,000	N	N	N	20	150
CC116	35 17 22	115 47 53	.3	.15	15	>2.0	1,000	N	N	N	30	700
CC200	35 10 28	115 48 24	.7	1.00	7	>2.0	700	N	N	N	30	700
CC201	35 17 0	115 42 55	1.0	.70	7	>2.0	500	N	N	N	30	700
CC202	35 20 39	115 44 40	1.0	.70	10	2.0	500	N	N	N	30	700
CC203	35 23 5	115 43 53	.7	.70	7	2.0	500	N	N	N	20	700
CC204	35 24 5	115 44 23	.7	.50	7	>2.0	500	N	N	N	20	700
CC205	35 21 20	115 48 27	.5	.20	15	>2.0	700	N	N	N	20	300
CC206	35 17 37	115 52 51	.7	.50	15	2.0	700	N	N	N	20	700
CC400	35 11 0	115 49 52	.7	.30	10	>2.0	700	N	N	N	20	500
CC402	35 18 22	115 44 10	.7	.50	7	2.0	700	N	N	N	20	700
CC403	35 20 37	115 44 37	.5	.30	5	.5	500	N	N	N	20	700
CC404	35 23 53	115 44 15	.5	.50	5	1.5	200	N	N	N	20	700
CC405	35 22 20	115 45 34	.5	.50	5	2.0	200	N	N	N	20	700
CC406	35 20 10	115 49 20	.3	.20	10	.7	700	N	N	N	20	300

TABLE 3. RESULTS OF ANALYSES OF HEAVY-MINERAL-CONCENTRATE SAMPLES FROM THE CINDER CONES WILDERNESS STUDY AREA, SAN BERNARDINO COUNTY, CALIFORNIA.--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
CC002	3	N	N	30	50	15	1,000	10	50	20	50
CC005	N	N	N	10	20	N	500	N	100	N	N
CC008	<2	100	N	10	N	300	300	N	50	N	10,000
CC010	2	N	N	10	100	10	500	N	70	N	1,000
CC100	N	N	N	<10	N	N	500	N	100	N	20
CC101	<2	N	N	10	N	<10	500	N	100	N	20
CC102	N	N	N	10	<20	N	700	N	200	N	70
CC104	<2	N	N	<10	N	30	1,000	N	200	N	20
CC105	N	N	N	10	N	N	1,000	N	200	N	N
CC106	<2	N	N	10	20	<10	300	N	100	N	N
CC107	N	N	N	20	50	10	1,500	N	150	N	200
CC109	N	N	N	20	50	<10	500	N	100	N	N
CC110	N	N	N	20	70	10	1,500	N	100	N	20
CC111	N	N	N	20	100	10	1,000	N	50	N	N
CC112	<2	N	N	30	150	15	1,000	10	50	N	50
CC113	N	N	N	10	N	N	1,500	N	150	N	50
CC114	<2	N	N	10	N	15	1,000	N	150	10	50
CC115	N	N	N	15	N	10	1,500	N	50	15	150
CC116	<2	N	N	30	20	10	1,000	N	70	<10	200
CC200	N	N	N	15	N	N	500	N	50	<10	N
CC201	<2	N	N	10	N	N	300	N	70	<10	N
CC202	<2	N	N	10	N	N	300	N	<50	N	N
CC203	<2	N	N	10	N	<10	300	N	<50	N	50
CC204	N	N	N	10	N	N	700	N	50	<10	20
CC205	N	N	N	10	N	N	500	N	100	N	20
CC206	50	N	N	10	N	N	500	N	<50	N	20
CC400	N	N	N	10	N	N	500	N	150	N	20
CC402	N	N	N	10	N	N	200	N	<50	N	N
CC403	<2	N	N	10	N	10	300	N	N	N	N
CC404	N	N	N	10	N	10	300	N	N	<10	20
CC405	N	N	N	10	N	<10	200	N	N	<10	20
CC406	N	N	N	<10	N	<10	500	N	<50	N	N

TABLE 3. RESULTS OF ANALYSES OF HEAVY-MINERAL-CONCENTRATE SAMPLES FROM THE CINDER CONES WILDERNESS STUDY AREA, SAN BERNARDINO COUNTY, CALIFORNIA.--Continued

Sample	Sb-ppm s	Sc-ppm s	Sn-ppm s	Sr-ppm s	V-ppm s	W-ppm s	Y-ppm s	Zn-ppm s	Zr-ppm s	Th-ppm s
CC002	N	70	N	N	500	N	1,500	N	>2,000	>5,000
CC006	N	N	N	500	200	N	500	N	>2,000	1,500
CC008	N	<10	100	300	200	N	500	N	>2,000	500
CC010	N	50	100	<200	300	N	700	N	>2,000	1,000
CC100	N	N	N	500	200	N	300	N	>2,000	200
CC101	N	N	N	500	200	N	300	N	>2,000	1,500
CC102	N	<10	30	500	300	N	700	N	>2,000	500
CC104	N	20	50	500	200	N	500	N	>2,000	300
CC105	N	20	70	N	300	N	700	N	>2,000	1,000
CC106	N	<10	N	<200	300	N	500	N	>2,000	3,000
CC107	N	30	70	N	500	N	1,000	N	>2,000	2,000
CC109	N	20	N	N	300	<100	500	N	>2,000	2,000
CC110	N	30	N	500	300	N	700	N	>2,000	5,000
CC111	N	50	N	<200	300	N	700	N	>2,000	3,000
CC112	N	50	N	<200	500	N	1,000	N	>2,000	5,000
CC113	N	20	N	<200	150	N	700	N	>2,000	1,000
CC114	N	<10	N	500	200	N	700	N	>2,000	1,000
CC115	N	50	N	<200	300	N	1,000	N	>2,000	5,000
CC116	N	50	N	<200	500	N	1,000	N	>2,000	>5,000
CC200	N	20	N	700	150	N	500	N	>2,000	500
CC201	N	<10	N	500	200	N	500	N	>2,000	700
CC202	N	N	N	500	200	N	300	N	>2,000	1,000
CC203	N	<10	N	500	500	N	500	N	>2,000	5,000
CC204	N	30	N	<200	300	N	1,000	N	>2,000	2,000
CC205	N	<10	N	<200	200	N	500	N	>2,000	700
CC206	N	N	N	500	200	N	500	N	>2,000	1,500
CC400	N	<10	N	500	200	N	500	N	>2,000	1,500
CC402	N	<10	N	700	100	N	300	N	>2,000	300
CC403	N	<10	N	500	300	N	300	N	>2,000	3,000
CC404	N	<10	200	500	300	N	500	N	>2,000	5,000
CC405	N	<10	N	500	150	N	500	N	>2,000	1,500
CC406	N	<10	N	<200	200	N	500	N	>2,000	2,000

TABLE 4. RESULTS OF ANALYSES OF ROCK SAMPLES FROM THE CINDER CONES WILDERNESS STUDY AREA, SAN BERNARDINO COUNTY, CALIFORNIA.

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

Sample	Latitude	Longitude	Fe-pct.s	Mg-pct.s	Ca-pct.s	Ti-pct.s	Mn-ppm s	Ag-ppm s	As-ppm s	Au-ppm s	B-ppm s	Ba-ppm s	Be-ppm s
CC001A	35 25 9	115 48 1	>20.00	.15	<.05	.002	100	150.0	2,000	N	N	<20	N
CC001B	35 25 9	115 48 2	.30	>10.00	3.00	.010	200	N	N	N	N	<20	N
CC002A	35 22 54	115 50 45	3.00	.10	1.50	.010	300	7.0	N	N	N	200	N
CC002B	35 22 55	115 50 45	.30	.15	.15	.030	30	N	N	N	<10	150	1.0
CC003	35 23 21	115 49 40	.70	.10	10.00	.030	1,500	70.0	N	N	N	300	1.5
CC004B	35 25 19	115 48 17	7.00	.10	1.00	.200	100	1.0	N	N	<10	150	1.0
CC005A	35 25 40	115 48 41	7.00	.20	7.00	.007	300	150.0	N	N	<10	20	1.0
CC005B	35 25 41	115 48 41	15.00	.30	1.50	.010	>5,000	500.0	N	N	<10	30	5.0
CC006A	35 21 21	115 43 19	.30	2.00	15.00	.030	50	1.5	N	N	N	100	N
CC006B	35 21 20	115 43 19	1.00	.15	.30	.150	300	N	N	N	20	700	1.0
CC007	35 11 55	115 53 46	3.00	.05	.07	.030	150	N	N	N	10	100	N
CC009A	35 11 57	115 53 27	1.50	.15	.30	.100	30	N	N	N	10	150	1.0
CC102	35 12 18	115 52 10	.10	.20	20.00	.003	20	N	N	N	N	30	N
CC104A	35 14 7	115 48 41	5.00	10.00	1.00	.300	300	N	N	N	N	30	N
CC108	35 13 38	115 50 20	5.00	.70	.20	.200	300	.5	N	N	<10	500	3.0
CC009B	35 11 57	115 53 25	.30	3.00	15.00	.020	200	N	N	N	N	30	N
CC116	35 17 22	115 47 53	2.00	.20	.15	.150	30	N	N	N	N	1,000	1.0
CC401	35 15 20	115 52 40	.07	.02	.10	.050	70	N	N	N	N	20	N
CC404C	35 23 53	115 44 15	5.00	1.50	3.00	.500	700	N	N	N	N	700	<1.0
CC404B	35 23 54	115 44 15	2.00	.70	1.50	.200	300	N	N	N	N	1,000	1.0
CC2-1	35 11 40	115 49 20	>20.00	3.00	.15	.015	>5,000	15.0	N	N	70	1,500	N
CC2-2	35 11 40	115 49 20	>20.00	.30	.70	.015	1,500	1.5	N	N	30	150	N
CC3-1	35 11 45	115 53 40	20.00	.07	.15	.015	150	5.0	N	20	70	200	7.0

TABLE 4. RESULTS OF ANALYSES OF ROCK SAMPLES FROM THE CINDER CONES WILDERNESS STUDY AREA, SAN BERNARDINO COUNTY, CALIFORNIA.--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
CC001A	N	500	N	<10	5,000	N	N	N	<5	>20,000	7,000	N	50	<100
CC001B	N	N	N	<10	15	N	N	N	<5	150	N	N	N	300
CC002A	15	N	20	<10	300	N	7	N	10	150	N	N	N	<100
CC002B	N	N	N	<10	15	N	N	<20	N	70	N	N	N	100
CC003	N	N	N	<10	50	N	N	N	<5	70	N	<5	N	<100
CC004B	N	N	5	20	70	N	5	N	10	50	N	7	N	<100
CC005A	700	N	N	<10	2,000	N	7	N	<5	7,000	N	N	N	<100
CC005B	2,000	70	7	<10	>20,000	N	H	N	5	20,000	N	N	N	<100
CC006A	N	N	N	<10	100	N	N	N	7	50	N	N	N	300
CC006B	N	N	<5	15	20	70	N	N	7	50	N	<5	N	300
CC007	N	N	20	<10	15	N	7	N	<5	N	N	N	N	N
CC009A	N	N	N	15	50	N	N	N	<5	30	N	<5	N	<100
CC102	N	N	N	<10	7	N	N	N	<5	N	N	N	N	300
CC104A	N	N	15	200	<5	N	N	N	100	N	N	30	N	<100
CC108	20	N	N	<10	500	70	10	<20	<5	20	N	15	20	300
CC009B	N	N	N	<10	7	N	N	N	<5	15	N	<5	N	100
CC116	N	N	<5	<10	5	50	N	N	<5	10	N	<5	N	150
CC401	N	N	N	<10	<5	N	N	N	N	<10	N	<5	N	<100
CC404C	N	N	15	30	20	50	N	N	15	15	N	15	N	700
CC404B	N	N	5	15	<5	100	N	N	7	20	N	7	N	300
CC2-1	N	70	5	30	300	N	30	<20	30	>20,000	N	N	H	100
CC2-2	N	N	15	<10	700	N	<10	<20	30	1,500	N	N	H	<100
CC3-1	30	N	50	<10	300	30	30	<20	30	70	N	N	H	<100

TABLE 4. RESULTS OF ANALYSES OF ROCK SAMPLES FROM THE CINDER CONES WILDERNESS STUDY AREA, SAN BERNARDINO COUNTY, CALIFORNIA.--Continued

Sample	V-ppm s	W-ppm s	Y-ppm s	Zn-ppm s	Zr-ppm s	Th-ppm s	Au-ppm aa	Hg-ppm aa	As-ppm icp	Zn-ppm icp	Cd-ppm icp	Bi-ppm icp	Sb-ppm icp
CC001A	N	N	<10	>10,000	N	N	3.40	--	2,300	14,000	180.0	8	3,900
CC001B	10	N	N	N	N	N	<.10	--	23	61	.8	<2	69
CC002A	70	N	<10	N	15	N	44.00	--	55	88	1.9	10	47
CC002B	<10	N	<10	N	50	N	<.10	--	<5	75	.1	<2	14
CC003	20	N	<10	N	20	N	11.00	--	5	82	2.9	<2	12
CC004B	70	N	10	N	100	N	<.10	--	45	100	1.9	<2	16
CC005A	150	150	N	2,000	N	N	<.10	--	21	1,700	17.0	710	8
CC005B	20	70	10	>10,000	N	N	<.10	--	12	25,000	62.0	1,300	<2
CC006A	10	N	N	N	15	N	<.10	--	<5	75	.4	3	7
CC006B	50	N	<10	N	100	N	<.10	--	<5	25	.2	<2	3
CC007	50	N	<10	N	10	N	2.30	--	7	13	.7	4	6
CC009A	20	N	<10	N	70	N	1.20	--	11	19	.3	<2	6
CC102	<10	N	N	N	N	N	<.10	--	<5	4	.3	<2	2
CC104A	150	N	15	N	30	N	<.10	--	<5	8	.2	<2	13
CC108	30	50	50	N	300	N	<.10	--	<5	22	.8	13	<2
CC009B	20	N	N	N	15	N	<.10	--	7	15	.3	<2	<2
CC116	70	N	<10	N	150	N	<.10	--	<5	8	.3	<2	<2
CC401	<10	N	<10	N	30	N	<.10	--	<5	4	<.1	<2	<2
CC404C	150	N	15	N	15	N	<.10	--	<5	74	1.1	<2	6
CC404B	50	N	20	N	100	N	<.10	--	<5	34	.3	<2	<2
CC2-1	30	N	15	3,000	30	N	<.01	2.10	166	2,840	44.6	8	81
CC2-2	70	N	10	700	15	N	.10	.11	48	192	4.9	<2	50
CC3-1	30	N	70	300	10	N	52.00	.02	35	91	.5	16	32

TABLE 5. Description of rock samples

[O = outcrop; F = float; S = stream cobble; and D = mine dump or prospect]

CC001A	F	Gossan
1B	D	Tremolite(?)
2A	F	Quartz veins and brecciated granitic rock
2B	F	Disseminated pyrite in granitic rock
3	D	Brecciated granitic rock
4B	D	Limonitic breccia
5A	D	Breccia
5B	D	Quartz-hematite-turquoise veins
6A	O	Caliche
6B	O	Quartz monzonite
7	D	Brecciated quartz vein
9A	D	Brecciated quartz vein
9B	D	Brecciated chert and dolomitic limestone
102	S	Limestone
104A	O	Chlorite vein
108	D	Sericitally altered gossan rock
116	S	Limonitic quartz monzonite
401	D	Silicified quartz monzonite
404A	O	Limonitic mafic dike
404B	O	Granite gneiss
2-1	D	Composite mine dump sample
2-2	D	Composite mine dump sample
3-1	D	Composite mine dump sample