UNITED STATES DEPARTMENT OF THE INTERIOR

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Analytical results and sample locality map for stream-sediment and nonmagnetic heavy-mineral-concentrate samples from the Marble Canyon Wilderness Study Area (NV-040-086), White Pine County, Nevada

By

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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 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 Marble Canyon (NV-040-086) Wilderness Study Area, White Pine County, Nevada.

INTRODUCTION

In May 1987, the U.S. Geological Survey conducted a reconnaissance geochemical survey of approximately 50 mi^2, hereafter termed the "study area," that includes the Marble Canyon Wilderness Study Area, White Pine County, Nevada. The U.S. Bureau of Land Management requested studies on 8,300 acres (about 13 mi^2) of the study area.

The Marble Canyon Wilderness Study Area is in extreme eastern White Pine County, about 45 mi east-northeast of Ely, Nevada, and about 25 mi north of Baker, Nevada (fig. 1). Primary access is by way of gravel and dirt roads that branch from a gravel road that runs from U.S. Highway 6 and 50 north of Baker, Nevada, to Gandy, Utah (fig. 1).

The study area is in the Snake Range, a north-south-trending range in the Basin and Range Physiographic Province. Wheeler Peak and Mt. Moriah (fig. 1) are major peaks in the range. Elevations in the wilderness study area range from about 5,200 ft to almost 9,400 ft. The terrain of the study area appears to be a gently sloping erosion surface modified by rolling hills; subsequent erosion of the old surface resulted in steep-sided canyons and rounded ridgelines. The eastern edge of the study area is a bajada that slopes gently away from the mountain front.

Streams in the wilderness study area are ephemeral but nearby streams such as Smith Creek, on the south edge, are perennial. Vegetation ranges from sagebrush at lower elevations to pinyon pine and juniper at higher elevations to probable limber pine, bristlecone pine, and white fir at the highest elevations as in other parts of the White Pine County (Hose and others, 1976). Grass is interspersed with trees at all elevations in the study area.

Geology of the study area is included in a report on geology and mineral resources of White Pine County by Hose and others (1976). Bedrock within the study area consists of Cambrian to Devonian sedimentary rocks. The bedrock of the study area is dominated by Cambrian limestone that was metamorphosed to marble. Hose and others (1976) consider that the most important structural feature of the Snake Range is a large low-angle fault complex termed a decollement. Rocks below the decollement are early Middle Cambrian or older, are only moderately faulted, are commonly metamorphosed, and are intruded by Mesozoic and Cenozoic intermediate igneous rocks. Rocks above the decollement are all Middle Cambrian or younger, are complexly faulted, lack intrusive rocks, and are metamorphosed to a lesser extent than rocks of the lower plate. Approximately one-fourth of the study area is underlain by upper-plate rocks and the remainder by lower-plate rocks. Exposed intrusive rocks are no closer than 1 mile from the study area.

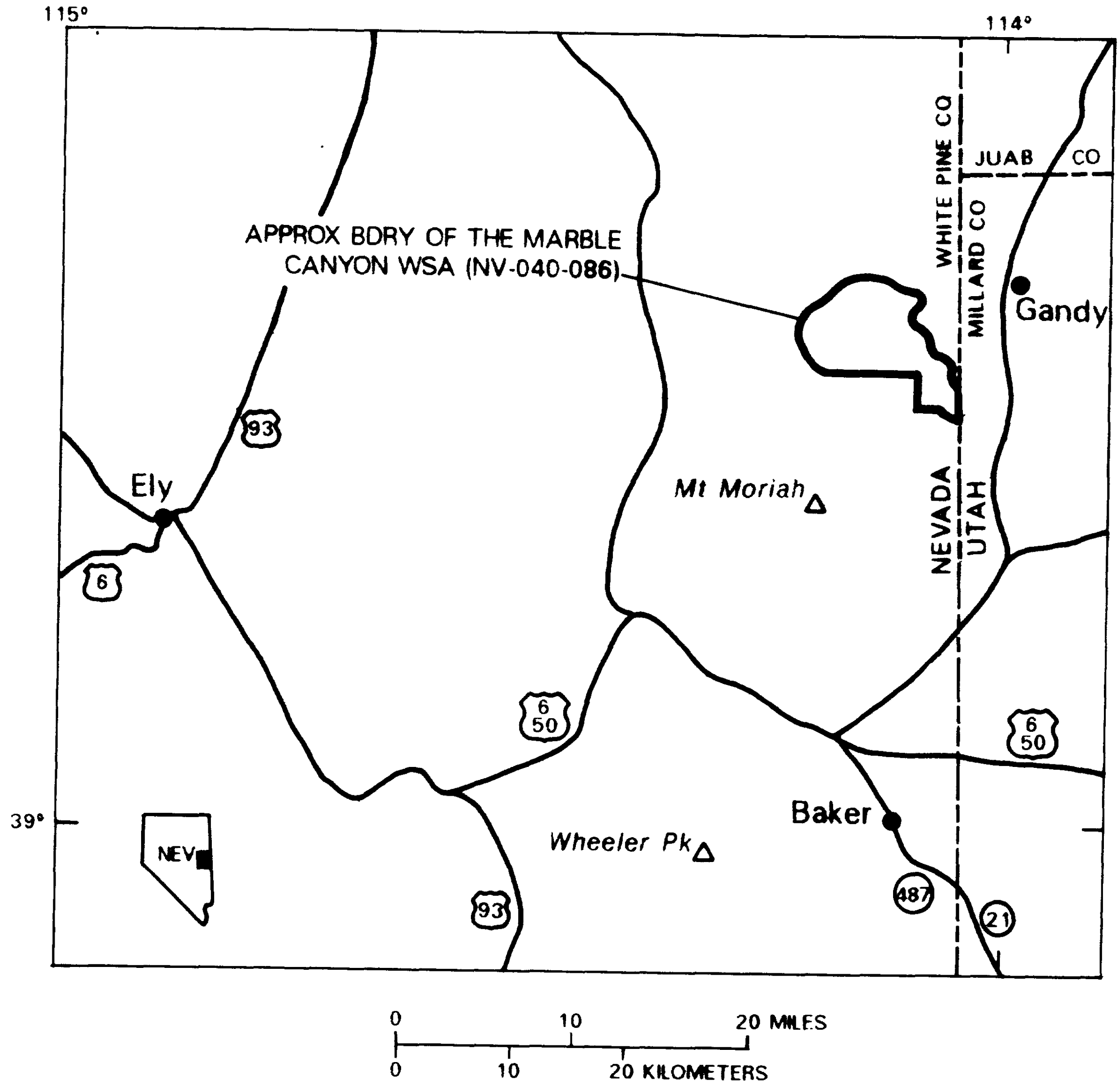

Figure 1. Index map of the location of the Marble Canyon Wilderness Study Area, White Pine County, Nevada.

Mineral deposits are unknown within about 5 mi of the study area. Replacement deposits in marble about 5 mi southwest of the study area have yielded a recorded production of 275 oz of silver, 0.06 oz of gold, and over 38,000 lb of lead (Hose and others, 1976). A deposit about 5 mi northwest of the study area produced slightly less silver, gold, and zinc plus 225 lb of copper and 1,553 lb of zinc (Hose and others, 1976); this deposit is presumably a carbonate replacement deposit, also. Coarse-grained scheelite in silicified limestone was prospected about 5 mi west of the study area; no production has been recorded (Hose and others, 1976).

METHODS OF STUDY

Sample Media

Analyses of stream-sediment samples represent the chemistry of the rock material eroded from the drainage basin upstream from each sample site. Such information is useful in identifying those basins which contain concentrations of elements that may be related to mineral deposits. Heavy-mineral-concentrate samples derived from stream sediment 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.

Sample Collection and Preparation

Stream-sediment and heavy-mineral-concentrate samples were collected at 47 sites in the study area (plate 1). Sampling density was about one sample site per mi^2. The area of the drainage basins sampled ranged from about 0.1 mi^2 to about 2 mi^2. Samples were collected by Gary A. Nowlan.

Stream-sediment samples

The stream-sediment samples consisted of active alluvium collected primarily from first-order (unbranched) and second-order (below the junction of two first-order) streams (plate 1). The stream-sediment samples were air dried, then sieved using 80-mesh (0.17-mm) stainless-steel sieves. The portion of the sediment passing through the sieve was pulverized to approximately minus 100-mesh (0.15-mm) for analysis.

Nonmagnetic heavy-mineral-concentrate samples

Active alluvium was screened with a 2.0-mm (10-mesh) screen to obtain about 20 lb of sample after removal of the coarse material. The samples were then panned to remove most of the quartz, feldspar, carbonate rock material, organic material, and clay-sized material and then sieved using 35-mesh (0.5 mm) stainless-steel sieves. The resulting concentrate samples weighed an estimated 1-2 oz.

After oven drying the samples at 90 °C, bromoform (specific gravity 2.8) was used to remove the remaining quartz, feldspar, and other light minerals. 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° and a tilt of 10° with a current of 0.2 ampere to remove the magnetite and ilmenite, and a current of 0.6 ampere to split the remainder of the sample into paramagnetic and nonmagnetic fractions.

Sample Analysis

Spectrographic method

The stream-sediment samples were analyzed for 31 elements and the nonmagnetic heavy-mineral-concentrate samples for 37 elements using a semiquantitative, direct-current arc emission spectrographic method (Grimes and Marranzino, 1968). The elements analyzed and their limits of determination are listed in tables 1 and 2. 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). Emission spectrographic analyses were performed by John H. Bullock, Jr.

Other methods

Stream-sediment samples were also analyzed by inductively coupled plasma-atomic emission spectroscopy (ICP), graphite furnace atomic absorption spectroscopy (AA), and ultraviolet fluorimetry. The samples were analyzed for arsenic (As), antimony (Sb), bismuth (Bi), cadmium (Cd), and zinc (Zn) using ICP, for gold (Au) using AA, and for uranium (U) using ultraviolet fluorimetry. Limits of determination, precision, and references for the methods are included in table 3. Analysts were Paul H. Briggs, John B. McHugh, and Theodore A. Roemer.

Analytical results for stream-sediment and heavy-mineral-concentrate samples are listed in tables 4 and 5, respectively.

DATA STORAGE SYSTEM

Upon completion of all analytical work, the results were entered into a U.S. Geological Survey computer data base called PLUTO. 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, VanTrump and Miesch, 1977) for computerized statistical analysis or publication.

DESCRIPTION OF DATA TABLES

The numeric part of each sample identification in tables 4-5 is the same as the corresponding sampling-site number on plate 1. 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 tables 1 and 2. For emission spectrographic analyses, a "less than" symbol (<) entered in the tables indicates that an element was observed but was below the lowest reporting value. For AA and ICP analyses, a "less than" symbol (<) entered in the tables indicates that an element was below the lowest reporting value. If an element was above the highest reporting value, a "greater than" symbol (>) was entered in the tables. Because of the formatting used in the computer program that produced tables 4-5, some of the elements listed in these tables (Ca, Fe, Mg, Ti, and Be) carry one or more nonsignificant digits to the right of the significant digits.

Some elements were not detected in any sample by emission spectrography and are omitted from tables 4-5. These elements are As, Au, Bi, Cd, Sb, Sn, Th, and W in stream-sediment samples and As, Au, Cd, Ge, Mo, Sb, Th, Pd, and Pt in nonmagnetic heavy-mineral-concentrate samples. Concentrations of Bi, as determined by ICP, are all less than the lower limits of determination and thus are omitted from table 4.

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

Elements	Lower determination limit	Upper determination limit
	Weight percent	
Calcium (Ca)	0.05	20
Iron (Fe)	.05	20
Magnesium (Mg)	.02	10
Titanium (Ti)	.002	1
	Parts per million	
Silver (Ag)	0.5	5,000
Arsenic (As)	200	10,000
Gold (Au)	10	500
Boron (B)	10	2,000
Barium (Ba)	20	5,000
Beryllium (Be)	1	1,000
Bismuth (Bi)	10	1,000
Cadmium (Cd)	20	500
Cobalt (Co)	5	2,000
Chromium (Cr)	10	5,000
Copper (Cu)	5	20,000
Lanthanum (La)	20	1,000
Manganese (Mn)	10	5,000
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	1000
Tin (Sn)	10	1,000
Strontium (Sr)	100	5,000
Thorium (Th)	100	2,000
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

TABLE 2.--Limits of determination for the spectrographic analysis of nonmagnetic heavy-mineral-concentrate samples, based on a 5-mg sample

Elements	Lower determination limit	Upper determination limit
	Percent	
Calcium (Ca)	0.1	50
Iron (Fe)	.1	50
Magnesium (Mg)	.05	20
Sodium (Na)	.5	10
Phosphorus (P)	.5	20
Titanium (Ti)	.005	2
	Parts per million	
Silver (Ag)	1	10,000
Arsenic (As)	500	20,000
Gold (Au)	20	1,000
Boron (B)	20	5,000
Barium (Ba)	50	10,000
Beryllium (Be)	2	2,000
Bismuth (Bi)	20	2,000
Cadmium (Cd)	50	1,000
Cobalt (Co)	20	5,000
Chromium (Cr)	20	10,000
Copper (Cu)	10	50,000
Gallium (Ga)	10	1,000
Germanium (Ge)	20	200
Lanthanum (La)	100	2,000
Manganese (Mn)	20	10,000
Molybdenum (Mo)	10	5,000
Niobium (Nb)	50	5,000
Nickel (Ni)	10	10,000
Lead (Pb)	20	50,000
Antimony (Sb)	200	20,000
Scandium (Sc)	10	2,000
Tin (Sn)	20	2,000
Strontium (Sr)	200	10,000
Thorium (Th)	200	5,000
Vanadium (V)	20	20,000
Tungsten (W)	50	20,000
Yttrium (Y)	20	5,000
Zinc (Zn)	500	20,000
Zirconium (Zr)	20	2,000
Palladium (Pd)	5	1,000
Platinum (Pt)	20	1,000

TABLE 3.--Analytical methods used other than emission spectrography

[AA, graphite furnace atomic absorption; F, ultraviolet fluorimetry; ICP, inductively coupled plasma-atomic emission spectroscopy]

Element determined	Sample type	Method	Lower determination, limit, ppm	Precision, percent relative standard deviation	References
Arsenic (As)	stream sediment	ICP	5	3.5-20	Crock and others, 1987.
Antimony (Sb)	stream sediment	ICP	2	6.4-11	
Bismuth (Bi)	stream sediment	ICP	2	2.2-11.9	
Cadmium (Cd)	stream sediment	ICP	0.1	2.8-8.8	
Zinc (Zn)	stream sediment	ICP	2	1.4-11.9	
Uranium (U)	stream sediment	F	0.1	6.9-14.2	Centanni and others, 1956; O'Leary and Meier, 1986.
Gold (Au)	stream sediment	AA	0.001	3.7-21.1	Meier, 1980; O'Leary and Meier, 1986.

TABLE 4.--Results of analyses of stream-sediment samples from the Marble Canyon Wilderness Study Area, White Pine County, Nevada

[N, not detected; <, detected below limit of determination shown for emission spectrographic analyses, less than concentration shown for other methods; >, greater than concentration shown. Methods: Au-a, graphite furnace atomic absorption spectroscopy; As-i, Cd-i, Sb-i, Zn-i, inductively coupled plasma-atomic emission spectroscopy; U-f, ultraviolet fluorimetry. Concentrations in ppm except Ca, Fe, Mg, and Ti, which are weight percent]

Sample	Latitude	Longitude	Ca	Fe	Mg	Ti	Ag	B	Ba	Be	Co	Cr	Cu	La
MAR047A	39 25 1	114 9 7	1.5	1.5	.7	.10	N	30	200	1.5	5	10	10	<20
MAR048A	39 24 55	114 9 20	5.0	2.0	3.0	.07	N	20	300	<1.0	<5	<10	15	<20
MAR049A	39 24 41	114 9 36	2.0	1.5	2.0	.15	N	30	200	2.0	5	<10	15	<20
MAR050A	39 24 41	114 9 41	5.0	3.0	3.0	.30	N	50	300	2.0	15	20	20	20
MAR051A	39 25 27	114 9 1	7.0	2.0	2.0	.07	N	30	500	2.0	<5	10	15	30
MAR052A	39 25 29	114 8 38	7.0	2.0	5.0	.20	N	50	500	3.0	7	20	20	50
MAR053A	39 25 59	114 8 24	3.0	3.0	3.0	.15	N	30	300	2.0	10	10	20	20
MAR054A	39 26 10	114 7 34	2.0	2.0	2.0	.10	N	20	300	2.0	5	<10	15	<20
MAR055A	39 26 23	114 6 37	10.0	2.0	5.0	.10	N	20	300	1.5	5	<10	10	30
MAR056A	39 26 44	114 7 23	5.0	2.0	3.0	.10	N	20	300	2.0	7	20	10	20
MAR057A	39 26 35	114 8 13	10.0	2.0	3.0	.10	N	10	200	2.0	7	<10	10	<20
MAR058A	39 26 38	114 9 2	7.0	3.0	3.0	.15	N	20	300	3.0	7	20	20	30
MAR059A	39 26 54	114 9 37	10.0	3.0	5.0	.50	N	30	500	5.0	20	20	30	70
MAR060A	39 26 52	114 9 56	5.0	2.0	5.0	.20	N	50	500	3.0	10	30	20	50
MAR061A	39 26 18	114 11 4	5.0	1.5	2.0	.05	N	<10	150	1.0	<5	N	10	<20
MAR062A	39 26 14	114 10 59	5.0	2.0	3.0	.20	N	70	500	3.0	5	20	20	30
MAR063A	39 24 27	114 11 10	2.0	3.0	3.0	.20	N	50	300	5.0	10	20	20	20
MAR064A	39 24 34	114 11 59	2.0	2.0	2.0	.15	N	20	200	2.0	5	10	15	<20
MAR065A	39 24 19	114 12 27	3.0	2.0	3.0	.10	N	30	200	1.5	5	10	10	<20
MAR066A	39 24 5	114 12 30	3.0	3.0	2.0	.20	N	70	500	5.0	7	20	15	30
MAR067A	39 23 45	114 10 21	10.0	3.0	5.0	.30	<.5	70	1,500	5.0	10	50	20	100
MAR068A	39 23 44	114 10 19	2.0	3.0	1.5	.20	N	50	500	3.0	15	30	20	30
MAR069A	39 22 4	114 10 34	3.0	2.0	5.0	.10	N	20	300	2.0	<5	N	7	<20
MAR070A	39 21 34	114 10 16	15.0	3.0	5.0	.20	N	30	500	3.0	5	30	10	50
MAR071A	39 21 15	114 9 28	3.0	2.0	3.0	.15	N	50	300	1.0	5	20	15	20
MAR072A	39 20 18	114 5 48	2.0	1.0	5.0	.03	N	10	150	N	<5	N	7	N
MAR073A	39 20 9	114 4 25	2.0	1.5	3.0	.07	N	20	300	<1.0	<5	<10	10	<20
MAR074A	39 20 34	114 2 50	3.0	2.0	3.0	.10	N	50	700	2.0	5	10	15	30
MAR075A	39 21 10	114 4 29	3.0	1.0	5.0	.07	N	70	500	1.5	<5	N	15	N
MAR076A	39 20 50	114 4 24	3.0	1.0	5.0	.07	N	10	300	1.0	<5	N	15	<20
MAR077A	39 21 31	114 3 34	7.0	1.5	3.0	.20	N	30	500	2.0	7	10	20	30
MAR078A	39 22 2	114 4 3	3.0	1.0	5.0	.05	N	20	200	<1.0	N	N	10	<20
MAR079A	39 22 24	114 4 4	3.0	1.0	3.0	.05	N	30	300	1.0	N	N	10	N
MAR080A	39 22 26	114 4 3	5.0	1.5	3.0	.07	N	15	200	1.0	5	N	7	N
MAR081A	39 22 59	114 4 3	3.0	1.5	3.0	.10	N	20	200	1.0	<5	<10	7	30
MAR082A	39 23 12	114 4 6	3.0	1.0	2.0	.07	N	10	200	<1.0	<5	N	7	N
MAR083A	39 23 36	114 6 12	3.0	1.5	1.5	.10	N	20	300	1.0	<5	15	10	N
MAR084A	39 23 35	114 6 11	3.0	1.0	3.0	.07	N	10	200	<1.0	N	N	7	N
MAR085A	39 23 19	114 5 35	5.0	2.0	2.0	.15	N	30	500	2.0	7	10	15	20
MAR086A	39 23 49	114 4 0	3.0	1.5	1.5	.10	N	20	300	1.5	<5	15	10	20
MAR087A	39 24 6	114 4 2	7.0	3.0	3.0	.50	<.5	50	700	3.0	15	20	20	70
MAR088A	39 24 26	114 4 57	7.0	2.0	2.0	.30	N	50	700	3.0	10	30	15	50
MAR089A	39 24 18	114 6 36	5.0	2.0	2.0	.10	N	70	700	3.0	<5	15	20	30
MAR090A	39 24 52	114 6 17	5.0	3.0	3.0	.10	<.5	70	700	2.0	7	10	20	30
MAR091A	39 25 6	114 6 20	3.0	2.0	2.0	.15	N	30	500	2.0	<5	<10	10	<20
MAR092A	39 25 21	114 6 24	5.0	3.0	2.0	.20	N	30	500	3.0	10	15	15	30
MAR093A	39 26 2	114 7 11	10.0	2.0	2.0	.20	N	50	500	3.0	7	20	15	50

TABLE 4.--Results of analyses of stream-sediment samples from the Marble Canyon Wilderness Study Area, White Pine County, Nevada--Continued

Sample	Mn	Mo	Nb	Ni	Pb	Sc	Sr	V	Y	Zn	Zr	As-i	Cd-i	Sb-i	Zn-i	Au-a	U-f
MAR047A	150	N	N	10	20	<5	<100	30	10	N	100	7	.7	<2	56	.001	.90
MAR048A	200	N	N	7	20	<5	150	20	10	N	50	7	.6	<2	33	.001	.55
MAR049A	200	N	N	7	20	<5	<100	30	10	N	70	<5	.6	<2	50	.001	1.10
MAR050A	500	N	<20	20	30	10	200	50	20	N	200	10	.6	<2	39	<.001	1.00
MAR051A	500	N	N	10	30	5	200	20	10	N	70	11	.7	<2	38	<.001	1.00
MAR052A	700	N	N	15	30	7	150	50	15	N	100	36	.8	<2	52	.007	1.30
MAR053A	300	N	N	15	50	5	150	50	10	N	70	12	.8	<2	43	<.001	.70
MAR054A	150	N	N	10	30	<5	<100	30	<10	N	70	20	.8	<2	51	.001	.80
MAR055A	300	N	N	10	30	5	150	50	10	N	70	12	.6	<2	33	.001	.85
MAR056A	200	N	N	15	30	5	100	50	10	N	100	16	.7	<2	43	.001	1.20
MAR057A	200	N	N	15	30	5	200	30	10	N	70	8	.7	<2	36	<.001	1.00
MAR058A	300	N	N	15	50	5	100	50	15	N	100	7	.8	<2	47	.001	1.10
MAR059A	700	N	<20	30	50	15	500	70	15	N	150	5	.7	<2	44	<.001	1.10
MAR060A	500	N	<20	15	30	10	150	50	10	N	150	9	.8	<2	52	.001	1.30
MAR061A	50	N	N	5	20	N	<100	10	<10	N	50	9	.5	<2	24	<.001	.75
MAR062A	700	N	<20	15	30	7	150	30	20	<200	150	12	.8	<2	48	.001	1.10
MAR063A	500	N	N	20	20	7	100	30	15	N	100	11	.9	<2	52	.001	1.30
MAR064A	150	N	N	10	30	5	<100	30	10	N	70	6	.7	<2	56	.001	.70
MAR065A	200	N	N	10	20	5	100	30	10	N	70	6	.8	<2	46	.001	.85
MAR066A	700	N	<20	20	20	7	150	50	20	<200	100	11	.8	<2	54	<.001	1.00
MAR067A	2,000	N	<20	30	30	15	300	70	30	<200	150	11	.9	<2	60	.001	1.10
MAR068A	700	N	<20	20	30	10	100	70	20	<200	150	15	.9	<2	55	.001	.90
MAR069A	200	N	N	10	20	<5	<100	20	<10	N	70	8	.5	<2	31	.001	1.10
MAR070A	1,000	N	N	15	30	7	200	50	15	N	100	9	.7	<2	37	<.001	1.00
MAR071A	300	N	N	15	30	5	100	50	10	N	70	6	.4	2	26	<.001	.70
MAR072A	70	N	N	<5	30	N	N	20	<10	N	70	<5	.4	<2	11	<.001	.55
MAR073A	200	N	N	<5	50	<5	<100	30	10	N	100	7	.5	<2	25	<.001	.75
MAR074A	500	N	N	10	30	5	200	50	20	N	100	7	.6	<2	34	<.001	.75
MAR075A	700	N	N	5	50	<5	<100	15	<10	N	50	7	.4	<2	30	<.001	.60
MAR076A	200	N	N	5	20	<5	100	20	<10	N	70	5	.4	<2	15	<.001	.50
MAR077A	500	<5	N	15	30	5	300	50	20	N	200	11	.6	<2	30	<.001	1.10
MAR078A	200	N	N	N	30	N	100	10	<10	N	50	5	.5	<2	18	<.001	.70
MAR079A	300	N	N	N	30	N	<100	10	10	N	50	<5	.6	<2	18	<.001	.55
MAR080A	300	N	N	10	20	N	100	15	10	N	30	<5	.5	<2	12	<.001	.60
MAR081A	300	N	N	7	20	<5	100	20	15	N	100	6	.6	<2	20	<.001	.80
MAR082A	100	N	N	<5	20	N	<100	20	<10	N	50	6	.6	<2	24	<.001	.75
MAR083A	300	N	N	10	30	<5	100	30	10	N	50	8	.7	<2	41	<.001	.70
MAR084A	150	N	N	5	20	N	<100	15	10	N	70	10	.6	<2	20	<.001	.75
MAR085A	500	N	N	15	30	7	200	50	20	N	150	7	.7	<2	39	.001	.75
MAR086A	500	N	N	10	30	5	200	50	15	N	70	5	.9	<2	42	<.001	.90
MAR087A	700	<5	<20	30	30	10	300	70	30	N	150	11	.9	<2	39	.001	.75
MAR088A	700	N	N	20	30	7	300	50	30	N	150	12	.7	<2	31	<.001	.70
MAR089A	700	N	N	15	30	7	200	30	20	N	100	16	.7	<2	41	<.001	1.20
MAR090A	700	N	N	20	50	10	200	50	30	N	100	6	.6	<2	29	<.001	.80
MAR091A	300	N	N	15	20	5	100	30	10	N	70	13	.8	<2	49	<.001	.90
MAR092A	500	N	<20	20	30	15	200	50	30	N	200	12	.7	<2	43	.001	1.10
MAR093A	500	N	N	20	20	7	300	50	20	N	150	17	.7	<2	38	.001	1.00

TABLE 5.--Results of analyses of nonmagnetic heavy-mineral-concentrate samples, Marble Canyon Wilderness Study Area, White Pine County, Nevada

[N, not detected; <, detected below limit of determination shown; >, greater than upper limit of determination; ---, not enough sample for analysis. Concentrations in ppm except Ca, Fe, Mg, Na, P, and Ti, which are weight percent]

Sample	Latitude	Longitude	Ca	Fe	Mg	Na	P	Ti	Ag	B	Ba	Be	Bi	Co	Cr
MAR047H	39 25 1	114 9 7	7	10.0	1.5	<.5	<.5	1.0	N	N	5,000	N	N	N	100
MAR048H	39 24 55	114 9 20	5	5.0	2.0	N	N	1.0	<1	20	<50	N	N	N	150
MAR049H	39 24 41	114 9 36	7	3.0	10.0	N	.5	2.0	N	50	3,000	<2	N	N	50
MAR050H	39 24 41	114 9 41	7	5.0	2.0	N	.5	>2.0	N	100	300	N	70	<20	100
MAR051H	39 25 27	114 9 1	10	7.0	1.5	N	N	1.0	N	N	<50	N	N	N	150
MAR052H	39 25 29	114 8 38	7	2.0	7.0	N	1.0	1.5	<1	N	>10,000	5	N	N	200
MAR053H	39 25 59	114 8 24	5	3.0	2.0	N	<.5	2.0	N	20	700	<2	N	<20	70
MAR054H	39 26 10	114 7 34	10	3.0	5.0	<.5	1.0	1.5	7	N	10,000	N	N	20	20
MAR055H	39 26 23	114 6 37	7	5.0	1.0	N	N	2.0	N	100	150	3	N	N	100
MAR056H	39 26 44	114 7 23	5	5.0	1.0	N	N	1.0	N	N	1,000	N	N	N	200
MAR057H	39 26 35	114 8 13	10	7.0	1.0	N	N	.7	N	N	50	N	N	N	100
MAR058H	39 26 38	114 9 2	7	3.0	1.0	N	N	1.5	N	N	100	3	N	N	150
MAR059H	39 26 54	114 9 37	3	5.0	1.0	N	N	.7	<1	N	50	N	N	N	100
MAR060H	39 26 52	114 9 56	7	5.0	2.0	N	N	1.0	N	<20	70	N	N	N	150
MAR061H	39 26 18	114 11 4	5	5.0	2.0	N	<.5	>2.0	N	150	50	N	N	20	50
MAR062H	39 26 14	114 10 59	5	2.0	1.5	N	<.5	>2.0	N	50	10,000	N	N	N	70
MAR063H	39 24 27	114 11 10	5	3.0	1.0	N	.5	>2.0	N	300	200	<2	N	<20	70
MAR064H	39 24 34	114 11 59	3	3.0	.7	N	.5	2.0	N	50	50	N	N	<20	70
MAR065H	39 24 19	114 12 27	5	5.0	1.0	N	<.5	>2.0	N	70	70	N	N	50	30
MAR066H	39 24 5	114 12 30	5	3.0	.7	N	<.5	>2.0	N	200	300	N	N	<20	100
MAR067H	39 23 45	114 10 21	5	3.0	.7	N	.5	>2.0	N	70	700	N	N	N	70
MAR068H	39 23 44	114 10 19	7	7.0	1.0	N	<.5	>2.0	N	100	1,000	N	<20	<20	150
MAR069H	39 22 4	114 10 34	3	2.0	2.0	N	<.5	2.0	N	50	1,000	N	N	<20	50
MAR070H	39 21 34	114 10 16	3	3.0	.7	N	.5	2.0	N	30	150	7	N	N	70
MAR071H	39 21 15	114 9 28	---	---	---	---	---	---	---	---	---	---	---	---	---
MAR072H	39 20 18	114 5 48	5	2.0	7.0	N	N	.3	<1	N	>10,000	N	N	N	N
MAR073H	39 20 9	114 4 25	3	2.0	2.0	N	.7	.7	N	N	1,500	10	N	N	20
MAR074H	39 20 34	114 2 50	---	---	---	---	---	---	---	---	---	---	---	---	---
MAR075H	39 21 10	114 4 29	5	1.5	5.0	N	.5	.5	<1	N	3,000	N	N	N	<20
MAR076H	39 20 50	114 4 24	7	3.0	10.0	N	N	.3	N	N	3,000	N	N	N	<20
MAR077H	39 21 31	114 3 34	5	3.0	3.0	N	N	1.5	N	30	500	3	N	N	30
MAR078H	39 22 2	114 4 3	5	2.0	5.0	N	N	.7	N	<20	10,000	<2	N	N	<20
MAR079H	39 22 24	114 4 4	3	1.0	5.0	N	N	.7	N	20	150	N	N	N	<20
MAR080H	39 22 26	114 4 3	5	1.5	3.0	N	<.5	1.0	N	20	3,000	10	N	N	20
MAR081H	39 22 59	114 4 3	5	2.0	3.0	N	<.5	.7	N	20	>10,000	<2	N	N	<20
MAR082H	39 23 12	114 4 6	7	1.5	5.0	N	.5	.7	N	<20	1,000	N	N	N	<20
MAR083H	39 23 36	114 6 12	5	1.5	2.0	N	N	2.0	N	N	700	N	N	N	20
MAR084H	39 23 35	114 6 11	5	1.0	3.0	N	.7	2.0	N	N	300	N	N	N	20
MAR085H	39 23 19	114 5 35	---	---	---	---	---	---	---	---	---	---	---	---	---
MAR086H	39 23 49	114 4 0	5	2.0	3.0	N	.5	1.0	N	N	2,000	15	N	N	20
MAR087H	39 24 6	114 4 2	7	1.5	5.0	N	<.5	2.0	N	<20	700	N	N	N	20
MAR088H	39 24 26	114 4 57	5	2.0	2.0	N	N	2.0	N	<20	10,000	N	N	N	30
MAR089H	39 24 18	114 6 36	5	2.0	5.0	N	N	.7	N	N	200	N	N	<20	<20
MAR090H	39 24 52	114 6 17	7	2.0	5.0	N	N	1.0	N	<20	200	N	N	N	30
MAR091H	39 25 6	114 6 20	7	2.0	7.0	N	N	.5	N	N	150	N	N	<20	N
MAR092H	39 25 21	114 6 24	5	3.0	5.0	N	<.5	1.0	N	N	150	<2	N	N	30
MAR093H	39 26 2	114 7 11	5	2.0	7.0	N	N	.7	N	N	70	N	N	N	<20

TABLE 5.--Results of analyses of nonmagnetic heavy-mineral-concentrate samples, Marble Canyon Wilderness Study Area, White Pine County, Nevada--Continued

Sample	Cu	Ga	La	Mn	Nb	Ni	Pb	Sc	Sn	Sr	V	W	Y	Zn	Zr
MAR047H	15	150	<100	150	70	<10	300	N	N	<200	70	N	50	N	700
MAR048H	N	100	<100	30	<50	N	<20	<10	N	N	100	N	50	N	1,000
MAR049H	N	50	<100	20	100	<10	700	N	N	<200	50	N	70	N	2,000
MAR050H	N	<10	100	30	150	<10	1,000	<10	N	<200	100	N	200	N	>2,000
MAR051H	N	150	100	20	70	N	20	<10	N	300	150	N	30	N	2,000
MAR052H	30	20	100	30	100	N	5,000	N	<20	200	100	N	100	700	>2,000
MAR053H	N	50	N	50	N	<10	30	<10	150	N	50	N	100	N	>2,000
MAR054H	20	10	<100	100	<50	15	>50,000	<10	N	<200	50	N	200	700	>2,000
MAR055H	N	100	N	20	100	N	300	<10	N	<200	100	N	70	N	>2,000
MAR056H	N	100	<100	30	N	N	500	<10	N	<200	100	N	70	N	>2,000
MAR057H	N	150	<100	30	50	N	70	N	N	200	150	<50	20	N	1,500
MAR058H	N	70	N	20	70	N	50	N	N	200	70	N	50	N	>2,000
MAR059H	N	100	N	<20	<50	N	20	N	N	<200	100	N	20	N	500
MAR060H	N	70	N	50	100	<10	300	<10	N	<200	200	N	30	N	>2,000
MAR061H	N	N	N	<20	100	20	1,000	N	N	N	20	<50	150	N	>2,000
MAR062H	N	20	N	<20	100	<10	1,000	<10	N	<200	150	N	200	N	>2,000
MAR063H	N	N	N	20	150	10	N	N	<20	N	50	N	100	N	2,000
MAR064H	N	N	N	<20	70	<10	150	N	N	<200	20	N	100	N	2,000
MAR065H	N	N	N	<20	100	<10	N	N	N	N	<20	N	200	N	1,500
MAR066H	N	<10	N	20	100	10	N	N	N	<200	30	N	150	N	2,000
MAR067H	N	N	N	30	150	<10	N	N	N	<200	50	N	150	N	2,000
MAR068H	N	10	<100	30	150	<10	N	<10	<20	<200	100	N	200	N	>2,000
MAR069H	N	<10	100	<20	50	<10	300	N	N	N	50	N	100	N	>2,000
MAR070H	N	10	<100	50	70	<10	150	N	<20	<200	30	N	70	N	>2,000
MAR071H	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MAR072H	15	N	<100	70	<50	N	20,000	N	N	2,000	70	N	50	N	>2,000
MAR073H	N	15	N	70	<50	N	100	N	N	<200	50	50	150	N	>2,000
MAR074H	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MAR075H	15	N	<100	100	N	N	3,000	N	N	<200	50	<50	100	10,000	>2,000
MAR076H	10	N	100	500	N	<10	300	N	50	N	50	N	150	<500	2,000
MAR077H	N	<10	300	300	<50	N	200	<10	N	<200	100	N	300	N	>2,000
MAR078H	N	<10	200	100	N	N	200	N	N	<200	100	N	200	N	>2,000
MAR079H	N	<10	<100	50	<50	N	70	N	N	N	50	N	100	N	>2,000
MAR080H	N	<10	100	100	<50	N	N	N	N	N	70	N	300	N	>2,000
MAR081H	N	N	N	50	N	N	70	N	N	<200	100	N	200	N	>2,000
MAR082H	N	N	100	150	<50	N	70	N	N	N	50	N	100	N	>2,000
MAR083H	N	N	<100	30	50	N	N	N	N	N	30	N	70	N	300
MAR084H	N	N	N	50	70	N	30	N	N	<200	30	N	70	N	1,000
MAR085H	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MAR086H	N	N	100	200	N	<10	N	<10	N	<200	70	N	300	N	>2,000
MAR087H	N	N	<100	70	<50	N	20	N	N	<200	70	N	200	N	>2,000
MAR088H	N	<10	150	30	<50	<10	<20	N	N	N	50	N	100	N	2,000
MAR089H	10	N	200	70	<50	10	N	N	N	N	50	N	20	N	2,000
MAR090H	N	15	<100	150	50	10	N	N	N	N	100	N	50	N	>2,000
MAR091H	<10	N	<100	150	N	<10	150	N	N	N	70	N	<20	N	2,000
MAR092H	N	20	N	100	<50	<10	20	N	N	<200	100	N	100	N	>2,000
MAR093H	N	N	<100	100	N	<10	<20	N	N	N	50	N	70	N	>2,000