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Geological Survey

GEOCHEMICAL DATA FOR THE WEST CLEAR CREEK ROADLESS AREA, YAVAPAI AND COCONINO COUNTIES, ARIZONA

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Mineral Surveys Related to U.S. Forest Service Roadless Areas

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 of 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 West Clear Creek Roadless Area, in Coconino National Forest, Yavapai and Coconino Counties, Arizona. The West Clear Creek Roadless Area was classified as a further planning area, Forest Service Number 047, during the Second Roadless Area Review and Evaluation of the U.S. Forest Service, January 1979.

Introduction

This report presents all of the chemical data determined for five stream-sediment samples and 61 rock samples collected from the West Clear Creek RARE II Further Planning Area of approximately 53 sq. mi, in Yavapai and Coconino Counties, central Arizona.

Geologic Setting

The study area lies mainly on the southwestern margin of the Colorado Plateau and includes part of the Verde Valley, one of several tectonic basins in the Arizona Transition Zone that separates the Basin and Range and Colorado Plateaus provinces (figure 1). The canyon cut by West Clear Creek has very youthful longitudinal and cross-sectional profiles. Upper Tertiary volcanic rocks, primarily basalts, overlying Lower Permian sedimentary rocks are exposed in the precipitous walls.

The structural setting is one of gentle westward dips in the sedimentary rocks and steep normal faults. Significant faulting occurred prior to volcanism and probably continued through late Miocene and Pliocene(?) time. The result of the early tectonism was deep erosional downcutting of a broad channel near the Plateau margin and subsequent infilling by coarse fluvial sediments and later volcanic flows and pyroclastic deposits. Fluviolacustrine sediments of the Verde Formation were deposited during and following the volcanic activity in the western part of the study area.

Methods

The procedures for collection and analysis of the geochemical samples reported here were designed to reveal first-order anomalies that might indicate potential mineral resources in the region.

Sampling procedures

Stream-sediment samples were collected from stream beds at six sites in and near the area. Four of the samples were collected from alluvial deposits near running water. The general practice was to sieve the samples to less than 0.59 mm (-30 mesh) and then to pan the fine fraction for heavy minerals, retaining approximately 1/2 kg for laboratory analysis. Sample no. 47 was sieved but not panned; sample no. 53A was collected directly from a naturally concentrated olivine-rich sand. Rock samples were collected from outcrops to represent the various facies of sedimentary formations, the lithologic variety of the volcanic suite, and alteration products where mineralization was suspected.

Analytical methods

Sixty-seven (67) samples were analyzed for 30 elements by the Branch of Exploration Research laboratories of the U.S. Geological Survey in Denver, using the six-step semiquantitative emission-spectrographic technique of Grimes and Marranzino (1968). Twenty-three (23) rocks were analyzed for uranium and thorium by the U.S. Geological Survey laboratories in Denver, using neutron-activation methods. Twenty-five (25) rocks were analyzed for major elements by the same laboratories using X-ray fluorescence spectroscopy; seven of these were also analyzed for FeO, H_2O, and CO_2, using the rapid-rock procedures described by Shapiro (1967, 1975).

Discussion

The geology, geochemistry, geophysics, and mineral resource potential of the area are summarized by Ulrich and Bielski (unpub. data, 1983). That report lists data for only 24 samples having anomalous trace element concentrations. Figure 2 shows the locations of all analyzed samples with respect to the main geographic features.

Table 1 is a complete listing, by sample type and in order of increasing sample number, of the semiquantitative spectrographic data. Of 67 samples, 23 were also analyzed by neutron activation for uranium and thorium. Missing sample numbers represent specimens collected for all other than geochemical purposes.

Table 2 lists the major elements in weight percent determined by X-ray fluorescence for 25 igneous rocks. Twenty-two of these are from the volcanic suite of late Tertiary age, two are xenoliths from the Precambrian basement collected from the Tertiary volcanic rocks, and one sample is a Precambrian granite clast collected from a conglomerate underlying the thick volcanic pile. Due to their pumiceous textures, seven of the silicic rocks were analyzed by rapid-rock techniques for FeO, H_2O, and CO_2 to determine the extent of their alteration.

Table 3 lists adjusted values for the major elements from table 2, in order of increasing silica content. The values are normalized to 100 percent after removal of volatiles and adjustment of ferrous and ferric iron oxides to "fresh-rock" values. The ratio of FeO to Fe_2O_3 was recalculated from the values in Table 2 according to the equation:

$$FeO/Fe_2O_3 = 9.627 - 0.0921 \times SiO_2$$

This equation was derived empirically from a comparison of 599 rocks in the San Francisco volcanic field, 80 km north of West Clear Creek, for which both FeO and Fe_2O_3 were determined. It represents a best-fit linear regression for those rocks with the highest (and presumably the least altered) values.

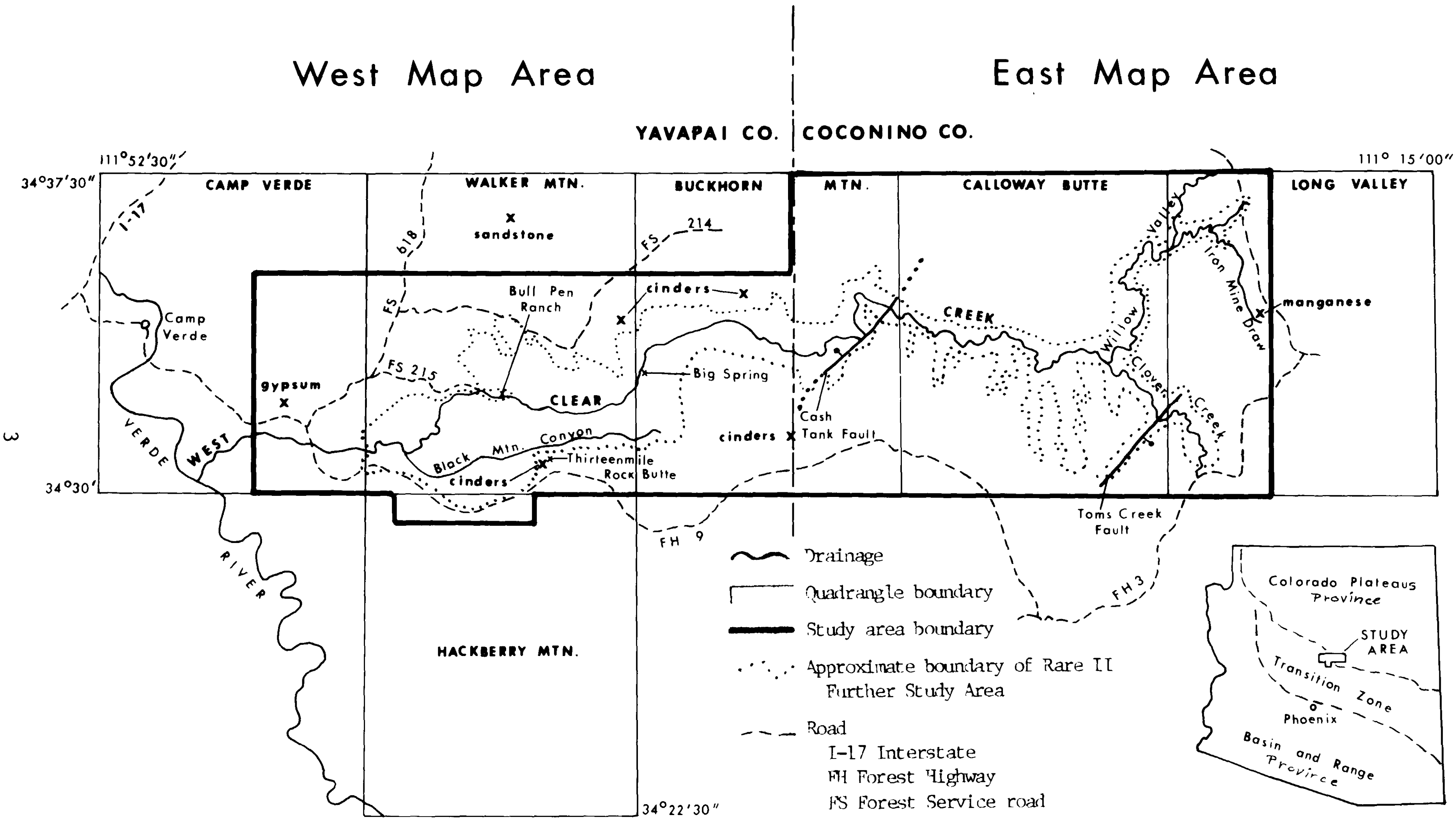

Figure 1. Index map of the West Clear Creek Roadless Area

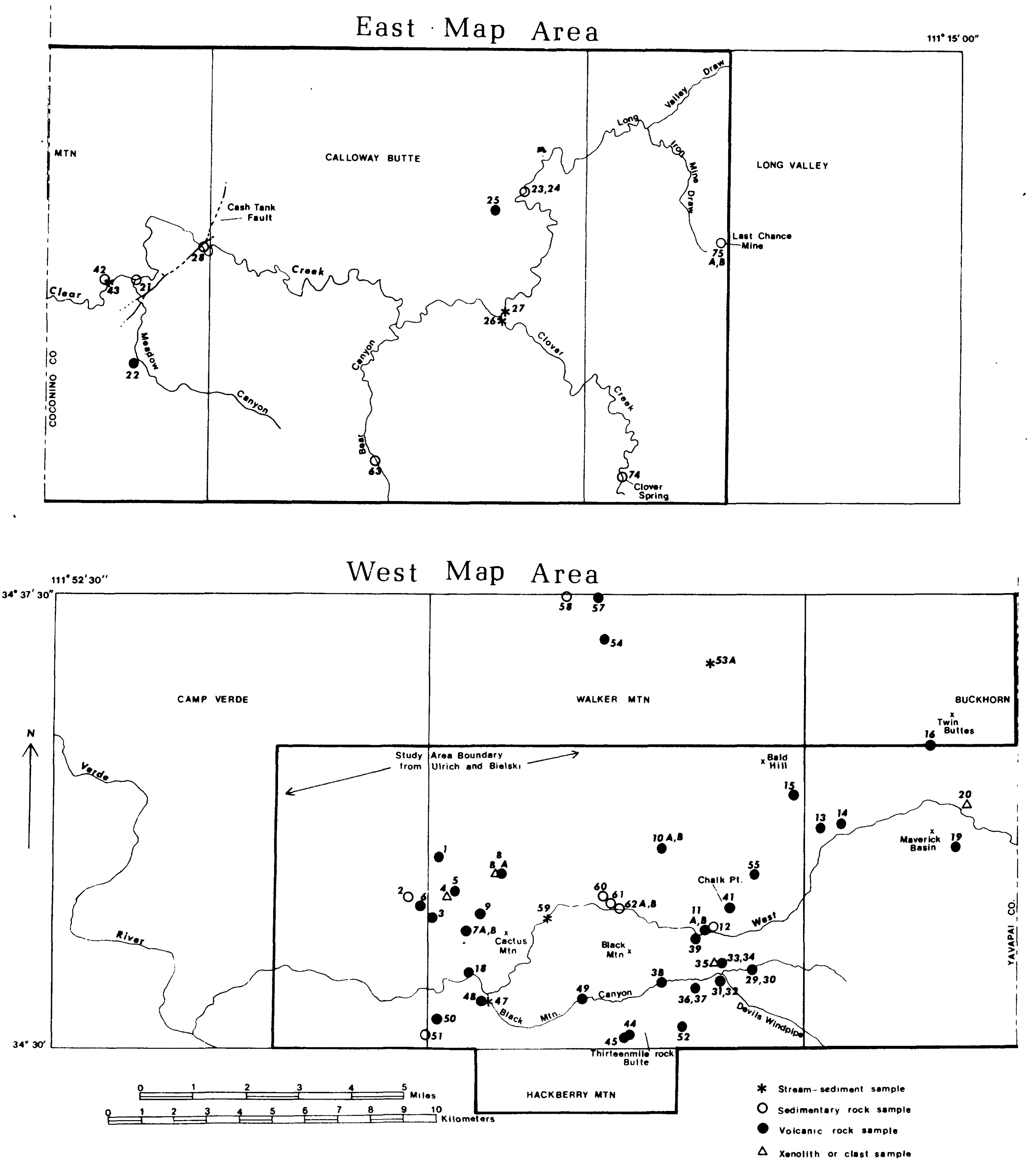

Figure 2. Sample location map for the West Clear Creek area.

TABLE I. SEMIQUANTITATIVE SPECTROGRAPHIC ANALYSES OF SEDIMENT SAMPLES AND ROCKS FROM WEST CLEAR CREEK RARE II FURTHER PLANNING AREA

Sample No.	Fe	Mg	Ca	Ti	Mn	Ag	As	Au	B	Ba	Be	Bi	Cd	Co	Cr	Cu	La	Mo	Nb	Ni	Pb	Sb	Sc	Sn	Sr	V	W	Y	Zn	Zr	U	Th	Remarks
																															Neutron activation analysis		
Lower limit of determination	.05	.02	.05	.002	10	.5	200	10	10	20	1	10	20	5	10	5	20	5	20	5	10	100	5	10	100	10	50	10	200	10			
	Percent				Parts per million																												
Sediment Samples (Alluvium), sieved and panned																																	
26	2	.5	.5	.3	300	1	N	N	70	200	1.5	N	N	10	150	15	20	N	N	30	30	N	N	N	N	100	N	20	N	g1000			Lower end of Clover Creek
27	2	.7	.7	.2	500	1	N	N	50	300	1	N	N	7	300	10	20	N	N	50	50	N	5	N	N	100	N	10	N	500			Lower end of Willow Valley Creek
43	1.5	.7	1	.2	300	.7	N	N	30	200	1	N	N	7	200	10	20	N	N	70	20	N	5	N	100	70	N	15	N	200			West Clear Creek-source area all above Supai Formation
47	10	7	10	1	2000	N	N	N	20	1500	1	N	N	50	1500	100	100	N	30	200	30	N	50	N	1000	500	N	50	N	200			Lower end of Black Mountain Canyon
53A	10	10	20	.7	2000	2	N	N	15	1000	L	N	N	50	g5000	70	70	N	20	500	20	N	70	N	300	500	N	30	N	100			Natural concentrate, olivine sand
59	5	3	5	1	1000	L	N	N	30	500	1	N	N	20	700	20	50	N	L	150	15	N	20	N	200	200	N	15	N	1000			Lower end of West Clear Creek
Verde Formation																																	
2	5	2	5	.7	1000	N	N	N	50	3000	2	N	N	10	100	20	100	10	20	30	50	N	15	N	2000	200	N	30	N	200			Ash bed
51	10	3	7	.7	2000	N	N	N	20	2000	2	N	N	30	200	30	100	N	30	100	50	N	20	N	3000	300	N	20	N	200			Conglomerate facies at formation margin
Basalt Vents and Flows																																	
1	15	5	10	g1	2000	N	N	N	15	700	1.5	N	N	50	200	100	70	N	30	70	20	N	50	N	1000	500	N	50	N	100			Underlies Verde Formation
3	15	10	10	g1	3000	N	N	N	50	2000	2	N	N	70	1500	100	100	N	30	500	20	N	50	N	2000	300	N	50	N	100			Feldspathiodel(?) basalt; probable vent
5	15	3	15	g1	1500	N	N	N	50	500	1	N	N	30	200	70	30	N	20	100	15	N	50	N	1000	500	N	30	N	100			Basalt vent
7A	15	7	10	1	2000	N	N	N	30	1500	2	N	N	50	150	200	70	N	30	100	20	N	50	N	2000	300	N	50	N	200	1.6	14.0	Cactus Mountain basalt
7B	20	7	20	1	1500	N	N	N	50	5000	2	N	N	30	1000	200	200	N	50	150	20	N	50	N	3000	500	N	50	N	200	3.0	11.8	Cactus Mountain basalt
8A	15	7	15	g1	5000	N	N	N	70	5000	3	N	N	50	700	100	200	N	50	150	30	N	50	N	5000	500	N	50	N	150			Feldspathoidel(?) basalt vent
9	15	5	10	1	3000	N	N	N	20	1000	2	N	N	50	150	100	70	N	20	100	30	N	30	N	1500	300	N	30	N	100			Cactus Mountain basalt
11B	15	5	10	g1	2000	N	N	N	20	2000	3	N	N	50	500	70	150	10	50	150	15	N	30	N	2000	150	N	70	N	500	3.2	14.1	Basalt, envelops andesite (11A)
16	10	5	10	1	2000	N	N	N	20	2000	1.5	N	N	50	700	100	150	N	30	200	20	N	50	N	2000	200	N	30	N	150			Basalt vent, South Twin Butte
18	7	5	10	.7	2000	N	N	N	30	5000	3	N	N	30	500	50	100	N	50	100	50	N	30	N	1500	300	N	30	N	200			Basalt flow, Lower West Clear Creek
19	15	7	15	1	2000	N	N	N	20	1500	1	N	N	50	500	150	70	N	20	150	15	N	70	N	1500	500	N	50	200	100			Basalt vent, Maverick Basin
22	10	7	15	.7	2000	N	N	N	10	1500	1.5	N	N	50	1000	200	100	N	20	200	10	N	50	N	1500	500	N	50	L	100			Basalt flow, Meadow Canyon
25	15	10	10	1	2000	N	N	N	15	700	1	N	N	100	1500	100	30	N	30	1000	N	N	50	N	1000	300	N	30	200	100	0.9	2.8	Basalt vent, west side Willow Valley
33	15	7	15	1	3000	N	N	N	30	3000	1.5	N	N	50	500	100	100	N	50	100	30	N	50	N	2000	500	N	50	N	150			Basalt flow, Black Mountain ridge
37	5	10	20	.5	2000	3	N	N	30	1500	1.5	N	N	50	1000	70	50	N	20	150	30	N	20	N	1000	150	N	20	N	100			Basalt tuff, Black Mountain Canyon
39	15	7	10	g1	3000	N	N	N	20	2000	5	N	N	50	700	200	150	N	30	150	30	N	30	N	5000	200	N	30	200	300			Basalt, basal flow NE of Black Mountain
48	20	7	10	1	2000	N	N	N	20	1000	1.5	N	N	50	700	150	50	N	20	200	15	N	50	N	1000	300	N	50	N	150	1.5	5.0	Basalt flow, Black Mountain Canyon
54	15	10	10	g1	2000	N	N	N	10	1000	1.5	N	N	50	1500	150	100	N	30	500	20	N	50	N	1000	300	N	50	N	200			Basalt flow
Dikes, Basalt or Andesite																																	
10A	15	5	15	1	3000	N	N	N	20	3000	2	N	N	50	100	200	300	N	100	50	30	N	30	N	5000	500	N	70	200	200	4.9	24.0	Chill margin, 5-m-wide, quartz-bearing basalt
10B	15	7	20	1	3000	N	N	N	20	2000	1.5	N	N	50	500	500	150	N	50	150	20	N	50	N	3000	500	N	50	N	200	3.1	14.5	Central 3-m part of 10A, porphyritic basalt
14	15	5	15	1	3000	N	N	N	20	5000	2	N	N	50	20	100	200	N	70	50	30	N	20	N	2000	500	N	50	N	300	7.5	25.2	Chill margin, hornblende basalt
15	20	7	10	g1	2000	N	N	N	10	3000	1.5	N	N	50	700	200	150	N	50	150	20	N	50	N	2000	200	N	50	N	200	4.3	15.5	Typical basalt, Bald Hill
44	20	5	10	g1	3000	N	N	N	L	2000	2	N	N	50	N	70	200	N	70	20	20	N	20	N	2000	500	N	50	200	200	3.1	12.6	Aphyric basalt, intrudes andesite (45)
49	15	5	10	g1	1500	N	N	N	10	2000	1.5	N	N	50	500	100	70	N	30	150	20	N	30	N	1000	200	N	30	N	200	2.0	6.6	Andesite, intrudes basalt; quartz+plagioclase
57	10	10	20	g1	2000	2	N	N	20	3000	2	N	N	50	1500	150	200	N	50	200	20	N	5	N	1500	300	N	30	N	300			Basalt
Andesite and Dacite																																	
6	15	3	10	g1	1500	N	N	N	20	2000	1.5	N	N	30	500	70	100	N	20	100	20	N	50	N	2000	200	N	50	N	150	0.9	5.4	Andesite vent
11A	10	2	5	.7	1500	N	N	N	20	2000	2	N	N	20	150	50	70	5	30	70	20	N	15	N	1500	100	N	20	N	200	1.1	5.7	Dacite plug
45	15	5	10	1	2000	N	N	N	10	1500	1.5	N	N	50	150	100	70	N	20	50	20	N	30	N	1000	300	N	50	N	200	1.6	5.8	Andesite flow/vent, west side Thirteenmile Rock Butte

TABLE 1. (CONTINUED)

Sample No.	Fe	Mg	Ca	Ti	Mn	Ag	As	Au	B	Ba	Be	Bi	Cd	Co	Cr	Cu	La	Mo	Nb	Ni	Pb	Sb	Sc	Sn	Sr	V	W	Y	Zn	Zr	U	Th	Remarks
Lower limit of determination	.05	.02	.05	.002	10	.5	200	10	10	20	1	10	20	5	10	5	20	5	20	5	10	100	5	10	100	10	50	10	200	10			
	Percent				Parts per million																												
Silicic Tuff or Ash																																	
13	2	10	20	1.5	1000	5	N	N	50	500	2	N	N	7	50	15	30	N	N	50	30	N	10	N	2000	100	N	10	N	100			Thin bed below basal basalt, West Clear Creek
29	3	3	5	.5	1500	N	N	N	50	g5000	3	N	N	15	150	20	70	N	20	50	50	N	10	N	1500	100	N	20	N	200			Near head of Black Mountain Canyon
30	3	2	2	.3	1000	N	N	N	50	3000	5	N	N	10	100	20	70	N	20	50	70	N	10	N	1000	100	N	20	N	150			Underlies 29, same unit as 29 but poorly indurated
31	1.5	2	g20	.15	500	1	N	N	20	1500	1.5	N	N	5	20	15	50	N	L	15	200	N	7	N	1000	50	N	10	N	70			Devils Windpipe, well-cemented
32	7	5	10	.5	2000	3	N	N	50	2000	2	N	N	30	200	100	100	N	30	100	50	N	30	N	1500	200	N	30	N	100			Devils Windpipe, chalky, basalt clasts
34	5	5	7	.3	1500	N	N	N	50	2000	2	N	N	20	150	30	100	N	20	70	50	N	20	N	1000	100	N	30	N	150	2.4	9.7	Saddle north of Devils Windpipe
36	1	.7	1	.15	500	1	N	N	70	2000	2	N	N	L	N	5	70	5	L	10	50	N	N	N	500	10	N	15	N	200	2.3	6.8	Rhyolite clast in Devils Windpipe tuff
38	7	5	7	.7	3000	N	N	N	30	1500	2	N	N	30	100	30	100	N	30	50	50	N	20	N	2000	200	N	30	N	100			Ash bed in basalt vent, Black Mountain Canyon
41	5	3	5	.3	1500	N	N	N	50	5000	2	N	N	20	200	30	100	N	20	70	30	N	20	N	500	200	N	20	N	150	2.0	5.8	Chalk Point tuff
50	5	2	5	.5	1000	N	N	N	50	2000	2	N	N	20	50	20	70	L	30	50	50	N	15	N	1500	100	N	20	N	100	2.7	9.9	Underlies Verde Formation, SW corner
52	3	3	3	.3	1000	N	N	N	50	3000	2	N	N	15	100	30	70	5	20	70	30	N	15	N	700	70	N	20	N	150	2.0	6.0	East of Thirteenmile Rock Butte
55	3	3	5	.3	1000	N	N	N	50	2000	2	N	N	10	150	20	50	N	L	50	50	N	15	N	700	100	N	20	N	150	1.7	6.3	Chalk Point tuff
Xenoliths and Exotic Clasts																																	
4	10	10	20	.7	2000	2	N	N	20	1500	L	N	N	30	5000	20	20	N	L	200	15	N	100	N	500	200	N	20	N	70			Pyroxenite clast in Tv conglomerate facies
8B	1	.2	3	.1	300	1	N	N	50	1500	1.5	N	N	5	N	10	N	N	N	20	30	N	N	N	1000	50	N	N	N	70	0.3	lt1.2	Granulite xenolith in 8A basalt
20A	2	.2	.2.	.1	150	.7	N	N	100	300	3	L	N	5	20	15	100	5	30	10	30	N	N	20	N	150	N	100	N	300	6.0	18.7	Granite clast in prevolcanic conglomerate
35	10	7	10	.5	3000	N	N	N	100	700	1	N	N	30	100	150	20	N	N	30	20	N	50	N	700	500	N	20	L	30	0.7	lt1.8	Quartz diorite xenolith in 34
Prevolcanic Conglomerate																																	
12	1.5	10	20	.1	700	N	N	N	70	200	1.5	N	N	7	50	15	N	N	N	15	30	N	5	N	150	70	N	20	N	70			Abundant limestone clasts
Kaibab Formation																																	
23	.3	5	15	.1	300	3	N	N	70	70	1.5	N	N	L	50	20	20	N	N	10	20	N	5	N	N	50	N	15	N	100			Basal ledge, Willow Valley
63	.5	.07	L	.05	30	2	N	N	50	N	1.5	N	N	5	20	L	20	N	N	10	L	N	N	N	N	20	N	N	N	50			Coconino-like sandstone tongue, Bear Canyon
75A	5	.5	20	.5	g5000	2	1000	N	100	5000	5	N	N	300	100	700	50	500	N	100	10	N	-	N	500	500	50	20	N	300			Mineralized crust, Last Chance Mine
75B	5	.7	g20	.1	g5000	.5	2000	N	70	700	5	N	N	10	100	30	50	50	N	20	70	N	-	N	N	70	N	20	N	200			Oxidized breccia, Last Chance Mine
Coconino Sandstone																																	
21	.5	.2	.2	.2	70	3	N	N	70	150	1	N	N	5	50	L	20	N	L	20	L	N	N	N	N	50	N	L	N	100			Meadow Canyon, 150 m below top of formation
24	.2.	.1	.1	.2	100	5	N	N	100	50	1	N	N	5	50	5	30	N	L	7	10	N	L	N	300	50	N	15	N	300			Top ledge Willow Valley
28	.2	.1	.2	.05	20	7	N	N	50	50	1	N	M	L	20	L	20	N	N	15	10	N	N	N	N	20	N	10	N	70			In Cash Tank fault zone
42	.2	.15	.2	.1	50	7	N	N	70	200	L	N	N	L	30	5	20	N	N	15	L	N	N	N	N	20	N	15	N	200			Near base of formation, West Clear Creek
74	.2	.07	.1	.05	100	2	N	N	20	50	L	N	N	N	20	L	70	N	N	5	N	N	-	N	N	10	N	10	N	50			Near top at Clover Spring
Supai Formation																																	
58	.5	10	15	.1	1000	.5	N	N	50	150	1.5	N	N	5	50	20	50	N	N	5	30	N	N	N	100	30	N	15	N	70			5-m-thick limestone, 75 m below top of formation
60	1	g10	20	.2	1500	L	N	N	150	300	2	N	N	10	70	30	20	N	N	20	50	N	5	N	200	150	N	15	N	150			7-m-thick limestone, 45 m below top of formation
61	1	.5	.5	.3	200	N	N	N	100	500	1.5	N	N	5	50	5	N	N	N	10	20	N	N	N	N	70	N	20	N	300			Sandy siltstone, 40 m below top of formation
62A	.5	g10	20	.1	1500	N	N	N	100	100	1	N	N	N	50	20	20	N	N	10	20	N	5	N	150	50	N	15	N	70			7-m-thick limestone, 75 m below top of formation
62B	.3	10	20	.1	1000	L	N	N	100	100	1	N	N	N	50	20	20	N	N	7	15	N	N	N	200	30	N	10	N	50			7-m-thick limestone, 75 m below top of formation

N = Not detected; L = Detected but below limit of determination; g = Greater than; lt = Less than

Semiquantitative spectographic analyses by D. E. Detra. Neutron activation analyses by H. T. Millard, Jr., B. A. Keaten, F. M. Luman, J. Storey, S. Danahey, B. Vaughn, M. Coughlin

Table 2. Chemical Analyses of Igneous Rocks from the West Clear Creek RARE II Further Planning Area

Sample No.	SiO_2	Al_2O_3	Fe_2O_3	FeO	MgO	CaO	Na_2O	K_2O	TiO_2	P_2O_5	MnO	H_2O	CO_2	LOI	Total
6	53.1	17.2	9.83	na	2.94	8.77	3.69	1.32	1.06	0.39	0.12	na	na	1.00	99.4[illegible]
7A	46.0	16.3	10.8	na	6.77	11.6	2.89	0.87	1.34	0.53	0.16	na	na	2.47	99.7[illegible]
7B	45.5	12.8	5.86	2.76	8.79	15.9	2.32	0.70	1.00	0.89	0.11	2.89	0.21	--	99.7[illegible]
8B	72.0	15.7	0.64	na	0.15	2.45	4.93	2.06	0.07	0.00	0.00	na	na	0.59	98.5[illegible]
10A	44.9	17.5	11.3	na	4.79	11.4	3.61	1.16	1.27	1.35	0.21	na	na	1.56	99.0[illegible]
10B	44.7	12.9	9.83	na	9.40	15.6	2.12	0.64	1.12	0.84	0.18	na	na	1.96	99.2[illegible]
11A	60.3	16.0	4.72	0.63	1.94	4.98	4.69	2.04	0.78	0.40	0.11	2.42	0.54	--	99.5[illegible]
11B	44.9	14.9	10.4	na	6.90	8.89	4.64	2.16	2.06	1.17	0.17	na	na	3.01	99.2[illegible]
14	45.7	17.7	7.39	2.80	4.36	10.9	3.32	2.44	1.30	1.43	0.20	2.10	0.61	--	100.2[illegible]
15	45.8	12.5	9.96	na	9.93	14.0	1.96	0.94	1.56	0.85	0.17	na	na	1.54	99.2[illegible]
20A	76.1	11.9	1.50	na	0.26	0.22	2.32	5.76	0.08	0.00	0.00	na	na	0.82	98.9[illegible]
25	44.6	11.2	11.5	na	18.5	9.60	2.21	0.63	1.17	0.33	0.17	na	na	0.00	99.91
34	60.0	15.4	3.36	1.11	3.95	4.88	2.39	2.56	0.55	0.25	0.10	6.31	0.07	--	100.9[illegible]
35	52.7	16.2	4.21	6.47	5.11	8.26	2.36	1.51	0.67	0.21	0.21	2.38	0.01	--	100.3[illegible]
36	71.0	14.4	0.78	0.41	0.71	1.69	3.47	3.66	0.15	0.00	0.04	3.30	0.00	--	99.6[illegible]
41	62.6	13.9	2.41	1.12	3.47	3.85	2.21	3.05	0.35	0.17	0.08	3.09	0.01	--	96.3[illegible]
44	43.3	17.5	12.8	na	5.32	10.3	3.91	1.23	1.79	1.17	0.23	na	na	1.52	99.0[illegible]
45	53.3	16.6	6.42	2.73	5.51	8.94	3.56	1.30	1.04	0.33	0.15	0.74	0.06	--	100.6[illegible]
48	47.7	14.7	10.8	na	9.71	9.36	2.88	0.88	1.12	0.35	0.16	na	na	1.92	99.5[illegible]
49	52.6	14.8	7.73	na	6.31	7.61	2.98	1.03	0.98	0.30	0.08	na	na	5.26	99.6[illegible]
50	64.6	16.4	2.61	0.84	1.68	3.86	3.81	2.52	0.37	0.17	0.06	3.18	0.13	--	100.2[illegible]
52	65.5	14.3	1.88	0.75	2.51	3.02	2.61	3.07	0.30	0.10	0.06	6.13	0.00	--	100.2[illegible]
54	44.6	12.6	10.5	na	15.2	9.71	2.35	0.96	1.29	0.65	0.17	na	na	1.21	99.2[illegible]
55	63.1	14.1	2.18	0.48	3.07	3.36	1.97	3.32	0.28	0.10	0.06	8.54	0.09	--	100.6[illegible]
57	45.9	11.4	9.72	na	11.5	12.4	2.48	1.60	1.89	0.83	0.15	na	na	1.74	99.61

Notes: Analysts--J.S. Wahlberg, J. Taggart, J. Baker; H. Neiman (FeO, H_2O, CO_2)
LOI - Loss on ignition
na - not analyzed
Where FeO is not analyzed, total Fe is reported as Fe_2O_3

Sample #	Rock Name and Feature	Quadrangle
6	Andesite cone	Camp Verde
7A	Basalt flow, Cactus Mountain	Walker Mountain
7B	Basalt flow, Cactus Mountain	Walker Mountain
8B	Granulite xenolith in basalt cone	Walker Mountain
10A	Basalt dike, chill margin	Walker Mountain
10B	Basalt dike, porphyritic center	Walker Mountain
11A	Dacite plug	Walker Mountain
11B	Basalt flow	Walker Mountain
14	Basalt dike, hornblende bearing	Buckhorn Mountain
15	Basalt dike, Bald Hill cone	Walker Mountain
20A	Granite clast in prevolcanic conglomerate	Buckhorn Mountain
25	Basalt cone, Willow Valley	Calloway Butte
34	Dacite tuff	Walker Mountain
35	Quartz diorite xenolith in dacite tuff	Walker Mountain
36	Rhyolite clast in dacite tuff	Walker Mountain
41	Dacite tuff	Walker Mountain
44	Basalt dike	Walker Mountain
45	Andesite flow or vent	Walker Mountain
48	Basalt flow, Black Mountain Canyon	Walker Mountain
49	Andesite dike	Walker Mountain
50	Dacite tuff	Walker Mountain
52	Dacite tuff near Thirteenmile Rock Butte	Walker Mountain
54	Basalt flow	Walker Mountain
55	Dacite tuff	Walker Mountain
57	Basalt dike	Walker Mountain

Table 3. Chemical Analyses of Igneous Rocks Adjusted to "Fresh-Rock" Values of $FeO:Fe_2O_3$, Volatile-free; West Clear Creek RARE II Further Planning Area

	Sample No.	SiO_2	Al_2O_3	Fe_2O_3	FeO	MgO	CaO	Na_2O	K_2O	TiO_2	P_2O_5	MnO
Basalts	44	44.9	18.2	1.8	10.3	5.52	10.68	4.05	1.28	1.86	1.20	0.24
	25	45.1	11.3	1.6	9.0	18.7	9.71	2.22	0.64	1.18	0.33	0.17
	54	45.9	13.0	1.5	8.4	15.65	10.00	2.41	0.99	1.33	0.67	0.18
	10B	46.3	13.4	1.4	7.9	9.74	16.17	2.19	0.66	1.16	0.87	0.19
	10A	46.5	18.1	1.7	9.0	4.95	11.81	3.74	1.20	1.32	1.40	0.22
	11B	47.1	15.6	1.5	8.4	7.24	9.33	4.87	2.27	2.16	1.23	0.18
	15	47.3	12.9	1.5	7.9	10.26	14.46	2.02	0.97	1.61	0.88	0.18
	57	47.3	11.8	1.4	7.7	11.85	12.78	2.56	1.65	1.95	0.86	0.15
	7B	47.5	13.4	1.3	7.2	9.16	16.30	2.41	0.73	1.04	0.93	0.11
	14	47.5	18.4	1.6	8.4	4.52	10.53	3.45	2.54	1.35	1.49	0.21
	7A	47.8	16.9	1.6	8.6	7.03	12.04	3.00	0.90	1.39	0.54	0.17
	48	49.3	15.2	1.6	8.6	10.04	9.67	2.98	0.91	1.16	0.36	0.17
Andesites	45	53.7	16.7	1.5	7.2	5.55	8.92	3.58	1.31	1.05	0.33	0.15
	6	54.4	17.6	1.6	7.6	3.01	8.99	3.78	1.35	1.09	0.40	0.12
	49	56.1	15.8	1.3	6.2	6.73	8.12	3.18	1.09	1.05	0.32	0.09
Dacites	11A	63.1	16.8	1.0	4.18	2.03	4.49	4.91	2.13	0.82	0.42	0.12
	34	63.7	16.3	0.87	3.59	4.19	5.08	2.54	2.72	0.58	0.27	0.11
	50	66.9	17.0	0.71	2.65	1.74	3.83	3.95	2.61	0.38	0.18	0.06
	41	67.3	14.9	0.74	2.86	3.73	4.13	2.38	3.28	0.38	0.18	0.09
	55	68.8	15.4	0.56	2.15	3.35	3.54	2.15	3.62	0.30	0.11	0.07
	52	69.7	15.2	0.57	2.08	2.67	3.21	2.78	3.72	0.32	0.11	0.06
Rhyolite	36	73.8	15.0	0.28	0.89	0.74	1.76	3.61	3.80	0.16	0.00	0.04
Xenoliths and Granite Clast	35	54.0	16.6	1.8	8.8	5.23	8.45	2.41	1.55	0.69	0.22	0.22
	8B	73.5	16.0	0.1	0.5	0.15	2.50	5.02	2.10	0.07	0.00	0.00
	20A	77.6	12.1	0.4	1.0	0.27	0.22	2.37	5.88	0.08	0.00	0.00

Notes: Locations and geologic features represented are given in tables 1 and 2. Method of adjustment of the ferric and ferrous iron oxides is given in the text.

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