UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

Analytical results and sample locality map of soil and rock samples from the Wah Wah Mountains Wilderness Study Area (UT-050-073/040-205), Beaver and Millard Counties, Utah

By

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This report is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards and stratigraphic nomenclature. Any use of trade names is for descriptive purposes only and does not imply endorsement by the USGS.

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CONTENTS

ILLUSTRATIONS

TABLES

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 Wah Wah Mountain Wilderness Study Area, Beaver and Millard Counties, Utah.

INTRODUCTION

In late August, early September, 1986, the U.S. Geological Survey conducted a reconnaissance geochemical survey of the Wah Wah Mountains Wilderness Study Area (WSA), Beaver and Millard Counties, Utah. The Wah Wah Mountains WSA (UT-050-073/040-205) is comprised of about 42,140 acres (65.5 mi^2) (174.7 km^2). The WSA straddles the county line between Millard and Beaver Counties with the greatest portion of the area located in the southwest corner of Millard County (fig. 1).

Access to the study area is provided on the south by State Highway 21, which crosses the Wah Wah Summit pass just 0.3 mile south of the WSA boundary. Access routes from all other directions are light-duty, all-weather, improved surface (gravel and hard-packed soil) roads.

The Wah Wah Mountains are an east-tilted fault block in the Basin and Range physiographic province. Exposed bedrock within the study area consists of gently dipping Cambrian and Ordovician sedimentary rocks and small exposures of Tertiary volcanic and intrusive rock. Rocks in the southern portion of the study area have been affected by thermal metamorphism generated by Tertiary intrusions, generally dioritic in composition. The extent of the contact-metamorphic aureole was mapped by Hintze (1974b). Large-scale geologic maps and detailed descriptions of individual formations and rock types are available in Dunn (1959), Erickson (1966), Hintze (1974a), Hintze (1974b), and Hintze and others (1984).

Whereas the narrow, flat-topped Wah Wah range is rugged on all sides, the western edge is steep and cliffy. Relief in the study area is as great as 2,800 feet with the highest elevation of 8,980 feet at the southern end. Vegetation is sparse and the climate is semiarid to arid.

METHODS OF STUDY

Sample collection

One hundred thirty-seven rock samples (table 3 and table 5) and 22 soil samples (table 4) were collected by L. J. Cox and K. S. Panter for semiquantitative emission spectrographic analysis and for flame atomic-absorption spectroscopy. The rock and soil samples were collected at the localities shown in figure 2. Each "x" on figure 2 indicates the locality at which a rock sample was collected. Each "o" on figure 2 indicates the locality at which a soil sample was collected. The sample numbers of rocks are 001-137 and the sample numbers of soils are 201-222 (fig. 2 and tables 3, 4, and 5). Sampling density for rock samples is about one sample site per 1 mi^2.

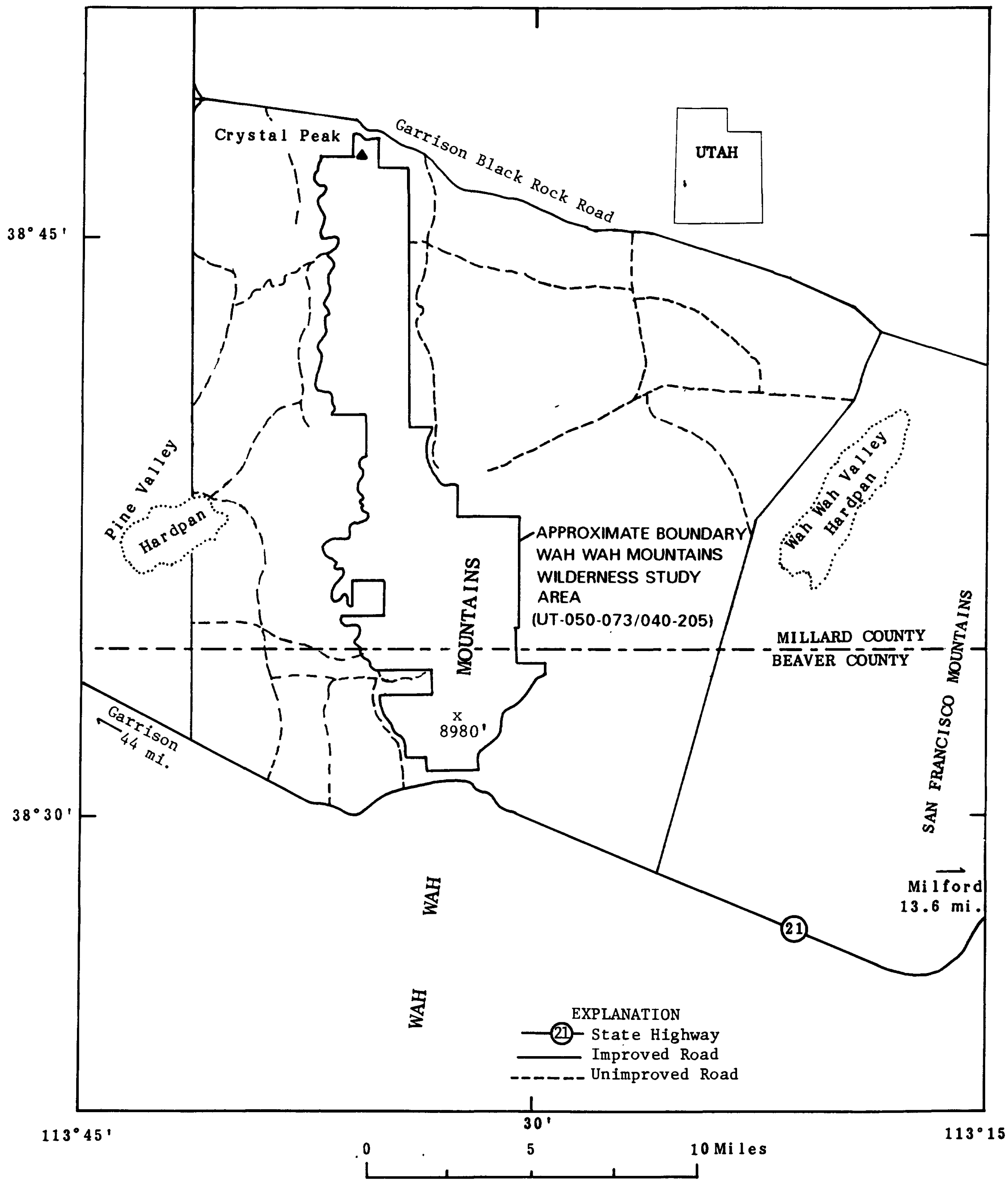

Figure 1. Location map of the Wah Wah Mountains Wilderness Study Area (UT-050-073/040-205), Beaver and Millard Counties, Utah.

Rock samples

All rock samples, unless otherwise described in table 5, are collected from outcrop and are representative of the unaltered sedimentary or igneous units from which they were collected. Twenty-two of the rock samples were collected within a contact metamorphic aureole as mapped by Hintze (1974b). Unaltered or unmineralized rock samples were collected to provide information on geochemical background values. Altered and metamorphosed rock samples were collected to provide information on the effects of alteration and metamorphism on the chemistry of the rocks and to discern whether mineralization had accompanied either alteration or metamorphism.

Soil samples

All soil samples, with the exception of #218, which is Quaternary-aged sand weathered from Tertiary-aged volcanic rock, were collected above faults mapped by L. F. Hintze (1974a and b). Soil samples #211-217 consist of Quaternary-aged alluvium which overlies and conceals a major normal fault. All other soil samples are of residual soil overlying a fault. These soils are typically reddish in color and were collected to provide information on the potential of faults to serve as conduits for fluids which might alter or mineralize adjacent rock.

Sample Preparation

The soil samples were oven dried, then sieved using 80-mesh (0.17-mm) stainless-steel sieves. The portion of the soil sample passing through the sieve was saved for analysis.

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

Sample Analysis

Spectrographic method

The soil and rock samples were analyzed for 31 elements using semiquantitative, direct-current arc emission spectrographic method (Grimes and Marranzino, 1968). The elements analyzed and their lower limits of determination are listed in table 1. Spectographic results were obtained by visual comparison of spectra derived from the sample against spectra obtained from standards made from pure oxides and carbonates. 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 Wah Wah Mountains WSA are listed in tables 3 and 4.

Chemical methods

Gold was analyzed for in rock and soil samples from the Wah Wah Mountains WSA by atomic absorption spectrophotometry. The lower limit of determination for gold is listed in table 2. The sample was treated with a hydrobromic acid -0.5 bromine solution. The gold-bromide complex that was formed is extracted from the acid solution with MIBK (methyl isobutenyl ketone). The interference due to iron was removed by washing the organic solvent with dilute hydrobromic acid. The MIBK was atomized in an atomic absorption spectrophotometer for estimation of gold content (Thompson and others, 1968).

Values determined for gold were reported in parts per million (micrograms/grams). Precision for this method is reported as a percent relative standard deviation (% RSD), and is based on replicate analysis of GXR (geochemical exploration reference) standards (Allcott and Lakin, 1975). The GXR standards used in this method vary in % RSD from 9.3 to 42.5 (O'Leary and Meier, 1984).

Analytical results for rock and soil samples are listed in tables 3 and 4.

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 3-4 list the results of analyses for the samples of rock and soil, 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 (fig. 2). Columns in which the element headings show the letter "s" preceding the element symbol are emission spectrographic analyses. 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. 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. Because of the formatting used in the computer program that produced tables 3-4, some of the elements listed in these tables (Fe, Mg, Ca, Ti, 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.

Of the 31 elements looked for spectrographically, those not detected in the samples have been omitted from each table. The elements (with the detection limits in ppm following each element in parenthesis) omitted from both tables 3 and 4 are: Ag (.5), Au (10), Bi (10), Cd (20), Sn (10), W (50), Zn (200), and Th (100). Additional exclusions from table 4 include: As (200), Mo (5), and Sb (100).

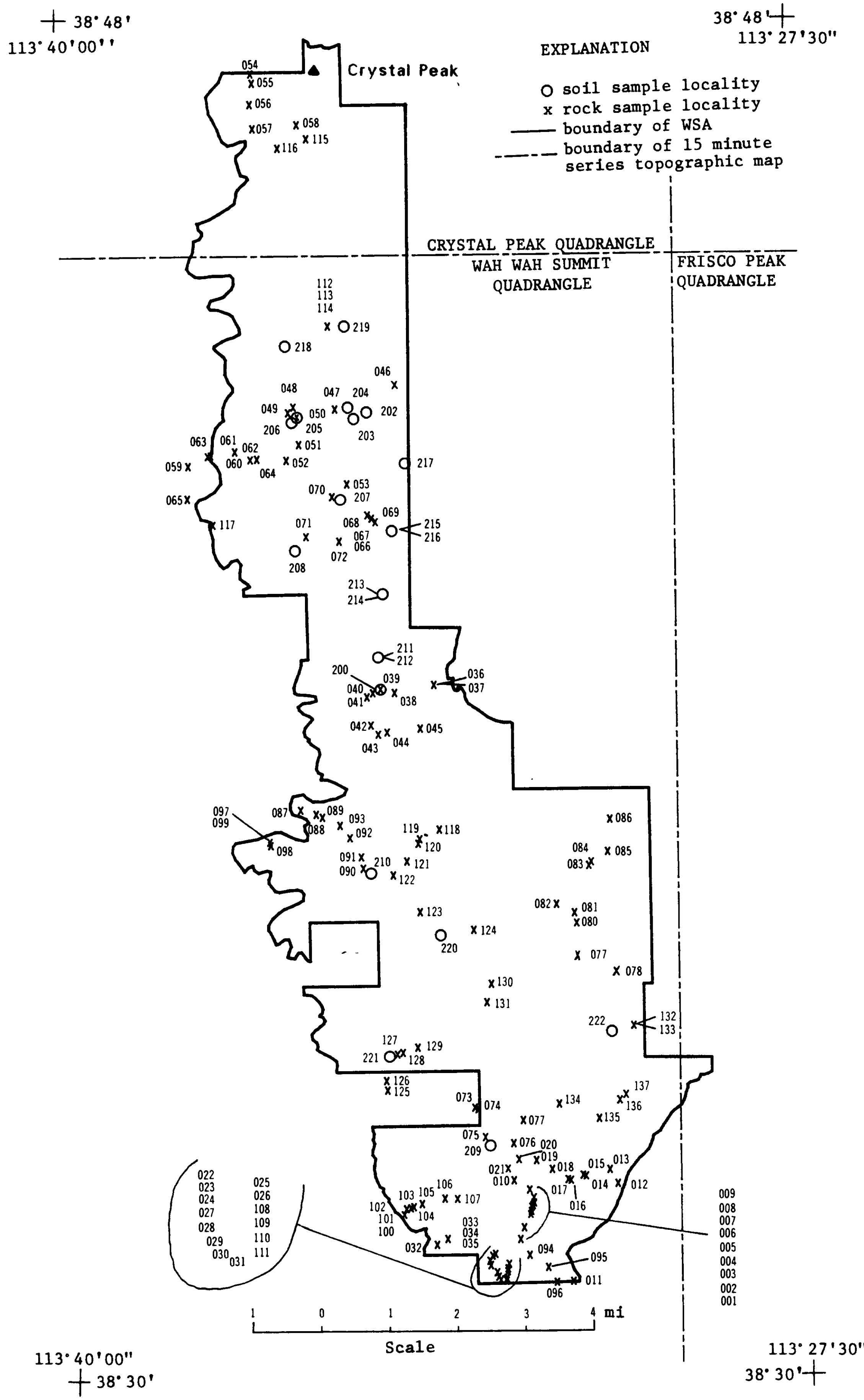

Figure 2.--Map showing geochemical sample sites, Wah Wah Mountains Wilderness Study Area, (WSA), (UT-050-073/040-205), Beaver and Millard Counties, Utah.

Gold was not detected in any sample by atomic absorption at or above a detection limit of 0.05 ppm and is therefore not reported in either table 3 or 4.

REFERENCES CITED

Allcott, G. H., and Lakin, H. W., 1975, The homogeneity of six geochemical exploration reference samples, in Elliott, I. L., and Fletcher, W. K., eds., Geochemical Exploration 1974: Amsterdam, Elsevier, p. 659-681.

Dunn, D. E., 1959, Geology of the Crystal Peak area, Millard County, Utah: Southern Methodist University, Dallas, Texas, M.S. thesis, 54 p.

Erickson, M. P., 1966, Igneous complex at Wah Wah Pass, Beaver County, Utah: Utah Geol. and Mineralog. Survey Special Studies 17, 14 p.

Grimes, D. J., and Marranzino, A. P., 1968, Direct-current arc and alternating-current spark emission spectrographic field methods for the semiquantitative analysis of geologic materials: U.S. Geological Survey Circular 591, 6 p.

Hintze, L. F., 1974a, Preliminary geologic map of the Crystal Peak Quadrangle, Millard County, Utah: U.S. Geological Survey Miscellaneous Field Studies Map MF-635, 2 sheets.

Hintze, L. F., 1974b, Preliminary geologic map of the Wah Wah Summit Quadrangle, Millard and Beaver Counties, Utah: U.S. Geological Survey Miscellaneous Field Studies Map MF-637, 2 sheets.

Hintze, L. F., Lemmon, D. M., and Morris, H. T., 1984, Geologic map of the Frisco Peak Quadrangle, Millard and Beaver Counties, Utah: U.S. Geological Survey Miscellaneous Investigations Series Map I-1573.

Motooka, J. M., and Grimes, D. J., 1976, Analytical precision of one-sixth order semiquantitative spectrographic analyses: U.S. Geological Survey Circular 738, 25 p.

O'Leary, R. M., and Meier, A. L., 1984, Analytical Methods used in geochemical exploration: U.S. Geological Survey Circular 948.

Thompson, C. E., Nakagawa, H. M., and Van Sickle, G. H., 1968, Rapid analysis for gold in geologic materials, in Geological Survey research 1968: U.S. Geological Survey Professional Paper 600-B, p. B130-B132.

VanTrump, George, Jr., and Miesch, A. T., 1977, The U.S. Geological Survey RASS-STATPAC system for management and statistical reduction of geochemical data: Computers and Geosciences, v. 3, p. 475-488.

TABLE 1.--Limits of determination for the spectrographic analysis of rock and soil samples based on a 10-mg sample

[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 and stream sediments]

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	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
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	2,000

TABLE 2.--Chemical methods used

[AA = atomic absorption]

Element determined	Sample type	Method	Determination limit (micrograms/ gram or ppm)	Analyst	Reference
Gold (Au)	Rocks and soils	AA	0.05	Phil Hageman	Thompson and others, 1968.

Table 3. Results of analyses of rock samples from the Wah Wah Mountains Wilderness Study Area, Beaver and Millard Counties, Utah.

Sample	Latitude	Longitud	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AS	S-B	S-BA
001	38 31 53	113 32 37	.30	2.00	>20.00	.030	100	N	N	<20
002	38 32 2	113 32 34	.20	10.00	>20.00	.020	300	N	N	N
003	38 32 15	113 32 29	5.00	5.00	5.00	.200	700	N	100	200
004	38 32 17	113 32 29	.50	1.00	>20.00	.050	300	N	N	<20
005	38 32 20	113 32 28	<.05	.05	1.00	.002	15	N	N	N
006	38 32 20	113 32 27	.20	.50	>20.00	.020	200	N	N	N
007	38 32 22	113 32 26	.05	5.00	>20.00	.015	30	N	N	N
008	38 32 25	113 32 26	<.05	10.00	20.00	.003	15	N	N	N
009	38 32 34	113 32 22	.05	10.00	>20.00	.003	<10	N	<10	N
010	38 32 42	113 32 43	.07	.50	>20.00	.005	30	N	N	<20
011	38 31 20	113 31 46	.20	2.00	>20.00	.020	300	N	N	N
012	38 32 40	113 30 57	.20	.05	.50	.002	>5,000	N	10	200
013	38 32 51	113 31 10	.20	.50	>20.00	.020	20	N	N	N
014	38 32 46	113 31 31	.20	2.00	>20.00	.020	30	N	N	N
015	38 32 46	113 31 36	.20	2.00	>20.00	.020	50	N	N	N
016	38 32 42	113 31 46	.05	10.00	20.00	.003	200	N	N	N
017	38 32 42	113 31 50	<.05	>10.00	>20.00	.003	50	N	N	N
018	38 32 51	113 32 7	.05	>10.00	>20.00	.005	20	N	N	N
019	38 32 59	113 32 22	.50	.50	>20.00	.050	100	N	10	<20
020	38 33 0	113 32 38	5.00	1.00	2.00	.500	700	N	10	700
021	38 32 52	113 32 50	.30	.70	>20.00	.030	100	N	<10	N
022	38 31 42	113 33 4	.07	10.00	>20.00	.007	100	N	N	N
023	38 31 40	113 33 6	.15	.70	>20.00	.030	15	N	N	N
024	38 31 38	113 33 5	.20	10.00	20.00	.020	100	N	N	N
025	38 31 38	113 33 5	.05	10.00	20.00	.010	10	N	<10	N
026	38 31 38	113 33 5	.10	10.00	20.00	.010	15	N	N	N
027	38 31 34	113 33 6	.07	10.00	20.00	.003	15	N	N	N
028	38 31 28	113 33 0	.50	2.00	>20.00	.015	300	N	N	N
029	38 31 24	113 33 0	.50	10.00	>20.00	.030	200	N	50	<20
030	38 31 20	113 32 59	2.00	3.00	>20.00	.100	700	N	<10	50
031	38 31 20	113 32 53	5.00	5.00	>20.00	.500	2,000	N	10	300
032	38 31 50	113 34 0	<.05	10.00	>20.00	.002	100	N	N	N
033	38 31 53	113 33 48	.50	10.00	>20.00	.070	70	N	10	<20
034	38 31 53	113 33 48	.20	10.00	>20.00	.050	100	N	20	<20
035	38 31 53	113 33 48	.30	10.00	>20.00	.020	200	N	10	N
036	38 39 18	113 34 0	.20	1.00	>20.00	.020	300	N	N	N
037	38 39 18	113 34 0	<.05	.05	1.00	<.002	<10	N	N	N
038	38 39 13	113 34 36	.20	1.00	>20.00	.015	1,000	N	N	N
039	38 39 14	113 34 50	.20	10.00	>20.00	.020	50	N	<10	N
040	38 39 11	113 34 59	.05	10.00	20.00	.003	20	N	N	N

Table 3. Results of analyses of rock samples from the Wah Wah Mountains Wilderness Study Area, Beaver and Millard Counties, Utah.

Sample	S-BE	S-CO	S-CR	S-CU	S-LA	S-MO	S-NB	S-NI	S-PB	S-SB	S-SC	S-SR	S-V	S-Y	S-ZR
001	N	N	<10	N	30	N	N	<5	N	N	<5	1,000	<10	10	30
002	N	N	N	N	N	N	N	N	N	N	N	700	<10	<10	10
003	1	20	100	30	70	N	<20	50	100	N	15	150	70	30	100
004	N	N	<10	N	30	N	N	N	10	N	<5	1,000	10	10	15
005	<1	N	N	<5	30	N	N	<5	<10	N	N	N	<10	<10	<10
006	N	N	<10	<5	30	N	N	<5	N	N	N	500	<10	<10	10
007	N	N	<10	<5	N	N	N	N	<10	N	N	500	<10	N	N
008	N	N	N	<5	30	N	N	<5	<10	N	N	N	<10	N	N
009	N	N	N	N	30	N	N	<5	N	N	N	N	<10	N	<10
010	<1	N	N	N	30	N	N	<5	N	N	N	<100	<10	N	<10
011	N	N	N	N	N	N	N	<5	N	N	<5	700	15	<10	<10
012	2	<5	<10	<5	30	N	N	7	N	N	N	100	30	<10	10
013	N	N	<10	N	N	N	N	<5	N	N	N	1,000	10	N	15
014	N	N	N	N	30	N	N	<5	N	N	N	700	<10	N	15
015	N	N	N	N	N	N	N	N	<10	N	N	700	<10	N	10
016	N	N	N	<5	30	N	N	N	<10	N	<5	N	<10	<10	<10
017	N	N	N	<5	N	N	N	N	N	N	N	N	<10	N	N
018	<1	N	N	N	30	N	N	<5	N	N	N	<100	<10	N	N
019	N	N	<10	N	30	N	N	N	10	N	<5	700	10	10	50
020	1	15	20	10	70	N	N	5	30	N	20	1,500	150	30	300
021	N	N	<10	<5	30	N	N	<5	N	N	<5	500	<10	10	15
022	N	N	N	N	30	N	N	<5	N	N	N	<100	<10	N	N
023	N	N	N	<5	N	N	N	<5	N	N	<5	1,000	<10	<10	<10
024	N	N	<10	<5	N	N	N	<5	10	N	<5	<100	<10	<10	15
025	N	N	N	N	30	N	N	<5	<10	N	<5	N	<10	<10	<10
026	N	N	N	<5	N	N	N	N	N	N	N	N	<10	N	<10
027	N	N	N	N	30	N	N	<5	N	N	<5	N	<10	<10	<10
028	N	N	N	N	N	N	N	<5	N	N	N	150	<10	<10	<10
029	N	N	<10	<5	30	N	N	N	N	N	<5	200	<10	10	70
030	N	7	10	5	50	N	N	<5	10	N	10	100	100	20	100
031	<1	15	50	<5	70	N	<20	10	10	N	20	150	150	30	150
032	N	N	N	N	N	N	N	N	N	N	N	100	<10	N	N
033	N	N	<10	<5	N	N	N	<5	N	N	5	<100	15	10	50
034	N	N	<10	<5	30	N	N	<5	<10	N	<5	<100	<10	<10	20
035	N	N	<10	<5	30	N	N	<5	N	N	<5	100	<10	<10	10
036	N	N	<10	N	30	N	N	<5	<10	N	<5	500	<10	N	<10
037	<1	N	N	N	30	N	N	<5	N	N	N	N	<10	<10	10
038	N	N	<10	<5	30	N	N	<5	N	N	N	500	<10	<10	<10
039	N	N	<10	<5	N	N	N	N	N	N	<5	150	<10	N	<10
040	N	N	N	N	30	N	N	<5	N	N	N	N	<10	<10	N

Table 3. Results of analyses of rock samples from the Wah Wah Mountains Wilderness Study Area, Beaver and Millard Counties, Utah.

Sample	Latitude	Longitud	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AS	S-B	S-BA
041	38 39 10	113 35 5	.10	10.00	20.00	.002	20	N	N	N
042	38 38 46	113 35 0	.15	1.00	>20.00	.020	30	N	N	N
043	38 38 38	113 34 54	.15	.70	>20.00	.070	100	N	N	N
044	38 38 39	113 34 45	.30	.20	>20.00	.050	100	N	<10	<20
045	38 38 42	113 34 10	.50	.15	10.00	.020	50	N	20	20
046	38 43 16	113 34 37	.15	.20	>20.00	.030	50	N	N	N
047	38 42 59	113 35 35	.30	1.50	>20.00	.030	500	N	N	N
048	38 43 0	113 36 11	.20	1.50	>20.00	.020	1,000	N	N	N
049	38 42 57	113 36 17	.30	1.50	>20.00	.020	1,000	N	N	<20
050	38 42 52	113 36 10	.50	1.00	>20.00	.020	700	N	<10	<20
051	38 42 31	113 36 9	.30	1.00	>20.00	.015	200	N	N	N
052	38 42 16	113 36 20	.20	1.00	>20.00	.020	1,500	N	<10	N
053	38 41 56	113 35 23	.20	2.00	>20.00	.015	100	N	<10	<20
054	38 47 25	113 36 52	.07	7.00	10.00	.005	30	N	20	N
055	38 47 18	113 36 50	1.00	10.00	20.00	.010	20	N	10	N
056	38 47 0	113 36 54	<.05	10.00	15.00	.002	15	N	30	N
057	38 46 44	113 36 52	.70	10.00	20.00	.030	150	N	20	20
058	38 46 45	113 36 8	.70	1.50	>20.00	.020	500	N	<10	<20
059	38 42 14	113 37 56	.07	.70	>20.00	.020	150	N	N	<20
060	38 42 22	113 37 35	.05	10.00	>20.00	.010	20	N	N	N
061	38 42 27	113 37 14	.30	1.50	>20.00	.030	200	N	N	20
062	38 42 20	113 36 55	.10	1.00	>20.00	.020	300	N	N	N
063	38 42 22	113 37 38	.30	.70	>20.00	.030	50	N	10	50
064	38 42 20	113 36 50	.10	10.00	15.00	.003	50	N	<10	<20
065	38 41 48	113 38 0	.50	7.00	>20.00	.030	100	N	<10	30
066	38 41 25	113 34 57	.10	10.00	20.00	.010	30	N	<10	N
067	38 41 25	113 34 57	.05	10.00	20.00	.002	30	N	N	N
068	38 41 28	113 35 0	<.05	.07	5.00	<.002	150	N	N	N
069	38 41 31	113 35 5	.10	.30	>20.00	.015	30	N	N	N
070	38 41 46	113 35 36	.10	.50	>20.00	.010	700	N	N	N
071	38 41 12	113 36 2	.20	.50	>20.00	.015	700	N	N	N
072	38 41 9	113 35 31	.15	.50	>20.00	.020	70	N	N	N
073	38 33 40	113 33 25	<.05	10.00	15.00	.002	10	N	10	N
074	38 33 38	113 33 22	.20	.50	>20.00	.015	100	N	<10	<20
075	38 33 15	113 33 13	<.05	10.00	20.00	.003	10	N	N	N
076	38 33 12	113 32 45	.30	.70	>20.00	.020	50	N	N	N
077	38 33 29	113 32 37	.20	.50	>20.00	.015	50	N	N	N
078	38 35 32	113 31 4	1.50	.30	1.50	.150	500	N	20	700
079	38 35 42	113 31 40	.10	2.00	>20.00	.007	100	N	N	N
080	38 36 8	113 31 42	.07	10.00	20.00	.005	20	N	N	N

Table 3. Results of analyses of rock samples from the Wah Wah Mountains Wilderness Study Area, Beaver and Millard Counties, Utah.

Sample	S-BE	S-CO	S-CR	S-CU	S-LA	S-MO	S-NB	S-NI	S-PB	S-SB	S-SC	S-SR	S-V	S-Y	S-ZR
041	N	N	N	N	30	N	N	<5	N	N	N	N	<10	<10	<10
042	N	N	<10	N	N	N	N	N	N	N	N	500	<10	N	15
043	<1	N	N	N	30	N	N	N	<10	N	<5	500	<10	<10	<10
044	N	N	<10	N	30	N	N	<5	<10	N	<5	300	15	10	50
045	<1	<5	<10	<5	30	N	N	<5	N	N	N	100	<10	<10	15
046	N	N	N	N	30	N	N	N	N	N	<5	150	<10	<10	N
047	N	N	N	N	30	N	N	N	N	N	N	700	<10	<10	<10
048	N	N	N	N	30	N	N	N	N	N	<5	500	<10	<10	10
049	N	N	N	<5	30	N	N	<5	N	N	<5	500	<10	<10	15
050	N	5	<10	<5	30	N	N	5	<10	N	5	500	<10	10	<10
051	N	N	N	<5	30	N	N	<5	N	N	N	700	<10	<10	<10
052	N	N	N	N	N	N	N	N	N	N	N	500	<10	<10	<10
053	N	N	<10	<5	30	N	N	<5	<10	N	N	200	<10	<10	10
054	<1	N	N	<5	30	N	N	<5	<10	N	N	<100	10	<10	<10
055	N	N	<10	<5	30	N	N	<5	N	N	N	150	10	N	N
056	N	N	<10	<5	30	N	N	<5	N	N	N	<100	10	<10	N
057	N	N	<10	<5	30	N	N	7	10	N	<5	150	15	10	100
058	N	N	<10	<5	30	N	N	<5	10	N	N	700	<10	10	30
059	N	N	N	<5	N	N	N	N	N	N	N	500	<10	N	15
060	<1	N	N	N	30	N	N	<5	<10	N	<5	<100	10	<10	<10
061	N	N	<10	<5	30	N	N	<5	<10	N	<5	200	10	<10	15
062	<1	N	<10	N	30	N	N	N	N	N	N	500	<10	<10	<10
063	N	N	<10	<5	N	N	N	<5	<10	N	N	300	<10	10	50
064	<1	N	<10	<5	30	N	N	<5	<10	N	N	N	<10	<10	10
065	N	N	<10	<5	N	N	N	<5	<10	N	<5	300	10	10	50
066	N	N	<10	<5	N	N	N	<5	<10	N	N	N	<10	<10	<10
067	<1	N	N	<5	30	N	N	<5	N	N	N	N	<10	<10	<10
068	<1	N	N	N	30	N	N	<5	N	N	<5	<100	<10	<10	10
069	N	N	<10	N	N	N	N	<5	<10	N	N	300	<10	N	<10
070	N	N	<10	N	N	N	N	<5	<10	N	N	300	<10	N	N
071	N	N	<10	N	N	N	N	<5	N	N	N	500	<10	N	<10
072	N	N	<10	N	N	N	N	N	<10	N	N	500	<10	<10	10
073	<1	N	<10	N	N	N	N	<5	N	N	N	N	<10	N	<10
074	N	N	<10	<5	30	N	N	<5	<10	N	N	200	<10	<10	15
075	<1	N	N	<5	30	N	N	<5	N	N	N	N	<10	<10	<10
076	N	N	<10	<5	N	N	N	<5	<10	N	N	700	<10	<10	15
077	N	N	<10	N	N	N	N	N	<10	N	N	700	<10	N	<10
078	1	5	<10	<5	100	N	N	<5	30	N	5	700	30	20	300
079	N	N	<10	<5	N	N	N	<5	<10	N	N	500	<10	N	<10
080	N	N	N	N	N	N	N	N	N	N	N	N	<10	N	<10

Table 3. Results of analyses of rock samples from the Wah Wah Mountains Wilderness Study Area, Beaver and Millard Counties, Utah.

Sample	Latitude	Longitud	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AS	S-B	S-BA
081	38 36 14	113 31 45	.07	.70	10.00	.005	10	N	<10	N
082	38 36 22	113 32 0	.15	1.00	>20.00	.015	15	N	N	N
083	38 36 53	113 31 29	.15	.20	>20.00	.020	20	N	N	N
084	38 36 56	113 31 28	.15	.50	>20.00	.020	70	N	N	N
085	38 37 2	113 31 10	.15	1.00	>20.00	.015	50	N	N	N
086	38 37 30	113 31 9	<.05	10.00	20.00	.002	10	N	N	N
087	38 37 38	113 36 8	.20	1.00	>20.00	.020	10	N	N	N
088	38 37 35	113 35 55	.15	10.00	>20.00	.015	30	N	N	N
089	38 37 34	113 35 50	.50	2.00	>20.00	.030	30	N	<10	<20
090	38 36 50	113 35 9	.07	.30	>20.00	.010	10	N	N	N
091	38 37 0	113 35 10	.05	.20	5.00	<.002	<10	N	N	N
092	38 37 16	113 35 20	.05	7.00	5.00	<.002	<10	N	N	N
093	38 37 25	113 35 30	.30	1.00	>20.00	.020	200	N	<10	70
094	38 31 43	113 32 30	.30	10.00	>20.00	.020	30	N	<10	<20
095	38 31 34	113 32 10	.15	10.00	20.00	.003	30	N	N	N
096	38 31 22	113 32 1	.50	.70	>20.00	.030	100	N	<10	50
097	38 37 13	113 36 35	.07	.50	20.00	.005	50	N	N	50
098	38 37 12	113 36 36	1.50	.30	>20.00	.015	>5,000	500	N	2,000
099	38 37 13	113 36 35	.20	10.00	>20.00	.030	30	N	N	<20
100	38 32 17	113 34 34	.20	5.00	>20.00	.010	10	N	N	N
101	38 32 17	113 34 34	.10	3.00	>20.00	.030	10	N	N	N
102	38 32 20	113 34 30	.20	2.00	>20.00	.010	20	N	N	N
103	38 32 20	113 34 26	.20	2.00	>20.00	.050	30	N	N	<20
104	38 32 20	113 34 21	.30	5.00	>20.00	.050	20	N	N	<20
105	38 32 22	113 34 14	.05	10.00	>20.00	.007	20	N	10	N
106	38 32 28	113 33 51	.05	5.00	2.00	.002	<10	N	N	N
107	38 32 28	113 33 40	.20	10.00	20.00	.015	70	N	N	N
108	38 31 34	113 32 50	.15	1.00	>20.00	.030	50	N	<10	50
109	38 31 30	113 32 50	.20	10.00	>20.00	.010	70	N	N	N
110	38 31 29	113 32 51	.10	2.00	>20.00	.015	70	N	N	N
111	38 31 24	113 32 51	3.00	3.00	>20.00	.100	500	N	50	100
112	38 44 1	113 35 40	<.05	.07	.20	.010	20	N	20	<20
113	38 44 1	113 35 40	.05	10.00	20.00	.003	30	N	50	N
114	38 44 1	113 35 40	.30	5.00	5.00	.050	100	N	30	20
115	38 46 33	113 35 59	>20.00	.20	.07	.002	30	500	30	100
116	38 46 26	113 36 29	.50	2.00	20.00	.050	100	N	50	50
117	38 41 21	113 37 32	1.50	1.50	>20.00	.100	200	N	20	50
118	38 37 24	113 33 54	.10	>10.00	>20.00	.015	30	N	N	N
119	38 37 13	113 34 12	.20	2.00	>20.00	.020	50	N	N	N
120	38 37 11	113 34 13	.30	.07	1.00	.030	150	<200	70	100

Table 3. Results of analyses of rock samples from the Wah Wah Mountains Wilderness Study Area, Beaver and Millard Counties, Utah.

Sample	S-BE	S-CO	S-CR	S-CU	S-LA	S-MO	S-NB	S-NI	S-PB	S-SB	S-SC	S-SR	S-V	S-Y	S-ZR
081	<1	N	<10	N	50	N	N	<5	<10	N	<5	200	<10	<10	10
082	N	N	<10	<5	N	N	N	<5	10	N	N	500	<10	N	10
083	N	N	N	5	N	N	N	<5	<10	N	N	150	<10	10	10
084	<1	N	<10	<5	30	N	N	<5	<10	N	N	300	<10	<10	10
085	N	N	N	<5	N	N	N	N	10	N	N	500	<10	N	<10
086	<1	N	N	N	30	N	N	<5	N	N	N	N	<10	N	<10
087	N	N	<10	N	N	N	N	<5	N	N	N	1,000	<10	N	10
088	N	N	N	N	N	N	N	<5	N	N	N	200	<10	N	<10
089	N	N	<10	<5	30	N	N	N	15	N	N	700	10	N	20
090	N	N	<10	N	N	N	N	N	N	N	N	500	<10	N	<10
091	<1	N	<10	N	50	N	N	<5	10	N	<5	<100	10	<10	15
092	<1	N	<10	N	50	N	N	<5	10	N	N	N	10	<10	10
093	N	N	<10	5	50	N	N	N	20	N	N	700	<10	15	20
094	N	N	<10	<5	N	N	N	N	<10	N	N	<100	15	N	50
095	<1	N	<10	N	50	N	N	<5	N	N	N	N	<10	<10	<10
096	N	N	<10	N	30	N	N	N	<10	N	<5	1,000	10	<10	50
097	<1	N	N	<5	50	N	N	<5	<10	N	N	100	10	<10	<10
098	1	5	<10	20	N	N	N	5	20	150	N	100	70	10	15
099	N	N	<10	<5	<20	N	N	<5	<10	N	<5	200	<10	<10	15
100	N	N	N	N	N	N	N	N	N	N	N	150	<10	N	N
101	N	N	N	N	30	N	N	<5	N	N	N	700	<10	N	<10
102	N	N	<10	30	N	N	N	N	<10	N	N	300	<10	N	<10
103	N	N	<10	N	30	N	N	N	<10	N	<5	300	<10	<10	20
104	N	N	<10	<5	N	N	N	N	10	N	<5	300	10	<10	30
105	N	N	N	N	30	N	N	N	N	N	N	N	<10	<10	<10
106	<1	N	N	N	30	N	N	<5	N	N	N	N	<10	<10	10
107	N	N	N	N	N	N	N	N	<10	N	<5	N	<10	N	<10
108	N	N	<10	<5	30	N	N	<5	N	N	<5	500	<10	10	70
109	N	N	<10	<5	N	N	N	N	N	N	N	200	10	N	10
110	<1	N	N	N	50	N	N	<5	N	N	5	700	<10	N	20
111	1	15	20	15	100	N	N	7	10	N	10	200	50	30	150
112	N	N	N	<5	30	N	N	<5	N	N	N	<100	<10	<10	70
113	N	N	N	N	N	N	N	N	N	N	N	<100	<10	N	<10
114	N	N	<10	N	30	N	N	<5	N	N	<5	<100	10	<10	100
115	5	15	20	150	N	20	N	100	70	N	N	N	500	N	<10
116	N	N	10	<5	N	N	N	<5	<10	N	<5	200	10	<10	200
117	<1	N	20	5	N	N	N	<5	20	N	<5	100	20	10	150
118	<1	N	N	N	N	N	N	<5	<10	N	<5	100	<10	N	<10
119	N	N	<10	N	N	N	N	<5	N	N	N	700	<10	N	<10
120	1	<5	<10	<5	30	N	N	5	N	N	<5	<100	50	<10	15

Table 3. Results of analyses of rock samples from the Wah Wah Mountains Wilderness Study Area, Beaver and Millard Counties, Utah.

Sample	Latitude	Longitud	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AS	S-B	S-BA
121	38 36 58	113 34 25	.20	2.00	20.00	.010	100	N	<10	N
122	38 30 47	113 34 39	7.00	5.00	7.00	1.000	1,000	N	<10	1,000
123	38 36 14	113 34 16	.15	.50	>20.00	.010	150	N	N	N
124	38 36 3	113 33 20	.30	.70	>20.00	.020	200	N	N	<20
125	38 33 54	113 34 49	.15	2.00	>20.00	.030	15	N	N	<20
126	38 34 1	113 34 49	.10	.70	>20.00	.015	10	N	N	N
127	38 34 23	113 34 47	.30	1.50	>20.00	.050	100	N	<10	70
128	38 34 24	113 34 33	.15	2.00	>20.00	.020	10	N	N	N
129	38 34 29	113 34 17	.20	2.00	>20.00	.020	50	N	<10	30
130	38 35 20	113 33 3	3.00	1.50	2.00	.500	700	N	20	1,000
131	38 35 5	113 33 9	1.50	.30	>20.00	.020	100	N	N	<20
132	38 34 44	113 30 48	.20	3.00	>20.00	.010	50	N	N	N
133	38 34 44	113 30 48	2.00	.10	1.00	.050	700	<200	30	200
134	38 33 42	113 31 59	<.05	10.00	7.00	<.002	<10	N	N	N
135	38 33 30	113 31 21	<.05	10.00	20.00	.002	<10	N	10	N
136	38 33 46	113 31 0	.05	10.00	20.00	.003	20	N	N	N
137	38 33 55	113 30 53	.07	.70	>20.00	.015	30	N	N	N

Table 3. Results of analyses of rock samples from the Wah Wah Mountains Wilderness Study Area, Beaver and Millard Counties, Utah.

Sample	S-BE	S-CO	S-CR	S-CU	S-LA	S-MO	S-NB	S-NI	S-PB	S-SB	S-SC	S-SR	S-V	S-Y	S-ZR
121	N	N	N	N	N	N	N	<5	N	N	N	300	<10	N	<10
122	<1	20	50	50	100	N	N	100	20	N	20	2,000	200	30	300
123	N	N	N	N	30	N	N	N	N	N	N	500	<10	N	<10
124	N	N	N	N	30	N	N	<5	<10	N	<5	700	<10	<10	15
125	N	N	<10	<5	30	N	N	<5	<10	N	N	700	<10	N	15
126	<1	N	N	N	30	N	N	<5	<10	N	N	300	<10	N	<10
127	N	N	<10	<5	30	N	N	N	10	N	<5	300	10	15	50
128	N	N	<10	N	N	N	N	<5	<10	N	N	500	<10	N	<10
129	N	N	<10	N	30	N	N	<5	<10	N	N	700	<10	<10	70
130	<1	10	10	7	70	N	N	5	30	N	15	1,000	100	30	150
131	N	N	<10	5	N	N	N	5	15	N	N	200	100	<10	20
132	N	N	<10	N	N	N	N	<5	N	N	N	1,000	<10	<10	<10
133	1	5	10	5	30	N	N	5	10	N	<5	<100	150	10	150
134	<1	N	N	N	30	N	N	<5	N	N	<5	N	<10	<10	<10
135	<1	N	N	N	30	N	N	<5	N	N	N	N	<10	<10	N
136	N	N	N	N	30	N	N	<5	N	N	N	N	20	<10	N
137	N	N	N	<5	N	N	N	N	N	N	N	300	<10	N	N

Table 4. Results of analyses of soil samples from the Wah Wah Mountains Wilderness Study Area, Beaver and Millard Counties, Utah.

Sample	Latitude	Longitud	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-B	S-BA
201	38 39 14	113 34 50	2.0	5.0	10	.15	500	70	300
202	38 42 57	113 35 0	2.0	2.0	20	.15	300	50	200
203	38 42 50	113 35 14	3.0	2.0	10	.20	500	70	500
204	38 42 59	113 35 20	2.0	2.0	15	.15	500	50	300
205	38 42 52	113 36 10	3.0	1.5	10	.15	500	70	300
206	38 42 48	113 36 15	2.0	1.0	10	.10	300	70	300
207	38 41 43	113 35 28	2.0	1.5	10	.15	500	50	500
208	38 41 4	113 36 13	3.0	1.5	5	.20	500	70	300
209	38 33 9	113 33 9	2.0	7.0	10	.15	500	50	200
210	38 36 46	113 35 4	2.0	7.0	20	.10	500	50	200
211	38 39 38	113 34 54	2.0	5.0	10	.10	500	50	300
212	38 39 38	113 34 54	2.0	5.0	10	.15	700	50	500
213	38 40 30	113 34 19	2.0	2.0	10	.15	500	70	300
214	38 40 30	113 34 49	2.0	3.0	10	.15	500	50	300
215	38 41 20	113 34 39	2.0	3.0	10	.15	500	70	500
216	38 41 20	113 34 39	2.0	3.0	10	.15	500	50	500
217	38 42 13	113 34 37	2.0	1.5	10	.15	500	50	500
218	38 43 50	113 36 20	5.0	1.0	2	.50	700	15	500
219	38 44 5	113 35 25	3.0	1.5	10	.15	500	150	200
220	38 35 56	113 34 0	5.0	1.5	1	.50	1,000	50	500
221	38 34 20	113 34 46	1.5	10.0	20	.10	500	50	200
222	38 34 40	113 31 2	3.0	3.0	15	.20	1,000	50	500

Sample	S-BE	S-CO	S-CR	S-CU	S-LA	S-NB	S-NI	S-PB	S-SC	S-SR	S-V	S-Y	S-ZR
201	1.0	7	20	7	50	N	20	30	7	200	70	20	70
202	1.0	7	50	7	30	N	20	20	10	200	50	15	100
203	1.0	10	50	10	50	<20	20	50	10	300	70	20	150
204	1.5	7	70	10	30	<20	20	30	15	200	70	20	200
205	1.5	7	50	7	50	<20	15	50	10	200	70	20	200
206	1.0	7	70	15	30	N	20	30	10	150	70	15	70
207	1.0	7	30	7	30	N	15	30	7	300	70	15	100
208	1.0	10	50	10	30	N	20	20	10	100	100	15	150
209	1.0	10	30	10	30	N	15	30	7	100	70	15	100
210	1.0	7	20	10	30	N	10	30	5	150	50	20	100
211	1.5	7	30	10	30	N	15	30	7	150	50	15	100
212	1.0	7	50	7	30	N	20	30	7	200	50	20	150
213	1.0	10	50	15	30	<20	20	30	7	200	70	20	100
214	1.0	10	50	15	30	<20	20	50	10	200	70	20	200
215	1.0	10	50	10	70	<20	20	30	10	200	70	20	150
216	1.0	7	30	10	50	N	10	50	7	300	70	15	150
217	1.0	7	50	10	50	N	15	30	10	300	70	20	200
218	1.0	20	100	10	300	20	15	50	10	300	200	30	200
219	1.0	15	100	15	50	N	30	30	10	150	70	20	150
220	1.5	15	100	15	50	<20	30	30	15	150	100	30	200
221	<1.0	5	20	7	30	N	7	30	5	200	30	15	100
222	1.5	10	70	15	50	<20	15	30	10	200	70	20	200

Table 4. Results of analyses of soil samples from the Wah Wah Mountains Wilderness Study Area, Beaver and Millard Counties, Utah.

Sample	Latitude	Longitud	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-B	S-BA
201	38 39 14	113 34 50	2.0	5.0	10	.15	500	70	300
202	38 42 57	113 35 0	2.0	2.0	20	.15	300	50	200
203	38 42 50	113 35 14	3.0	2.0	10	.20	500	70	500
204	38 42 59	113 35 20	2.0	2.0	15	.15	500	50	300
205	38 42 52	113 36 10	3.0	1.5	10	.15	500	70	300
206	38 42 48	113 36 15	2.0	1.0	10	.10	300	70	300
207	38 41 43	113 35 28	2.0	1.5	10	.15	500	50	500
208	38 41 4	113 36 13	3.0	1.5	5	.20	500	70	300
209	38 33 9	113 33 9	2.0	7.0	10	.15	500	50	200
210	38 36 46	113 35 4	2.0	7.0	20	.10	500	50	200
211	38 39 38	113 34 54	2.0	5.0	10	.10	500	50	300
212	38 39 38	113 34 54	2.0	5.0	10	.15	700	50	500
213	38 40 30	113 34 19	2.0	2.0	10	.15	500	70	300
214	38 40 30	113 34 49	2.0	3.0	10	.15	500	50	300
215	38 41 20	113 34 39	2.0	3.0	10	.15	500	70	500
216	38 41 20	113 34 39	2.0	3.0	10	.15	500	50	500
217	38 42 13	113 34 37	2.0	1.5	10	.15	500	50	500
218	38 43 50	113 36 20	5.0	1.0	2	.50	700	15	500
219	38 44 5	113 35 25	3.0	1.5	10	.15	500	150	200
220	38 35 56	113 34 0	5.0	1.5	1	.50	1,000	50	500
221	38 34 20	113 34 46	1.5	10.0	20	.10	500	50	200
222	38 34 40	113 31 2	3.0	3.0	15	.20	1,000	50	500

Sample	S-BE	S-CO	S-CR	S-CU	S-LA	S-NB	S-NI	S-PB	S-SC	S-SR	S-V	S-Y	S-ZR
201	1.0	7	20	7	50	N	20	30	7	200	70	20	70
202	1.0	7	50	7	30	N	20	20	10	200	50	15	100
203	1.0	10	50	10	50	<20	20	50	10	300	70	20	150
204	1.5	7	70	10	30	<20	20	30	15	200	70	20	200
205	1.5	7	50	7	50	<20	15	50	10	200	70	20	200
206	1.0	7	70	15	30	N	20	30	10	150	70	15	70
207	1.0	7	30	7	30	N	15	30	7	300	70	15	100
208	1.0	10	50	10	30	N	20	20	10	100	100	15	150
209	1.0	10	30	10	30	N	15	30	7	100	70	15	100
210	1.0	7	20	10	30	N	10	30	5	150	50	20	100
211	1.5	7	30	10	30	N	15	30	7	150	50	15	100
212	1.0	7	50	7	30	N	20	30	7	200	50	20	150
213	1.0	10	50	15	30	<20	20	30	7	200	70	20	100
214	1.0	10	50	15	30	<20	20	50	10	200	70	20	200
215	1.0	10	50	10	70	<20	20	30	10	200	70	20	150
216	1.0	7	30	10	50	N	10	50	7	300	70	15	150
217	1.0	7	50	10	50	N	15	30	10	300	70	20	200
218	1.0	20	100	10	300	20	15	50	10	300	200	30	200
219	1.0	15	100	15	50	N	30	30	10	150	70	20	150
220	1.5	15	100	15	50	<20	30	30	15	150	100	30	200
221	<1.0	5	20	7	30	N	7	30	5	200	30	15	100
222	1.5	10	70	15	50	<20	15	30	10	200	70	20	200

Table 5.--Description of rock samples

W001	Bioclastic and oolitic limestone, medium light gray; very coarsely crystalline; rusty, weathered surface
W002	Limestone, dark gray, finely crystalline; 1-cm-thick bands interbedded with 3-cm-thick medium dark-gray dolomitic limestone; dolomitic rock is light olive gray on weathered surface
W003	Fissile shale, medium greenish gray
W004	Calcilutite with irregularly shaped, 1-cm-long areas of coarsely crystalline limestone, medium dark gray
W005	Calcilutite with silty partings, medium light gray, weathers light olive gray
W006	Calcilutite with trilobite hash and silty partings, medium light gray
W007	Limestone, dark gray, very finely crystalline; contains grayish-black chert nodules
W008	Dolomite, medium gray, medium crystalline, beds generally 1 foot thick; some show thin lamination
W009	Dolomite, dark gray, medium to coarsely crystalline
W010	Banded, coarse calcarenite to fine calcirudite, medium gray and light olive gray; composed of oolites and coarser fossil fragments
W011	Brecciated limestone collected within contact-metamorphic aureole; medium-gray mottled by light-olive-gray limestone; surficial coat is yellowish gray
W012	Breccia of limestone and chert; chert is both light brown and white and is coated with black, dendritic manganese oxide which is also interstitial to limestone fragments; sample is from within contact-metamorphic aureole
W013	Calcarenite, medium light gray to light olive gray, fine grained; with minor oolite and other bioclastic debris; red (hematite?) along partings
W014	Oolite-bearing micrite to very coarsely crystalline limestone, mottled medium gray to light gray, variably textured; light-brownish-gray and yellow-weathered surfaces
W015	Gray, fossiliferous calcarenite with fragments up to 1 cm long
W016	Dolomite, medium dark gray, fine to medium crystalline; <5% is composed of chert nodules and lenses that are 5 cm wide and 6->10 cm long and light gray in color

W017	Dolomite, medium gray, finely laminated; contains very light bluish-gray chert lenses
W018	Coarsely crystalline dolomite, light to very light gray
W019	Limestone, medium dark gray, thin-bedded, very finely crystalline; contains chert nodules; weathered surface is in places dark yellowish orange and grayish orange pink
W020	Andesite, greenish gray, porphyritic with lath-shaped, 4 mm long, plagioclase, hornblende, and biotite phenocrysts in an aphanitic groundmass; weathers light brownish gray
W021	Micritic limestone medium dark gray; interbedded with calcarenite; contains some chert
W022	Dolomite collected within contact-metamorphic aureole is cut by white, dolomite-filled veins
W023	Limestone, dark gray, very fine grained; collected within contact-metamorphic aureole is criss-crossed by calcite veins and on broken surfaces exhibits light-yellowish- and greenish-gray alteration
W024	Dolomite, medium light gray, coarsely crystalline; mottled with fine-grained, white calcite which is rimmed by epidote; collected within contact-metamorphic aureole
W025	Diorite or quartz diorite, medium light gray, medium grained (½-1 mm)
W026	Dolomite, dark gray, finely crystalline; collected within the contact-metamorphic aureole; thin coats of iron oxides along fractured surface
W027	Dolomitic marble, very light gray, coarse to very coarsely crystalline; disseminated, light-brown alteration after a metal oxide or sulfide (?); collected within the contact-metamorphic aureole
W028	Marble, coarsely crystalline; mottled red and grayish yellow by alteration and cut by hairline quartz veins
W029	Skarn of dolomite; light-greenish and yellowish-gray dolomite is groundmass to disseminated ½-mm-wide grains of garnet and a dark-green mineral suspected to be pyroxene; cut by 2-mm-wide quartz vein
W030	Skarn of limestone; consists of green aggregates of epidote within yellowish-gray carbonate matriz
W031	Skarn of silty limestone (?) is a fine grained, medium gray; contains greenish-gray garnet and yellowish-gray carbonate
W032	Dolomitic marble, light gray, coarsely crystalline yellowish alteration

W033	Dolomite, medium-light gray, texture ranging from fine to coarsely crystalline; areas of white, coarse dolomite crystals surrounded by finer gray and pinkish-gray dolomite; collected within contact-metamorphic aureole
W034	Dolomite weathered grayish yellow and orange
W035	Breccia of white dolomitic marble weathered pale yellowish orange and pink
W036	Limestone, medium gray, finely crystalline; bedded
W037	Quartz filling 3-mm-wide fractures spaced -4 cm apart in limestone
W038	Limestone, medium light gray, very finely crystalline
W039	Calcareous fault breccia composed of angular, gray and dark-gray limestone and dolomite fragments
W040	Dolomite, medium gray, medium crystalline
W041	Dolomite, medium gray, coarsely crystalline; contains rounded lenses and vugs of very coarsely crystalline, white dolomite
W042	Calcareous fault breccia composed of angular limestone fragments
W043	Micritic limestone, medium gray; contains lenticular black chert nodules ranging from <1 mm to 3 cm in length
W044	Limestone, gray
W045	Chert
W046	Brecciated calcite
W047	Micritic limestone, medium gray; fossiliferous
W048	Calcilutite, medium gray; thin-bedded (1 cm)
W049	1-2 cm wide, closely spaced calcite veins cut gray micritic limestone
W050	Composite of residual, red, hematite-stained limestone
W051	Limestone conglomerate with medium-light-gray subrounded clasts of micrite ranging 2 mm to 6 cm and larger in length within a very coarsely crystalline matrix both light gray and light olive gray in color
W052	Quartz silty limestone, medium gray, finely crystalline; sparse amount of brown chert
W053	Quartz silty limestone, medium gray, pinkish-gray weathered surface

W054	Dolomitic quartz sandstone, light to very light gray, medium to coarse grained
W055	Dolomite, dark gray, finely crystalline
W056	Dolomite, dark gray, finely crystalline; laminated
W057	Dolomitic sandstone, medium gray and light olive gray, fine grained; gradational with medium-dark-gray, burrowed, dolomite
W058	Fossiliferous calcarenite, medium light gray and olive gray
W059	Calcite vein within limestone
W060	1-2 cm wide, laterally discontinuous bands of very coarsely crystalline, dark-gray dolomite disrupted by an equal volume of lenses filled with coarser white to yellowish-gray dolomite crystals
W061	Angular cobbles of limestone in fault breccia; hematite on surface
W062	Fault gauge, mostly gray limestone fragments
W063	Calcite veins cutting light-gray chert, calcilutite
W064	Dolomite fracture-fill, pale grayish yellow, very coarsely crystalline
W065	Dolomitic limestone, medium light gray, finely crystalline; laminated
W066	Coarse dolomite calcarenite, medium light gray; contains thick lenses and bands of very coarse grained, white dolomite crystals and less abundant (-5%) and smaller layers of light-gray chert
W067	Composite chips of dolomite, very light gray to white, very coarsely crystalline (1-4 mm)
W068	Fine to medium calcarenite, medium dark gray, light-brownish-gray weathered surface; contains 2-in-thick gray chert bands
W069	Coarse calcarenite to calcilutite, medium gray
W070	Fossiliferous fine calcarenite to medium calcirudite, medium gray; thin-bedded
W071	Fossiliferous fine calcarenite to medium calcirudite, medium gray; thin-bedded
W072	Closely spaced (-3 inches apart), discontinuous beds of brown chert in limestone
W073	Brecciated dolomite light to very light gray, very coarsely crystalline; bluish chalcedony locally interstitial to angular fragments

W074	Composite of chips of limestone and dolomite breccia collected over 100-ft distance
W075	Massive dolomite, medium light gray, medium to finely crystalline
W076	Micritic limestone, medium gray; thin-bedded
W077	Limestone, medium gray, medium crystalline; minor chert
W078	Porphyritic dacite with hornblende and plagioclase phenocrysts; aphanitic groundmass varies in color locally from grayish to brownish black and to light brownish gray
W079	Dismicrite, medium gray; contains 5-mm-long pink-rimmed vugs of white, coarsely crystalline calcite
W080	Dolomite, medium gray, very coarsely crystalline; contains irregularly shaped 1- to 1.5-cm-long calcite-filled vugs
W081	Biomicrite, medium gray; cut by closely spaced (every 2-4 inches), ½-mm-wide fractures filled with white coarsely crystalline calcite; this limestone is thin-bedded and has a mottled light-yellow and brownish-gray weathered surface, contains bryozoan fossils, and has twice background radiation (20 vs 10 cps)
W082	Limestone, medium light gray, finely crystalline; massively bedded; cut by thin, calcite-filled fractures
W083	Limestone, light gray to olive gray, medium to coarsely crystalline; thick to massive bedded; also contains ½-mm buff-colored clasts of limestone
W084	Limestone, medium dark gray, medium to coarsely crystalline
W085	Limestone, medium gray, coarsely crystalline, whitish-buff calcite alteration
W086	Dolomite, very light ray, coarse to very coarsely crystalline; cliff-forming
W087	Micritic limestone, medium dark gray
W088	Dolomite, light gray, fine to coarsely crystalline
W089	Calcite vein in limestone; red hematite alteration
W090	Calcite veins cut medium-dark-gray limestone
W091	Dolomitized algal stromatolite
W092	Fault breccia of very angular, medium-gray dolomite, very coarse sand to fine pebble gravel in size cemented by very light gray aphanocrystalline limestone

W093	Limestone with rusty-red partings; thin-bedded (1-3")
W094	Dolomite, light gray, finely crystalline
W095	Dolomite, light gray, coarsely crystalline; yellowish-gray weathered surface; vugs filled with coarse dolomite crystals
W096	Bioclastic calcilutite, medium light gray; pink and grayish-yellow alteration on surface and along calcite veins
W097	Dolomitic limestone, medium light gray
W098	Porous coarse calcarenite (?) with vugs filled with extremely coarsely crystalline calcite; much of the rock is hematite stained
W099	Dolomite, medium light gray; laminated
W100	Dolomitic limestone, light gray, coarsely crystalline
W101	Dolomitic limestone, medium dark gray, medium crystalline
W102	Limestone, medium light gray, finely crystalline
W103	Calcilutite, medium light olive gray; contains trilobite fragments
W104	Dolomitic limestone, medium gray, medium to coarsely crystalline
W105	Dolomite, light gray, medium to coarsely crystalline
W106	Dolomite, very light gray, coarsely crystalline; contains coarser lens of crystalline dolomite and/or calcite
W107	Dolomite, medium light gray, fine to medium grained
W108	Limestone, very light gray, medium to coarsely crystalline; collected within contact-metamorphic aureole
W109	Skarn of dolomite; areas of pale bluish greenish gray within very light gray aphanitic groundmass
W110	Skarn of limestone; white, coarsely crystalline limestone mottled with finer grained, blue-greenish-gray areas and sparse grains of hematite
W111	Skarn of dolomite limestone; very coarsely crystalline rock composed of green epidote, brownish-black euhedral andradite, white calcite, and tremolite in nearly equal proportions
W112	Quartz sandstone, white, medium grained, yellowish-gray weathered surface
W113	Float sample of dolomite, medium dark gray, finely crystalline
W114	Quartz sandstone, yellowish to light olive gray, fine to medium grained

Table 5.--Continued

W115	Iron concretion in float of Tertiary-aged Conglomerate of Skull Rock Pass (Hintze, 1974a)
W116	Siliceous limestone, light brownish gray; finely laminated, fossiliferous
W117	Limestone, pale reddish brown to grayish red, fine to coarse grained; calcite veined and brecciated
W118	Dolomite, medium gray, medium crystalline
W119	Calcilutite, medium dark gray; contains chert lenses
W120	Chert, moderate red; botryoidal form; thin, translucent coat of light-bluish-gray silica covers part of the surface
W121	Coarse calcarenite, medium gray to light gray; contains dark-gray chert stringers and nodules
W122	Dacite flow rock, light gray; subporphyritic with biotite and minor quartz; contains small (<4-mm) rock fragments
W123	Calcarenite and calcilutite, medium dark gray; fossiliferous
W124	Fossiliferous calcilutite, medium dark gray; thin-bedded (1-3")
W125	Fine calcilutite, dark gray, finely laminated; alternate 1-cm-thick beds weather light olive gray; beds are generally 2 ft thick
W126	Limestone, medium dark gray; thick-bedded (-4 ft)
W127	Limestone, mottled medium dark gray and light brownish gray, medium to coarsely crystalline
W128	Limestone, medium gray, finely crystalline
W129	Fault breccia of angular, gray limestone fragments with calcareous, grayish-orange-pink cement
W130	Porphyritic flow-banded andesite with 2-4 mm laths of hornblende, plagioclase, and biotite; aphanitic groundmass is dark gray with pale-reddish-brown layers
W131	Fault breccia consists mainly of very light gray, fine calcirudite and angular fragments of medium-gray, coarsely crystalline limestone. Calcite veins stained reddish orange.
W132	Coarse calcarenite, light gray to brownish gray
W133	Chert, grayish red
W134	Dolomite, light to very light gray, medium to coarsely crystalline

Table 5.--Continued

W135	Dolomite, medium dark gray, fine to medium crystalline
W136	Dolomite, medium dark gray, medium crystalline
W137	Calcilutite, medium light gray