

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

**Analytical results and sample locality map
of stream-sediment samples from the Turtle Canyon Wilderness Study Area
(UT-060-067), Emery County, Utah**

By John H. Bullock Jr.*, Harlan N. Barton*,
Paul H. Briggs*, and Ted Roemer*

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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.

* U.S. Geological Survey, DFC, Box 25046, MS 973, Denver, CO 80225

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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 Turtle Canyon Wilderness Study Area (WSA), Emery County, Utah.

INTRODUCTION

In July 1986, the U.S. Geological Survey conducted a reconnaissance geochemical survey of the Turtle Canyon Wilderness Study Area (WSA) in northeast Emery County, Utah. The 33,690 acre (53 square mile) WSA is 10 miles northeast of Woodside, Utah, and 30 miles north of Green River, Utah (fig. 1). It is adjacent to Desolation Canyon Wilderness Study Area. The WSA is bounded on the north by the Emery County line and on the east by the Range Creek Road extending from the Emery County line to Turtle Canyon.

Access to the WSA is provided from U. S. Highway 6 which runs west of the WSA and from Utah State Highway 124 to the northwest. Both highways connect with a road that runs to the northwest corner and along the eastern border of the WSA and continues as a jeep trail along the southern boundary of the WSA.

The geology of the Turtle Canyon Wilderness Study Area is described by Cashion (1967). The WSA lies on the southern and southwestern structural limbs of the Uinta Basin. Rocks exposed in the WSA are sedimentary, deposited in marine, lacustrine, and continental environments, and range in age from Late Cretaceous to Middle Eocene. The rocks dip one to ten degrees northward toward the trough of the basin and are interrupted by only minor faults and folds.

Relief in the WSA is about 4,400 feet, rising from about 4,950 ft on Range Creek in the southeastern part of the WSA to 9,342 on the crest of an unnamed peak near the northwest corner of the WSA. The climate is arid to semiarid. It is heavily forested, with stands of Douglas Fir on the higher ridges and a mixed forest of Pinyon Pine and Juniper at lower altitudes.

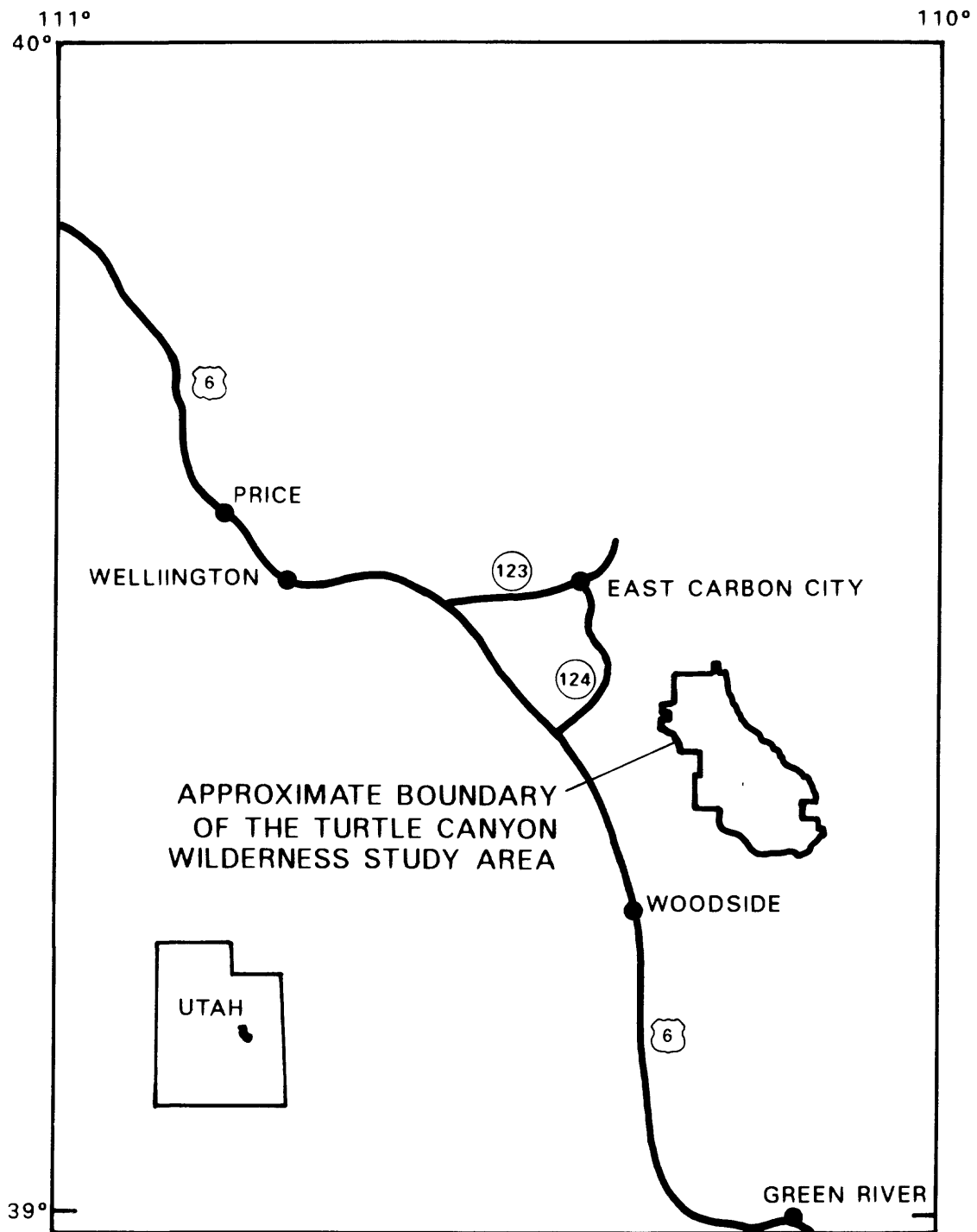
METHODS OF STUDY

Sample Media

Analyses of the 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.

Sample Collection

Samples were collected at 30 sites within the WSA or just outside the WSA but on stream drainages originating within the WSA. At all sites, both a stream-sediment sample and a heavy-mineral-concentrate sample were collected. Results of the analysis of the heavy-mineral-concentrate samples have been reported by Day and Barton (1987). Sampling density was about one sample site per 1.7 square miles. The area of the drainage basins sampled ranged from 0.5 to 2 square miles.



Index map of the Turtle Canyon Wilderness Study Area,
Emery County, Utah
FIG. 1

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) stream as shown on USGS topographic maps (scale = 1:24,000). Each sample was composited from several localities within an area that may extend as much as 50 feet from the site plotted on the map.

Sample Preparation

The stream-sediment samples were air dried, then sieved using an 80-mesh (0.17-mm) stainless-steel sieve. The portion of the sediment passing through the sieve was saved for analysis.

Sample Analysis

Spectrographic Method

Stream-sediment samples were analyzed for 31 elements using a 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.

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

Chemical Methods

The stream-sediment samples from the study area were also analyzed by inductively coupled plasma atomic emission spectroscopy (ICP), atomic absorption emission spectroscopy (AA), and ultraviolet fluorimetry (UF). The samples were analyzed for arsenic (As), antimony (Sb), bismuth (Bi), cadmium (Cd), and zinc (Zn) using ICP, gold (Au) using AA, and uranium (U) using UF. Limits of determination and references are listed in table 2.

Analytical results using these methods are listed in table 3.

ROCK ANALYSIS STORAGE SYSTEM

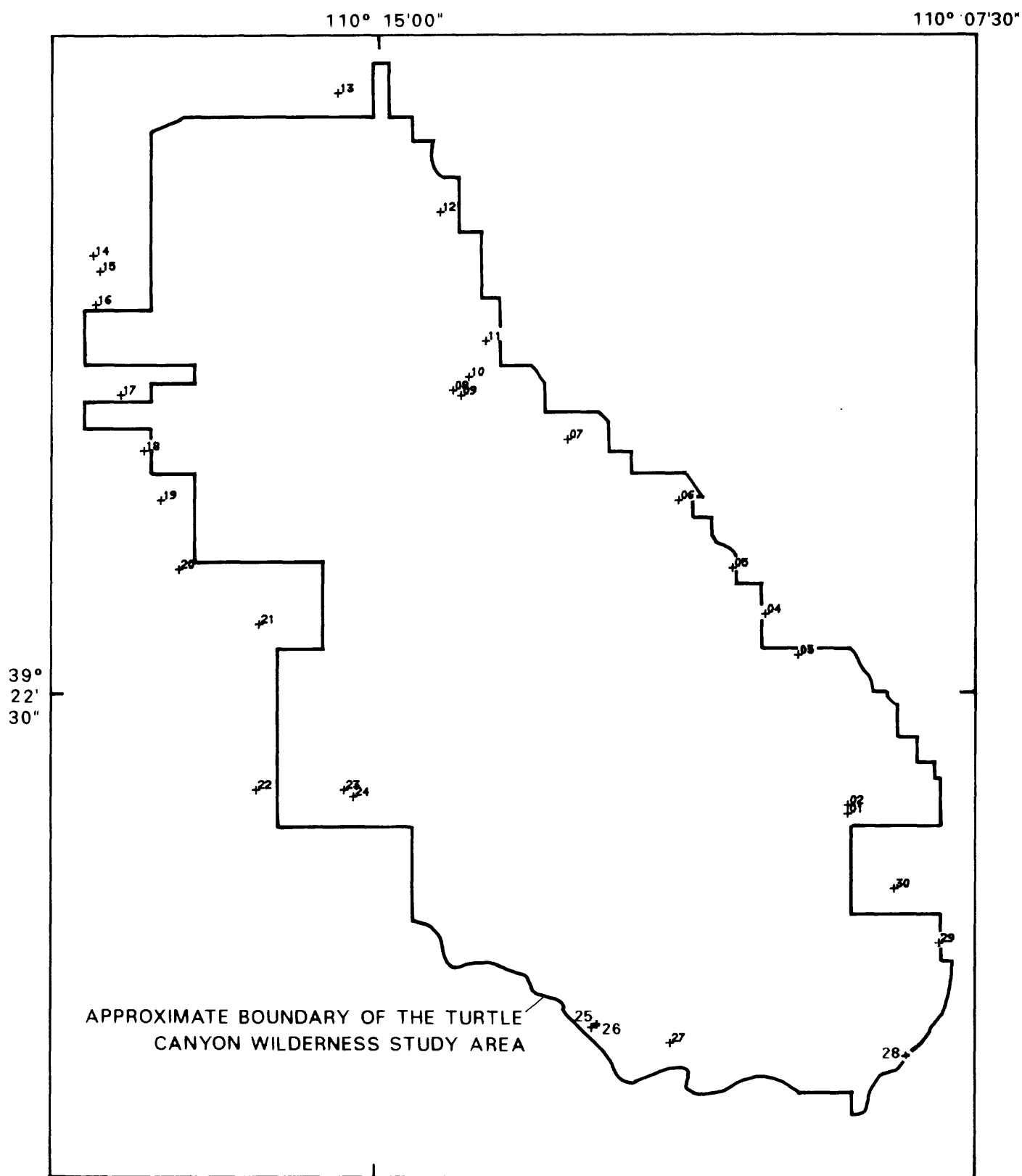
Upon completion of all analytical work, the analytical results were entered into a computer-based file called Rock Analysis Storage System (RASS). This data base contains both descriptive geological information and analytical data. Any or all of this information may be retrieved and converted to a binary form (STATPAC) for computerized statistical analysis or publication (VanTrump and Miesch, 1976).

DESCRIPTION OF DATA TABLES

Table 3 lists the results of analyses for stream-sediment samples from the Turtle Canyon Wilderness Study Area. 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 map (fig. 2). Columns in which the element headings show the letter "s" below the element symbol are emission spectrographic analyses, "aa" indicates atomic absorption analyses, "uf" indicates ultraviolet fluorimetric analyses, and "icp" indicates inductively couple plasma 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. For emission spectrographic analyses, a "less than" symbol (<) entered in the tables in front of the lower limit of determination indicates that the element was observed but was below the lowest reporting value. For ICP analyses, a "less than" symbol entered in the tables in front of the lower limit of determination indicates that the element was below the lowest reporting value. If an element was observed but was above the highest reporting value, a "greater than" symbol (>) was entered in front of the upper limit of determination. If an element was not looked for in a sample, two dashes (--) are entered in the tables in place of the analytical value. Because of the formatting used in the computer program that produced table 3, some of the elements listed in these tables (Fe, Mg, Ca, Ti, Ag, and Be) carry one or more nonsignificant digits to the right of the significant digits. The analysts did not determine these elements to the accuracy suggested by the extra zeros.

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Analytical results and sample locality map of stream-sediment samples from the Turtle Canyon Wilderness Study Area (UT-060-067), Emery County, Utah

FIG. 2

TABLE 1.--Limits of determination for the spectrographic analysis of rocks and stream sediments, 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 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)	10	2,000
Chromium (Cr)	10	5,000
Copper (Cu)	5	20,000
Lanthanum (La)	50	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)	20	10,000
Yttrium (Y)	10	2,000
Zinc (Zn)	200	10,000
Zirconium (Zr)	10	1,000
Thorium (Th)	100	2,000

TABLE 2.--Analytical methods used other than emission spectrography

[ICP = inductively coupled plasma spectroscopy; UF= ultraviolet fluorimetry;
AA = atomic absorption spectroscopy]

Element determined	Sample type	Method	Lower determination limit, ppm	References
Arsenic (As)	stream sediment	ICP	5	Crock and others, 1987.
Antimony (Sb)	stream sediment	ICP	2	
Bismuth (Bi)	stream sediment	ICP	2	
Cadmium (Cd)	stream sediment	ICP	0.1	
Zinc (Zn)	stream sediment	ICP	2	
Uranium (U)	stream sediment	UF	0.1	Centanni and others, 1956; O'Leary and Meier, 1986.
Gold (Au)	stream sediment	AA	0.1	Thompson and others, 1968; O'Leary and Meier, 1986.

TABLE 3--ANALYTICAL RESULTS OF STREAM-SEDIMENT SAMPLES FROM THE TURTLE CANYON WILDERNESS STUDY AREA, EMBURY COUNTY, UTAH.

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

Sample	Latitude	Longitude	Fe-pct. %	Hg-pct. %	Cu-pct. %	Tl-pct. %	Mn-ppt. ppm	Ag-ppt. ppm	As-ppt. ppm	Au-ppt. ppm	B-ppt. ppm	Ba-ppt. ppm
TC001S	39 21 23	110 9 7	2.0	2.0	2.0	.10	150	<.5	N	N	20	1,000
TC002S	39 21 28	110 9 7	2.0	2.0	1.0	.10	150	N	N	N	<10	1,000
TC003S	39 22 57	110 9 45	2.0	3.0	1.5	.07	150	N	N	N	10	1,000
TC004S	39 23 21	110 10 10	2.0	2.0	.7	.07	70	N	N	N	10	700
TC005S	39 23 44	110 10 35	3.0	3.0	1.0	.10	200	N	N	N	10	700
TC006S	39 24 28	110 11 16	3.0	1.5	.7	.10	100	N	N	N	10	1,000
TC007S	39 25 4	110 12 41	3.0	1.5	.7	.15	200	N	N	N	10	1,000
TC008S	39 25 33	110 14 8	1.5	1.0	.5	.07	70	N	N	N	<10	700
TC009S	39 25 30	110 14 2	5.0	2.0	1.0	.10	200	N	N	N	10	500
TC010S	39 25 41	110 13 56	2.0	1.5	.5	.07	100	N	N	N	<10	500
TC011S	39 26 2	110 13 43	1.5	1.0	.3	.07	50	N	N	N	<10	500
TC012S	39 27 18	110 14 18	3.0	1.5	.5	.07	100	N	N	N	<10	500
TC013S	39 28 28	110 15 36	2.0	1.0	.5	.10	150	N	N	N	15	1,000
TC014S	39 26 52	110 18 42	2.0	3.0	1.5	.10	300	N	N	N	15	700
TC015S	39 26 43	110 18 37	2.0	1.5	1.5	.10	150	N	N	N	15	1,000
TC016S	39 26 23	110 18 40	1.5	2.0	.5	.05	100	N	N	N	10	700
TC017S	39 25 30	110 18 21	2.0	2.0	1.0	.07	200	N	N	N	15	700
TC018S	39 24 57	110 18 3	1.5	2.0	.5	.05	100	N	N	N	10	500
TC019S	39 24 28	110 17 50	1.5	2.0	1.0	.07	150	N	N	N	10	700
TC020S	39 23 47	110 17 36	1.5	1.5	1.0	.07	70	N	N	N	20	1,000
TC021S	39 23 15	110 16 35	1.5	1.5	1.0	.15	200	N	N	N	20	700
TC022S	39 21 37	110 16 37	2.0	2.0	1.0	.10	200	N	N	N	10	3,000
TC023S	39 21 37	110 15 30	1.5	2.0	.7	.05	150	N	N	N	<10	500
TC024S	39 21 33	110 15 23	2.0	2.0	.5	.07	150	N	N	N	N	500
TC025S	39 19 17	110 12 22	2.0	3.0	2.0	.10	200	N	N	N	20	500
TC026S	39 19 19	110 12 18	1.5	1.5	1.0	.07	100	N	N	N	15	700
TC027S	39 19 8	110 11 22	2.0	2.0	.7	.10	200	N	N	N	15	700
TC028S	39 19 0	110 8 23	2.0	1.0	.5	.07	70	N	N	N	<10	1,000
TC029S	39 20 7	110 7 58	3.0	1.5	2.0	.20	200	N	N	N	50	1,500
TC030S	39 20 39	110 8 32	3.0	2.0	1.0	.07	70	N	N	N	15	700

TABLE 3--ANALYTICAL RESULTS OF STREAM-SEDIMENT SAMPLES FROM THE TURTLE CANYON WILDERNESS STUDY AREA, EMERY COUNTY,
UTAH.--Continued

Sample	Re-fpm S	Bi-ppm S	Cd-ppm S	Co-ppm S	Cr-ppm S	Cu-ppm S	La-ppm S	Mo-ppm S	Nb-ppm S	Mi-ppm S	Pb-ppm S	Sb-ppm S	Sc-ppm S	Sn-ppm S
TC001S	N	N	N	N	<10	7	N	N	N	5	<10	N	N	N
TC002S	N	N	N	N	<10	5	N	N	N	<5	10	N	N	N
TC003S	N	N	N	N	15	7	N	N	N	<5	<10	N	N	N
TC004S	N	N	N	N	15	5	<50	N	N	<5	<10	N	N	N
TC005S	N	N	N	N	30	7	N	N	N	10	10	N	<5	N
TC006S	N	N	N	N	10	7	N	N	N	7	<10	N	N	N
TC007S	N	N	N	N	15	5	N	N	N	5	10	N	N	N
TC008S	N	N	N	N	N	<5	N	N	N	<5	<10	N	N	N
TC009S	N	N	N	N	10	7	N	N	N	5	10	N	N	N
TC010S	N	N	N	N	<10	5	N	N	N	<5	10	N	N	N
TC011S	N	N	N	N	<10	<5	N	N	N	<5	10	N	N	N
TC012S	N	N	N	N	10	<5	N	N	N	<5	10	N	N	N
TC013S	N	N	N	N	<10	7	N	N	N	5	10	N	N	N
TC014S	N	N	N	N	<10	7	N	N	N	5	<10	N	<5	N
TC015S	N	N	N	N	10	7	N	N	N	5	<10	N	N	N
TC016S	N	N	N	N	10	7	N	N	N	<5	N	N	N	N
TC017S	N	N	N	N	<10	5	N	N	N	<5	10	N	N	N
TC018S	N	N	N	N	10	<5	N	N	N	N	<10	N	N	N
TC019S	N	N	N	N	<10	5	N	N	N	<5	N	N	N	N
TC020S	N	N	N	N	<10	5	N	N	N	<5	N	N	N	N
TC021S	N	N	N	N	<10	5	N	N	N	<5	10	N	N	N
TC022S	N	N	N	N	10	5	100	N	N	5	15	N	N	N
TC023S	N	N	N	N	<10	<5	N	N	N	<5	<10	N	N	N
TC024S	N	N	N	N	<10	5	N	N	N	<5	10	N	N	N
TC025S	N	N	N	N	10	7	N	N	N	7	<10	N	<5	N
TC026S	N	N	N	N	<10	5	N	N	N	<5	<10	N	N	N
TC027S	N	N	N	N	10	7	N	N	N	<5	10	N	N	N
TC028S	N	N	N	N	10	7	N	N	N	<5	<10	N	N	N
TC029S	<1	N	N	<10	15	10	<50	N	<20	15	<10	N	<5	N
TC030S	N	N	N	N	15	10	N	<5	N	5	10	N	N	N

TABLE 3--ANALYTICAL RESULTS OF STREAM-SEDIMENT SAMPLES FROM THE TURTLE CANYON WILDERNESS STUDY AREA, EMERY COUNTY,
UTAH.--Continued

Sample	Sr-ppm s	V-ppm s	W-ppm s	Y-ppm s	Zn-ppm s	Zr-ppm s	Th-ppm s	As-ppm icp	Bi-ppm icp	Cd-ppm icp	Sb-ppm icp	Zn-ppm icp	Au-ppm aa	U-ppm uf
TC001S	N	50	N	N	N	70	N	<5	<2	.3	<2	20	N	1.4
TC002S	N	100	N	N	N	100	N	<5	<2	.3	<2	21	N	1.3
TC003S	N	50	N	<10	N	70	N	<5	<2	.4	<2	27	N	1.1
TC004S	N	30	N	N	N	30	N	<5	<2	.3	<2	30	N	1.5
TC005S	N	100	N	<10	N	70	N	5	<2	.3	<2	32	N	1.2
TC006S	N	50	N	N	N	200	N	<5	<2	.2	<2	26	N	1.5
TC007S	N	100	N	N	N	150	N	<5	<2	.3	<2	33	N	1.6
TC008S	N	50	N	N	N	70	N	<5	<2	.2	<2	16	N	.8
TC009S	N	100	N	N	N	100	N	5	<2	.3	<2	32	N	1.7
TC010S	N	50	N	N	N	20	N	<5	<2	.2	<2	26	N	1.2
TC011S	N	30	N	N	N	70	N	<5	<2	.2	<2	27	N	1.1
TC012S	N	100	N	N	N	70	N	<5	<2	.3	<2	26	N	1.2
TC013S	N	50	N	N	N	200	N	<5	<2	.3	<2	27	N	1.3
TC014S	N	100	N	N	N	100	N	<5	<2	.3	<2	30	N	1.9
TC015S	N	50	N	N	N	70	N	<5	<2	.3	<2	28	N	1.5
TC016S	N	30	N	N	N	30	N	<5	<2	.2	<2	24	N	1.2
TC017S	N	50	N	<10	N	100	N	<5	<2	.2	<2	24	N	1.3
TC018S	N	70	N	N	N	20	N	<5	<2	.3	<2	24	N	1.1
TC019S	N	30	N	15	N	150	N	<5	<2	.2	<2	21	N	.9
TC020S	N	50	N	N	N	20	N	<5	<2	.3	<2	24	N	1.1
TC021S	N	100	N	N	N	100	N	<5	<2	.2	<2	26	N	1.2
TC022S	N	70	N	20	N	200	N	5	<2	.3	<2	24	N	1.1
TC023S	N	70	N	N	N	70	N	<5	<2	.2	<2	28	N	1.5
TC024S	N	70	N	N	N	100	N	<5	<2	.3	<2	27	N	1.9
TC025S	N	100	N	<10	N	100	N	6	<2	.4	<2	28	N	1.2
TC026S	N	30	N	N	N	70	N	<5	<2	.2	<2	17	N	1.0
TC027S	N	100	N	N	N	100	N	<5	<2	.3	<2	28	N	1.2
TC028S	N	70	N	N	N	50	N	<5	<2	.4	<2	36	N	1.0
TC029S	N	70	N	10	N	200	N	<5	<2	.3	<2	27	N	1.7
TC030S	N	50	N	N	N	70	N	<5	<2	.3	<2	29	N	1.5