UNITED STATES DEPARTMENT OF THE INTERIOR

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Analytical results and sample locality map of stream-sediment, heavy-mineral-concentrate, and rock samples from the Red Mountain Wilderness Study Area (UT-40-132), Washington County, 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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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 Red Mountain Wilderness Study Area, Washington County, Utah.

INTRODUCTION

In April 1986, the U.S. Geological Survey conducted a reconnaissance geochemical survey of the Red Mountain Wilderness Study Area, Washington County, Utah.

The Red Mountain Wilderness Study Area comprises about 27.3 mi^2 (17,450 acres in the southwest corner of Washington County, Utah, and lies about 10 mi northwest of St. George, Utah (see fig. 1).

Access to the study area is provided on the east by highway 18 and on the west by the road through Santa Clara leading to the Gunlock Reservoir. Access within the area is limited to a few four-wheel-drive roads.

The study area lies along the transition zone between Basin and Range on the west and the Colorado Plateau on the east. The area is dominantly covered by flat-lying to gently dipping sandstone of Triassic to Jurassic age namely the Navajo formation. This red to white eolian formation is approximately 1,500-2,000 ft thick and is characterized by large scale cross bedding. In the northwestern part of this area the sandstone is overlain by a thin flow of Quaternary basalt. Volcanism is readily apparent a few miles to the north and west of the area.

The study area is bounded by steep escarpments on the south, west, and east but slopes more gradually to the north. Elevations range from 3,200 ft just north of Twins to 5,570 ft at the top of Snow Mountain in the northeast central part of the area. The area is drained by a network of intermittent streams that run northerly for the majority of the area. The area above 4,500 ft is covered by a woodland of pinyon and juniper trees with many open meadows. The climate is arid to semiarid.

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

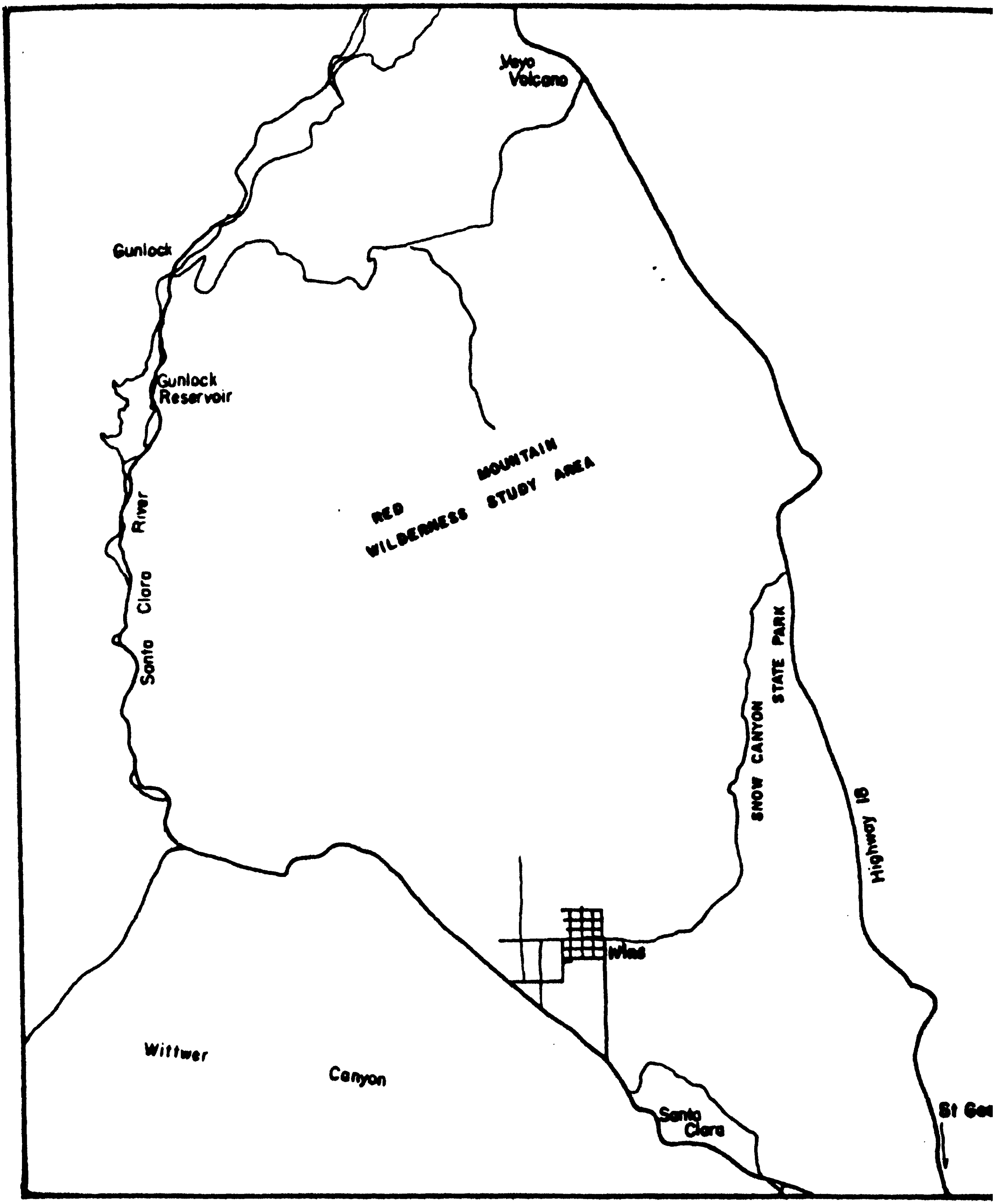

Figure 1. Location map of the Red Mountain Wilderness Study Area, Washington County, Utah.

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

Sample Collection

Samples were collected at 38 sites (plate 1). At nearly all of those sites, both a stream-sediment sample and a heavy-mineral-concentrate sample were collected. Where suitable outcrop was available, rock samples were collected. Average sampling density was about one sample site per 7 mi^2 for the stream sediments and heavy-mineral concentrates, and about one sample site per .8 mi^2 for the rocks. The area of the drainage basins sampled ranged from .5 mi^2 to 2 mi^2.

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 as shown on USGS topographic maps (scale = 1:24,000).

Heavy-mineral-concentrate samples

Heavy-mineral-concentrate samples were collected from the same active alluvium as the stream-sediment samples. Each bulk sample was screened with a 2.0-mm (10-mesh) screen to remove the coarse material. The less than 2.0-mm fraction was panned until most of the quartz, feldspar, organic material, and clay-sized material were removed.

Rock samples

Rock samples were collected from outcrops or exposures in the vicinity of the plotted site locations. Samples were collected from unaltered and altered rocks.

Sample Preparation

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 saved for analysis.

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

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.

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

Sample Analysis

Spectrographic method

The stream-sediment, heavy-mineral-concentrate, and rock 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 weignt percent; all others are given in parts per million (micrograms/gram). Analytical data for samples from the Red Mountain Wilderness Study Area are listed in tables 3-5.

Chemical methods

Other methods of analysis for the determination of Au, As, Bi, Cd, Sb, Th, U, and Zn were used on samples from the Red Mountain Wilderness Study Area and are summarized in table 2.

Analytical results for stream-sediment, heavy-mineral-concentrate, and rock samples are listed in tables 3, 4, and 5, respectively.

ROCK ANALYSIS STORAGE SYSTEM

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

DESCRIPTION OF DATA TABLES

Tables 3-5 list the results of analyses for the samples of stream sediment, heavy-mineral concentrate, and rock, respectively. For the three tables, the data are arranged so that column 1 contains the USGS-assigned sample numbers. These numbers correspond to the numbers shown on the site location maps (plate 1). Columns in which the element headings show the letter "s" below the element symbol are emission spectrographic analyses; "aa" indicates atomic absorption analyses; ICP indicates inductively coupled plasma atomic emission spectroscopy; DNA indicates delayed neutron activation. 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. If an element was not looked for in a sample, two dashes (--) are entered in tables 3-5 in place of an analytical value. Because of the formatting used in the computer program that produced tables 3-5, 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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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 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; ICP = inductively coupled plasma spectroscopy]

Element or constituent determined	Sample type	Method	Determination limit (micrograms/ gram or ppm)	Reference
Gold (Au)		AA	0.05	Thompson and others, 1968.
Arsenic (As)		ICP	5	Crock and others, 1987.
Antimony (Sb)		ICP	2	
Zinc (Zn)		ICP	2	
Bismuth (Bi)		ICP	2	
Cadmium (Cd)		ICP	.1	
Uranium (U)		DNA	0.05 or 1	McKown and Millard, 1987.
Thorium (Th)				

TABLE 3. RESULTS FROM THE ANALYSES OF STREAM-SEDIMENT SAMPLES FROM THE RED MOUNTAIN WILDERNESS STUDY AREA, 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. s	Mg-pct. s	Ca-pct. s	Ti-pct. s	Mn-ppm s	Ag-ppm s	As-ppm s	Au-ppm s	B-ppm s	Ba-ppm s
RM100S	37 17 15	113 40 0	.07	<.02	<.05	.020	N	N	N	N	10	200
RM101S	37 16 52	113 41 43	.07	.02	<.05	.050	15	N	N	N	10	150
RM102S	37 17 17	113 41 8	.07	<.02	<.05	.030	20	N	N	N	<10	100
RM103S	37 15 30	113 42 32	.10	.02	<.05	.030	20	N	N	N	10	100
RM104S	37 15 5	113 42 16	.10	.02	<.05	.030	10	N	N	N	10	100
RM105S	37 15 51	113 43 51	.15	.03	<.05	.050	30	N	N	N	20	150
RM106S	37 16 26	113 42 54	.30	<.02	<.05	.050	1,000	N	N	N	15	500
RM107S	37 15 12	113 45 55	.20	.02	.05	.050	30	N	N	N	<10	20
RM108S	37 14 14	113 46 22	.20	.03	.10	.050	50	N	N	N	10	100
RM109S	37 13 50	113 44 20	.30	.02	<.05	.050	500	N	N	N	30	200
RM110S	37 13 48	113 44 20	.50	.03	<.05	.070	700	N	N	N	10	300
RM111S	37 15 4	113 43 42	.20	<.02	<.05	.050	300	N	N	N	20	150
RM112S	37 12 54	113 43 22	.15	.07	.10	.050	30	N	N	N	20	100
RM113S	37 12 54	113 43 18	.15	<.02	<.05	.050	30	N	N	N	20	70
RM114S	37 14 12	113 39 12	<.05	N	N	.010	<10	N	N	N	10	<20
RM115S	37 13 57	113 39 28	N	N	N	.010	N	N	N	N	10	20
RM200S	37 16 18	113 38 41	.70	.50	1.50	.150	100	N	N	N	50	500
RM201S	37 17 17	113 40 8	.07	<.02	<.05	.015	20	N	N	N	10	200
RM202S	37 17 2	113 39 6	.10	<.02	<.05	.020	15	N	N	N	20	150
RM203S	37 16 17	113 40 45	.10	.02	<.05	.030	20	N	N	N	10	150
RM204S	37 15 20	113 41 53	.07	<.02	<.05	.020	N	N	N	N	10	50
RM205S	37 15 7	113 43 23	.30	.02	<.05	.050	50	N	N	N	10	100
RM206S	37 15 8	113 43 22	.20	.03	.05	.070	50	N	N	N	15	150
RM207S	37 15 40	113 43 18	.20	<.02	<.05	.020	100	N	N	N	10	100
RM208S	37 16 37	113 43 25	.07	N	<.05	.020	10	N	N	N	10	50
RM209S	37 16 43	113 44 14	.20	.03	.07	.070	30	N	N	N	10	150
RM210S	37 16 35	113 45 12	.07	<.02	<.05	.030	10	N	N	N	<10	50
RM211S	37 12 34	113 41 35	1.50	1.00	1.00	.150	200	N	N	N	100	200
RM212S	37 12 35	113 41 17	.10	<.02	<.05	.030	<10	N	N	N	15	100
RM213S	37 12 30	113 41 17	.10	.05	.05	.020	10	N	N	N	10	30
RM214S	37 11 42	113 41 38	1.00	.70	.70	.100	100	N	N	N	50	150
RM215S	37 11 25	113 41 17	.50	.50	.20	.070	50	N	N	N	30	150
RM216S	37 12 34	113 42 9	.15	.15	.15	.070	15	N	N	N	50	100
RM217S	37 12 40	113 42 38	.30	.20	.15	.070	20	N	N	N	15	100
RM218S	37 12 52	113 44 28	.30	.20	.15	.070	30	N	N	N	20	100
RM219S	37 12 51	113 44 26	.50	.30	.50	.100	50	N	N	N	20	100
RM220S	37 12 57	113 43 44	.07	<.02	<.05	.020	10	N	N	N	15	20
RM221S	37 14 32	113 39 57	.05	<.02	<.05	.030	<10	N	N	N	20	100

TABLE 3. RESULTS FROM THE ANALYSES OF STREAM-SEDIMENT SAMPLES FROM THE RED MOUNTAIN WILDERNESS STUDY AREA, UTAH--Continued

Sample	Be-ppm s	Bi-ppm s	Cd-ppm s	Co-ppm s	Cr-ppm s	Cu-ppm s	La-ppm s	Mo-ppm s	Nb-ppm s	Ni-ppm s	Pb-ppm s	Sb-ppm s	Sc-ppm s
RM100S	<1	N	N	N	N	N	N	N	N	N	N	N	N
RM101S	<1	N	N	N	N	N	N	N	N	N	N	N	N
RM102S	<1	N	N	N	N	N	N	N	N	N	N	N	N
RM103S	<1	N	N	N	N	<5	N	N	N	N	N	N	N
RM104S	<1	N	N	N	N	N	N	N	N	N	N	N	N
RM105S	<1	N	N	N	N	N	N	N	N	N	N	N	N
RM106S	<1	N	N	5	N	<5	N	N	N	N	N	N	N
RM107S	N	N	N	N	N	N	N	N	N	N	N	N	N
RM108S	N	N	N	N	N	7	N	N	N	N	N	N	N
RM109S	<1	N	N	N	N	N	N	N	N	N	N	N	N
RM110S	<1	N	N	N	10	N	N	N	N	N	N	N	N
RM111S	<1	N	N	N	10	N	N	N	N	N	N	N	N
RM112S	<1	N	N	N	N	N	N	N	N	N	N	N	N
RM113S	<1	N	N	N	N	N	N	N	N	N	N	N	N
RM114S	<1	N	N	N	N	N	N	N	N	N	N	N	N
RM115S	<1	N	N	N	N	N	N	N	N	N	N	N	N
RM200S	<1	N	N	N	20	10	N	N	N	5	N	N	5
RM201S	N	N	N	N	N	N	N	N	N	N	N	N	N
RM202S	<1	N	N	N	N	N	N	N	N	N	N	N	N
RM203S	<1	N	N	N	N	N	N	N	N	N	N	N	N
RM204S	<1	N	N	N	N	N	N	N	N	N	N	N	N
RM205S	<1	N	N	N	N	N	N	N	N	N	N	N	N
RM206S	<1	N	N	N	<10	<5	N	N	N	N	N	N	N
RM207S	<1	N	N	N	50	N	N	N	N	N	N	N	N
RM208S	<1	N	N	N	N	N	N	N	N	N	N	N	N
RM209S	<1	N	N	N	<10	N	N	N	N	N	N	N	N
RM210S	<1	N	N	N	N	N	N	N	N	N	N	N	N
RM211S	1	N	N	10	20	15	30	N	N	10	<10	N	7
RM212S	<1	N	N	N	N	N	N	N	N	N	N	N	N
RM213S	<1	N	N	N	N	N	N	N	N	N	N	N	N
RM214S	<1	N	N	5	10	7	20	N	N	7	N	N	5
RM215S	<1	N	N	N	<10	5	N	N	N	5	N	N	N
RM216S	<1	N	N	N	N	N	N	N	N	N	N	N	N
RM217S	<1	N	N	N	N	N	N	N	N	N	N	N	N
RM218S	<1	N	N	N	<10	<5	N	N	N	N	N	N	N
RM219S	<1	N	N	N	<10	<5	N	N	N	5	N	N	N
RM220S	N	N	N	N	N	N	N	N	N	N	N	N	N
RM221S	<1	N	N	N	N	N	N	N	N	N	N	N	N

TABLE 3. RESULTS FROM THE ANALYSES OF STREAM-SEDIMENT SAMPLES FROM THE RED MOUNTAIN WILDERNESS STUDY AREA, UTAH--Continued

Sample	Sn-ppm s	Sr-ppm s	V-ppm s	W-ppm s	Y-ppm s	Zn-ppm s	Zr-ppm s	Th-ppm s	Au-ppm ICP	As-ppm ICP	Bi-ppm ICP	Cd-ppm ICP	Sb-ppm ICP	Zn-ppm ICP
RM100S	N	N	10	N	N	N	200	N	<.1	<5	<2	<.1	<2	<2
RM101S	N	N	10	N	N	N	100	N	<.1	<5	<2	<.1	<2	3
RM102S	N	N	10	N	N	N	200	N	<.1	<5	<2	<.1	<2	2
RM103S	N	N	<10	N	N	N	1,000	N	<.1	5	<2	<.1	5	2
RM104S	N	N	<10	N	N	N	150	N	<.1	<5	<2	<.1	3	2
RM105S	N	N	10	N	N	N	70	N	<.1	<5	<2	<.1	2	3
RM106S	N	N	20	70	N	N	100	N	<.1	79	<2	<.1	46	10
RM107S	N	N	15	N	N	N	200	N	<.1	6	<2	<.1	3	3
RM108S	N	N	10	N	N	N	150	N	<.1	9	<2	<.1	3	4
RM109S	N	N	20	N	N	N	200	N	<.1	16	<2	<.1	7	6
RM110S	N	N	20	N	10	N	200	N	<.1	9	<2	<.1	5	6
RM111S	N	N	10	N	N	N	200	N	<.1	9	<2	<.1	7	5
RM112S	N	N	<10	N	N	N	50	N	<.1	<5	<2	<.1	2	3
RM113S	N	N	10	N	<10	N	150	N	<.1	<5	<2	<.1	2	2
RM114S	N	N	N	N	N	N	50	N	<.1	<5	<2	<.1	<2	<2
RM115S	N	N	N	N	N	N	700	N	<.1	<5	<2	<.1	<2	<2
RM200S	N	100	50	N	10	N	150	N	<.1	8	<2	<.1	<2	17
RM201S	N	N	<10	N	N	N	100	N	<.1	<5	<2	<.1	<2	3
RM202S	N	N	10	N	<10	N	500	N	<.1	<5	<2	<.1	<2	3
RM203S	N	N	10	N	N	N	500	N	<.1	<5	<2	<.1	<2	3
RM204S	N	N	<10	N	N	N	70	N	<.1	<5	<2	<.1	<2	<2
RM205S	N	N	15	N	<10	N	50	N	<.1	6	<2	<.1	11	5
RM206S	N	N	15	N	<10	N	100	N	<.1	7	<2	<.1	10	6
RM207S	N	N	10	N	N	N	50	N	<.1	13	<2	<.1	10	3
RM208S	N	N	<10	N	N	N	100	N	<.1	<5	<2	<.1	<2	3
RM209S	N	N	10	N	<10	N	700	N	<.1	5	<2	<.1	4	4
RM210S	N	N	<10	N	<10	N	30	N	<.1	<5	<2	<.1	<2	<2
RM211S	N	100	50	N	15	N	150	N	<.1	<5	<2	<.1	2	23
RM212S	N	N	<10	N	N	N	200	N	<.1	<5	<2	<.1	<2	<2
RM213S	N	N	<10	N	N	N	50	N	<.1	<5	<2	<.1	<2	3
RM214S	N	100	30	N	10	N	100	N	<.1	<5	<2	<.1	<2	18
RM215S	N	N	20	N	<10	N	70	N	<.1	<5	<2	<.1	<2	8
RM216S	N	N	10	N	N	N	100	N	<.1	<5	<2	<.1	<2	3
RM217S	N	N	10	N	N	N	200	N	<.1	<5	<2	<.1	4	7
RM218S	N	N	10	N	N	N	150	N	<.1	<5	<2	<.1	3	6
RM219S	N	N	20	N	10	N	100	N	<.1	<5	<2	<.1	<2	6
RM220S	N	N	<10	N	N	N	100	N	<.1	<5	<2	<.1	<2	<2
RM221S	N	N	<10	N	<10	N	200	N	<.1	<5	<2	<.1	<2	3

TABLE 4. RESULTS FROM THE ANALYSES OF HEAVY-MINERAL-CONCENTRATE SAMPLES FROM THE RED MOUNTAIN WILDERNESS STUDY AREA, 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. s	Mg-pct. s	Ca-pct. s	Ti-pct. s	Mn-ppm s	Ag-ppm s	As-ppm s	Au-ppm s
RM100C	37 17 15	113 40 0	.5	N	<.1	1.5	50	N	N	N
RM101C	37 16 52	113 41 43	.5	<.05	<.1	2.0	100	N	N	N
RM102C	37 17 17	113 41 8	.7	<.05	<.1	2.0	100	N	N	N
RM103C	37 15 30	113 32 32	.5	<.05	<.1	2.0	100	N	N	N
RM104C	37 15 5	113 42 16	1.5	.05	<.1	2.0	150	N	N	N
RM105C	37 15 51	113 43 51	.7	.05	<.1	2.0	70	N	N	N
RM106C	37 16 26	113 42 54	.7	<.05	<.1	.7	200	N	N	N
RM107C	37 15 12	113 45 55	.5	<.05	<.1	1.0	70	N	N	N
RM108C	37 14 14	113 46 22	1.5	.07	<.1	2.0	150	N	N	N
RM109C	37 13 50	113 44 20	.7	<.05	<.1	2.0	100	N	N	N
RM110C	37 13 48	113 44 20	2.0	<.05	<.1	1.5	700	N	N	N
RM111C	37 15 4	113 43 42	1.0	<.05	<.1	2.0	500	N	N	N
RM112C	37 12 54	113 43 22	1.5	<.05	<.1	2.0	500	N	N	N
RM113C	37 12 54	113 43 18	1.5	<.05	<.1	2.0	150	N	N	N
RM114C	37 14 12	113 39 12	.7	<.05	<.1	2.0	150	N	N	N
RM115C	37 13 57	113 39 28	1.0	<.05	<.1	2.0	150	N	N	N
RM200C	37 16 18	113 38 41	.7	.05	<.1	2.0	700	N	N	N
RMM201C	37 17 17	113 40 8	.3	<.05	<.1	2.0	70	N	N	N
RM202C	37 17 2	113 39 6	.3	<.05	<.1	1.5	70	N	N	N
RM203C	37 16 17	113 40 45	.7	<.05	<.1	2.0	100	N	N	N
RM204C	37 15 20	113 41 53	1.0	.07	<.1	>2.0	150	N	N	N
RM205C	37 15 7	113 43 23	.5	<.05	<.1	2.0	70	N	N	N
RM206C	37 15 8	113 43 22	2.0	.05	<.1	2.0	150	N	N	N
RM207C	37 15 40	113 43 18	.7	<.05	<.1	2.0	200	N	N	N
RM208C	37 16 37	113 43 25	.7	<.05	<.1	2.0	100	N	N	N
RM209C	37 16 43	113 44 14	.7	.10	<.1	2.0	100	N	N	N
RM210C	37 16 35	113 45 12	5.0	.15	.1	2.0	300	N	N	N
RM211C	37 12 34	113 41 35	3.0	.30	.5	2.0	300	N	N	N
RM212C	37 12 35	113 41 17	1.0	.05	<.1	>2.0	100	N	N	N
RM213C	37 12 30	113 41 17	1.0	.05	.1	2.0	50	N	N	N
RM214C	37 11 42	113 41 38	1.5	.20	.3	2.0	200	N	N	N
RM215C	37 11 25	113 41 17	3.0	.05	.1	2.0	300	N	N	N
RM216C	37 12 34	113 42 9	.7	<.05	<.1	2.0	100	N	N	N
RM217C	37 12 40	113 42 38	.7	<.05	<.1	1.0	70	N	N	N
RM218C	37 12 52	113 44 28	.7	.10	.1	>2.0	100	N	N	N
RM219C	37 12 51	113 44 26	1.0	.20	.1	2.0	200	N	N	N
RM220C	37 12 57	113 43 11	2.0	<.05	<.1	2.0	300	N	N	N
RM221C	37 14 32	113 39 57	.7	.07	<.1	1.5	70	N	N	N

TABLE 4. RESULTS FROM THE ANALYSES OF HEAVY-MINERAL-CONCENTRATE SAMPLES FROM THE RED MOUNTAIN WILDERNESS STUDY AREA, UTAH--Continued

Sample	B-ppm s	Ba-ppm s	Be-ppm s	Bi-ppm s	Cd-ppm s	Co-ppm s	Cr-ppm s	Cu-ppm s	La-ppm s	Mo-ppm s	Nb-ppm s
RM100C	100	>10,000	N	N	N	N	70	<10	N	N	N
RM101C	100	>10,000	N	N	N	N	200	N	<50	N	<50
RM102C	200	>10,000	N	N	N	N	300	N	N	N	N
RM103C	150	2,000	N	N	N	N	70	N	N	N	<50
RM104C	300	3,000	N	N	N	N	500	N	70	N	N
RM105C	200	1,000	N	N	N	N	70	N	70	N	N
RM106C	50	3,000	N	N	N	N	<20	N	100	N	<50
RM107C	70	1,500	N	N	N	N	50	N	N	N	<50
RM108C	300	2,000	N	N	N	N	500	N	100	N	N
RM109C	150	500	N	N	N	N	200	N	70	N	<50
RM110C	100	500	N	N	N	N	300	N	100	N	N
RM111C	200	500	N	N	N	N	300	N	<50	N	N
RM112C	200	7,000	N	N	N	N	200	N	N	N	<50
RM113C	200	1,000	N	N	N	N	150	N	70	N	N
RM114C	150	1,500	N	N	N	N	150	N	N	N	<50
RM115C	200	>10,000	N	N	N	N	300	N	N	N	<50
RM200C	500	>10,000	N	N	N	N	300	N	50	N	N
RMM201C	70	>10,000	N	N	N	N	20	N	N	N	N
RM202C	70	>10,000	N	N	N	N	150	N	N	N	N
RM203C	100	5,000	N	N	N	N	50	N	N	N	N
RM204C	300	7,000	N	N	N	N	50	N	N	N	N
RM205C	150	3,000	N	N	N	N	30	N	150	N	N
RM206C	200	2,000	<2	N	N	N	100	N	150	N	N
RM207C	200	5,000	N	N	N	N	70	N	N	N	N
RM208C	150	2,000	N	N	N	N	150	N	N	N	N
RM209C	500	>10,000	N	N	N	N	70	N	100	N	N
RM210C	1,000	7,000	N	N	N	<10	700	N	100	N	N
RM211C	500	>10,000	N	N	N	N	200	<10	70	N	50
RM212C	300	2,000	N	N	N	N	100	N	N	N	N
RM213C	200	2,000	N	N	N	N	100	N	N	N	N
RM214C	200	3,000	N	N	N	N	150	<10	150	N	<50
RM215C	200	5,000	N	N	N	N	300	N	<50	N	N
RM216C	70	10,000	N	N	N	N	70	N	N	N	N
RM217C	100	5,000	N	N	N	N	100	N	N	N	N
RM218C	200	2,000	N	N	N	N	50	N	70	N	N
RM219C	300	>10,000	N	N	N	N	70	N	N	N	<50
RM220C	150	3,000	N	N	N	N	150	N	N	N	N
RM221C	500	5,000	N	N	N	N	700	N	N	N	N

TABLE 4. RESULTS FROM THE ANALYSES OF HEAVY-MINERAL-CONCENTRATE SAMPLES FROM THE RED MOUNTAIN WILDERNESS STUDY AREA, UTAH--Continued

Sample	Ni-ppm s	Pb-ppm s	Sb-ppm s	Sc-ppm s	Sn-ppm s	Sr-ppm s	V-ppm s	W-ppm s	Y-ppm s	Zn-ppm s	Zr-ppm s	Th-ppm s
RM100C	N	N	N	100	N	200	70	N	300	N	>2,000	N
RM101C	N	N	N	>200	N	N	150	N	700	N	>2,000	N
RM102C	N	N	N	>200	N	N	150	N	500	N	>2,000	N
RM103C	N	20	N	>200	N	N	100	N	500	N	>2,000	N
RM104C	<10	30	N	200	<20	N	150	N	700	N	>2,000	N
RM105C	N	N	N	100	N	N	100	N	300	N	>2,000	N
RM106C	N	<20	N	150	N	N	100	N	500	N	>2,000	N
RM107C	<10	N	N	150	N	N	100	N	700	N	>2,000	N
RM108C	N	100	N	150	N	N	150	N	700	N	>2,000	N
RM109C	N	<20	N	200	N	N	100	N	500	N	>2,000	N
RM110C	N	<20	N	150	N	N	100	N	500	N	>2,000	N
RM111C	N	<20	N	200	N	N	100	N	700	N	>2,000	N
RM112C	N	<20	N	150	N	N	150	N	700	N	>2,000	N
RM113C	N	<20	N	200	<20	N	150	N	500	N	>2,000	N
RM114C	N	<20	N	150	N	N	100	N	700	N	>2,000	N
RM115C	N	<20	N	150	N	N	100	N	700	N	>2,000	N
RM200C	N	<20	N	150	N	N	150	N	500	N	>2,000	N
RMM201C	N	N	N	150	N	<200	100	N	500	N	>2,000	N
RM202C	N	N	N	100	N	N	70	N	500	N	>2,000	N
RM203C	N	20	N	200	N	N	100	N	500	N	>2,000	N
RM204C	N	30	N	>200	N	N	150	N	700	N	>2,000	N
RM205C	N	20	N	200	N	N	150	N	500	N	>2,000	N
RM206C	N	20	N	200	50	N	200	N	500	N	>2,000	N
RM207C	N	<20	N	>200	N	N	100	N	700	N	>2,000	N
RM208C	N	20	N	>200	N	N	100	N	500	N	>2,000	N
RM209C	N	30	N	150	N	N	100	N	500	N	>2,000	N
RM210C	N	N	N	200	N	N	150	N	500	N	>2,000	N
RM211C	N	50	N	100	30	5,000	100	N	500	N	>2,000	N
RM212C	N	<20	N	200	N	N	150	N	700	N	>2,000	N
RM213C	N	<20	N	200	N	N	100	N	700	N	>2,000	N
RM214C	N	N	N	100	N	1,000	100	N	500	N	>2,000	N
RM215C	N	70	N	100	N	5,000	200	N	500	N	>2,000	N
RM216C	N	N	N	200	N	N	150	N	500	N	>2,000	N
RM217C	N	N	N	100	N	N	100	N	300	N	>2,000	N
RM218C	N	<20	N	>200	20	N	150	N	500	N	>2,000	N
RM219C	N	N	N	100	50	N	100	N	300	N	>2,000	N
RM220C	N	20	N	150	N	N	150	N	500	N	>2,000	N
RM221C	N	N	N	100	N	N	100	N	300	N	>2,000	N

TABLE 5. RESULTS FROM THE ANALYSES OF ROCK SAMPLES FROM THE RED MOUNTAIN WILDERNESS STUDY AREA, 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. s	Mg-pct. s	Ca-pct. s	Ti-pct. s	Mn-ppm s	Ag-ppm s	As-ppm s	Au-ppm s	B-ppm s	Ba-ppm s	Be-ppm s
RM100R	37 17 15	113 40 0	.05	.15	.30	.20	100	N	N	N	50	500	<1
RM101R	37 16 52	113 41 43	<.05	<.02	.05	.05	N	N	N	N	20	50	<1
RM102R	37 17 17	113 41 8	.20	<.02	<.05	.02	100	N	N	N	10	100	<1
RM104R	37 15 5	113 42 16	.70	.15	.10	.10	200	N	N	N	50	200	<1
RM105R	37 15 51	113 43 51	.10	.07	<.05	.05	20	N	N	N	30	200	<1
RM106R	37 16 26	113 42 54	5.00	2.00	5.00	.50	1,000	N	N	N	10	1,000	<1
RM107RA	37 15 12	113 45 55	5.00	5.00	3.00	.70	1,000	N	N	N	10	300	1
RM107RB	37 15 12	113 45 55	1.00	.70	>20.00	.07	700	N	N	N	15	200	<1
RM107RC	37 15 12	113 45 55	.30	.07	.20	.07	20	N	N	N	50	200	1
RM108R	37 14 14	113 46 22	.15	.02	<.05	.03	20	N	N	N	30	300	<1
RM111R	37 15 4	113 43 42	.50	.07	.07	.10	2,000	N	N	N	50	1,500	<1
RM112R	37 12 54	113 43 42	.10	.05	<.05	.07	20	N	N	N	30	100	<1
RM114RA	37 14 12	113 39 12	.30	.07	.05	.10	150	N	N	N	50	200	<1
RM114RB	37 14 12	113 39 12	10.00	5.00	5.00	1.00	1,000	N	N	N	10	300	<1
RM115R	37 13 57	113 39 28	.10	.03	.05	.10	50	N	N	N	20	500	<1
RM201R	37 17 17	113 40 8	.05	.02	.05	.02	<10	N	N	N	<10	30	<1
RM202R	37 17 2	113 39 6	.20	<.02	<.05	.07	100	N	N	N	15	50	<1
RM203R	37 16 17	113 40 45	.10	.03	.05	.15	50	N	N	N	70	50	<1
RM206R	37 15 8	113 43 22	.30	.03	<.05	.10	30	N	N	N	30	200	<1
RM207R	37 15 40	113 43 18	.50	.07	<.05	.07	300	N	N	N	30	300	<1
RM208RA	37 16 37	113 43 25	N	.02	.10	.03	<10	N	N	N	10	150	<1
RM208RB	37 16 37	113 43 25	N	.02	.05	.03	20	N	N	N	10	150	<1
RM208RC	37 16 37	113 43 25	N	.03	.05	.07	10	N	N	N	20	300	N
RM209R	37 16 43	113 44 14	N	.02	<.05	.03	N	N	N	N	15	300	<1
RM210R	37 16 35	113 45 12	.07	.02	<.05	.05	10	N	N	N	20	200	<1
RM213R	37 12 30	113 41 17	.20	.30	.20	.10	20	N	N	N	50	300	<1
RM214R	37 11 42	113 41 38	.50	.50	5.00	.10	300	N	N	N	70	200	<1
RM216R	37 12 34	113 42 9	1.50	2.00	3.00	.15	500	N	N	N	70	300	<1
RM217R	37 12 40	113 42 38	.50	1.00	2.00	.10	200	N	N	N	70	200	<1
RM220R	37 12 57	113 43 44	.10	1.50	2.00	.10	300	N	N	N	70	>5,000	<1
RM221RA	37 14 32	113 39 57	<.05	.03	<.05	.03	N	N	N	N	20	200	<1
RM221RB	37 14 32	113 39 57	N	.05	.05	.07	<10	N	N	N	20	150	N

TABLE 5. RESULTS FROM THE ANALYSES OF ROCK SAMPLES FROM THE RED MOUNTAIN WILDERNESS STUDY AREA, UTAH--Continued

Sample	Bi-ppm s	Cd-ppm s	Co-ppm s	Cr-ppm s	Cu-ppm s	La-ppm s	Mo-ppm s	Nb-ppm s	Ni-ppm s	Pb-ppm s	Sb-ppm s	Sc-ppm s	Sn-ppm s
RM100R	N	N	N	<10	5	N	N	N	5	N	N	N	N
RM101R	N	N	N	N	<5	N	N	N	N	N	N	N	N
RM102R	N	N	N	N	5	N	N	N	N	N	N	N	N
RM104R	N	N	N	10	5	N	N	N	N	N	N	N	N
RM105R	N	N	N	N	<5	N	N	N	N	N	N	N	N
RM106R	N	N	50	100	30	30	N	<20	50	15	N	20	N
RM107RA	N	N	70	200	70	20	N	N	200	<10	N	20	N
RM107RB	N	N	N	10	10	20	N	N	5	20	N	N	N
RM107RC	N	N	N	<10	<5	N	N	N	5	N	N	N	N
RM108R	N	N	N	N	<5	N	N	N	N	N	N	N	N
RM111R	N	N	10	<10	5	N	N	N	N	N	N	N	N
RM112R	N	N	N	N	N	N	N	N	N	N	N	N	N
RM114RA	N	N	N	N	<5	N	N	N	N	N	N	N	N
RM114RB	N	N	70	200	50	20	N	N	150	N	N	20	N
RM115R	N	N	N	30	<5	N	30	N	N	N	N	N	N
RM201R	N	N	N	N	<5	N	N	N	N	N	N	N	N
RM202R	N	N	N	10	<5	N	N	N	N	N	N	N	N
RM203R	N	N	N	15	<5	N	N	N	N	N	N	N	N
RM206R	N	N	N	10	N	N	N	N	N	N	N	<5	N
RM207R	N	N	N	15	5	N	N	N	N	<10	N	N	N
RM208RA	N	N	N	N	N	N	N	N	N	N	N	N	N
RM208RB	N	N	N	N	5	N	N	N	N	N	N	N	N
RM208RC	N	N	N	N	<5	N	N	N	N	<10	N	N	N
RM209R	N	N	N	N	<5	N	N	N	N	<10	N	N	N
RM210R	N	N	N	N	N	N	N	N	N	<10	N	N	N
RM213R	N	N	N	10	10	N	N	N	N	<10	N	N	N
RM214R	N	N	7	20	20	N	N	N	7	<10	N	5	N
RM216R	N	N	10	30	10	20	N	N	5	<10	N	7	N
RM217R	N	N	5	10	10	N	N	N	<5	<10	N	N	N
RM220R	N	N	5	10	<5	N	N	N	N	<10	N	N	N
RM221RA	N	N	N	<10	N	N	N	N	N	<10	N	N	N
RM221RB	N	N	N	<10	N	N	N	N	N	<10	N	N	N

TABLE 5. RESULTS FROM THE ANALYSES OF ROCK SAMPLES FROM THE RED MOUNTAIN WILDERNESS STUDY AREA, UTAH--Continued

Sample	Sr-ppm s	V-ppm s	W-ppm s	Y-ppm s	Zn-ppm s	Zr-ppm s	Th-ppm s	Au-ppm ICP	As-ppm ICP	Bi-ppm ICP	Cd-ppm ICP	Sb-ppm ICP	Zn-ppm ICP	Dna-Th ICP	Dna-U ICP
RM100R	100	20	N	10	N	1,000	N	--	<5	<2	<.1	2	4	<1.30	1.080
RM101R	N	15	N	N	N	50	N	--	<5	<2	<.1	<2	<2	<1.00	.264
RM102R	N	20	N	N	N	50	N	--	<5	<2	<.1	<2	<2	1.20	.196
RM104R	N	30	N	<10	N	300	N	--	<5	<2	<.1	4	9	2.75	.605
RM105R	N	<10	N	N	N	200	N	--	<5	<2	<.1	<2	<2	1.60	.183
RM106R	500	150	N	30	N	300	N	--	5	<2	.1	<2	63	6.40	.690
RM107RA	500	150	N	30	N	200	N	--	<5	<2	.2	7	61	1.80	.506
RM107RB	150	50	N	30	N	100	N	--	12	<2	.2	2	8	2.50	.670
RM107RC	N	10	N	N	N	70	N	--	<5	<2	<.1	4	<2	1.20	.271
RM108R	100	10	N	N	N	50	N	--	<5	<2	<.1	<2	<2	<1.00	.229
RM111R	N	30	200	N	N	300	N	--	19	<2	<.1	36	9	1.60	.467
RM112R	N	10	N	N	N	30	N	--	<5	<2	<.1	3	<2	1.30	.225
RM114RA	N	15	N	N	N	200	N	--	<5	<2	<.1	<2	4	<1.10	.530
RM114RB	300	150	N	30	N	100	N	--	<5	<2	.2	6	58	1.90	.452
RM115R	100	15	N	N	N	150	N	--	17	<2	<.1	7	<2	1.50	.377
RM201R	N	15	N	N	N	100	N	--	6	<2	<.1	<2	<2	<1.00	.200
RM202R	N	15	N	N	N	200	N	--	16	<2	<.1	3	<2	3.24	<.059
RM203R	N	20	N	<10	N	500	N	--	5	<2	<.1	<2	2	2.40	.900
RM206R	N	15	N	<10	N	300	N	--	6	<2	<.1	10	3	1.80	.325
RM207R	N	20	N	N	N	200	N	--	10	<2	<.1	30	4	1.20	.389
RM208RA	N	<10	N	N	N	50	N	--	<5	<2	<.1	<2	<2	<1.20	.294
RM208RB	N	<10	N	N	N	70	N	--	<5	<2	<.1	<2	<2	<1.10	.253
RM208RC	N	10	N	N	N	200	N	--	<5	<2	<.1	<2	<2	<1.20	.430
RM209R	N	<10	N	N	N	150	N	--	<5	<2	<.1	<2	<2	<1.20	.294
RM210R	N	<10	N	N	N	300	N	--	<5	<2	<.1	<2	<2	<1.20	.323
RM213R	N	10	N	10	N	1,000	N	--	<5	<2	<.1	<2	<2	<1.50	.894
RM214R	200	70	N	15	N	150	N	--	<5	<2	.2	<2	19	3.00	1.320
RM216R	N	30	N	30	N	300	N	--	<5	<2	.1	3	13	6.54	2.160
RM217R	300	50	N	20	N	200	N	--	<5	<2	<.1	<2	6	3.70	3.090
RM220R	150	15	N	15	N	500	N	--	<5	<2	<.1	4	4	2.70	1.510
RM221RA	150	<10	N	N	N	30	N	--	<5	<2	<.1	<2	<2	<1.20	.280
RM221RB	100	<10	N	N	N	100	N	--	<5	<2	<.1	<2	<2	<1.30	.434