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ANALYTICAL RESULTS FOR FORTY-TWO FLUVIAL TAILINGS CORES AND SEVEN STREAM SEDIMENT SAMPLES FROM HIGH ORE CREEK, NORTHERN JEFFERSON COUNTY, MONTANA

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ABSTRACT

Metal-mining related wastes in the Boulder River basin study area in northern Jefferson County, Montana have been implicated in their detrimental effects on water quality with regard to acid-generation and toxic-metal solubility (Buxton and others, 1997). Sediments, fluvial tailings and water from High Ore Creek have been identified as significant contributors to water quality degradation of the Boulder River below Basin, Montana (Marvin and others, 1996). A study of 42 fluvial tailings cores and 7 stream sediments from High Ore Creek was undertaken to determine the concentrations of environmentally sensitive elements (i.e. Ag, As, Cd, Cu, Pb, Zn) present in these materials, and the mineral phases containing those elements. Two sites of fluvial deposition of mine-waste contaminated sediment on upper High Ore Creek were sampled using a one-inch soil probe. Forty-two core samples were taken producing 247 subsamples. The samples were analyzed by ICP-AES (inductively coupled-plasma atomic emission spectroscopy) using a total mixed-acid digestion (Briggs, 1996). Results of the core analyses show that the elements described above are present at very high concentrations (to 22,000 ppm As, to 460 ppm Ag, to 900 ppm Cd, 4,300 ppm Cu, 46,000 ppm Pb, and 50,000 ppm Zn). Seven stream-sediment samples were also analyzed by ICP-AES for total element content and for leachable element content (as released by a warm 2M HCl-H_2O_2 leach; Church and others, 1993). Results show that the sediment of High Ore Creek has elevated levels of ore-related metals throughout its length, down to the confluence with the Boulder River, and that the metals are, to a significant degree, contained in the leachable phase, namely the hydrous amorphous iron- and manganese-hydroxide coatings on detrital sediment particles.

INTRODUCTION

Metal-mining related wastes in the Boulder River basin study area in northern Jefferson County, Montana, have been implicated in their detrimental effects on water quality with regard to acid generation and toxic-metal solubility during snowmelt and storm water runoff events (Buxton and others, 1997). The sediments and water of High Ore Creek have been identified as significant contributors to water quality degradation of the Boulder River below Basin, Montana (Marvin and others, 1996). The Comet mine was the principal producer of ore and ore-related wastes in the High Ore Creek basin. The mine operated intermittently between 1880 and 1941, mining three main quartz-sulfide veins. Sulfide minerals included galena, sphalerite, pyrite, chalcopyrite, tetrahedrite, and arsenopyrite. Nearly 500,000 tons of ore were produced since 1902; the ore was milled on-site between 1889 and 1941. Several hundred thousand tons of mill tailings are still present (Marvin and others 1996). Downstream of the Comet mine, numerous piles, lenses and veneers of reworked mill tailings material occur along the banks, on the floodplain and in the active channel of High Ore Creek. Some deposits are continuous for 50 to 100 m, wheras others are dissected by the stream channel. These fluvial tailings are most voluminous within 1 km of the Comet mine, but occur downstream to the confluence with the Boulder River. Two sites of continuous fluvial tailings deposits were sampled using a soil coring probe about 0.9 km downstream from the Comet mine. In addition, stream sediment samples were collected at 5 sites, from near the Comet mine to near the mouth of High Ore Creek. This report presents the analytical results for total-metal content of 42 cores and 7 stream sediments, partial extractions of 7 stream sediments, and total-metal contents of the residues from the partial extractions of the 7 stream sediments.

Methods of Study

Sample Collection

All samples were collected from or near High Ore Creek, located on the USGS Mount Thompson, Montana 1:24,000 topographic map.

Stream sediments

In October of 1996, we collected 47 stream sediment-samples in the Boulder River basin study area, including 6 from High Ore Creek below the Comet mine. Analyses of sediment samples represent the chemistry of material eroded from upstream of the sample site and from colloidal material coating the detrital grains. The samples were collected at each site by compositing 10 to 20 individual subsites within 15 m of the plotted site and collecting material from the active channel alluvium, to provide an integrated sample of the detrital bottom sediment. In the field, each composited sample was sieved through a 2 mm (10 mesh) stainless steel screen, and the minus-2mm fraction retained.

Fluvial Tailings Cores

In July of 1997, we collected two suites of cores from the flood plain (not the active stream channel) of upper High Ore Creek, about 0.9 km below the Comet mine. These suites come from sites identified as 97-BMF-130 and 97-BMF-131 (sample location map, figure 1). At each site, a suite of one-inch diameter cores was collected along the long axis of the deposit (roughly parallel to the flow of the creek), as well as one or more suites of cores along sub-perpendicular traverses. Samples were collected in plastic core tubes using a stainless-steel soil probe/sampler, to a depth of up to 100 cm; typical depths were 30 to 50 cm. Core penetration depth and actual length were recorded on-site, to determine the amount of compression. Core samples were taken on a 5m spacing; the configuration of sites and traverses are shown in figure 2.

Sample preparation

Stream-sediment samples

Stream sediment samples were dried at ambient temperature and sieved to minus-80-mesh (<.18 mm) in preparation for laboratory analyses.

Fluvial tailings core samples

In the laboratory, the core samples were subdivided into subsamples (by depth) according to visual identification of differences in mineralogy, organic content and apparent oxidation zones. See tables 1 and 2 for relation between subsample identifications and depths within cores. The compression factor was incorporated to determine the actual depth of the subsamples; the assigned depth for each is defined as the midpoint of that subsample. Each core was subdivided into 2 to 12 subsamples, typically about 5. These subsamples were then placed in a random order and ground using a vertical pulverizer with ceramic plates to -100-mesh (<.15mm). Twenty-seven cores were collected from site 97-BMF-130 with 162 subsamples. Fifteen cores were collected from site 97-BMF-131 with 85 subsamples.

Sample Analysis

Mixed-acid total digestion ICP analysis for 32 elements

The 5 stream-sediment samples, leach residues for the 5 stream-sediment samples from the partial extraction described below, and 247 core subsamples were digested with a mixed-acid procedure consisting of HCl, HNO_3, $HClO_4$, and HF, and analyzed by ICP-AES (inductively coupled plasma atomic emission spectroscopy) (Crock and others, 1983; Briggs, 1996). This procedure is effective in dissolving most minerals, including silicates, oxides and sulfides; resistant or refractory minerals such as zircon, chromite and some tin oxides are only partially attacked. Previous investigations using a variety of materials support the completeness of the digestion (Church and others, 1987; Wilson and others, 1994). Limits of determination for the total digestion method are given in table A7 in the Appendix. Comparisons of values observed for three NIST standard reference materials (SRM-2704, SRM-2709 and SRM-2711) with certified values are given in tables A1 through A6 in the Appendix.

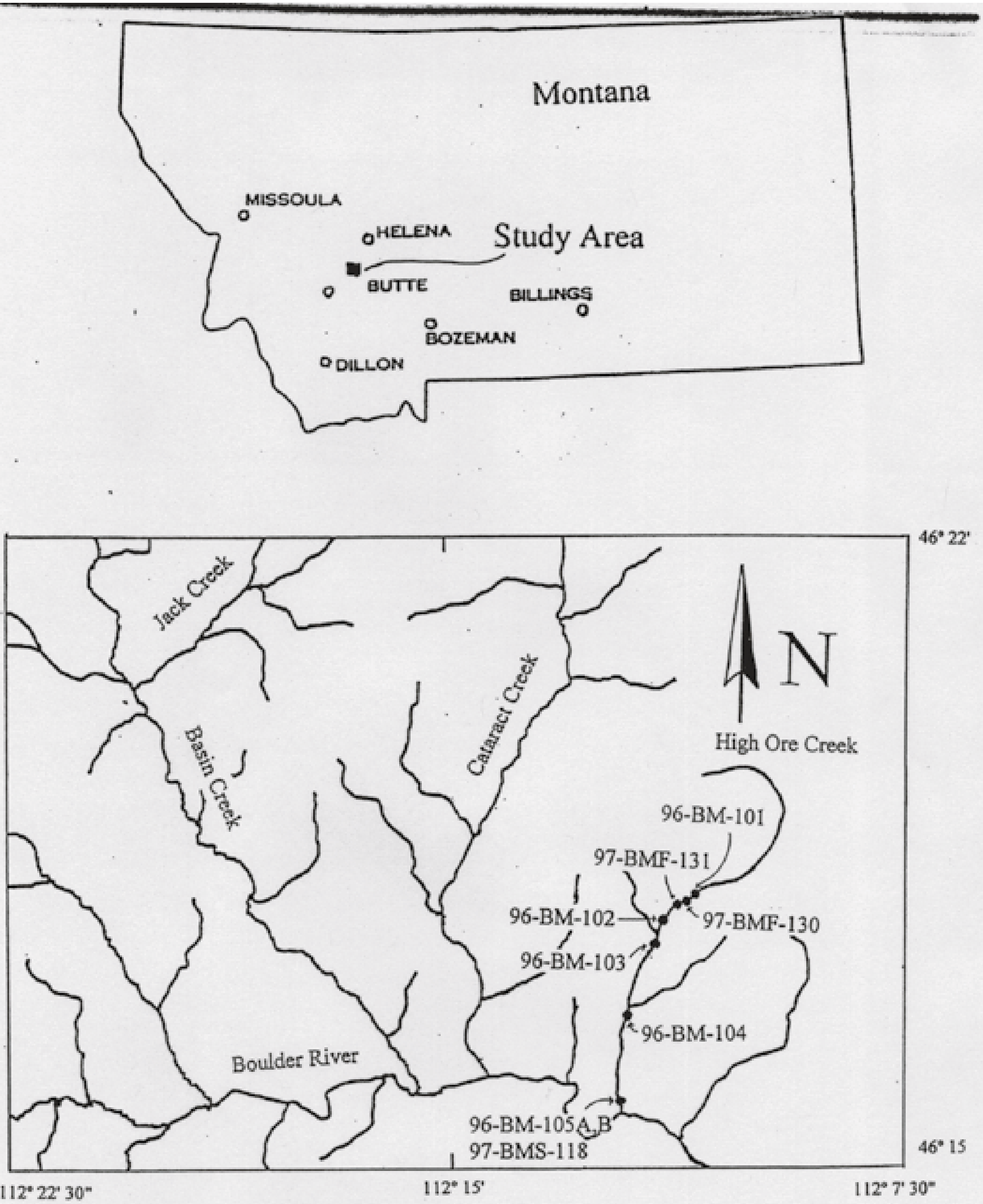

Figure 1. Study area and sample locality maps

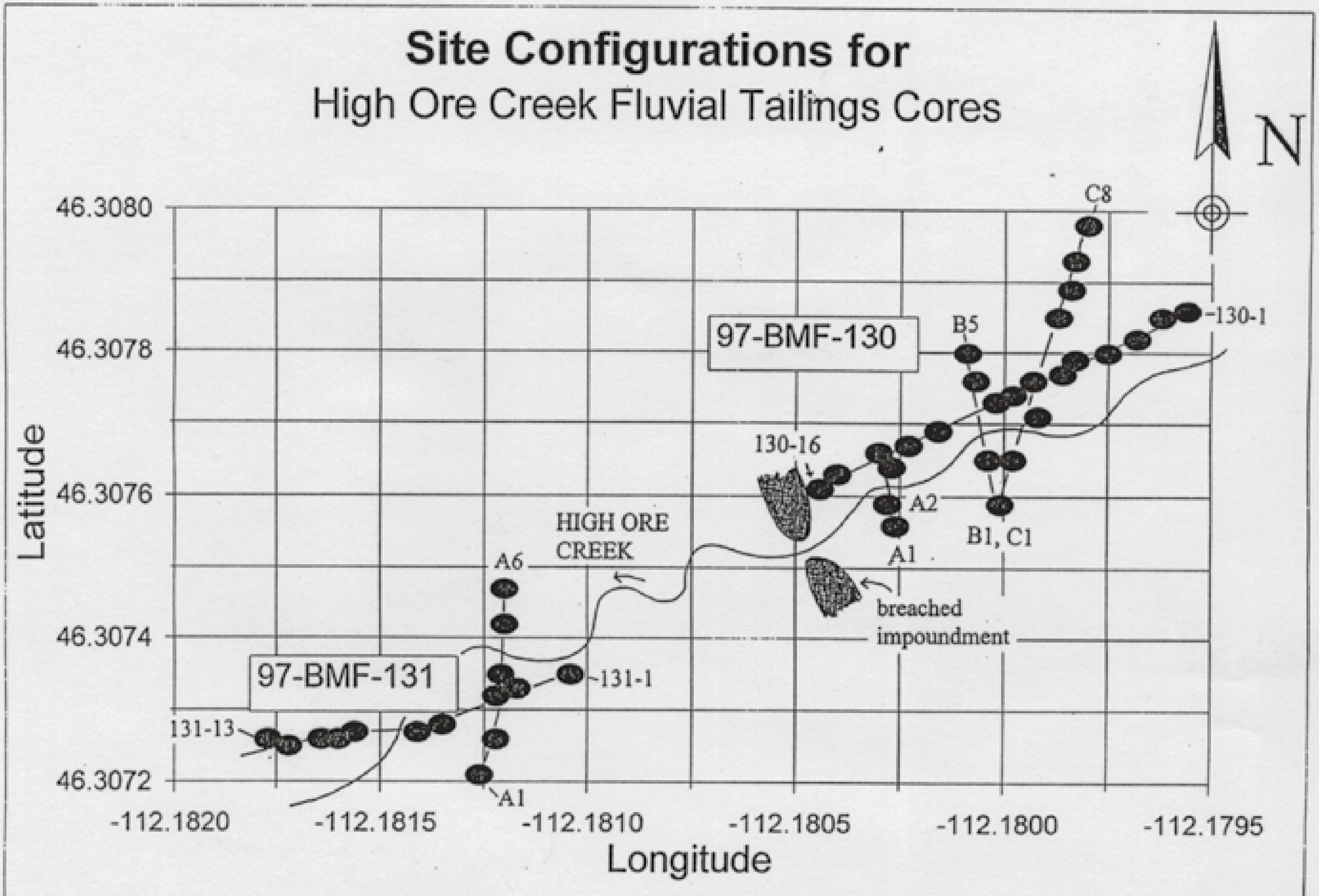

Figure 2. Site configurations for 97-BMF-130 and 97-BMF-131

Warm 2M HCl-1%H_2O_2 leach extraction for 32 elements

The use of a partial-digestion extraction enables one to determine concentrations of metals bound within different phases, whereas the total digestion releases all metals in a sample (Chao, 1984). The 5 stream sediments from High Ore Creek were subjected to a partial-digestion extraction consisting of warm (50^0 C) 2M HCl-1% H_2O_2 for three hours with continuous agitation. This partial extraction releases metals associated with hydrous amorphous iron- and manganese-oxide mineral coatings and colloidal particles (Appendix III of Church and others, 1993; Church and others, 1997). In the environment of High Ore Creek, such coatings can contain a significant percentage of the metals in a sample. The resulting residues from this extraction were then dried, weighed, and subjected to the total digestion described above to determine concentrations of metals bound in the more resistant sulfide, oxide and silicate phases. The values obtained from this extraction are presented in table 4. Analytical limits of determination for the partial digestion leach method are given in table A7 in the Appendix.

Site descriptions

Stream sediments

The locations of the sediment sample sites are shown on figure 1. Stream sediment sample 96-BM-101, the first of the five stream sediment sites, is located above the fluvial tailings sites, just below the Comet mine. 96-BM-102 and 96-BM-103 are located 1.7 km and 2.2 km below 96-BM-101, above and below the confluence of High Ore Creek with Bishop Creek. 96-BM-104 is located 3.8 km below 96-BM-101, just below Peters Gulch, and 96-BM-105 A and B and 97-BMS-118 are located 6 km below 96-BM-101, close to the mouth of High Ore Creek, about 0.1 km above its confluence with the Boulder River. Site 96-BM-105 is represented by two samples; A is from the active channel, and B is an overbank sediment sample. 97-BMS-118 is a sediment sample taken in the summer of 1997 from the same site as 96-BM-105A, and serves as a monitoring site.

Stream Sediments Field Number	Latitude	Longitude
96-BM-101	46.30917	-112.17472
96-BM-102	46.30000	-112.19333
96-BM-103	46.29667	-112.19389
96-BM-104	46.28361	-112.20056
96-BM-105A	46.26444	-112.20306
96-BM-105B	46.26444	-112.20306
97-BMS-118	46.26444	-112.20306

Fluvial Tailings Core Site	Latitude	Longitude
97-BMF-130-1	46.30786	-112.17956
97-BMF-131-1	46.30735	-112.18104

Fluvial Tailings sites 97-BMF-130 and 97-BMF-131

The locations of the two fluvial tailings sites are shown on figure 1, and the configurations for the traverses for both sites are shown in figure 2. The positions for each core site were determined from the GPS locations acquired by Rich Marvin and Mike Kerschen of the Montana Bureau of Mines and Geology on the day (July 18, 1997) we sampled the tailings. Traditional methods of location using pace and compass from a starting reference point were used to supplement the GPS data. Some of the GPS positions determined did not accurately reflect sample locations; most core sites are separated only by about 5 meters. The positions shown in figure 2 are plotted based on the GPS locations, with some adjustments based on field notes using the pace and compass method.

Site 97-BMF-130

This site is located on upper High Ore Creek, with the uppermost sample, number 130-1, located just below the lower end of a rip-rap diversion channel for the creek which skirts the impoundment piles of the Comet mine. Fluvial tailings at this site are mostly continuous, except where dissected by the creek channel. There are numerous in-place dead alders along the stream drainage. There is what appears to be a breached impoundment dam at the lower end of this site. Most of the tailings area is on the north side of the creek, although the depth of tailings on the south side creek bank are 1 to 2 m. The main traverse line runs roughly parallel to the stream bed, with a bearing of S 69^0 W, for a distance of 80 m. This traverse lies on the north side of High Ore Creek, and lies within 5-10 m of the creek bed. Samples were taken at 5 m intervals, labeled 97-BMF-130-1 through 130-16, except at positions 130-10 and 130-14, which were located in dry high-water channels, contained no tailings material and were not sampled. Three secondary traverses, labeled A, B, and C were completed, intersecting both the creek and the main traverse line. Traverse A is located at the southwest end of the main line, and has three sites, two on the south side of the creek and one on the north side. The bearing of Traverse A is N 13^0 W. Traverse B and C start from the same site, located about 10 m south of the creek and 3 m north from live aspens and forest soil. Traverse B trends N 15^0 W, crosses the main line between sites 130-9 and 130-10 and has 4 cores, 2 on the south side of the creek and 2 on the north side; site B3 was located over the creek and was not sampled. Traverse C trends N 21^0 E, contains 7 sites, 2 on the south side and 5 on the north side of the creek. Site C4 was not sampled, as this is where traverse C crosses the main line between sites 130-6 and 130-7.

Most cores were driven to a depth of between 40 and 65 cm, the depth of a single probe. At some locations, it was possible to penetrate deeper with a probe extension, and depths of 120 cm were reached. The depths of each core bottom, and the core subintervals, are in table 1.

Site 97-BMF-131

This site is located downstream of site 97-BMF-130, with the position of 131-1 about 50 m southwest of position 130-16, below the breached impoundment. The fluvial tailings at this site are more dissected by the creek channel and high-water channels. There is one main traverse line with sites 131-1 through 131-13, and one secondary traverse with sites 131-A1 through 131-A6. Sample spacing on these traverses was also 5 m. High Ore Creek has more meanders and high-water channels here; the main traverse crosses from the south side to the north side of the creek between sites 131-7 and 131-9. The main traverse has a bearing of S 72^0 W between sites 131-1 and 131-7, runs due west between 131-7 and 131-10, and has a bearing of S 70^0 W between sites 131-10 and 131-13. Ten cores were collected on this traverse. Site 131-2 was in the active stream channel, 131-5 was located in a high-water channel, and 131-8 was also in the active stream channel; no cores were taken at these three sites. Traverse A has a bearing of N 20^0 E, and has 5 cores collected from it. Site 131-A1 was taken next to the forest edge and contained no visible tailings. No core was taken at site A3, as this is where the traverse crosses the main line, and is represented by sample 131-4.

As at site 97-BMF-130, most cores were driven to depths between 30 and 60 cm, with some depths of 120 cm attained using a probe extension. The depths of each core bottom, and the core subintervals, are in table 2.

Discussion of Results

Site 97-BMF-130

Nearly all of the cores contained fluvially deposited mill tailings material greatly enriched in the elements As, Ag, Cd, Cu, Pb and Zn (See tables 1 and 2). Concentrations for arsenic ranged as high as 22,000 ppm, silver concentrations were as high as 460 ppm, cadmium concentrations reached 900 ppm, copper concentrations reached 4,300 ppm, lead concentrations were as high as 46,000 ppm, and zinc concentrations reached 50,000 ppm. In some cores, metal concentrations showed a consistent decrease with depth, whereas in others, there was considerable mixing, and metal concentrations showed either no trend with depth, or an increase at the bottom of the core. Metal concentrations usually did not decline to or approach crustal abundance values, or even the elevated background levels expected in a mineralized district (these background levels have not yet been determined for the Boulder River Basin study area), indicating that the cores usually did not penetrate to the bottom of the tailings material. Some cores collected from near the margins, or through thinner sections of tailings (probably due to erosion), did show lower concentrations and/or a decrease in concentrations with depth. Cores that did reach to the bottom of tailings are: 97-BMF-130-C7, at 109 cm, 97-BMF-130-C8 at 58 cm, 97-BMF-131-7 at 37 cm, 97-BMF-131-9 at 42 cm, 97-BMF-131-A1 at 31 cm, and 97-BMF-131-A5 at 61 cm.

Site 97-BMF-131

The distributions of the six environmentally sensitive elements from this site are similar to those from site 131: concentrations are high, show much variation with depth, and rarely approach background levels. Arsenic concentrations reached as high as 11,000 ppm, silver concentration ranged to 350 ppm, cadmium concentrations reached 740 ppm, copper concentrations were as high as 2,400 ppm, lead concentrations reached 32,000 ppm, and zinc concentrations reached 18,000 ppm.

Stream sediments

Fluvial tailings are present in discontinuous pods, lenses, and veneers down most of the length of High Ore Creek. The concentrations of metals in the sediment samples from total digestion analyses reflect the presence of a tailings component in the stream sediments. The first sample, 96-BM-101, located upstream from the two fluvial tailings core sites just below the Comet mine, has high concentrations of Ag,As, Cd,Cu, Pb, and Zn (see tables 3, 4, and 5). Samples 96-BM-102 and 96-BM-103 are located above and below the confluence with Bishop Creek. Significant dilution, or dispersion, of metals is seen between 96-BM-101 and 96-BM-102. There is additional dilution between 96-BM-102 and 96-BM-103, due to influx of sediment from Bishop Creek. The profiles of metals between 96-BM-103 and 96-BM-105A (and 97-BMS-118) do not reflect further dilution despite sediment contributions from Peters Gulch and two other small unnamed tributaries. This is likely due to continuous reworking of the fluvial tailings and overbank deposits and deposition in the active channel during high flow periods. Sample 96-BM-105B is an overbank sediment deposited by a high-water event, and illustrates the high levels of metals found in that environment.

Analyses of metals from the warm HCl-H_2O_2 leach (table 4) show that much of the contained metal in the stream sediments is in the leachable phase. As stated in the sample analysis section above, this partial extraction releases metals associated with hydrous amorphous iron- and manganese-oxide mineral coatings and colloidal particles (Church and others, 1997). This extraction solution only weakly attacks primary sulfide grains with the exception of galena (PbS) which is readily dissolved in warm 2M HCl. By looking at the ratio of total to leachable concentrations for individual elements, one can gain insight into which phases of material are responsible for transporting the metals downstream.

Examination of the individual elements reveals the following:

1. Silver in the leachable phase is greater than 80% of the total silver.

2. Arsenic in the leachable phase comprises 25% to 65% of the total amount. 3 Cadmium in the leachable phase comprises 45% to 100% of the total.

4. Copper in the leachable phase comprises 30% to 80% of the total.

5. Lead in the leachable phase is 100% of the total (the higher values for concentrations in the leach analyses are probably an analytical artifact related to a large sample weight (2g) used in the leach analyses versus a small sample weight (.2g) used in the total digestion analysis).

6. Zinc in the leachable phase comprises 70% to 95% of the total.

Summary and conclusions

Analytical results for 42 fluvial tailings cores and 7 stream-sediment samples from High Ore Creek reveal that 6 environmentally sensitive elements, Ag, As, Cd, Cu, Pb and Zn, occur in high concentrations in both media. These elements are derived from mill tailings and mine waste from the Comet mine at the upper end of High Ore Creek. Leach extractions of stream sediments reveal that a significant fraction (25% to 100%) of these metals are present as hydrous amorphous iron- and manganese-oxide coatings, derived from oxidation and weathering of primary sulfides present in the mine-waste material.

Table 1 Total element concentration data for fluvial tailings samples analyzed by ICP-AES, Site 97-BMF-130, High Ore Creek, Montana

Field No	DEPTH (cm)	Al %	Ca %	Fe %	K %	Mg %	Na %	P %	Ti %	Mn ppm	Ag ppm
97BMF-130-1-a	5	2.5	0.15	4.8	0.99	0.11	0.28	0.03	0.07	190	160
97BMF-130-1-b	17	2.9	0.11	5.3	1.1	0.13	0.20	0.03	0.10	180	280
97BMF-130-1-c	27	5.4	0.12	7.9	1.8	0.25	0.27	0.08	0.16	160	250
97BMF-130-1-d	39	3.0	0.18	6.2	1.2	0.10	0.37	0.10	0.08	120	180
97BMF-130-1-e	56	7.6	0.75	1.9	2.5	0.44	1.3	< 0.005	0.27	160	4
97BMF-130-1-f	65	7.7	0.87	2.1	2.6	0.52	1.3	0.04	0.30	200	< 2
97BMF-130-2-a	12	6.5	0.61	3.1	3.2	0.16	1.5	0.04	0.11	200	120
97BMF-130-2-b	31	6.4	0.66	1.4	3.4	0.19	1.5	0.03	0.13	130	24
97BMF-130-2-c	53	6.5	0.65	0.97	3.5	0.18	1.5	0.03	0.12	90	7
97BMF-130-3-a	5	2.2	0.18	4.0	1.0	0.08	0.31	0.03	0.07	810	99
97BMF-130-3-b	19	1.3	0.05	6.4	0.59	0.03	0.05	0.01	0.03	160	160
97BMF-130-3-c	31	2.2	0.18	4.4	0.85	0.08	0.28	0.03	0.06	160	140
97BMF-130-3-d	41	5.8	0.60	3.5	3.5	0.09	1.5	0.03	0.08	130	25
97BMF-130-3-e	53	2.5	0.21	5.4	1.2	0.07	0.41	0.01	0.04	840	150
97BMF-130-3-f	63	1.4	0.20	4.0	0.50	0.14	0.04	0.006	0.03	7000	120
97BMF-130-4-a	13	1.3	0.05	3.1	0.52	0.03	0.02	0.008	0.03	240	100
97BMF-130-4-b	32	1.3	0.05	4.0	0.57	0.04	0.05	0.007	0.03	240	140
97BMF-130-4-c	40	2.6	0.14	7.1	1.1	0.09	0.26	0.02	0.06	200	220
97BMF-130-5-a	3	2.7	0.30	4.9	1.1	0.15	0.27	0.02	0.06	3200	170
97BMF-130-5-b	12	7.2	0.75	2.4	1.8	0.48	1.1	0.08	0.26	2200	33
97BMF-130-5-c	21	6.9	0.82	2.6	1.6	0.64	1.0	0.07	0.33	1600	< 2
97BMF-130-5-d	31	6.5	0.92	2.3	1.8	0.56	1.1	0.07	0.32	1400	< 2
97BMF-130-5-e	43	7.0	1.1	1.2	2.9	0.37	1.8	0.04	0.20	650	< 2
97BMF-130-5-f	50	6.4	0.78	1.0	3.4	0.24	1.4	0.03	0.17	340	< 2
97BMF-130-6-a	4	2.7	0.36	3.7	0.98	0.15	0.25	0.03	0.07	1500	110
97BMF-130-6-b	14	5.9	0.68	2.2	1.5	0.45	0.95	0.09	0.25	14000	46
97BMF-130-6-c	24	4.8	0.63	1.8	1.3	0.37	0.86	0.09	0.23	550	< 2
97BMF-130-6-d	38	6.9	0.83	1.8	2.3	0.55	1.2	0.06	0.27	530	< 2
97BMF-130-6-e	57	6.8	0.69	1.0	3.1	0.28	1.3	0.03	0.15	470	< 2

Table 1 Total element concentration data for fluvial tailings samples analyzed by ICP-AES, Site 97-BMF-130, High Ore Creek, Montana (cont.)

Field No	As ppm	Ba ppm	Cd ppm	Ce ppm	Co ppm	Cr ppm	Cu ppm	Ga ppm	La ppm	Li ppm	Mo ppm
97BMF-130-1-a	10000	330	21	7	< 2	< 2	760	< 4	11	20	30
97BMF-130-1-b	13000	270	28	< 4	2	< 2	1200	< 4	11	19	35
97BMF-130-1-c	12000	400	15	< 4	< 2	6	1500	< 4	19	19	28
97BMF-130-1-d	21000	440	140	20	< 2	3	500	< 4	13	14	27
97BMF-130-1-e	300	1000	26	62	2	9	1100	12	29	24	< 2
97BMF-130-1-f	110	830	31	66	4	10	760	12	31	26	< 2
97BMF-130-2-a	4300	940	5	12	< 2	4	610	< 4	12	15	16
97BMF-130-2-b	630	1000	< 2	23	< 2	2	110	10	14	16	2
97BMF-130-2-c	130	1200	< 2	26	< 2	< 2	60	12	15	17	< 2
97BMF-130-3-a	6000	300	28	7	2	< 2	970	< 4	8	15	22
97BMF-130-3-b	15000	200	18	< 4	< 2	< 2	400	< 4	8	20	32
97BMF-130-3-c	15000	290	20	12	< 2	3	280	< 4	9	19	26
97BMF-130-3-d	4700	1200	6	13	< 2	3	170	5	8	14	5
97BMF-130-3-e	8300	450	130	11	6	< 2	2200	< 4	11	20	24
97BMF-130-3-f	7600	210	210	8	9	< 2	2600	11	8	20	24
97BMF-130-4-a	5200	120	11	8	< 2	< 2	540	< 4	7	23	25
97BMF-130-4-b	8000	150	12	6	2	< 2	710	< 4	7	21	28
97BMF-130-4-c	11000	340	21	< 4	3	< 2	890	< 4	10	20	29
97BMF-130-5-a	8600	340	50	15	9	< 2	2400	5	15	18	29
97BMF-130-5-b	1400	820	44	57	10	4	510	14	35	28	8
97BMF-130-5-c	190	890	24	68	6	7	100	15	41	32	4
97BMF-130-5-d	140	840	30	59	5	5	47	12	34	28	5
97BMF-130-5-e	100	970	< 2	50	2	13	26	13	29	23	< 2
97BMF-130-5-f	50	1000	< 2	40	2	< 2	20	11	21	16	< 2
97BMF-130-6-a	5400	360	77	19	12	4	1800	< 4	14	18	19
97BMF-130-6-b	1200	620	180	50	45	5	500	28	30	24	4
97BMF-130-6-c	320	560	81	63	4	3	160	8	34	23	12
97BMF-130-6-d	110	850	24	60	4	5	42	12	36	28	< 2
97BMF-130-6-e	58	1100	15	50	3	9	34	13	24	21	< 2

Table 1 Total element concentration data for fluvial tailings samples analyzed by ICP-AES, Site 97-BMF-130, High Ore Creek, Montana (cont.)

Field No	Nb ppm	Nd ppm	Ni ppm	Pb ppm	Sc ppm	Sr ppm	Th ppm	V ppm	Y ppm	Yb ppm	Zn ppm
97BMF-130-1-a	< 4	< 4	< 2	18000	2	88	< 4	38	< 2	< 1	1700
97BMF-130-1-b	< 4	< 4	< 2	29000	3	71	< 4	44	2	< 1	3300
97BMF-130-1-c	9	12	3	30000	5	160	11	58	3	< 1	1700
97BMF-130-1-d	4	11	< 2	6500	2	99	8	79	3	< 1	1400
97BMF-130-1-e	13	32	6	200	8	320	14	60	14	2	970
97BMF-130-1-f	15	30	7	140	8	300	12	61	17	2	1400
97BMF-130-2-a	7	< 4	< 2	15000	3	320	9	30	5	< 1	880
97BMF-130-2-b	12	10	< 2	2000	3	320	8	24	5	< 1	340
97BMF-130-2-c	12	10	< 2	220	3	320	7	22	4	< 1	230
97BMF-130-3-a	< 4	< 4	< 2	9700	< 2	81	< 4	31	2	< 1	3800
97BMF-130-3-b	< 4	< 4	< 2	10000	< 2	29	< 4	26	< 2	< 1	1700
97BMF-130-3-c	4	< 4	< 2	7200	< 2	72	< 4	24	2	< 1	1300
97BMF-130-3-d	8	< 4	< 2	1800	< 2	350	7	31	3	< 1	1000
97BMF-130-3-e	< 4	< 4	3	11000	< 2	110	< 4	29	3	< 1	21000
97BMF-130-3-f	< 4	< 4	< 2	10000	< 2	33	< 4	20	5	< 1	34000
97BMF-130-4-a	< 4	< 4	< 2	6700	< 2	21	< 4	17	< 2	< 1	1600
97BMF-130-4-b	< 4	< 4	< 2	8900	< 2	25	< 4	20	< 2	< 1	1700
97BMF-130-4-c	< 4	< 4	< 2	16000	< 2	66	< 4	38	2	< 1	3200
97BMF-130-5-a	< 4	11	< 2	20000	2	90	< 4	36	9	1	4600
97BMF-130-5-b	10	27	10	6000	8	260	12	56	17	2	5700
97BMF-130-5-c	10	34	13	280	10	240	12	72	22	2	5700
97BMF-130-5-d	8	29	11	140	8	250	11	66	16	2	4900
97BMF-130-5-e	8	21	5	230	5	390	9	42	9	1	2000
97BMF-130-5-f	11	14	< 2	140	4	320	8	32	6	< 1	1400
97BMF-130-6-a	< 4	10	3	9500	2	76	< 4	33	6	< 1	4400
97BMF-130-6-b	< 4	24	8	4400	7	200	13	63	14	1	5200
97BMF-130-6-c	9	27	9	200	5	180	9	56	21	2	4200
97BMF-130-6-d	9	29	8	190	8	260	10	59	18	2	2300
97BMF-130-6-e	11	18	3	270	4	290	9	35	10	1	1100

Table 1 Total element concentration data for fluvial tailings samples analyzed by ICP-AES, Site 97-BMF-130, High Ore Creek, Montana (cont.)

Field No	DEPTH (cm)	Al %	Ca %	Fe %	K %	Mg %	Na %	P %	Ti %	Mn ppm	Ag ppm
97BMF-130-7-a	7	4.1	0.83	3.8	1.8	0.18	0.48	0.07	0.11	220	120
97BMF-130-7-b	19	6.3	0.55	2.4	3.3	0.16	1.4	0.08	0.11	140	28
97BMF-130-7-c	26	7.1	0.68	2.1	1.8	0.54	1.0	0.06	0.37	640	3
97BMF-130-7-d	30	5.3	0.49	1.6	1.2	0.38	0.60	0.09	0.18	600	< 2
97BMF-130-7-e	34	6.5	0.73	1.7	2.3	0.46	1.1	0.05	0.25	390	< 2
97BMF-130-7-f	41	7.9	0.86	1.8	2.7	0.53	1.3	0.05	0.27	600	< 2
97BMF-130-7-g	56	7.7	0.94	1.9	2.7	0.55	1.4	0.05	0.29	820	< 2
97BMF-130-8-a	8	1.8	0.13	4.2	0.78	0.07	0.10	0.01	0.05	410	110
97BMF-130-8-b	23	1.7	0.08	4.3	0.73	0.06	0.07	0.01	0.05	360	140
97BMF-130-8-c	37	6.0	0.54	5.7	1.8	0.47	0.81	0.15	0.24	940	81
97BMF-130-8-d	43	6.7	0.80	2.2	2.5	0.46	1.3	0.06	0.24	570	3
97BMF-130-8-e	55	6.4	0.72	3.6	3.1	0.26	1.3	0.04	0.15	340	3
97BMF-130-9-a	7	1.6	0.12	4.2	0.67	0.07	0.08	< 0.005	0.04	2100	130
97BMF-130-9-b	19	1.5	0.08	3.6	0.64	0.04	0.07	0.006	0.03	380	98
97BMF-130-9-c	30	2.1	0.08	4.5	0.85	0.06	0.08	0.02	0.04	250	310
97BMF-130-9-d	40	1.9	0.04	3.7	0.80	0.06	0.02	0.02	0.04	290	360
97BMF-130-11-a	5	3.6	1.1	4.5	1.7	0.34	0.31	< 0.005	0.07	4600	120
97BMF-130-11-b	16	1.3	1.6	3.2	0.47	0.67	0.04	< 0.005	0.04	6800	38
97BMF-130-11-c	27	1.3	2.0	4.3	0.46	0.82	0.06	< 0.005	0.03	8100	38
97BMF-130-11-d	33	1.4	1.0	3.5	0.53	0.44	0.08	0.01	0.04	6900	41
97BMF-130-11-e	39	1.5	1.1	4.8	0.52	0.46	0.11	< 0.005	0.04	6000	49
97BMF-130-11-f	44	4.7	0.41	6.2	2.4	0.08	0.88	< 0.005	0.09	1600	72
97BMF-130-11-g	52	6.2	0.67	2.4	1.5	0.51	0.74	0.07	0.25	3700	43
97BMF-130-11-h	62	7.6	0.91	2.1	1.7	0.63	1.1	0.07	0.30	1300	2
97BMF-130-12-a	6	2.6	0.79	4.0	1.1	0.33	0.36	< 0.005	0.06	6700	52
97BMF-130-12-b	22	2.9	0.33	4.7	1.4	0.12	0.44	< 0.005	0.07	710	73
97BMF-130-12-c	34	2.6	0.09	6.0	1.1	0.08	0.17	< 0.005	0.06	150	65
97BMF-130-12-d	40	4.0	0.38	4.0	2.0	0.15	0.74	< 0.005	0.11	240	120
97BMF-130-12-e	55	3.2	0.28	6.4	1.6	0.11	0.53	0.03	0.09	550	160

Table 1 Total element concentration data for fluvial tailings samples analyzed by ICP-AES, Site 97-BMF-130, High Ore Creek, Montana (cont.)

Field No	As ppm	Ba ppm	Cd ppm	Ce ppm	Co ppm	Cr ppm	Cu ppm	Ga ppm	La ppm	Li ppm	Mo ppm
97BMF-130-7-a	3900	670	15	24	3	2	1100	5	18	22	22
97BMF-130-7-b	1400	1200	3	21	< 2	< 2	450	< 4	14	16	5
97BMF-130-7-c	280	790	32	66	6	25	1700	11	32	32	6
97BMF-130-7-d	1400	650	65	76	4	4	2700	8	42	23	15
97BMF-130-7-e	790	840	32	51	4	3	370	12	30	24	< 2
97BMF-130-7-f	100	990	53	74	5	23	47	14	39	28	< 2
97BMF-130-7-g	73	930	55	74	10	8	29	16	38	28	< 2
97BMF-130-8-a	6100	210	18	8	2	< 2	850	< 4	10	24	25
97BMF-130-8-b	6200	200	15	< 4	< 2	< 2	930	< 4	8	22	26
97BMF-130-8-c	5500	940	35	27	5	19	720	12	25	24	16
97BMF-130-8-d	340	950	35	52	3	8	270	10	31	24	< 2
97BMF-130-8-e	350	920	3	37	2	10	26	4	21	17	< 2
97BMF-130-9-a	6700	180	38	6	4	< 2	1500	< 4	8	23	27
97BMF-130-9-b	5900	190	11	7	< 2	< 2	1000	< 4	7	22	25
97BMF-130-9-c	22000	250	99	< 4	3	< 2	520	< 4	12	18	41
97BMF-130-9-d	7100	160	190	< 4	5	< 2	1400	< 4	8	20	26
97BMF-130-11-a	5100	420	140	18	13	< 2	1700	4	12	15	20
97BMF-130-11-b	3100	210	47	14	10	< 2	400	10	8	20	23
97BMF-130-11-c	3800	390	41	20	12	< 2	450	11	11	19	20
97BMF-130-11-d	3600	280	25	15	17	< 2	430	8	9	24	15
97BMF-130-11-e	4900	270	56	16	15	< 2	940	13	9	19	26
97BMF-130-11-f	7300	440	150	24	18	2	720	4	14	16	14
97BMF-130-11-g	1700	600	340	56	36	4	540	17	38	28	11
97BMF-130-11-h	190	810	190	71	21	3	77	15	41	31	4
97BMF-130-12-a	4500	370	110	18	21	< 2	870	10	11	19	27
97BMF-130-12-b	7300	530	56	19	3	< 2	480	< 4	12	21	27
97BMF-130-12-c	9700	410	68	11	< 2	< 2	290	< 4	7	22	28
97BMF-130-12-d	7700	790	61	16	< 2	3	670	< 4	14	17	17
97BMF-130-12-e	13000	460	42	7	3	5	610	< 4	10	18	22

Table 1 Total element concentration data for fluvial tailings samples analyzed by ICP-AES, Site 97-BMF-130, High Ore Creek, Montana (cont.)

Field No	Nb ppm	Nd ppm	Ni ppm	Pb ppm	Sc ppm	Sr ppm	Th ppm	V ppm	Y ppm	Yb ppm	Zn ppm
97BMF-130-7-a	5	13	3	15000	4	150	7	36	7	< 1	2000
97BMF-130-7-b	9	9	< 2	4600	3	300	8	26	6	< 1	690
97BMF-130-7-c	19	25	11	560	8	200	13	63	32	3	2700
97BMF-130-7-d	10	34	7	380	6	150	9	48	54	3	4400
97BMF-130-7-e	10	23	7	130	7	240	10	49	18	2	2200
97BMF-130-7-f	17	29	9	180	8	300	13	58	20	2	2800
97BMF-130-7-g	16	28	10	130	8	310	12	57	18	2	4600
97BMF-130-8-a	< 4	< 4	< 2	12000	< 2	41	< 4	25	2	< 1	2600
97BMF-130-8-b	< 4	< 4	< 2	13000	< 2	31	< 4	24	2	< 1	2500
97BMF-130-8-c	8	19	9	15000	7	240	12	75	10	1	5300
97BMF-130-8-d	10	25	7	440	7	280	10	52	16	2	2000
97BMF-130-8-e	10	14	4	400	4	300	7	37	6	< 1	610
97BMF-130-9-a	< 4	< 4	< 2	11000	< 2	36	< 4	21	4	< 1	5300
97BMF-130-9-b	< 4	< 4	< 2	9300	< 2	34	< 4	20	< 2	< 1	1700
97BMF-130-9-c	< 4	< 4	< 2	28000	< 2	63	< 4	24	< 2	< 1	13000
97BMF-130-9-d	< 4	< 4	< 2	24000	< 2	41	< 4	22	< 2	< 1	29000
97BMF-130-11-a	< 4	< 4	4	6700	2	96	< 4	37	5	< 1	17000
97BMF-130-11-b	< 4	< 4	4	1200	< 2	37	< 4	25	5	< 1	2400
97BMF-130-11-c	< 4	< 4	4	1300	< 2	46	< 4	30	5	< 1	2400
97BMF-130-11-d	< 4	< 4	3	950	< 2	37	< 4	24	4	< 1	2300
97BMF-130-11-e	< 4	< 4	4	2600	< 2	48	7	34	6	< 1	4300
97BMF-130-11-f	5	< 4	4	5800	2	210	9	55	5	< 1	16000
97BMF-130-11-g	5	30	13	9600	8	180	11	57	22	2	14000
97BMF-130-11-h	9	32	26	270	9	260	12	66	22	2	18000
97BMF-130-12-a	< 4	9	6	2600	< 2	100	7	34	7	< 1	11000
97BMF-130-12-b	< 4	< 4	< 2	5900	< 2	100	< 4	39	3	< 1	2100
97BMF-130-12-c	< 4	< 4	< 2	5600	< 2	52	< 4	49	< 2	< 1	1600
97BMF-130-12-d	9	10	< 2	14000	3	180	< 4	38	4	< 1	2900
97BMF-130-12-e	4	< 4	3	15000	2	140	< 4	38	3	< 1	5400

Table 1 Total element concentration data for fluvial tailings samples analyzed by ICP-AES, Site 97-BMF-130, High Ore Creek, Montana (cont.)

Field No	DEPTH (cm)	Al %	Ca %	Fe %	K %	Mg %	Na %	P %	Ti %	Mn ppm	Ag ppm
97BMF-130-13-a	6	2.2	1.4	6.3	0.91	0.55	0.20	0.01	0.06	6800	75
97BMF-130-13-b	25	7.6	1.0	2.2	2.6	0.52	1.4	0.06	0.29	1500	< 2
97BMF-130-13-c	45	7.7	1.1	1.5	2.6	0.51	1.6	0.06	0.29	780	< 2
97BMF-130-13-d	55	7.7	1.0	1.1	3.1	0.32	1.7	0.02	0.23	430	< 2
97BMF-130-13-e	62	6.9	0.91	1.1	2.9	0.32	1.7	0.03	0.20	590	< 2
97BMF-130-15-a	9	2.8	0.70	6.3	1.3	0.09	0.39	0.01	0.07	770	240
97BMF-130-15-b	21	6.9	0.10	5.7	3.1	0.23	0.03	0.02	0.11	490	180
97BMF-130-15-c	30	4.2	0.27	6.1	1.6	0.22	0.39	0.05	0.14	500	240
97BMF-130-15-d	38	4.3	0.12	6.1	1.6	0.18	0.16	0.06	0.09	1400	59
97BMF-130-15-e	48	6.6	0.56	2.6	3.4	0.17	1.2	0.03	0.15	4100	5
97BMF-130-15-f	61	7.1	0.63	1.9	3.3	0.23	1.3	0.05	0.20	6500	2
97BMF-130-16-a	7	2.0	0.42	5.8	0.84	0.06	0.14	0.01	0.05	280	160
97BMF-130-16-b	30	1.9	1.0	3.2	0.82	0.21	0.04	0.007	0.04	2800	72
97BMF-130A1-a	2	2.8	0.25	5.1	1.3	0.07	0.58	0.01	0.06	230	150
97BMF-130A1-b	12	3.5	0.08	6.0	1.3	0.11	0.14	0.02	0.08	220	300
97BMF-130A1-c	30	1.9	0.13	3.4	0.79	0.05	0.17	0.01	0.05	230	87
97BMF-130A1-d	44	4.1	0.23	6.0	1.5	0.16	0.17	0.03	0.11	470	300
97BMF-130A1-e	51	1.6	1.3	7.8	0.64	0.18	0.08	< 0.005	0.04	10000	220
97BMF-130A2-a	5	2.8	0.20	3.8	1.3	0.07	0.41	0.01	0.06	150	100
97BMF-130A2-b	12	3.9	0.16	1.9	2.1	0.09	0.38	0.01	0.08	180	90
97BMF-130A2-c	19	2.1	0.10	7.4	0.88	0.06	0.12	0.14	0.04	150	120
97BMF-130A2-d	26	3.4	0.21	5.4	1.3	0.15	0.27	0.13	0.09	140	270
97BMF-130A2-e	31	2.4	0.15	5.2	1.0	0.08	0.16	0.07	0.06	210	160
97BMF-130A2-f	37	2.7	0.17	5.7	1.3	0.09	0.35	0.03	0.06	450	190
97BMF-130A2-g	45	6.3	0.64	3.4	2.6	0.25	1.5	0.13	0.15	180	10
97BMF-130A2-h	52	7.7	1.2	1.8	2.5	0.61	1.4	0.05	0.30	240	3
97BMF-130A2-i	61	7.4	1.0	1.1	3.2	0.31	1.9	0.04	0.17	140	3

Table 1 Total element concentration data for fluvial tailings samples analyzed by ICP-AES, Site 97-BMF-130, High Ore Creek, Montana (cont.)

Field No	As ppm	Ba ppm	Cd ppm	Ce ppm	Co ppm	Cr ppm	Cu ppm	Ga ppm	La ppm	Li ppm	Mo ppm
97BMF-130-13-a	6400	200	110	25	22	< 2	1400	5	16	22	28
97BMF-130-13-b	150	940	780	68	14	24	32	17	35	26	4
97BMF-130-13-c	61	1000	260	74	10	< 2	26	18	41	30	< 2
97BMF-130-13-d	52	930	11	54	5	8	20	9	27	21	< 2
97BMF-130-13-e	76	1000	16	44	6	4	18	10	27	20	2
97BMF-130-15-a	11000	340	140	< 4	8	< 2	1800	< 4	10	17	25
97BMF-130-15-b	11000	440	20	27	2	6	1100	6	21	15	42
97BMF-130-15-c	10000	480	27	12	3	3	2300	5	18	17	35
97BMF-130-15-d	9200	560	59	24	9	< 2	4300	10	25	10	25
97BMF-130-15-e	1100	1100	39	39	93	5	970	14	20	15	11
97BMF-130-15-f	300	1000	76	54	160	7	300	18	27	17	5
97BMF-130-16-a	13000	360	19	8	< 2	< 2	1700	< 4	13	19	39
97BMF-130-16-b	4800	180	36	15	9	< 2	1100	< 4	9	23	21
97BMF-130A1-a	8700	130	91	5	4	< 2	1500	< 4	7	17	42
97BMF-130A1-b	12000	340	20	< 4	< 2	< 2	1300	< 4	14	21	45
97BMF-130A1-c	6200	240	12	9	< 2	2	540	< 4	9	23	21
97BMF-130A1-d	13000	360	30	< 4	3	4	1400	< 4	15	21	42
97BMF-130A1-e	9400	190	280	7	24	< 2	3900	11	8	14	26
97BMF-130A2-a	5700	470	19	10	< 2	3	540	< 4	9	21	26
97BMF-130A2-b	1400	500	10	12	< 2	3	320	6	9	18	17
97BMF-130A2-c	11000	200	43	7	9	5	1100	< 4	7	18	24
97BMF-130A2-d	17000	330	71	13	5	2	910	< 4	17	17	28
97BMF-130A2-e	12000	280	44	10	6	5	1300	< 4	12	21	27
97BMF-130A2-f	12000	230	320	19	13	4	4100	< 4	19	18	22
97BMF-130A2-g	3500	910	28	39	3	10	1600	7	25	19	4
97BMF-130A2-h	200	900	55	84	5	18	690	12	42	32	< 2
97BMF-130A2-i	260	1000	26	48	< 2	2	45	12	26	27	< 2

Table 1 Total element concentration data for fluvial tailings samples analyzed by ICP-AES, Site 97-BMF-130, High Ore Creek, Montana (cont.)

Field No	Nb ppm	Nd ppm	Ni ppm	Pb ppm	Sc ppm	Sr ppm	Th ppm	V ppm	Y ppm	Yb ppm	Zn ppm
97BMF-130-13-a	< 4	10	7	4200	< 2	70	< 4	33	10	< 1	10000
97BMF-130-13-b	14	26	12	150	7	330	11	59	17	2	12000
97BMF-130-13-c	11	30	13	130	6	360	14	63	16	2	10000
97BMF-130-13-d	14	18	7	90	5	380	10	39	9	1	3800
97BMF-130-13-e	8	20	6	110	5	350	10	38	10	1	4500
97BMF-130-15-a	< 4	< 4	< 2	17000	< 2	94	< 4	34	3	< 1	21000
97BMF-130-15-b	11	12	< 2	11000	4	89	8	68	3	< 1	3300
97BMF-130-15-c	5	13	< 2	33000	4	120	7	56	4	< 1	3900
97BMF-130-15-d	< 4	18	3	24000	6	140	14	52	11	2	6700
97BMF-130-15-e	9	13	5	3200	3	310	10	32	9	1	4300
97BMF-130-15-f	8	17	7	550	4	310	13	40	10	1	4300
97BMF-130-16-a	< 4	< 4	< 2	24000	< 2	55	< 4	36	3	< 1	3100
97BMF-130-16-b	< 4	< 4	< 2	3100	< 2	32	< 4	22	4	< 1	4500
97BMF-130A1-a	< 4	< 4	< 2	12000	< 2	130	< 4	33	2	< 1	13000
97BMF-130A1-b	< 4	10	< 2	38000	3	59	< 4	43	4	< 1	4000
97BMF-130A1-c	< 4	< 4	< 2	11000	< 2	56	< 4	21	3	< 1	2100
97BMF-130A1-d	6	11	< 2	34000	4	65	< 4	48	5	< 1	5300
97BMF-130A1-e	< 4	< 4	4	15000	< 2	41	< 4	39	6	< 1	39000
97BMF-130A2-a	< 4	< 4	< 2	8600	< 2	110	< 4	30	2	< 1	3200
97BMF-130A2-b	6	< 4	< 2	4600	< 2	99	< 4	31	< 2	< 1	2000
97BMF-130A2-c	< 4	< 4	4	7200	< 2	48	< 4	37	3	< 1	6400
97BMF-130A2-d	< 4	10	< 2	23000	3	130	10	38	4	< 1	9500
97BMF-130A2-e	< 4	< 4	< 2	16000	2	89	< 4	31	3	< 1	7000
97BMF-130A2-f	< 4	< 4	4	16000	4	140	6	29	3	< 1	50000
97BMF-130A2-g	8	17	4	1400	7	300	15	55	7	1	4000
97BMF-130A2-h	14	33	12	160	8	350	12	55	24	2	3500
97BMF-130A2-i	13	17	4	240	4	430	12	30	9	1	1200

Table 1 Total element concentration data for fluvial tailings samples analyzed by ICP-AES, Site 97-BMF-130, High Ore Creek, Montana (cont.)

Field No	DEPTH (cm)	Al %	Ca %	Fe %	K %	Mg %	Na %	P %	Ti %	Mn ppm	Ag ppm
97BMF-130A3-a	4	2.3	0.15	4.6	1.0	0.08	0.25	0.02	0.06	230	160
97BMF-130A3-b	21	8.0	0.85	2.3	2.4	0.61	1.2	0.06	0.31	760	4
97BMF-130A3-c	39	7.6	0.88	2.1	2.8	0.50	1.4	0.05	0.28	900	2
97BMF-130A3-d	51	7.0	0.99	1.9	2.1	0.48	1.4	0.04	0.28	780	< 2
97BMF-130A3-e	62	7.9	1.1	1.5	3.0	0.48	1.5	0.05	0.26	480	< 2
97BMF-130B1-a	4	6.8	0.76	1.4	3.1	0.25	1.6	0.05	0.19	1100	4
97BMF-130B1-b	16	6.7	0.69	1.4	2.9	0.29	1.4	0.04	0.20	420	< 2
97BMF-130B1-c	32	6.7	0.75	0.86	3.5	0.15	1.8	0.02	0.13	540	< 2
97BMF-130B1-d	47	6.9	0.81	1.1	3.3	0.20	1.7	0.05	0.16	1200	< 2
97BMF-130B1-e	61	7.4	0.76	1.3	3.5	0.24	1.8	0.04	0.20	1200	5
97BMF-130B2-a	13	2.5	0.31	6.0	1.2	0.12	0.44	< 0.005	0.05	4600	180
97BMF-130B2-b	30	1.4	0.31	4.5	0.61	0.18	0.07	< 0.005	0.03	7000	130
97BMF-130B2-c	50	1.3	0.06	3.1	0.54	0.03	0.06	0.006	0.03	280	100
97BMF-130B2-d	72	3.0	0.34	4.7	1.4	0.13	0.49	0.02	0.06	3400	130
97BMF-130B2-e	120	7.5	0.22	1.0	2.8	0.06	0.46	0.04	0.18	210	8
97BMF-130B4-a	6	1.9	0.16	4.1	0.80	0.07	0.10	0.009	0.05	760	130
97BMF-130B4-b	18	7.7	1.6	4.7	3.3	0.25	0.01	0.01	0.09	1500	160
97BMF-130B4-c	31	5.9	1.1	4.1	1.9	0.36	0.57	0.04	0.20	1700	170
97BMF-130B4-d	43	5.5	0.92	2.2	2.9	0.22	1.0	0.09	0.14	1700	68
97BMF-130B4-e	50	2.2	0.76	4.3	0.86	0.09	0.20	0.02	0.06	790	65
97BMF-130B4-f	55	2.6	0.38	3.7	1.2	0.10	0.30	0.01	0.07	840	110
97BMF-130B4-g	79	3.1	0.67	4.4	1.2	0.12	0.36	0.02	0.09	510	150
97BMF-130B4-h	92	5.9	0.22	4.2	2.0	0.30	0.27	0.09	0.19	390	460
97BMF-130B4-i	100	7.3	0.30	5.7	2.2	0.41	0.37	0.09	0.22	650	300
97BMF-130B4-j	103	6.3	0.26	2.6	< 0.01	0.38	0.23	0.08	0.21	990	270
97BMF-130B4-k	113	5.4	0.80	2.0	1.6	0.50	0.87	0.12	0.24	1500	19
97BMF-130B4-l	126	7.6	0.88	2.0	2.3	0.64	1.2	0.06	0.30	1000	< 2

Table 1 Total element concentration data for fluvial tailings samples analyzed by ICP-AES, Site 97-BMF-130, High Ore Creek, Montana (cont.)

Field No	As ppm	Ba ppm	Cd ppm	Ce ppm	Co ppm	Cr ppm	Cu ppm	Ga ppm	La ppm	Li ppm	Mo ppm
97BMF-130A3-a	8600	370	45	14	2	< 2	900	< 4	14	22	27
97BMF-130A3-b	160	990	200	81	13	28	700	18	40	31	6
97BMF-130A3-c	130	1000	180	57	7	23	350	13	32	26	2
97BMF-130A3-d	67	860	900	67	6	7	1100	11	40	27	5
97BMF-130A3-e	100	1100	11	67	7	6	31	14	36	26	4
97BMF-130B1-a	240	1100	4	45	4	7	66	8	19	19	< 2
97BMF-130B1-b	56	980	< 2	50	4	3	20	12	23	19	< 2
97BMF-130B1-c	40	1200	< 2	29	2	4	15	12	14	15	< 2
97BMF-130B1-d	38	1200	19	36	3	5	22	10	17	17	< 2
97BMF-130B1-e	130	1200	2	48	5	8	210	13	18	18	< 2
97BMF-130B2-a	10000	180	220	6	14	< 2	2500	< 4	8	17	23
97BMF-130B2-b	7300	140	210	7	9	< 2	1800	7	8	21	27
97BMF-130B2-c	7000	150	18	5	< 2	< 2	670	< 4	6	22	20
97BMF-130B2-d	7800	340	160	8	10	9	1700	< 4	8	20	20
97BMF-130B2-e	380	900	5	33	< 2	7	110	11	26	16	< 2
97BMF-130B4-a	7200	220	28	8	3	< 2	1100	< 4	9	23	25
97BMF-130B4-b	5000	530	39	30	4	5	2200	13	21	16	42
97BMF-130B4-c	6200	580	37	45	8	12	2600	9	30	22	18
97BMF-130B4-d	2600	830	16	36	8	< 2	800	10	23	17	7
97BMF-130B4-e	5600	260	15	17	4	4	1100	< 4	11	17	21
97BMF-130B4-f	5300	340	16	19	4	10	1200	< 4	13	22	21
97BMF-130B4-g	5900	420	11	21	3	6	1200	< 4	15	20	25
97BMF-130B4-h	5800	570	21	14	2	8	1200	8	29	21	49
97BMF-130B4-i	5600	600	22	20	4	15	1400	11	25	23	30
97BMF-130B4-j	3000	620	160	19	6	< 2	2000	12	25	24	37
97BMF-130B4-k	1400	700	110	49	10	4	540	12	29	27	10
97BMF-130B4-l	89	1000	< 2	68	8	4	45	13	39	32	< 2

Table 1 Total element concentration data for fluvial tailings samples analyzed by ICP-AES, Site 97-BMF-130, High Ore Creek, Montana (cont.)

Field No	Nb ppm	Nd ppm	Ni ppm	Pb ppm	Sc ppm	Sr ppm	Th ppm	V ppm	Y ppm	Yb ppm	Zn ppm
97BMF-130A3-a	< 4	< 4	< 2	13000	< 2	89	< 4	30	3	< 1	4400
97BMF-130A3-b	17	34	11	330	9	290	13	67	26	2	4400
97BMF-130A3-c	14	24	9	110	8	320	13	57	13	2	4000
97BMF-130A3-d	10	29	12	99	7	290	12	61	20	2	7800
97BMF-130A3-e	14	26	9	190	7	370	11	49	16	2	5100
97BMF-130B1-a	14	12	4	440	4	340	10	32	7	< 1	1000
97BMF-130B1-b	11	16	5	58	4	320	10	37	8	< 1	320
97BMF-130B1-c	12	< 4	< 2	39	2	390	6	21	4	< 1	230
97BMF-130B1-d	12	10	3	50	3	380	9	26	5	< 1	810
97BMF-130B1-e	15	12	3	300	4	400	11	30	7	< 1	280
97BMF-130B2-a	< 4	< 4	4	10000	< 2	110	< 4	27	5	< 1	36000
97BMF-130B2-b	< 4	< 4	3	9600	< 2	31	< 4	21	6	< 1	35000
97BMF-130B2-c	< 4	< 4	< 2	8400	< 2	27	< 4	17	< 2	< 1	2700
97BMF-130B2-d	< 4	< 4	5	8200	< 2	140	< 4	27	5	< 1	25000
97BMF-130B2-e	16	16	< 2	540	2	170	17	27	5	< 1	1100
97BMF-130B4-a	< 4	< 4	< 2	13000	< 2	43	< 4	24	5	< 1	3900
97BMF-130B4-b	8	14	< 2	7900	4	78	14	59	15	2	6500
97BMF-130B4-c	9	21	5	15000	6	150	13	51	10	1	4500
97BMF-130B4-d	9	15	< 2	7200	4	240	8	34	10	1	2200
97BMF-130B4-e	< 4	< 4	< 2	6100	< 2	61	< 4	30	4	< 1	2000
97BMF-130B4-f	< 4	9	4	7900	2	78	< 4	27	5	< 1	2100
97BMF-130B4-g	< 4	11	< 2	10000	2	98	< 4	35	4	< 1	1800
97BMF-130B4-h	12	18	< 2	46000	7	130	11	56	7	1	3700
97BMF-130B4-i	12	19	5	32000	8	150	15	71	10	2	4500
97BMF-130B4-j	9	17	6	42000	7	99	12	63	11	< 1	14000
97BMF-130B4-k	6	27	12	2400	6	200	10	61	19	2	38000
97BMF-130B4-l	11	31	13	170	9	260	13	66	19	2	7900

Table 1 Total element concentration data for fluvial tailings samples analyzed by ICP-AES, Site 97-BMF-130, High Ore Creek, Montana (cont.)

Field No	DEPTH (cm)	Al %	Ca %	Fe %	K %	Mg %	Na %	P %	Ti %	Mn ppm	Ag ppm
97BMF-130B5-a	16	1.8	0.11	3.7	0.77	0.06	0.15	0.01	0.05	400	120
97BMF-130B5-b	45	1.6	0.23	4.1	0.65	0.05	0.09	0.008	0.04	630	120
97BMF-130B5-c	51	1.5	0.13	3.9	0.63	0.04	0.06	0.009	0.04	410	130
97BMF-130B5-d	82	3.1	0.15	5.0	1.2	0.11	0.23	0.03	0.08	690	190
97BMF-130B5-e	101	1.7	1.1	4.6	0.73	0.38	0.02	< 0.005	0.04	7000	150
97BMF-130B5-f	119	2.1	1.3	4.8	0.92	0.45	0.03	< 0.005	0.05	5600	150
97BMF-130B5-g	129	2.0	1.3	4.0	0.89	0.45	0.04	0.006	0.04	4900	110
97CMF-130C1-a	4	6.8	0.76	1.4	3.1	0.25	1.6	0.05	0.19	1100	4
97CMF-130C1-b	16	6.7	0.69	1.4	2.9	0.29	1.4	0.04	0.20	420	< 2
97CMF-130C1-c	32	6.7	0.75	0.86	3.5	0.15	1.8	0.02	0.13	540	< 2
97CMF-130C1-d	47	6.9	0.81	1.1	3.3	0.20	1.7	0.05	0.16	1200	< 2
97CMF-130C1-e	61	7.4	0.76	1.3	3.5	0.24	1.8	0.04	0.20	1200	5
97BMF-130C2-a	7	1.6	0.05	4.6	0.69	0.04	0.05	0.01	0.04	250	130
97BMF-130C2-b	25	7.0	0.66	1.6	3.2	0.21	1.6	0.04	0.19	670	13
97BMF-130C2-c	40	8.1	0.16	0.37	3.3	0.05	0.25	0.04	0.22	240	< 2
97BMF-130C2-d	50	6.8	0.74	1.2	3.3	0.23	1.6	0.06	0.18	560	< 2
97BMF-130C2-e	57	7.2	0.65	1.1	3.5	0.18	1.4	0.04	0.18	350	2
97BMF-130C2-f	91	6.9	0.64	1.3	3.4	0.23	1.3	0.04	0.20	420	< 2
97BMF-130C2-g	110	7.1	0.72	1.5	3.1	0.25	1.5	0.04	0.21	540	< 2
97BMF-130C2-h	123	7.7	0.70	1.5	3.2	0.26	1.5	0.04	0.23	670	< 2
97BMF-130C3-a	9	1.9	0.12	3.9	0.83	0.06	0.16	0.01	0.04	260	120
97BMF-130C3-b	21	2.2	0.18	3.5	1.0	0.06	0.29	0.01	0.06	220	110
97BMF-130C3-c	31	1.9	0.12	4.6	0.83	0.05	0.18	0.009	0.05	260	120
97BMF-130C3-d	41	1.5	0.02	4.8	0.61	0.04	< 0.005	< 0.005	0.03	190	180
97BMF-130C3-e	56	3.9	0.34	2.5	2.1	0.09	0.77	0.01	0.08	330	160

Table 1 Total element concentration data for fluvial tailings samples analyzed by ICP-AES, Site 97-BMF-130, High Ore Creek, Montana (cont.)

Field No	As ppm	Ba ppm	Cd ppm	Ce ppm	Co ppm	Cr ppm	Cu ppm	Ga ppm	La ppm	Li ppm	Mo ppm
97BMF-130B5-a	6800	220	10	12	2	3	840	< 4	10	25	23
97BMF-130B5-b	7300	190	21	7	4	< 2	1100	< 4	8	25	25
97BMF-130B5-c	7400	170	13	7	3	4	900	< 4	8	23	30
97BMF-130B5-d	8700	350	25	6	3	4	830	< 4	12	24	30
97BMF-130B5-e	5800	190	69	9	26	< 2	2600	7	7	24	20
97BMF-130B5-f	6700	280	73	23	27	< 2	3400	10	15	21	17
97BMF-130B5-g	5000	250	48	18	22	< 2	2400	< 4	12	21	17
97CMF-130C1-a	240	1100	4	45	4	7	66	8	19	19	< 2
97CMF-130C1-C	56	980	< 2	50	4	3	20	12	23	19	< 2
97CMF-130C1-c	40	1200	< 2	29	2	4	15	12	14	15	< 2
97CMF-130C1-d	38	1200	19	36	3	5	22	10	17	17	< 2
97CMF-130C1-e	130	1200	2	48	5	8	210	13	18	18	< 2
97BMF-130C2-a	7800	180	16	< 4	< 2	< 2	1000	< 4	8	21	29
97BMF-130C2-b	490	1100	< 2	37	3	< 2	180	14	18	18	< 2
97BMF-130C2-c	29	1200	< 2	45	< 2	2	20	14	15	14	< 2
97BMF-130C2-d	20	1300	39	41	2	< 2	17	14	17	18	< 2
97BMF-130C2-e	130	1300	5	40	2	< 2	33	12	16	18	< 2
97BMF-130C2-f	72	1300	13	45	3	4	20	10	21	21	< 2
97BMF-130C2-g	140	1000	15	46	3	< 2	22	12	21	21	< 2
97BMF-130C2-h	49	1200	15	54	4	< 2	22	11	23	23	< 2
97BMF-130C3-a	6200	220	12	7	3	4	830	< 4	7	23	22
97BMF-130C3-b	6500	330	12	7	< 2	< 2	740	< 4	8	22	23
97BMF-130C3-c	8300	240	9	7	< 2	< 2	1100	< 4	8	23	25
97BMF-130C3-d	9200	120	12	< 5	-	< 2	1800	< 4	8	23	31
97BMF-130C3-e	2400	560	7	12	2	< 2	550	6	10	18	14

Table 1 Total element concentration data for fluvial tailings samples analyzed by ICP-AES, Site 97-BMF-130, High Ore Creek, Montana (cont.)

Field No	Nb ppm	Nd ppm	Ni ppm	Pb ppm	Sc ppm	Sr ppm	Th ppm	V ppm	Y ppm	Yb ppm	Zn ppm
97BMF-130B5-a	< 4	< 4	< 2	7600	< 2	47	< 4	23	3	< 1	1500
97BMF-130B5-b	< 4	< 4	< 2	8900	< 2	35	< 4	22	3	< 1	3300
97BMF-130B5-c	< 4	< 4	4	11000	< 2	30	< 4	21	3	< 1	2400
97BMF-130B5-d	< 4	< 4	< 2	22000	3	76	< 4	36	4	< 1	4600
97BMF-130B5-e	< 4	< 4	4	4800	< 2	29	< 4	26	8	< 1	7800
97BMF-130B5-f	< 4	< 4	4	4500	< 2	37	< 4	28	13	< 1	9200
97BMF-130B5-g	< 4	< 4	4	3700	< 2	38	< 4	24	14	1	5900
97CMF-130C1-a	14	12	4	440	4	340	10	32	7	< 1	1000
97CMF-130C1-C	11	16	5	58	4	320	10	37	8	< 1	320
97CMF-130C1-c	12	< 4	< 2	39	2	390	6	21	4	< 1	230
97CMF-130C1-d	12	10	3	50	3	380	9	26	5	< 1	810
97CMF-130C1-e	15	12	3	300	4	400	11	30	7	< 1	280
97BMF-130C2-a	< 4	< 4	< 2	13000	< 2	30	< 4	24	< 2	< 1	2300
97BMF-130C2-b	13	12	< 2	1800	4	350	11	31	7	< 1	500
97BMF-130C2-c	18	10	< 2	30	3	180	13	25	6	< 1	260
97BMF-130C2-d	11	11	4	30	4	360	10	29	6	< 1	2200
97BMF-130C2-e	14	10	< 2	170	3	340	10	28	6	< 1	830
97BMF-130C2-f	14	13	4	33	4	320	10	31	8	< 1	1400
97BMF-130C2-g	13	14	4	41	4	320	11	33	8	1	1500
97BMF-130C2-h	15	16	5	36	5	330	13	35	9	1	1600
97BMF-130C3-a	< 4	< 4	5	8800	< 2	54	< 4	24	2	< 1	1900
97BMF-130C3-b	4	< 4	< 2	9800	< 2	86	< 4	23	3	< 1	1900
97BMF-130C3-c	< 4	< 4	< 2	10000	< 2	57	< 4	24	2	< 1	1400
97BMF-130C3-d	< 4	< 4	< 2	20000	< 2	31	< 4	24	< 2	< 1	1800
97BMF-130C3-e	< 4	< 4	< 2	8100	< 2	180	< 4	23	2	< 1	1400

Table 1 Total element concentration data for fluvial tailings samples analyzed by ICP-AES, Site 97-BMF-130, High Ore Creek, Montana (cont.)

Field No	DEPTH (cm)	Al %	Ca %	Fe %	K %	Mg %	Na %	P %	Ti %	Mn ppm	Ag ppm
97BMF-130C5-a	8	1.7	0.13	4.1	0.72	0.05	0.06	0.01	0.04	460	130
97BMF-130C5-b	20	5.1	0.64	4.6	1.6	0.40	0.67	0.06	0.29	430	150
97BMF-130C5-c	25	2.1	0.22	5.7	0.83	0.07	0.05	0.02	0.04	340	260
97BMF-130C5-d	31	5.8	0.63	4.4	1.9	0.31	0.55	0.09	0.17	500	290
97BMF-130C5-e	39	6.6	0.51	3.6	1.6	0.48	0.76	0.10	0.27	650	87
97BMF-130C5-f	47	4.2	0.53	1.9	1.1	0.32	0.53	0.09	0.17	700	2
97BMF-130C5-g	57	6.5	0.89	1.3	2.6	0.39	1.4	0.04	0.22	420	< 2
97BMF-130C5-h	64	6.8	0.84	0.92	3.4	0.26	1.6	0.03	0.15	240	< 2
97BMF-130C6-a	7	4.2	0.43	3.1	2.0	0.16	0.79	0.03	0.10	1400	90
97BMF-130C6-b	18	5.3	0.49	3.1	2.6	0.19	1.0	0.03	0.11	1900	95
97BMF-130C6-c	27	1.9	0.08	3.6	0.80	0.06	0.12	0.01	0.05	250	120
97BMF-130C6-d	33	2.8	0.07	3.5	1.2	0.11	0.11	0.02	0.07	210	210
97BMF-130C6-e	40	1.9	0.09	3.8	0.80	0.06	0.12	0.01	0.05	240	110
97BMF-130C6-f	51	2.5	0.12	4.3	1.0	0.09	0.17	0.02	0.07	300	140
97BMF-130C6-g	58	6.9	0.63	3.7	2.3	0.50	1.2	0.12	0.34	360	85
97BMF-130C7-a	9	1.9	0.15	3.1	0.80	0.06	0.26	0.02	0.05	220	64
97BMF-130C7-b	26	1.6	0.08	3.4	0.64	0.05	0.10	0.01	0.04	220	100
97BMF-130C7-c	45	1.5	0.07	3.3	0.63	0.05	0.09	0.01	0.05	200	99
97BMF-130C7-d	55	6.9	0.56	5.5	2.1	0.58	1.1	0.11	0.39	360	71
97BMF-130C7-e	60	1.4	0.05	3.1	0.59	0.04	0.06	0.008	0.04	250	91
97BMF-130C7-f	67	1.7	0.09	3.5	0.72	0.06	0.13	0.01	0.05	640	97
97BMF-130C7-g	85	8.5	1.0	2.0	3.0	0.56	1.9	0.09	0.35	390	23
97BMF-130C7-h	97	6.3	0.94	2.0	2.4	0.43	1.3	0.08	0.30	470	< 2
97BMF-130C7-i	109	7.1	1.1	2.1	3.1	0.57	1.4	0.08	0.28	440	< 2
97BMF-130C7-j	122	7.3	0.94	2.0	2.6	0.50	1.4	0.08	0.30	310	< 2

Table 1 Total element concentration data for fluvial tailings samples analyzed by ICP-AES, Site 97-BMF-130, High Ore Creek, Montana (cont.)

Field No	As ppm	Ba ppm	Cd ppm	Ce ppm	Co ppm	Cr ppm	Cu ppm	Ga ppm	La ppm	Li ppm	Mo ppm
97BMF-130C5-a	6500	200	10	6	< 2	< 2	960	< 4	9	24	24
97BMF-130C5-b	6600	480	29	31	5	10	1300	10	24	29	17
97BMF-130C5-c	14000	120	74	< 4	4	< 2	1600	< 4	8	21	32
97BMF-130C5-d	5200	620	72	21	3	4	1800	5	35	18	38
97BMF-130C5-e	4900	670	79	45	6	7	730	11	35	28	16
97BMF-130C5-f	810	590	140	51	10	3	59	7	30	18	11
97BMF-130C5-g	47	990	4	51	4	< 2	18	13	30	23	< 2
97BMF-130C5-h	66	1100	< 2	39	< 2	2	18	9	21	18	< 2
97BMF-130C6-a	3500	590	20	25	8	7	1000	10	15	20	12
97BMF-130C6-b	2900	700	25	27	8	< 2	1200	10	16	19	11
97BMF-130C6-c	6100	200	8	9	< 2	< 2	850	< 4	9	23	24
97BMF-130C6-d	5500	310	7	7	< 2	< 2	1000	< 4	10	21	30
97BMF-130C6-e	6100	220	7	11	< 2	< 2	980	< 4	11	24	25
97BMF-130C6-f	6300	280	9	13	2	< 2	1100	< 4	12	21	22
97BMF-130C6-g	2500	700	8	43	5	7	1200	11	29	29	8
97BMF-130C7-a	5300	370	7	13	< 2	< 2	700	< 4	10	19	21
97BMF-130C7-b	6200	160	6	11	< 2	< 2	750	< 4	9	24	25
97BMF-130C7-c	5900	140	5	8	< 2	< 2	580	< 4	8	21	21
97BMF-130C7-d	5200	700	2	61	6	14	530	7	31	31	10
97BMF-130C7-e	5800	130	5	10	< 2	< 2	630	< 4	8	22	23
97BMF-130C7-f	5900	180	6	11	2	18	700	< 4	8	23	24
97BMF-130C7-g	310	1000	4	77	4	9	320	16	38	30	< 2
97BMF-130C7-h	200	850	15	63	8	3	100	9	34	22	3
97BMF-130C7-i	53	1000	< 2	62	8	7	18	12	30	21	< 2
97BMF-130C7-j	67	890	< 2	73	7	6	30	12	43	25	< 2

Table 1 Total element concentration data for fluvial tailings samples analyzed by ICP-AES, Site 97-BMF-130, High Ore Creek, Montana (cont.)

Field No	Nb ppm	Nd ppm	Ni ppm	Pb ppm	Sc ppm	Sr ppm	Th ppm	V ppm	Y ppm	Yb ppm	Zn ppm
97BMF-130C5-a	< 4	< 4	< 2	14000	< 2	32	< 4	24	< 2	< 1	1800
97BMF-130C5-b	13	16	7	12000	7	140	14	56	7	< 1	4500
97BMF-130C5-c	< 4	< 4	< 2	24000	< 2	36	< 4	32	< 2	< 1	11000
97BMF-130C5-d	6	17	< 2	45000	6	250	10	58	7	< 1	11000
97BMF-130C5-e	13	25	10	16000	8	230	14	72	15	2	6400
97BMF-130C5-f	4	22	10	430	5	140	8	46	19	2	9700
97BMF-130C5-g	9	23	6	110	5	310	9	43	14	2	2100
97BMF-130C5-h	11	15	3	120	4	360	8	28	8	< 1	760
97BMF-130C6-a	6	10	3	5800	3	180	7	27	7	< 1	2200
97BMF-130C6-b	8	11	< 2	4500	3	230	8	31	9	1	3400
97BMF-130C6-c	< 4	< 4	< 2	11000	< 2	47	< 4	23	2	< 1	1200
97BMF-130C6-d	4	< 4	< 2	16000	3	39	< 4	32	2	< 1	1200
97BMF-130C6-e	< 4	< 4	< 2	11000	< 2	43	< 4	24	3	< 1	1200
97BMF-130C6-f	< 4	< 4	< 2	11000	2	51	< 4	31	3	< 1	1400
97BMF-130C6-g	17	22	8	8500	9	240	24	63	10	1	1700
97BMF-130C7-a	< 4	< 4	< 2	6800	< 2	66	< 4	23	2	< 1	960
97BMF-130C7-b	< 4	< 4	< 2	7900	< 2	35	< 4	20	2	< 1	910
97BMF-130C7-c	< 4	< 4	< 2	6600	< 2	32	< 4	20	< 2	< 1	790
97BMF-130C7-d	19	21	10	6200	10	220	26	78	11	2	590
97BMF-130C7-e	< 4	< 4	< 2	7400	< 2	27	< 4	18	< 2	< 1	750
97BMF-130C7-f	< 4	< 4	7	7600	< 2	43	< 4	21	2	< 1	950
97BMF-130C7-g	20	29	7	1700	9	400	23	60	16	2	830
97BMF-130C7-h	11	23	9	320	7	270	13	54	13	2	1500
97BMF-130C7-i	14	21	8	62	7	310	11	55	13	1	200
97BMF-130C7-j	16	32	9	90	7	300	14	55	23	2	200

Table 1 Total element concentration data for fluvial tailings samples analyzed by ICP-AES, Site 97-BMF-130, High Ore Creek, Montana (cont.)

Field No	DEPTH (cm)	Al %	Ca %	Fe %	K %	Mg %	Na %	P %	Ti %	Mn ppm	Ag ppm
97BMF-130C8-a	9	6.6	0.81	1.4	3.6	0.18	1.8	0.04	0.14	300	14
97BMF-130C8-b	22	1.3	0.03	3.5	0.54	0.03	0.005	0.008	0.04	180	110
97BMF-130C8-c	33	7.8	0.94	2.4	3.3	0.44	1.8	0.09	0.30	1300	13
97BMF-130C8-d	45	7.0	1.1	2.1	2.7	0.44	1.4	0.11	0.28	480	< 2
97BMF-130C8-e	58	7.4	1.0	2.1	2.8	0.44	1.5	0.08	0.31	350	< 2

Field No	As ppm	Ba ppm	Cd ppm	Ce ppm	Co ppm	Cr ppm	Cu ppm	Ga ppm	La ppm	Li ppm	Mo ppm
97BMF-130C8-a	920	1100	< 2	38	2	< 2	120	12	19	16	< 2
97BMF-130C8-b	6700	170	8	7	< 2	< 2	630	< 4	8	25	24
97BMF-130C8-c	580	1100	10	100	11	5	250	12	50	26	< 2
97BMF-130C8-d	120	890	20	67	6	11	75	13	32	24	< 2
97BMF-130C8-e	29	910	< 2	73	6	15	16	11	35	26	< 2

Field No	Nb ppm	Nd ppm	Ni ppm	Pb ppm	Sc ppm	Sr ppm	Th ppm	V ppm	Y ppm	Yb ppm	Zn ppm
97BMF-130C8-a	13	13	< 2	1300	3	370	11	26	6	< 1	260
97BMF-130C8-b	< 4	< 4	< 2	10000	< 2	16	< 4	19	< 2	< 1	1300
97BMF-130C8-c	18	30	7	1300	8	360	22	53	16	2	1200
97BMF-130C8-d	16	22	9	250	7	300	14	49	13	1	2000
97BMF-130C8-e	16	22	8	58	7	320	14	50	12	1	780

Table 2 Total element concentration data for fluvial tailings samples analyzed by ICP-AES, Site 97-BMF-131, High Ore Creek, Montana

Field No	DEPTH(cm)	Al %	Ca %	Fe %	K %	Mg %	Na %	P %	Ti %	Mn ppm	Ag ppm
97BMF-131-1-a	2	4.8	1.1	3.7	2.0	0.42	0.89	0.06	0.19	2700	22
97BMF-131-1-b	7	4.7	0.84	2.6	2.5	0.23	1.1	0.04	0.12	2100	24
97BMF-131-1-c	15	5.5	0.65	2.6	2.7	0.17	1.2	0.04	0.12	1100	32
97BMF-131-1-d	21	6.7	1.1	3.5	2.5	0.63	1.4	0.07	0.24	2100	21
97BMF-131-3-a	6	2.0	1.6	3.6	0.80	0.47	0.16	0.02	0.05	9000	52
97BMF-131-3-b	13	3.3	1.3	5.9	1.2	0.25	0.66	0.03	0.09	12000	65
97BMF-131-3-c	16	2.7	1.1	5.7	1.1	0.17	0.44	0.02	0.06	4000	43
97BMF-131-4-a	3	4.9	0.59	1.7	1.8	0.30	0.75	0.10	0.16	13000	27
97BMF-131-4-b	7	6.5	0.83	2.2	2.3	0.50	1.2	0.12	0.27	2200	< 2
97BMF-131-4-c	11	7.6	0.84	2.1	2.7	0.49	1.3	0.09	0.27	2900	< 2
97BMF-131-4-d	19	6.6	0.70	1.7	3.2	0.27	1.5	0.05	0.18	1600	4
97BMF-131-4-e	31	6.7	0.64	1.7	3.2	0.25	1.3	0.05	0.17	2300	< 2
97BMF-131-6-a	5	4.3	0.43	3.3	2.1	0.12	0.91	0.03	0.11	150	94
97BMF-131-6-b	14	4.6	0.40	2.7	2.4	0.09	0.96	0.01	0.09	240	160
97BMF-131-6-c	21	2.5	0.20	2.8	1.1	0.07	0.35	0.009	0.06	310	160
97BMF-131-6-d	35	2.9	0.21	2.9	1.4	0.07	0.44	0.01	0.07	330	140
97BMF-131-7-a	5	3.8	0.53	3.1	1.8	0.43	0.83	0.03	0.23	260	< 2
97BMF-131-7-b	15	6.9	1.5	1.9	2.8	0.48	1.8	0.03	0.38	380	< 2
97BMF-131-7-c	21	4.7	0.43	2.1	2.0	0.38	0.72	0.04	0.40	300	< 2
97BMF-131-7-d	27	5.5	0.91	2.3	2.8	0.33	1.4	0.03	0.16	480	9
97BMF-131-7-e	32	6.2	0.72	2.8	2.1	0.49	1.5	0.04	0.28	300	< 2
97BMF-131-7-f	37	4.5	1.2	3.2	1.7	0.66	1.3	0.12	0.62	500	< 2
97BMF-131-9-a	3	3.4	0.22	6.0	1.3	0.16	0.29	0.02	0.09	320	250
97BMF-131-9-b	9	5.8	0.53	2.3	1.7	0.54	1.7	0.04	0.30	270	< 2
97BMF-131-9-c	16	6.5	0.87	2.8	2.4	0.41	1.5	0.05	0.24	200	8
97BMF-131-9-d	22	6.6	0.63	2.1	3.6	0.27	1.1	0.05	0.20	140	3
97BMF-131-9-e	27	8.3	0.95	1.6	2.6	0.52	1.4	0.05	0.29	180	< 2
97BMF-131-9-f	34	7.3	0.84	1.0	3.3	0.28	1.7	0.04	0.19	110	< 2
97BMF-131-9-g	42	7.0	0.76	1.1	3.3	0.27	1.5	0.03	0.20	110	< 2

Table 2 Total element concentration data for fluvial tailings samples analyzed by ICP-AES, Site 97-BMF-131, High Ore Creek, Montana (cont.)

Field No	As ppm	Ba ppm	Cd ppm	Ce ppm	Co ppm	Cr ppm	Cu ppm	Ga ppm	La ppm	Li ppm	Mo ppm
97BMF-131-1-a	2500	780	27	41	13	4	420	9	24	21	11
97BMF-131-1-b	2400	910	12	25	7	< 2	310	7	14	17	10
97BMF-131-1-c	2700	960	4	21	6	5	220	6	12	29	10
97BMF-131-1-d	3100	770	19	42	11	6	220	11	21	23	5
97BMF-131-3-a	4100	270	89	19	18	< 2	580	13	11	22	34
97BMF-131-3-b	6900	120	64	38	40	2	1200	9	24	16	25
97BMF-131-3-c	6000	170	27	23	18	2	1300	6	13	16	28
97BMF-131-4-a	660	780	740	40	23	2	330	24	21	16	7
97BMF-131-4-b	99	990	290	59	7	5	50	12	31	25	< 2
97BMF-131-4-c	55	920	93	71	13	20	34	20	35	27	< 2
97BMF-131-4-d	160	1100	25	37	8	3	43	10	20	20	< 2
97BMF-131-4-e	45	1000	28	57	8	4	44	14	27	22	< 2
97BMF-131-6-a	4600	640	4	15	< 2	< 2	500	4	11	17	12
97BMF-131-6-b	3600	1000	5	10	< 2	< 2	560	< 4	10	16	13
97BMF-131-6-c	4000	340	6	11	< 2	4	890	< 4	11	21	27
97BMF-131-6-d	3900	400	19	8	< 2	2	700	< 4	11	19	21
97BMF-131-7-a	150	230	< 2	130	81	26	1200	12	60	20	< 2
97BMF-131-7-b	55	490	< 2	140	4	27	6	18	74	30	< 2
97BMF-131-7-c	24	310	< 2	120	7	26	9	12	56	31	< 2
97BMF-131-7-d	840	690	< 2	62	4	< 2	83	7	37	21	5
97BMF-131-7-e	290	540	< 2	110	160	25	480	14	52	23	< 2
97BMF-131-7-f	21	380	< 2	140	58	35	9	11	62	14	< 2
97BMF-131-9-a	10000	490	16	< 4	< 2	< 2	2400	< 4	20	17	40
97BMF-131-9-b	18	400	< 2	100	6	29	12	13	53	23	< 2
97BMF-131-9-c	3200	820	4	39	2	4	250	9	24	22	5
97BMF-131-9-d	1000	1200	< 2	30	2	3	82	7	17	19	< 2
97BMF-131-9-e	88	960	< 2	84	2	15	320	13	41	28	< 2
97BMF-131-9-f	40	1000	< 2	48	< 2	5	85	10	26	18	< 2
97BMF-131-9-g	31	1000	< 2	45	< 2	< 2	48	9	26	17	< 2

Table 2 Total element concentration data for fluvial tailings samples analyzed by ICP-AES, Site 97-BMF-131, High Ore Creek, Montana (cont.)

Field No	Nb ppm	Nd ppm	Ni ppm	Pb ppm	Sc ppm	Sr ppm	Th ppm	V ppm	Y ppm	Yb ppm	Zn ppm
97BMF-131-1-a	4	18	7	1600	4	200	9	47	11	< 1	3300
97BMF-131-1-b	< 4	10	4	2000	< 2	260	7	29	5	< 1	1800
97BMF-131-1-c	9	< 4	< 2	3500	3	280	8	29	3	< 1	950
97BMF-131-1-d	10	14	9	960	7	320	10	63	8	< 1	2500
97BMF-131-3-a	< 4	< 4	6	2800	< 2	60	< 4	23	6	< 1	11000
97BMF-131-3-b	< 4	16	8	3400	2	140	6	42	15	1	11000
97BMF-131-3-c	< 4	11	6	2700	3	110	8	38	6	1	5000
97BMF-131-4-a	< 4	15	18	1600	5	190	12	34	10	< 1	13000
97BMF-131-4-b	12	22	19	140	7	260	12	56	14	2	12000
97BMF-131-4-c	15	26	11	100	7	300	14	55	16	2	6100
97BMF-131-4-d	7	14	4	490	4	320	10	39	8	1	1800
97BMF-131-4-e	13	17	5	37	4	310	11	39	11	1	1500
97BMF-131-6-a	7	< 4	< 2	8300	2	220	< 4	34	3	< 1	880
97BMF-131-6-b	8	< 4	< 2	9900	< 2	240	< 4	30	2	< 1	1200
97BMF-131-6-c	< 4	< 4	< 2	13000	< 2	89	< 4	24	< 2	< 1	1500
97BMF-131-6-d	4	< 4	< 2	16000	< 2	120	< 4	26	2	< 1	3300
97BMF-131-7-a	49	55	9	6	5	48	50	26	69	5	24
97BMF-131-7-b	36	59	5	22	6	370	27	33	100	6	51
97BMF-131-7-c	22	58	10	10	6	100	21	34	62	3	51
97BMF-131-7-d	8	19	4	810	4	300	10	39	8	1	450
97BMF-131-7-e	21	41	16	9	7	200	18	34	46	3	36
97BMF-131-7-f	15	58	12	4	7	190	12	52	41	2	34
97BMF-131-9-a	< 4	11	< 2	59000	3	140	< 4	41	2	< 1	3700
97BMF-131-9-b	15	50	11	10	8	130	18	37	49	2	44
97BMF-131-9-c	10	19	6	700	6	300	12	55	6	< 1	550
97BMF-131-9-d	7	12	4	380	5	300	8	46	7	< 1	220
97BMF-131-9-e	11	34	8	150	8	340	14	55	18	2	690
97BMF-131-9-f	10	20	4	64	4	370	9	44	8	1	340
97BMF-131-9-g	10	18	3	51	5	330	11	39	7	1	300

Table 2 Total element concentration data for fluvial tailings samples analyzed by ICP-AES, Site 97-BMF-131, High Ore Creek, Montana (cont.)

Field No	DEPTH(cm)	Al %	Ca %	Fe %	K %	Mg %	Na %	P %	Ti %	Mn ppm	Ag ppm
97BMF-131-10-a	6	4.7	0.40	4.1	1.7	0.25	0.64	0.04	0.17	260	180
97BMF-131-10-b	20	6.7	0.71	4.3	2.1	0.44	1.1	0.06	0.27	190	48
97BMF-131-10-c	31	7.8	0.78	3.4	2.1	0.63	1.2	0.07	0.33	220	17
97BMF-131-10-d	38	5.0	0.55	3.4	2.0	0.22	1.1	0.04	0.16	170	100
97BMF-131-10-e	46	5.2	0.44	4.7	2.3	0.21	0.84	0.05	0.14	190	160
97BMF-131-10-f	55	7.8	0.90	3.2	2.4	0.65	1.3	0.06	0.33	300	11
97BMF-131-10-g	63	8.1	0.87	2.8	2.6	0.51	1.4	0.06	0.31	200	3
97BMF-131-10-h	87	5.8	0.54	3.9	2.1	0.34	0.87	0.05	0.22	240	86
97BMF-131-10-i	108	7.1	1.0	1.7	3.1	0.25	1.7	0.03	0.18	100	4
97BMF-131-10-j	116	7.0	0.79	1.7	3.3	0.25	1.5	0.04	0.19	96	6
97BMF-131-11-a	7	4.9	0.36	4.9	1.8	0.24	0.70	0.05	0.16	220	290
97BMF-131-11-b	18	4.5	0.41	3.7	2.2	0.13	0.93	0.03	0.12	130	130
97BMF-131-11-c	32	5.3	0.52	2.5	3.1	0.09	1.2	0.03	0.10	100	83
97BMF-131-11-d	44	3.6	0.43	2.6	1.8	0.07	0.81	0.01	0.07	150	350
97BMF-131-11-e	51	4.7	0.48	3.5	2.5	0.15	0.96	0.03	0.11	140	140
97BMF-131-11-f	61	7.4	0.82	2.6	3.1	0.65	1.1	0.04	0.28	320	4
97BMF-131-12-a	4	7.8	0.88	2.4	2.8	0.37	1.6	0.05	0.32	530	2
97BMF-131-12-b	11	8.6	0.91	3.6	2.1	0.48	1.8	0.07	0.38	910	< 2
97BMF-131-12-c	19	7.9	0.81	3.0	2.6	0.51	1.3	0.06	0.41	1200	< 2
97BMF-131-13-a	13	7.1	0.69	2.2	3.1	0.30	1.3	0.05	0.23	830	26
97BMF-131-13-b	35	6.9	0.83	1.2	3.3	0.20	1.7	0.06	0.15	710	< 2
97BMF-131-13-c	55	7.2	0.85	1.4	3.4	0.23	1.7	0.06	0.18	430	< 2
97BMF-131-13-d	72	6.7	0.79	1.2	3.6	0.16	1.6	0.04	0.15	280	< 2
97BMF-131-13-e	106	7.3	0.98	1.4	3.5	0.24	1.9	0.04	0.18	360	< 2
97BMF-131-13-f	120	8.1	0.98	2.2	3.0	0.41	1.7	0.05	0.31	1300	< 2
97BMF-131-13-g	132	8.2	0.94	2.8	2.3	0.48	1.6	0.06	0.36	1100	< 2

Table 2 Total element concentration data for fluvial tailings samples analyzed by ICP-AES, Site 97-BMF-131, High Ore Creek, Montana (cont.)

Field No	As ppm	Ba ppm	Cd ppm	Ce ppm	Co ppm	Cr ppm	Cu ppm	Ga ppm	La ppm	Li ppm	Mo ppm
97BMF-131-10-a	7600	520	26	21	3	11	700	< 4	18	22	19
97BMF-131-10-b	6800	770	13	44	3	22	400	6	25	24	8
97BMF-131-10-c	810	840	11	53	4	31	360	16	28	29	4
97BMF-131-10-d	6100	740	15	26	< 2	7	390	7	19	17	11
97BMF-131-10-e	9700	620	13	17	< 2	8	500	4	15	16	16
97BMF-131-10-f	740	890	4	56	5	14	280	12	30	28	< 2
97BMF-131-10-g	64	880	3	49	3	9	200	16	25	26	< 2
97BMF-131-10-h	4800	730	16	32	4	9	410	6	21	22	9
97BMF-131-10-i	160	910	< 2	41	< 2	5	55	13	22	19	< 2
97BMF-131-10-j	850	1100	< 2	37	< 2	8	48	14	20	17	< 2
97BMF-131-11-a	7400	630	14	16	2	6	900	4	16	19	20
97BMF-131-11-b	5600	640	6	16	< 2	5	440	< 4	14	17	15
97BMF-131-11-c	3500	1000	6	14	< 2	2	210	< 4	10	15	6
97BMF-131-11-d	2500	780	22	< 4	< 2	< 2	420	< 4	17	16	22
97BMF-131-11-e	7200	750	60	15	3	4	300	< 4	13	15	12
97BMF-131-11-f	570	1000	< 2	63	5	9	54	14	34	24	< 2
97BMF-131-12-a	76	960	< 2	70	6	14	91	14	32	24	< 2
97BMF-131-12-b	140	920	8	98	8	7	180	13	45	34	5
97BMF-131-12-c	130	860	14	99	9	17	250	17	51	26	< 2
97BMF-131-13-a	1200	1000	4	53	8	5	170	15	29	20	3
97BMF-131-13-b	53	1200	11	46	3	7	21	11	23	14	< 2
97BMF-131-13-c	22	1200	< 2	45	4	< 2	9	10	22	17	< 2
97BMF-131-13-d	54	1200	< 2	41	2	< 2	12	13	20	14	< 2
97BMF-131-13-e	13	1100	< 2	49	3	5	6	7	25	16	< 2
97BMF-131-13-f	25	1000	5	71	14	3	16	17	37	24	< 2
97BMF-131-13-g	29	830	6	82	13	8	22	15	40	32	< 2

Table 2 Total element concentration data for fluvial tailings samples analyzed by ICP-AES, Site 97-BMF-131, High Ore Creek, Montana (cont.)

Field No	Nb ppm	Nd ppm	Ni ppm	Pb ppm	Sc ppm	Sr ppm	Th ppm	V ppm	Y ppm	Yb ppm	Zn ppm
97BMF-131-10-a	8	13	4	16000	5	170	6	47	5	< 1	3400
97BMF-131-10-b	11	20	8	3200	7	260	12	65	8	1	1400
97BMF-131-10-c	16	22	10	1200	12	270	16	74	9	1	2000
97BMF-131-10-d	5	13	3	9200	4	240	8	42	4	< 1	1700
97BMF-131-10-e	9	10	4	12000	4	200	6	42	4	< 1	1300
97BMF-131-10-f	15	23	10	740	9	300	15	74	10	1	1100
97BMF-131-10-g	14	18	9	150	8	320	14	70	8	1	960
97BMF-131-10-h	10	14	7	7900	6	210	8	56	6	< 1	2300
97BMF-131-10-i	12	14	4	180	4	390	7	37	5	< 1	460
97BMF-131-10-j	13	13	4	290	4	350	8	34	6	< 1	300
97BMF-131-11-a	8	11	4	18000	5	180	7	48	5	< 1	1700
97BMF-131-11-b	9	< 4	< 2	9200	3	230	< 4	34	3	< 1	950
97BMF-131-11-c	10	< 4	< 2	5500	< 2	290	< 4	34	4	< 1	1300
97BMF-131-11-d	4	< 4	< 2	32000	< 2	220	< 4	26	< 2	< 1	3900
97BMF-131-11-e	9	< 4	< 2	11000	2	230	< 4	55	3	< 1	9000
97BMF-131-11-f	13	24	8	180	8	280	12	78	10	1	560
97BMF-131-12-a	16	26	9	160	7	330	14	49	14	2	690
97BMF-131-12-b	16	39	12	49	10	270	15	59	27	3	1700
97BMF-131-12-c	18	36	11	71	10	270	18	70	27	3	1900
97BMF-131-13-a	13	21	7	2600	6	310	14	45	12	1	800
97BMF-131-13-b	13	14	5	85	4	410	9	29	7	< 1	1100
97BMF-131-13-c	13	14	5	32	4	410	10	33	7	< 1	1000
97BMF-131-13-d	13	12	3	100	3	390	12	27	6	< 1	150
97BMF-131-13-e	12	15	4	30	4	430	11	34	7	< 1	170
97BMF-131-13-f	18	27	9	45	8	370	15	53	16	2	550
97BMF-131-13-g	16	33	11	43	9	290	16	56	21	2	950

Table 2 Total element concentration data for fluvial tailings samples analyzed by ICP-AES, Site 97-BMF-131, High Ore Creek, Montana (cont.)

Field No	DEPTH (cm)	Al %	Ca %	Fe %	K %	Mg %	Na %	P %	Ti %	Mn ppm	Ag ppm
97BMF-131A1-a	6	5.5	0.38	2.8	1.6	0.58	1.3	0.04	0.27	300	< 2
97BMF-131A1-b	19	6.8	0.81	1.0	3.4	0.20	1.8	0.04	0.14	1200	< 2
97BMF-131A1-c	31	4.3	0.89	3.7	1.8	0.35	0.95	0.05	0.71	580	< 2
97BMF-131A2-a	4	3.5	0.33	5.3	1.6	0.12	0.65	0.02	0.08	2200	70
97BMF-131A2-b	11	5.4	0.54	2.3	3.0	0.11	1.3	0.02	0.08	460	46
97BMF-131A2-c	19	4.9	0.30	3.3	2.4	0.15	0.57	0.03	0.12	210	77
97BMF-131A2-d	32	5.8	0.76	2.4	2.4	0.19	1.8	0.07	0.14	1300	22
97BMF-131A2-e	47	6.9	0.74	1.4	3.3	0.24	1.6	0.04	0.17	1400	< 2
97BMF-131A2-f	60	7.2	0.78	1.6	3.1	0.30	1.6	0.04	0.20	1400	< 2
97BMF-131A4-a	6	6.0	0.76	4.4	1.9	0.42	1.2	0.07	0.24	1200	72
97BMF-131A4-b	15	7.0	0.38	5.2	2.3	0.37	0.31	0.16	0.19	12000	210
97BMF-131A4-c	22	5.7	0.72	1.9	1.8	0.38	0.55	0.10	0.21	2000	48
97BMF-131A4-d	33	4.7	1.1	4.6	1.9	0.46	1.1	0.10	1.1	680	< 2
97BMF-131A4-e	50	6.9	0.63	2.4	3.2	0.28	1.3	0.06	0.18	1100	< 2
97BMF-131A4-f	63	7.5	0.86	1.7	2.7	0.42	1.3	0.05	0.26	1900	< 2
97BMF-131A5-a	2	1.2	0.03	4.5	0.48	0.04	< 0.005	0.007	0.03	180	63
97BMF-131A5-b	6	5.8	1.7	2.9	1.8	0.54	1.3	0.05	0.64	350	< 2
97BMF-131A5-c	12	1.6	0.02	5.7	0.64	0.05	0.005	0.006	0.03	150	170
97BMF-131A5-d	19	6.4	0.56	4.7	2.1	0.36	1.1	0.08	0.22	130	63
97BMF-131A5-e	25	6.6	0.67	2.6	2.3	0.38	1.2	0.07	0.24	140	22
97BMF-131A5-f	33	7.1	0.71	3.0	2.6	0.47	1.2	0.06	0.25	240	6
97BMF-131A5-g	42	6.5	1.8	3.3	2.0	1.4	1.0	0.05	0.30	460	< 2
97BMF-131A5-h	51	8.0	0.83	3.2	2.3	0.58	1.2	0.07	0.32	170	13
97BMF-131A5-i	61	6.0	1.0	2.0	2.2	0.44	1.7	0.03	0.47	290	< 2

Table 2 Total element concentration data for fluvial tailings samples analyzed by ICP-AES, Site 97-BMF-131, High Ore Creek, Montana (cont.)

Field No	As ppm	Ba ppm	Cd ppm	Ce ppm	Co ppm	Cr ppm	Cu ppm	Ga ppm	La ppm	Li ppm	Mo ppm
97BMF-131A1-a	41	430	< 2	81	8	33	240	13	38	19	< 2
97BMF-131A1-b	110	1300	3	28	3	< 2	46	10	12	18	< 2
97BMF-131A1-c	14	540	< 2	150	5	40	8	16	70	8	< 2
97BMF-131A2-a	6400	690	11	19	13	2	690	< 4	13	18	23
97BMF-131A2-b	3900	1100	4	17	3	< 2	420	7	11	15	8
97BMF-131A2-c	5200	730	3	22	< 2	< 2	470	< 4	17	19	13
97BMF-131A2-d	1800	1200	< 2	14	12	< 2	340	9	10	15	3
97BMF-131A2-e	24	1100	< 2	45	12	5	120	8	18	21	< 2
97BMF-131A2-f	52	1000	< 2	51	8	11	280	14	27	25	< 2
97BMF-131A4-a	4400	670	8	52	7	13	770	10	31	22	12
97BMF-131A4-b	8200	440	180	38	44	4	1700	23	31	20	30
97BMF-131A4-c	790	500	220	49	10	2	390	11	30	20	5
97BMF-131A4-d	88	480	< 2	180	82	44	230	10	88	13	< 2
97BMF-131A4-e	150	1100	17	46	6	4	200	9	26	22	3
97BMF-131A4-f	44	880	31	57	5	7	360	15	32	26	< 2
97BMF-131A5-a	8000	110	13	< 4	< 2	< 2	920	< 4	7	23	28
97BMF-131A5-b	18	440	< 2	180	7	42	7	14	78	13	< 2
97BMF-131A5-c	11000	120	13	< 4	< 2	< 2	1600	< 4	8	21	36
97BMF-131A5-d	9200	760	12	26	2	2	660	8	21	21	10
97BMF-131A5-e	1100	850	3	37	2	3	570	8	24	22	3
97BMF-131A5-f	700	910	< 2	44	3	11	260	10	26	24	< 2
97BMF-131A5-g	26	730	< 2	47	11	87	27	17	19	46	< 2
97BMF-131A5-h	970	870	< 2	67	4	19	350	11	39	29	3
97BMF-131A5-i	20	640	< 2	130	5	27	20	13	63	19	< 2

Table 2 Total element concentration data for fluvial tailings samples analyzed by ICP-AES, Site 97-BMF-131, High Ore Creek, Montana (cont.)

Field No	Nb ppm	Nd ppm	Ni ppm	Pb ppm	Sc ppm	Sr ppm	Th ppm	V ppm	Y ppm	Yb ppm	Zn ppm
97BMF-131A1-a	14	41	13	11	8	110	12	44	26	1	67
97BMF-131A1-b	9	< 4	< 2	190	3	400	9	23	4	< 1	420
97BMF-131A1-c	67	55	6	13	7	140	42	48	93	6	32
97BMF-131A2-a	< 4	< 4	4	6900	< 2	150	< 4	40	4	< 1	1700
97BMF-131A2-b	7	< 4	< 2	4200	< 2	300	< 4	24	3	< 1	770
97BMF-131A2-c	6	10	3	7900	3	170	10	32	5	< 1	610
97BMF-131A2-d	8	< 4	2	1800	2	350	8	32	2	< 1	230
97BMF-131A2-e	8	12	4	48	4	360	9	31	6	1	170
97BMF-131A2-f	11	16	5	68	5	360	10	35	13	1	270
97BMF-131A4-a	8	24	6	8600	7	250	13	63	14	2	1400
97BMF-131A4-b	< 4	24	8	21000	7	120	15	71	18	2	11000
97BMF-131A4-c	6	25	14	1900	5	170	11	47	17	2	18000
97BMF-131A4-d	72	64	11	10	8	160	33	68	80	5	37
97BMF-131A4-e	6	17	5	180	4	310	10	45	12	1	1400
97BMF-131A4-f	12	23	7	110	7	310	13	42	17	2	1500
97BMF-131A5-a	< 4	< 4	< 2	12000	< 2	19	< 4	22	< 2	< 1	1700
97BMF-131A5-b	31	78	8	8	14	250	25	58	120	6	25
97BMF-131A5-c	< 4	< 4	< 2	23000	< 2	32	< 4	29	< 2	< 1	2400
97BMF-131A5-d	8	16	5	13000	6	240	9	60	7	< 1	1100
97BMF-131A5-e	10	17	6	2600	6	270	11	51	8	< 1	690
97BMF-131A5-f	9	19	7	1000	7	270	12	57	9	1	630
97BMF-131A5-g	11	20	63	14	10	200	13	84	26	2	80
97BMF-131A5-h	11	27	10	910	9	280	16	73	15	2	560
97BMF-131A5-i	20	52	6	10	6	240	19	39	48	3	34

Table 3 Total digestion concentration data from stream-sediment sample, High Ore Creek, Montana

Field No	Al %	Ca %	Fe %	K %	Mg %	Na %	P %	Ti %	Mn ppm	Ag ppm	As ppm
96-BM-101	3.2	1.4	8.0	0.92	0.61	0.37	0.05	0.09	21000	52	8100
96-BM-102	2.8	2.0	5.9	0.91	0.75	0.47	0.05	0.09	9200	34	6100
96-BM-103	5.4	2.2	6.0	1.8	0.87	1.3	0.11	0.31	5800	14	2500
96-BM-104	4.8	1.9	6.3	1.6	0.78	0.96	0.11	0.24	8400	22	4100
96-BM-105A	4.7	2.0	9.0	1.6	0.79	1.0	0.12	0.27	9100	25	4800
96-BM-105B	4.0	2.2	6.2	1.4	0.97	0.66	0.10	0.21	8100	34	4300
97-BMS-118	5.0	2.0	8.9	2.0	0.72	1.2	0.08	0.27	9600	27	3900
Field No	Ba ppm	Cd ppm	Ce ppm	Co ppm	Cr ppm	Cu ppm	Ga ppm	La ppm	Li ppm	Mo ppm	Nb ppm
96-BM-101	390	150	42	66	13	2000	18	27	23	23	7
96-BM-102	170	22	37	28	12	460	10	23	24	14	7
96-BM-103	550	14	82	25	44	220	16	49	24	4	16
96-BM-104	270	30	76	30	31	400	15	45	28	9	14
96-BM-105A	480	32	82	33	63	460	15	50	26	5	17
96-BM-105B	110	68	66	29	28	740	12	41	30	11	11
97-BMS-118	120	30	75	34	63	680	27	40	24	7	< 4
Field No	Nd ppm	Ni ppm	Pb ppm	Sc ppm	Sr ppm	Th ppm	V ppm	Y ppm	Yb ppm	Zn ppm	
96-BM-101	16	18	5700	4	120	7	24	20	2	17000	
96-BM-102	14	6	1900	3	130	7	36	13	1	4200	
96-BM-103	31	13	930	9	290	22	130	24	2	3800	
96-BM-104	27	13	1500	8	230	12	96	20	2	7500	
96-BM-105A	32	14	1600	9	240	40	210	24	2	7300	
96-BM-105B	27	13	1600	8	170	36	92	22	2	10000	
97-BMS-118	30	17	1600	8	260	< 4	220	17	2	6800	

Table 4 Partial digestion data (2M HCl -1%H_2O_2) from stream-sediment samples from High Ore Creek, Montana

Field No	AL ppm	Ca ppm	Fe ppm	K ppm	Mg ppm	Na ppm	P ppm	Si ppm	Ti ppm	Mn ppm	Ag ppm
96-BM-101	2500	12000	55500	360	4600	37	380	3600	61	20000	45
96-BM-102	890	16000	26000	260	6500	31	440	980	63	9000	22
96-BM-103	3000	11000	18000	1100	5100	47	1100	1200	300	6100	13
96-BM-104	2500	12000	24000	920	5100	44	1100	1400	240	9000	22
96-BM-105A	2100	10000	22000	760	4200	50	1200	1300	200	8800	22
96-BM-105B	2700	16000	30000	1300	7000	390	940	1200	220	8500	27
97-BMS-118	2200	11000	24000	850	4400	50	1100	1600	280	10000	29

Field No	As ppm	Ba ppm	Cd ppm	Ce ppm	Co ppm	Cr ppm	Cu ppm	La ppm	Li ppm	Mo ppm	Ni ppm
96-BM-101	5300	83	140	30	49	3.4	1600	18	< 2	14	14
96-BM-102	1700	78	13	14	12	1.8	210	6.9	< 2	11	3.1
96-BM-103	770	110	11	29	12	4.2	120	15	6.0	4.2	6.7
96-BM-104	1200	130	25	29	16	4.0	220	15	4.3	5.8	8.4
96-BM-105A	1200	100	24	32	15	3.8	200	16	3.6	6.7	7.4
96-BM-105B	2300	5.5	68	32	18	3.3	600	17	5.4	8.9	8.9
97-BMS-118	1300	120	26	33	25	3.5	200	16	3.7	5.7	8.3

Field No	Pb ppm	Sr ppm	Th ppm	V ppm	Y ppm	Zn ppm
96-BM-101	5900	41	< 2	7.7	17	14000
96-BM-102	2000	29	< 2	6.2	8.2	2900
96-BM-103	1100	30	5.8	13	11	3400
96-BM-104	1700	34	4.5	13	12	6800
96-BM-105A	1800	30	8.3	12	12	5900
96-BM-105B	1900	34	8.0	12	14	9800
97-BMS-118	1800	27	< 2	16	10	6100

Table 5 Total digestion data from residues following the 2M HCl -1%H_2O_2 extraction from stream-sediment samples, High Ore Creek, Montana

Field No	Al %	Ca %	Fe %	K %	Mg %	Na %	P %	Ti %	Mn ppm	Ag ppm	As ppm
96-BM-101	2.8	0.21	2.6	0.79	0.14	0.34	0.02	0.07	270	10	2800
96-BM-102	2.6	0.35	3.6	0.81	0.11	0.48	< 0.005	0.08	160	10	4000
96-BM-103	4.7	1.2	4.8	1.6	0.39	1.3	0.01	0.26	290	4	1900
96-BM-104	4.3	0.88	4.8	1.4	0.30	0.96	0.01	0.22	260	11	3300
96-BM-105A	4.2	0.96	8.1	1.3	0.36	0.97	0.01	0.24	330	7	4000
96-BM-105B	3.6	0.64	3.7	1.2	0.29	0.64	0.01	0.16	240	4	2000
97-BMS-118	4.8	1.0	6.9	1.5	0.34	1.1	0.008	0.24	340	11	3200
Field No	**Ba ppm**	**Cd ppm**	**Ce ppm**	**Co ppm**	**Cr ppm**	**Cu ppm**	**Ga ppm**	**La ppm**	**Li ppm**	**Mo ppm**	**Nb ppm**
96-BM-101	210	10	10	12	8	320	6	6	20	8	5
96-BM-102	37	8	16	16	10	280	< 4	10	24	4	6
96-BM-103	110	2	61	12	49	110	9	37	16	< 2	15
96-BM-104	39	6	51	16	31	270	7	31	22	3	13
96-BM-105A	50	6	46	16	74	240	7	28	20	2	14
96-BM-105B	55	2	30	10	30	150	7	19	24	2	10
97-BMS-118	84	8	63	14	61	330	7	38	21	5	10
Field No	**Nd ppm**	**Ni ppm**	**Pb ppm**	**Sc ppm**	**Sr ppm**	**Th ppm**	**V ppm**	**Y ppm**	**Yb ppm**	**Zn ppm**	
96-BM-101	4	4	310	3	80	6	17	2	< 1	1800	
96-BM-102	5	2	110	2	110	5	33	3	< 1	1500	
96-BM-103	22	6	58	8	260	16	130	13	1	540	
96-BM-104	18	4	94	7	200	13	97	10	1	1300	
96-BM-105A	18	7	84	8	200	15	240	12	1	1300	
96-BM-105B	11	6	88	6	140	11	94	8	< 1	510	
97-BMS-118	27	7	110	7	220	6	210	10	1	1600	

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Appendix

TABLE A1 Comparison of contract laboratory results with NIST values for SRM-2704

SRM-2704 n=20					
Element	observed conc.	observed % RSD	NIST value	NIST C.I.*	PERCENT RECOVERY
Al %	5.71	2.8	6.11	0.16	93
Ca %	2.61	5.6	2.6	0.03	100
Fe %	3.73	3.9	4.11	0.10	91
K %	1.84	4.9	2.00	0.04	92
Mg %	1.12	3.3	1.2	0.02	93
Na %	0.56	4.8	0.55	0.014	102
P %	0.08	8.1	0.099	0.003	81
Ti %	0.33	5.3	0.457	0.018	72
Mn, ppm	550	4.3	555	19	99
Ag, ppm	<2				
As, ppm	33.6	60	23.4	0.8	144
Ba, ppm	405	14	414	12	98
Cd, ppm	<2		3.45	0.22	
Ce, ppm	62	3.7	72		86
Co, ppm	10.9	0.7	14	0.6	78
Cr, ppm	76.6	20	135	5	57
Cu, ppm	88.9	5.5	98.6	5	90
Ga, ppm	10.9	3.5	15		73
La, ppm	29.2	0.8	29		101
Li, ppm	39.5	1.3	50		79
Mo, ppm	3.6	0.5			
Nb, ppm	6.2	3.8			
Nd, ppm	28.9	1.3			
Ni, ppm	38.4	1.8	44	3	87
Pb, ppm	161	20	161	17	100
Sc, ppm	10.6	0.5	12		88
Sr, ppm	125	4.5	130		96
Th, ppm	7.4	2	9.2		80
V, ppm	88.4	9.8	95	4	93
Y, ppm	18.9	0.9			
Yb, ppm	2.1	0.3	2.8		75
Zn, ppm	375	22	438	12	86

* 95% confidence interval

This table shows the results for twenty analyses for SRM-2704 submitted as blind samples to the contract laboratory.

TABLE A2 Comparison of contract laboratory results with NIST values for SRM-2709

SRM-2709	n=20				
	observed	observed	NIST	NIST	PERCENT
Element	conc.	% RSD	value	C.I.*	RECOVERY
Al %	7.02	3.4	7.5	0.06	94
Ca %	1.82	3.4	1.89	0.05	96
Fe %	3.26	3.4	3.50	0.11	93
K %	1.89	5.3	2.03	0.06	93
Mg %	1.41	5.1	1.51	0.05	93
Na %	1.11	6.5	1.16	0.03	96
P %	0.05	11	0.062	0.005	81
Ti %	0.35	2.8	0.342	0.024	102
Mn, ppm	482	4.80	538	17	90
Ag, ppm	<2		0.41	0.03	
As, ppm	27.7	14	17.7	0.8	156
Ba, ppm	903	24	968	40	93
Cd, ppm	<2		0.38	0.01	
Ce, ppm	42.6	2.1	42		101
Co, ppm	10.6	0.7	13.4	0.7	79
Cr, ppm	41.2	16	130	4	32
Cu, ppm	30.1	1.3	34.6	0.7	87
Ga, ppm	14.2		14		101
La, ppm	21.7	1.2	23		94
Li, ppm	47.5	1.3	50		95
Mo, ppm	<2		2		
Nb, ppm	8.1	4.6			
Nd, ppm	18.5	0.7	19		97
Ni, ppm	72.5	2.5	88	5	82
Pb, ppm	30	12	18.9	0.5	159
Sc, ppm	11	0.3	12		92
Sr, ppm	215	7.8	231	2	93
Th, ppm	9.8	0.8	11		89
V, ppm	108	8.3	112	5	96
Y, ppm	13.4	0.5	18		74
Yb, ppm	1.8	0.2	1.6		113
Zn, ppm	95.6	8.6	106	3	90

* 95% confidence interval

This table shows the results for twenty analyses for SRM-2709 submitted as blind samples to the contract laboratory.

TABLE A3 Comparison of contract laboratory results with NIST values for SRM-2711

SRM-2711	n=20				
Element	observed conc.	observed % RSD	NIST value	NIST C.I.*	PERCENT RECOVERY
Al %	6.33	2.79	6.53	0.09	97
Ca %	2.81	3.73	2.88	0.08	98
Fe %	2.70	1.75	2.89	0.06	93
K %	2.34	4.76	2.45	0.08	95
Mg %	0.99	3.62	1.05	0.03	94
Na %	1.16	4.30	1.14	0.03	101
P %	0.07	9.59	0.086	0.007	83
Ti %	0.29	1.69	0.306	0.023	96
Mn, ppm	575	4.1	638	28	90
Ag, ppm	4.5	15	4.63	0.39	97
As, ppm	93.8	13	105	8	89
Ba, ppm	747	21	726	38	103
Cd, ppm	34.6	4.9	41.7	0.25	83
Ce, ppm	70	6.6	69		101
Co, ppm	8	8.3	10		80
Cr, ppm	18.1	34	47		39
Cu, ppm	106	5.6	114	2	93
Ga, ppm	13.7	18	15		91
La, ppm	37.2	4.7	40		93
Li, ppm	24.1	4.1			
Mo, ppm	<2				
Nb, ppm	15	21			
Nd, ppm	31.1	2.9	31		100
Ni, ppm	17.8	4	20.6	1.1	86
Pb, ppm	1060	3.8	1162	31	91
Sc, ppm	8.8	4.2	9		98
Sr, ppm	236	2.3	245	0.7	96
Th, ppm	12.1	12	14		86
V, ppm	79.4	7.9	81.6	2.9	97
Y, ppm	23	4.3	25		92
Yb, ppm	2.9	11	2.7		107
Zn, ppm	304	3.9	350	4.8	87

* 95% confidence interval

This table shows the results for twenty analyses for SRM-2711 submitted as blind samples to the contract laboratory.

TABLE A4 Comparison of USGS laboratory results with NIST values for SRM-2704

SRM-2704 n=7					
Element	USGS conc.	USGS % RSD	NIST value	NIST C.I.*	PERCENT RECOVERY
Al %	6.04	2.5	6.11	0.16	99
Ca %	2.64	2.8	2.6	0.03	102
Fe %	4.07	2.5	4.11	0.10	99
K %	1.93	3.6	2.00	0.04	96
Mg %	1.20	0.0	1.2	0.02	100
Na %	0.61	4.1	0.55	0.014	110
P %	0.10	4.4	0.099	0.003	104
Ti %	0.29	11.5	0.457	0.018	64
Mn, ppm	580	5.6	555	19	105
Ag, ppm	<2				
As, ppm	23	19	23.4	0.8	98
Ba, ppm	406	3.9	414	12	98
Cd, ppm	<2		3.45	0.22	
Ce, ppm	60	9.5	72		83
Co, ppm	15.7	2.9	14	0.6	112
Cr, ppm	146	3.4	135	5	108
Cu, ppm	96	7.5	98.6	5	97
Ga, ppm	15	6.2	15		100
La, ppm	30.9	0.8	29		107
Li, ppm	46.7	1.3	50		93
Mo, ppm	<2				
Nb, ppm	14.3	14			
Nd, ppm	28.4	9.4			
Ni, ppm	42.3	2.7	44	3	96
Pb, ppm	149	6.7	161	17	93
Sc, ppm	11.7	3.4	12		98
Sr, ppm	133	4.5	130		102
Th, ppm	9.6	17	9.2		104
V, ppm	89	3.3	95	4	94
Y, ppm	23.3	5			
Yb, ppm	2	0	2.8		71
Zn, ppm	431	3.6	438	12	98

* 95% confidence interval

This table shows the results for seven analyses for SRM-2704 analyzed in-house in the USGS analytical laboratories in Denver, Co.

TABLE A5 Comparison of USGS laboratory results with NIST values for SRM-2709

SRM-2709 n=7					
Element	USGS conc.	USGS % RSD	NIST value	NIST C.I.*	PERCENT RECOVERY
Al %	7.26	1.6	7.5	0.06	97
Ca %	1.93	2.3	1.89	0.05	102
Fe %	3.47	1.3	3.50	0.11	99
K %	1.89	3.4	2.03	0.06	93
Mg %	1.49	2.4	1.51	0.05	98
Na %	1.20	4.5	1.16	0.03	103
P %	0.07	6.7	0.062	0.005	108
Ti %	0.32	1.4	0.342	0.024	93
Mn, ppm	537	1.9	538	17	100
Ag, ppm	<2		0.41	0.03	
As, ppm	18.7	20	17.7	0.8	106
Ba, ppm	895	2.6	968	40	92
Cd, ppm	<2		0.38	0.01	
Ce, ppm	41.3	4.0	42		98
Co, ppm	15.0	5.0	13.4	0.7	112
Cr, ppm	124.3	5.9	130	4	96
Cu, ppm	31.3	5.3	34.6	0.7	90
Ga, ppm	15.3	4.6	14		109
La, ppm	23.6	3.1	23		102
Li, ppm	53.6	2.6	50		107
Mo, ppm	<2		2		
Nb, ppm	14.3	18			
Nd, ppm	17.9	6.3	19		94
Ni, ppm	83.1	2.0	88	5	94
Pb, ppm	14.4	20	18.9	0.5	76
Sc, ppm	11.9	3.0	12		99
Sr, ppm	227	3.1	231	2	98
Th, ppm	10.7	8.2	11		97
V, ppm	110.0	0.0	112	5	98
Y, ppm	17.9	5.5	18		99
Yb, ppm	1.9	19	1.6		116
Zn, ppm	98.9	1.3	106	3	93

* 95% confidence interval

This table shows the results for seven analyses for SRM-2709 analyzed in-house in the USGS analytical laboratories in Denver, Co.

TABLE A6 Comparison of USGS laboratory results with NIST values for SRM-2711

SRM-2711 n=7					
	USGS	USGS	NIST	NIST	PERCENT
Element	conc.	% RSD	value	C.I.*	RECOVERY
Al %	6.39	3.3	6.53	0.09	98
Ca %	2.93	3.5	2.88	0.08	102
Fe %	2.86	3.2	2.89	0.06	99
K %	2.34	6.0	2.45	0.08	96
Mg %	1.04	4.7	1.05	0.03	99
Na %	1.21	5.3	1.14	0.03	107
P %	0.08	5.9	0.086	0.007	98
Ti %	0.26	3.5	0.306	0.023	84
Mn, ppm	677	14	638	28	106
Ag, ppm	3.6	14	4.63	0.39	77
As, ppm	100	6.6	105	8	95
Ba, ppm	688	4.7	726	38	95
Cd, ppm	37.3	1.9	41.7	0.25	89
Ce, ppm	67.4	4.1	69		98
Co, ppm	11.6	4.3	10		116
Cr, ppm	47.0	3.4	47		100
Cu, ppm	108	6.5	114	2	95
Ga, ppm	16.0	6.7	15		107
La, ppm	37.9	3.8	40		95
Li, ppm	26.7	4.8			
Mo, ppm	<2				
Nb, ppm	17.0	31			
Nd, ppm	28.9	4.3	31		93
Ni, ppm	19.6	2.5	20.6	1.1	95
Pb, ppm	1070	6.7	1162	31	92
Sc, ppm	9.3	4.9	9		103
Sr, ppm	244	3.7	245	0.7	100
Th, ppm	13.9	4.6	14		99
V, ppm	77.6	2.7	81.6	2.9	95
Y, ppm	26.9	5.0	25		107
Yb, ppm	2.7	17	2.7		101
Zn, ppm	353	5.4	350	4.8	101

* 95% confidence interval

This table shows the results for seven analyses for SRM-2711 analyzed in-house in the USGS analytical laboratories in Denver, Co.

TABLE A7 ICP-AES elements and their limits of determination

Element	Symbol	Total Digestion Procedure	$HCl-H_2O_2$ Leach Procedure
Aluminum	Al	.005 %	30 ppm
Calcium	Ca	.005 %	30 ppm
Iron	Fe	.005 %	30 ppm
Potassium	K	.01 %	30 ppm
Magnesium	Mg	.005 %	30 ppm
Sodium	Na	.005 %	30 ppm
Phosphorus	P	.005 %	30 ppm
Silicon	Si	--	30 ppm
Titanium	Ti	.005 %	30 ppm
Manganese	Mn	4 ppm	1.2 ppm
Silver	Ag	2 ppm	1.2 ppm
Arsenic	As	10 ppm	6 ppm
Barium	Ba	1 ppm	.6 ppm
Cadmium	Cd	2 ppm	1.2 ppm
Cerium	Ce	4 ppm	2.4 ppm
Cobalt	Co	1 ppm	.6 ppm
Chromium	Cr	1 ppm	.6 ppm
Copper	Cu	1 ppm	.6 ppm
Gallium	Ga	4 ppm	--
Lanthanum	La	2 ppm	1.2 ppm
Lithium	Li	2 ppm	2 ppm
Molybdenum	Mo	2 ppm	1.2 ppm
Niobium	Nb	4 ppm	--
Neodymium	Nd	4 ppm	--
Nickel	Ni	2 ppm	1.2 ppm
Lead	Pb	4 ppm	2.4 ppm
Scandium	Sc	2 ppm	--
Strontium	Sr	2 ppm	1.2 ppm
Thorium	Th	4 ppm	2 ppm
Vanadium	V	2 ppm	1.2 ppm
Yttrium	Y	2 ppm	1.2 ppm
Ytterbium	Yb	1 ppm	--
Zinc	Zn	2 ppm	.6 ppm

Discussion of results in tables A1 through A6

The ICP-AES analyses of the core samples were done by an outside laboratory; the analyses of the stream-sediment samples were done in-house in the USGS laboratories in Denver, Colorado. The results from the contract laboratory are generally acceptable, but there are several notable exceptions. The recoveries were somewhat less accurate, and the variances were higher for samples run by the contract laboratory than for those by the run USGS laboratory. Arsenic is biased high below 100 ppm, and somewhat low above 100 ppm, relative to recommended NIST values. No recommendations are presented to normalize these analyses; at the high As levels contained in the cores, the values are acceptable. Cobalt is biased low, but is not an important element in this study. Chromium recoveries are very low, due to incomplete digestion, and it is not recommended to use the chromium analyses. Lead shows a high bias at levels below 50 ppm, is relatively neutral at several hundred ppm, and shows a low bias at levels greater than 1000 ppm. The analyses are still quite acceptable for the purpose of this report. The values for titanium from both laboratories tend to be low, due to the refractory nature of titanium oxides with may not be completely dissolved in this acid digestion.