



**GEOCHEMICAL FOLLOW-UP OF RGS DATA
ORIENTATION REPORT ON THE
FIELD-SIEVED STREAM SEDIMENT SAMPLING METHOD
BLACKWATER MOUNTAIN AREA*
(93G/2)**

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INTRODUCTION

The aim of this limited sampling survey was to investigate the benefits of field-sieved stream sediment sampling as a follow-up method to the Regional Geochemical Surveys (RGS), and as an inexpensive alternative to field panning and the costly heavy mineral separation methods.

The area selected for sampling is located east and south of Blackwater Mountain, northwest of Quesnel, where the 1984 RGS

12 identified a site highly anomalous in several trace elements, in a creek draining the southeastern flank of the mountain. Following release of the RGS data, A.J. Boronowski followed up the anomaly with a program of high density field-panned sampling and heavy liquid and magnetic separation of the panned stream sediments (Boronowski, 1986, page 115). The survey confirmed and further defined the multi-element anomaly and also established the presence of highly anomalous gold values in the concentrates. Due to extreme variability in gold content between adjacent sites, rang ng

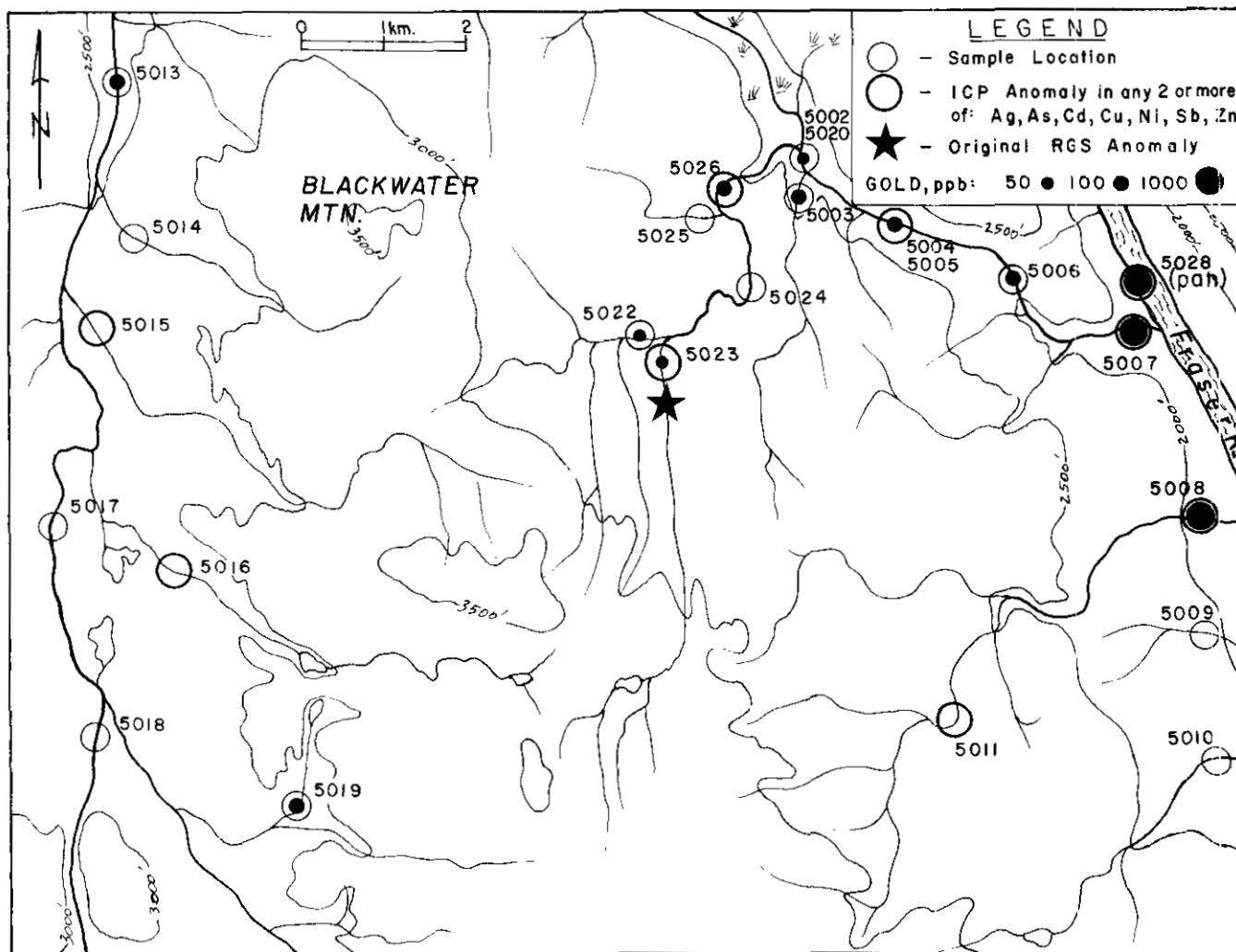


Figure 6-5-1. Topographic 1:50 000-scale sample location and anomaly map.

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British Columbia Ministry of Energy, Mines and Petroleum Resources, Geological Fieldwork, 1986, Paper 1987-1.

from undetectable to 21 000 parts per billion (ppb), no attempt was made to relate the gold to the trace element values.

In 1986 the writer collected six sediment samples downstream from the original RGS anomaly at approximately 2-kilometre intervals to the mouth of the main stream. Additional samples were collected on neighbouring drainages for comparison purposes.

The samples were sieved through an 80-mesh screen and analysed for trace elements by inductively coupled plasma (ICP), and for gold by geochemical fire assay and atomic absorption (AA). Field and laboratory sample duplicates were inserted according to the sampling standards established for the RGS (Garrett, 1974). Analytical results, a manganese-iron graph and a sample location and anomaly map are included as figures in this article.

GENERAL PHYSIOGRAPHY AND GEOLOGY

The original RGS anomalous sample 841053 is located at the mouth of a headwaters tributary to a larger stream draining the eastern flank of Blackwater Mountain easterly toward the Fraser River (*see* Figure 6-5-1). The surficial geology map (Tipper, 1971) shows the regional ice movement in the area to be from south to north, though on the local scale it may have also moved downslope to the east.

The drainage basin is underlain by argillites and greenstones of the Permian Cache Creek Group, probably intruded by Permian to Triassic ultramafics, as suggested by elevated nickel values. Oligocene Endako Group basic volcanic rocks outcrop on the peak of Blackwater Mountain and further west.

FIELD AND ANALYTICAL METHODS

Wet-sieving the stream sediments through a stainless steel sieve in combination with a perforated pan device helped isolate lithic silt from organic debris, providing sample consistency between sites. The writer used a 40-mesh screen, but other screen sizes would serve equally well. Trace-metal values in sediment grab samples are usually higher than those in field-sieved samples from the same sites, due to scavenging by organics, but are much less repeatable and more difficult to interpret.

A total of 25 sediment samples was collected from the anomalous drainage and neighbouring streams. Samples 8693G-5001 and 5021 are internal laboratory duplicate splits of field samples 5003 and 5020 respectively. Samples 5004 and 5005 are field duplicates for external checking. Samples 5002 and 5020 were taken at the same site, but from low-water and high-water environments respectively. Sample 5028 is a panned concentrate of Fraser River sand. Except for sieving through an 80-mesh screen, no further sample processing was done prior to analysis.

The samples were analysed at the Min-En Laboratory in North Vancouver for 26 elements by ICP after a nitric-perchloric acid digestion, and for gold by fire assay preconcentration of a 15-gram sample, followed by aqua regia digestion and extraction with methyl iso-butyl ketone prior to analysis by atomic absorption (Table 6-5-1).

DISCUSSION

The sampled area overlaps the designated placer area along the Fraser River thus it is not surprising that high gold values are encountered in the stream silt samples. Results indicate the amount of gold in the sediments increases in an easterly direction, toward the Fraser River valley, suggesting that most of the gold is of placer origin. This is also suggested by the consistent distribution of gold between the main fork of the sampled stream and the river. Natural traps for heavy minerals in the streams were sampled preferentially

and it is rewarding to see the continuity of gold values in unpanned samples, and the reliability of the 15-gram sample in the laboratory.

Geochemical trace element sample analysis is necessary to help distinguish gold values of placer origin from those due to bedrock mineralization. Strong placer gold values may mask weak responses related to mineralized quartz veins in bedrock. Such mineralization generally yields subdued, though detectable trace element responses, but much more detailed sampling would be needed to detect them. Provided that a high sampling standard is maintained, the ICP multi-element analytical method is particularly useful as it provides both lithology and mineralization-related information in terms of elemental ratios, which help to identify true rather than purely statistical anomalies. Poor sampling technique totally obscures such relationships.

For example, the dependence of vanadium values on those of iron is readily apparent in the analytical results. Other elemental correlations are present, though somewhat less obvious. Recognition of such patterns leads to the recognition of anomalies based on multi-element ratios rather than values for a single element. Using manganese and iron alone as a first approximation for an X/Y plot, the manganese/iron versus zinc graph, Figure 6-5-2, illustrates that samples 5024 and 5026 are still anomalous in zinc, indicating the length of the dispersion train from the highly anomalous sample 5023. The graph also indicates that sample 5011 is somewhat anomalous or enriched in zinc, but that sample 5018 is less so, though they have identical analytical values for zinc.

Other helpful patterns based on the multi-element analysis can be derived by grouping samples with similar trace element geochemistry, then comparing their lithology and environment. Thus sample numbers 5008 and 5015 have similar trace element patterns to the panned river sand sample 5028, implying the presence of heavy minerals, such as can be present in thick, well-reworked, glacial gravels.

The slope of the manganese/iron line on the graph indicates the fundamental lithological ratio between the two elements, though too few samples were taken to establish this clearly. Samples plotting far above the line represent environmental manganese enrichment, such as encountered in swampy terrain. Samples plotting far below the line are indicative of environmental manganese depletion, such as occurs in reworked glacial sediments.

These brief examples from this very limited follow-up study illustrate both the simplicity and the complexity involved in the interpretation of geochemical results, and the absolute necessity for high-quality sampling.

CONCLUSIONS

- (1) The sampling of stream sediments by wet-sieving in the field, using a sieve and perforated pan device, greatly improves the sample quality and increases the interpretability of the analytical results.
- (2) Experienced sampling site selection, combined with field-sieving and geochemical fire assay preconcentration of a minimum 15-gram laboratory subsample, can effectively bypass the expensive heavy liquid separation methods in geochemical analysis for gold.
- (3) The ICP method of trace element analysis is particularly well suited to stream sediment sampling studies as it inexpensively provides a wealth of both lithological and mineralization-related information.
- (4) In areas where gold of placer origin is present in the streams, detailed high-quality sediment sampling is necessary to detect potential gold mineralization in bedrock, by measuring subdued, but detectable trace element enrichment.

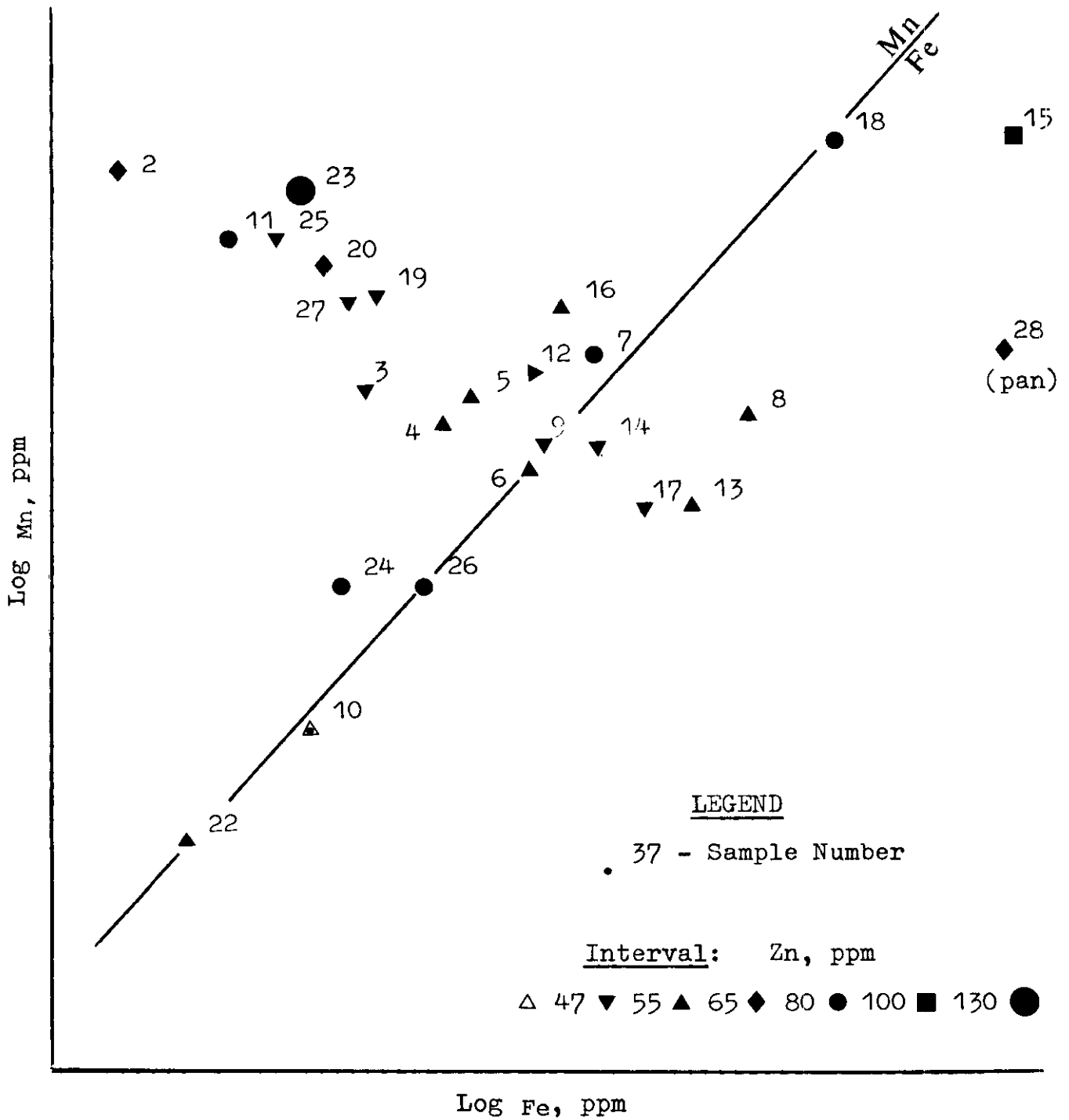


Figure 6-5-2. Mn/Fe versus Zn graph.

TABLE 6-5-1. ANALYTICAL RESULTS
(Values in p.p.m. except Au)

Sample No.	K	Li	Mg	Mn	Mo	Na	Ni	P	Pb	Sb	Sr	Zn	Au-PPB
8693G-5001	420	6	5040	408	7	80	25	490	21	8	20	60	315
8693G-5002	510	8	4790	631	5	90	22	370	12	2	23	69	3
8693G-5003	430	6	4770	388	7	80	22	450	19	7	18	53	220
8693G-5004	390	5	4290	374	6	90	18	450	18	9	20	59	395
8693G-5005	420	5	4700	396	7	100	21	470	15	8	21	64	280
8693G-5006	320	5	5180	338	7	100	20	460	21	10	22	56	245
8693G-5007	520	5	6190	429	8	140	28	440	23	13	29	82	1450
8693G-5008	450	6	5630	380	10	120	22	510	20	16	23	63	3300
8693G-5009	430	4	4670	362	6	140	18	420	14	7	22	52	25
8693G-5010	860	6	4700	201	4	120	10	1020	9	2	25	37	5
8693G-5011	570	7	4410	556	5	80	30	430	10	2	20	83	3
8693G-5012	430	4	5010	415	5	160	15	410	9	5	20	55	6
8693G-5013	340	4	4140	314	5	200	6	410	7	7	16	58	105
8693G-5014	510	4	5710	351	7	180	20	430	13	8	24	51	5
8693G-5015	350	3	6780	668	9	110	11	420	13	21	15	103	3
8693G-5016	640	6	7100	476	6	220	19	410	9	2	31	57	4
8693G-5017	330	3	4590	311	5	160	11	350	7	6	16	52	4
8693G-5018	470	3	4310	660	5	410	6	460	2	5	36	82	7
8693G-5019	380	4	5550	493	5	150	25	370	9	3	20	52	160
8693G-5020	460	6	4370	522	6	90	18	420	12	4	20	69	14
8693G-5021	450	6	4390	508	6	90	19	460	11	5	19	71	75
8693G-5022	430	4	3080	160	4	110	12	330	3	1	23	57	62
8693G-5023	620	8	4350	591	6	90	30	400	14	4	25	165	55
8693G-5024	470	5	3810	268	5	90	17	410	10	3	22	87	16
8693G-5025	560	8	4770	547	5	140	17	350	10	1	23	52	12
8693G-5026	410	4	3760	265	5	90	16	420	13	5	19	86	158
8693G-5027	570	4	4130	479	4	170	16	510	6	1	34	54	3
8693G-5028	110	2	3730	423	18	20	16	500	52	40	23	69	95000
Sample No.	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd	Co	Cu	Fe	V
8693G-5001	0.4	5800	58	11	70	3.8	4	3980	2.2	6	19	55410	81.1
8693G-5002	0.3	7520	7	5	103	2.2	2	4200	3.2	5	23	33950	29.3
8693G-5003	0.4	5870	49	7	71	3.7	3	3870	3.0	6	19	59300	86.7
8693G-5004	2.4	5770	54	5	79	4.0	2	3780	2.6	6	18	66930	95.2
8693G-5005	1.5	6260	64	7	77	3.9	4	4160	2.0	7	21	70730	98.0
8693G-5006	0.6	5360	82	7	65	4.7	4	5230	3.3	7	24	79740	117.1
8693G-5007	0.7	6680	80	10	114	5.0	5	6830	4.5	9	41	90380	110.9
8693G-5008	0.8	684.0	98	10	124	6.0	4	4630	4.0	9	20	124330	173.0
8693G-5009	0.6	6990	37	8	85	3.5	2	4500	3.0	7	18	81680	93.6
8693G-5010	0.5	8100	1	5	92	2.3	1	8570	2.2	5	12	50920	61.3
8693G-5011	0.5	7720	1	6	103	2.5	1	2910	3.0	5	22	43310	46.5
8693G-5012	0.5	6830	6	6	101	2.8	1	3720	2.5	7	17	81090	73.6
8693G-5013	0.7	6410	2	6	83	2.6	1	3420	2.2	7	11	114100	106.1
8693G-5014	0.6	7890	26	9	94	3.8	1	3570	2.9	7	17	92840	96.1
8693G-5015	1.1	7050	74	14	105	6.1	1	3100	3.7	14	19	234150	239.2
8693G-5016	0.6	14160	1	15	86	2.3	1	5330	4.2	7	25	84770	69.6
8693G-5017	0.6	6180	7	7	69	2.9	1	3370	2.5	6	12	100330	97.1
8693G-5018	0.9	14620	1	14	184	3.3	1	4670	3.1	10	12	152950	107.4
8693G-5019	0.5	7080	1	7	81	2.3	1	3480	2.6	6	17	58430	47.8
8693G-5020	0.6	6480	23	7	93	2.7	4	3960	2.5	5	19	52310	56.6
8693G-5021	0.6	6400	23	6	88	2.7	3	3970	2.8	5	18	52270	57.4
8693G-5022	0.5	8820	1	6	97	1.2	1	2880	1.8	3	15	39700	23.9
8693G-5023	0.6	9230	12	9	93	3.2	3	2760	3.9	7	28	50370	57.2
8693G-5024	0.6	7450	3	6	97	2.5	1	3060	2.2	5	20	54160	53.3
8693G-5025	0.5	9750	1	7	158	2.4	1	4140	3.0	6	20	46660	33.9
8693G-5026	0.6	6610	20	7	78	3.1	1	3310	2.6	6	17	65150	56.7
8693G-5027	0.5	12360	1	9	154	2.0	2	3910	2.6	5	21	55840	46.7
8693G-5028	3.4	3380	308	15	43	13.8	9	2770	4.9	14	14	210400	387.6

RECOMMENDATIONS

The wet-sieving field method of stream sediment sample collection should be seriously considered for future RGS work as it provides a high degree of uniformity of sampled material unobtainable by the standard "grab-and-run" sampling method.

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