MINERAL DEPOSITS IN THE BIRK CREEK AREA: AN INTRODUCTION TO A METALLOGENIC STUDY OF THE ADAMS PLATEAU-CLEARWATER AREA, (82M)

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INTRODUCTION

Mineral deposits in the Adams Lake-Clearwater area, centred 35 kilometres northeast of Kamloops, were studied during July and August, 1984 by the senior author. This project is part of a regional metallogenic study by Höy and is the basis for a detailed examination of mineral deposits and galena-lead isotopes in the area.

Thirty-two mineral occurrences were visited and sampled and a number were mapped. This work, the descriptions and the classification scheme of Preto and Dickie (1984), and the regional geology of Schiarizza, *et al.* (1984) form the basis for the data in Table 1. The occurrences are classified as: vein, stratiform, disseminated, polymetallic volcanogenic (Kuroko), basic volcanogenic ('Cyprus'), replacement, or of unknown origin. They occur mainly in rocks of the Eagle Bay Formation. These rocks include limestone, phyllite, siliceous schist, sericitic schist, and chloritic schist; many of the schists appear to be volcanic in origin. Galena-lead isotope analyses on deposits listed in Table 1 should more clearly define ages of some of the deposits and host rocks, and allow a better interpretation of the tectonic and metallogenic evolution for deposits and rocks in the Eagle Bay Formation.

The deposits and occurrences studied are located on Figure 15, a generalized geological map from Schiarizza, *et al.* (1984). Some deposits have readily available published descriptions (for example, Rexspar; Preto, 1978) but for most, assessment reports are the best source of information. The Birk Creek area is described in the following; the occurrences are of particular interest because they are demonstrably stratabound. Locally they contain significant concentrations of pyrite with chalcopyrite, sphalerite, and galena. Other deposits in the table will be described later.

BIRK CREEK AREA

INTRODUCTION

The Birk Creek area, 3 kilometres west of North Barriere Lake, is accessible from the main logging road to North Barriere Lake which

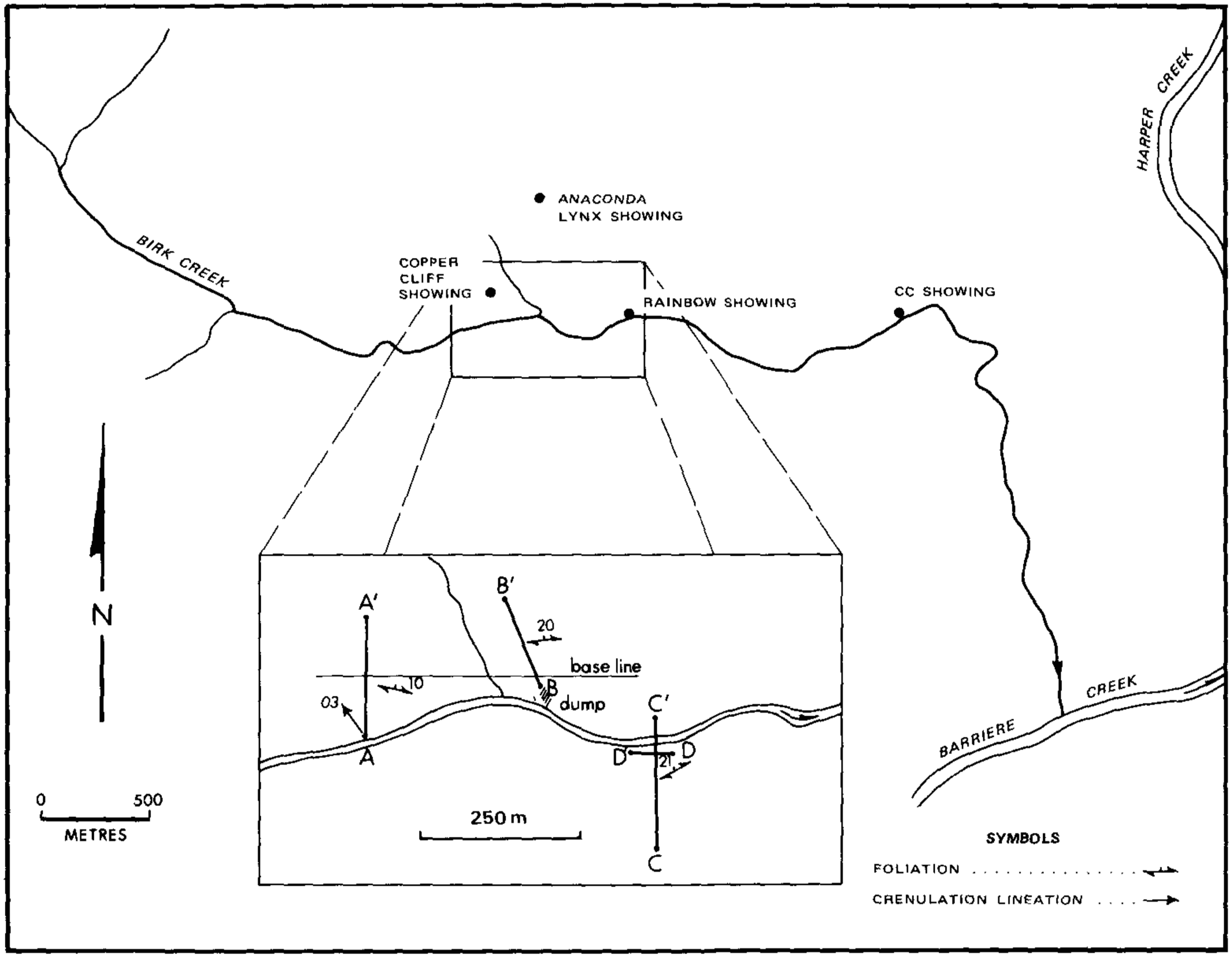

Figure 16. Birk Creek area showing location of sections A-A', B-B', C-C', and D-D'.

TABLE 1
DATA FOR DEPOSITS STUDIED IN THE ADAMS PLATEAU AREA

MAP NO.	DEPOSIT NAME	LAT N	LONG W	UNIT[1]	DEPOSIT TYPE[2]	STATUS[3]	AGE[4]
03	CHU CHUA	51.38	120.07	UFE	CYPRUS: Cu Zn	R	M
04	ENARGITE	51.35	119.99	EBPi	VEIN: Pb Ag Cu Zn	P	M
05	FOGHORN	51.54	119.93	EBFq	VEIN: Ag Pb Zn Au Ag	P	L
06	AGATE BAY	51.08	119.75	EBAa	VEIN: Zn Pb Ag Cu	S	L
07	BECA (TOM)	51.05	119.71	EBAa	KUROKO: Cu Pb Zn Au Ag	P	D
08	BIRK CREEK	51.33	119.90	EBAa	KUROKO: Pb Zn Cu	P	D
09	BROKEN RIDGE	51.35	119.88	EBAa	STB & DIS: Pb Zn Cu	S	D
10	HARPER CREEK	51.34	119.85	EBAa	STB & DIS: Cu Pb Ag	S	D
11	HOMESTAKE	51.11	119.83	EBAa	MASSIVE: Ba Ag Zn Pb Cu Au	P	D
12	FORTUNA	51.01	119.71	EBAa	UNKNOWN: Cu Pb Zn	S	D
13	JOE (GLEN)	51.37	119.93	EBAa	VEIN: Pb	P	D
14	LYDIA	51.52	119.94	EBAa	MASSIVE: Pb Ag Cu	S	D
15	REA GOLD	51.13	119.81	EBAf?	VOLC: Au Ag Pb Zn Cu	R	L
16	REXPAR	51.57	119.90	EBAf	VOLC: U F	R	D
17	ART	51.10	119.95	EBSa	UNKNOWN: Pb	S	O
18	LUCKY COON	51.07	119.60	EBG	STRATIFORM: Ag Pb Zn	P	O
19	TWIN MOUNTAIN	51.13	119.80	EBG	MASSIVE: Ag Pb Zn Cu Au Ba	S	O
20	BOWLER CREEK	51.01	119.48	EBG	STB & DIS: Unknown	S	O
21	JUNE (KAJUN)	51.26	119.80	EBGp	STF & VEIN: Ag Pb Zn Cu	S	O
22	B.C. (ZINC 1)	51.01	119.52	EBGs	MASSIVE: Cu Ag Pb Zn Fe Mo	R	O
23	ELSIE	51.07	119.60	EBGs	UNKNOWN: Pb Zn Ag Au	P	O
24	KING TUT	51.07	119.60	EBGs	UNKNOWN: Ag Pb Zn Au	P	O
25	MOSQUITO KING	51.06	119.52	EBGs	STF & REPL: Pb ZN Ag Cu	P	O
26	PET	51.05	119.53	EBGs	UNKNOWN: Pb Zn	S	O
27	SPAR (FLUORINE)	51.06	119.54	EBGs	STF: Pb Zn Ag Cu Mo Au	P	O
28	WHITE ROCK	51.30	119.91	EBGt	UNKNOWN: Ag Zn Pb Cu	P	O
29	GRIZZLY	51.29	119.76	SDQ	UNKNOWN	S	E
30	BET	51.29	119.74	SDQ	DIS: Cu Ni Pb Zn	S	E
31	RED TOP	51.64	119.86	-	STF & DIS: Cu Pb Zn Ag Au	S	?
32	FLUKE (SAUL)	51.06	119.25	-	REPL: Cu Ag Pb Zn	S	?
33-37	ORELL 1-5	51.04	119.51	-	VEIN & DIS: Pb Zn Cu	S	?
38	UTAH PROSPECT	51.10	119.30	-	VEIN: Zn Pb	S	?

[1]Units are described in Table 2
[2]VOLC - volcanogenic, STB - stratabound, STF- stratiform, DIS - disseminated, REPL - replacement
[3]R - reported reserves, P - past producer, S - showing
[4]M - Mississippian, L - Devonian and/or Mississippian, D - Devonian, O - Devonian and/or older, E - Lower Cambrian and/or Hadrynian (Eocambrian ?), ? - Unknown

branches north from the road between Barriere and East Barriere Lake. The showings (Fig. 16) are accessible by a trail that follows the northeast side of Birk Creek. Several properties (Copper Cliff, May, Anaconda, Lynx, Cc, Bet, and Rainbow) occur in the area. These showings were discovered in the 1920's and are marked by small adits and dumps. In most cases the original names cannot be assigned unequivocally to individual workings.

From 1938 to 1940, 234 tonnes of ores were extracted from the Anaconda-Iron Cap property (MINFILE No. 082M-067, 1984); 6 500 grams of gold, 13 500 grams of silver, and 4 810 kilograms of copper were recovered but only an old dump (Fig. 16) remains from this activity.

TABLE 2
HOST UNITS OF MINERAL DEPOSITS EXAMINED IN THE ADAMS PLATEAU AREA
(Symbols in brackets after the age are the codes used in the age column in Table 1)

EAGLE BAY FORMATION

MISSISSIPPIAN (M)

EBPl	Limestone in a phyllite, slate, and interbedded siltstone, sandstone, and grit sequence. The one deposit in this unit (Enargite) is adjacent to the lower structural division of the Fennell Formation (lFu) which consists of chert, cherty argillite, slate, phyllite, metabasalt, gabbro, and diorite

DEVONIAN AND/OR MISSISSIPPIAN (L)

EBFq	Cherty quartzite, adjacent to a feldspathic phyllite unit (EBFf), which is derived from intermediate to felsic tuff and volcanic breccia

DEVONIAN (D)

EBAa	Sericitic phyllite and sericitic chlorite, quartz phyllite derived from intermediate volcanic and volcaniclastic rocks that include pyritic feldspathic and coarsely fragmental varieties; chlorite schist occurs locally. Some deposits in EBAa are adjacent to green chloritic phyllite, siltstone, limestone, and quartzite (EBu) which is possibly older than Devonian
EBDF	Feldspar porphyry, feldspathic phyllite, and metavolcanic breccia

DEVONIAN AND/OR OLDER (O)

EBSs	Phyllitic sandstone, grit, phyllite, and quartzite; locally limestone, dolostone, green chloritic phyllite, and sericitic quartz phyllite
EBG	Calcareous chlorite schist and fragmental schist derived largely from mafic to intermediate volcanic and volcaniclastic rocks; lesser amounts of limestone, quartzite, and phyllite
EBGp	Dark grey phyllite, calcareous phyllite, and limestone; lesser amounts of rusty-weathering carbonate-sericite-quartz phyllite are also associated with some of the deposits
EBGs	Grey siliceous and/or graphitic phyllite, calcareous phyllite, limestone, calc-silicate rock, cherty quartzite, and some chlorite and sericite-quartz schist
EBGt	Tshinakin limestone in massive, light grey, finely crystalline limestone and dolostone

LOWER CAMBRIAN AND/OR HADRYNIAN (E)

SDQ	Quartzite, micaceous quartzite, and phyllite; locally, calcareous phyllitic carbonate and green chloritic schist

Northwestern Explorations Ltd. drilled and trenched the property from 1952 to 1953, and Mining Corporation of Canada Ltd. were active in the area in 1966. Duncannex Resources Ltd. rehabilitated the trenches during 1971 and 1972, and in 1976 Kennco Explorations (Western) Ltd. and Cominco Ltd. conducted geochemical surveys in the area.

The mineral occurrences are statiform massive pyrite deposits with minor chalcopyrite, sphalerite, and galena within a metamorphosed felsic to intermediate volcanic sequence.

GEOLOGICAL SETTING OF THE BIRK CREEK AREA

The Birk Creek area (Fig. 16) contains less than 5 per cent outcrop, most of which occurs in cliffs along the creek. The area is underlain by sericite schist, chlorite schist, black phyllite, and some recrystallized limestone. The units EBAa (Tables 1 and 2) have been tentatively assigned a Devonian to Mississippian age (Schiarizza, *et al.*, 1984). No direct ages have been obtained from the area, but dating of zircons from felsic metavolcanic rocks that occur to the southeast, which are correlated with those in the Birk Creek area, have yielded ages between 367 and 379 Ma (Preto, 1981). Mississippian ages were obtained from conodonts found in limestone pods (Preto, 1981). These units have been regionally metamorphosed to greenschist facies.

A well-developed foliation, locally parallel to bedding, strikes east-west and dips variably to the south and north. A superimposed north-striking, shallow east-dipping crenulation cleavage is pronounced in outcrops near the creek (Fig. 17). Although the area is strewn with quartz monzonite boulders, the nearest known outcrop of such rocks is in the Cretaceous Baldy batholith, 2.5 kilometres to the north. Most mineralization on the property appears to be stratabound and syngenetic and, consequently, not related to the later Cretaceous intrusion.

Two stratigraphic sections, A-A', B-B', and a longitudinal section D-D' crossing the section C-C', are shown on Figures 16, 17, and 18, and are described in the following paragraphs.

Section A-A'

A cliff section is exposed from an elevation of 970 metres at the creek to 1 102 metres up section. It consists dominantly of quartz-eye sericite schist (Fig. 17). The strike of foliation varies from 265 to 290 degrees and dips 5 to 20 degrees to the north. The overall minimum thickness (perpendicular to foliation, which is approximately coincident with bedding) is 175 metres (Fig. 17); both ends of the section are covered. At the base of the section the schists contain 15 per cent quartz and plagioclase phenocrysts (maximum size, 2 millimetres) in a quartz-muscovite-plagioclase matrix. The plagioclase is altered to

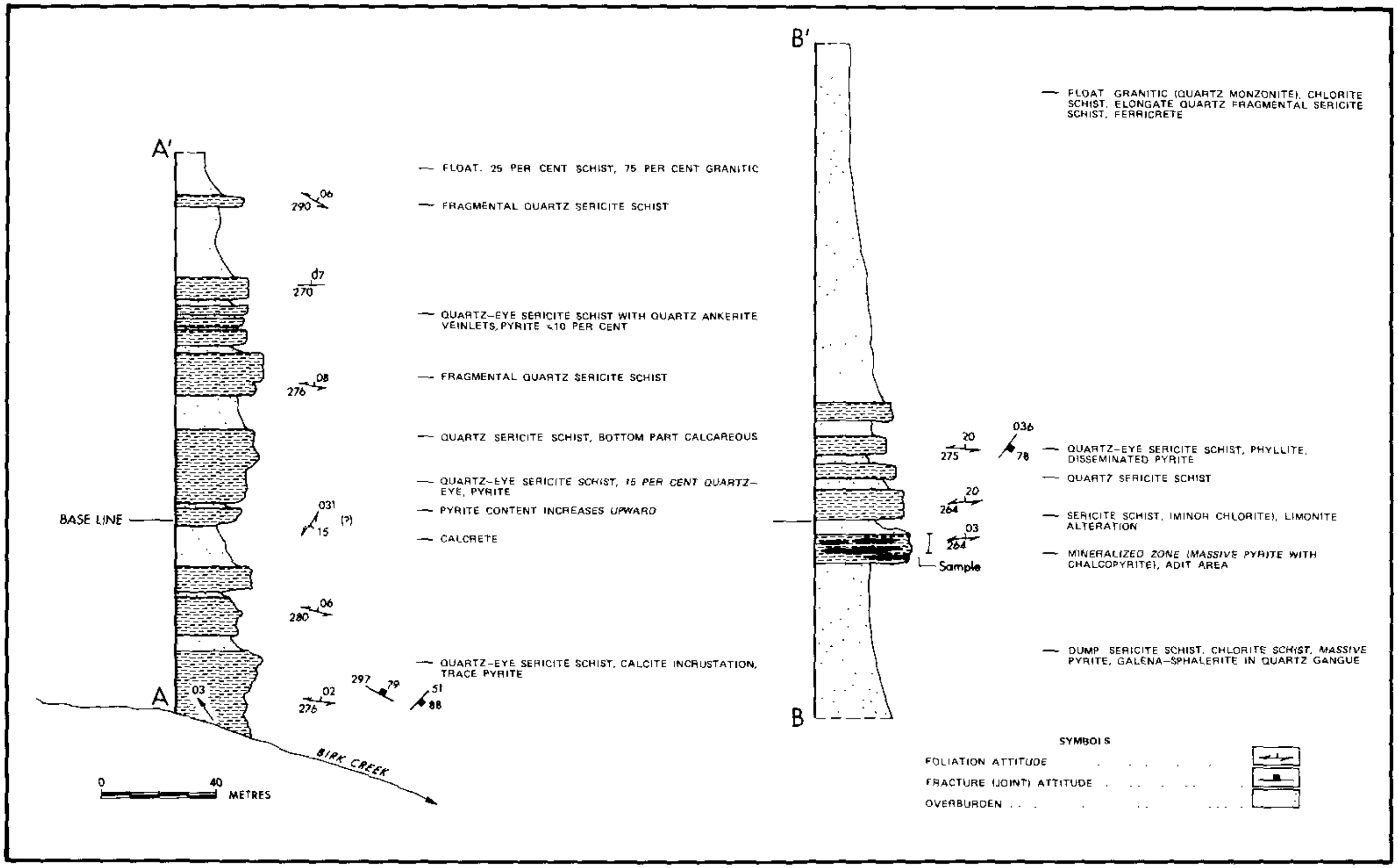

Figure 17. Detailed sections A-A', B-B' from the north side of Birk Creek (sections about 350 metres apart, see Fig. 16).

calcite, but up section this alteration is not apparent as the plagioclase content decreases. Autolithic fragmental units (average fragment size, 1.5 millimetres) occur locally.

Disseminated pyrite with an average grain size of 0.5 millimetre constitutes up to 8 per cent of the rock. Trace amounts of interstitial chalcopyrite are present in the pyrite. No markedly sulphide-rich horizons were observed.

Section B-B'

This section (Figs. 16 and 17) passes close to several old workings. Exposure is limited to a few outcrops and the collars of two slumped adits. A well-developed foliation, parallel to compositional layering, trends 265 to 275 degrees and dips gently north (5 to 20 degrees). Observable bedrock is composed of quartz-sericite and chlorite schist with limonite-altered pyrite-rich layers, and minor laminated black phyllites. Thin sections of the schists show zones with elongated fragments (up to 3 millimetres) of polycrystalline quartz grains.

Disseminated pyrite is present throughout much of the section. Silicified massive pyrite lenses with minor chalcopyrite were observed within an 8-metre section near the old adits. The pyrite is euhedral, but fragmented, and associated with chalcopyrite which generally occurs at the borders of the pyrite grains. Material observed on a dump in the immediate area contains similar mineralization, as well as a few blocks of vein quartz with blebs of sphalerite and galena. The latter type of mineralization was not observed in outcrop.

Sections C-C' and D-D'

Sections C-C' and D-D' (Figs. 16 and 18) cross a major showing along a cliff section on the south side of Birk Creek. Three short accessible adits, about 9 metres long, parallel a major joint direction (012 degrees). Other workings in the immediate vicinity have been flooded by the creek and are observable when water levels are low (Preto, personal communication, 1984). An east-west longitudinal section (Fig. 18) follows Birk Creek and illustrates the distribution of lithologies, mineralization, and workings.

A recrystallized medium-grained limestone with disseminated quartz grains and pods of coarsely crystalline white calcite crops out at the east end of Figure 18. Minor micaceous-rich layers occur in the unit. The limestone unit is in fault contact with generally contorted, sulphide-rich sericite schist to the west.

Sulphides occur as massive pods (up to 1 metre thick), as layers (up to 10 centimetres thick), and as fragments in silicified breccia. Sulphide

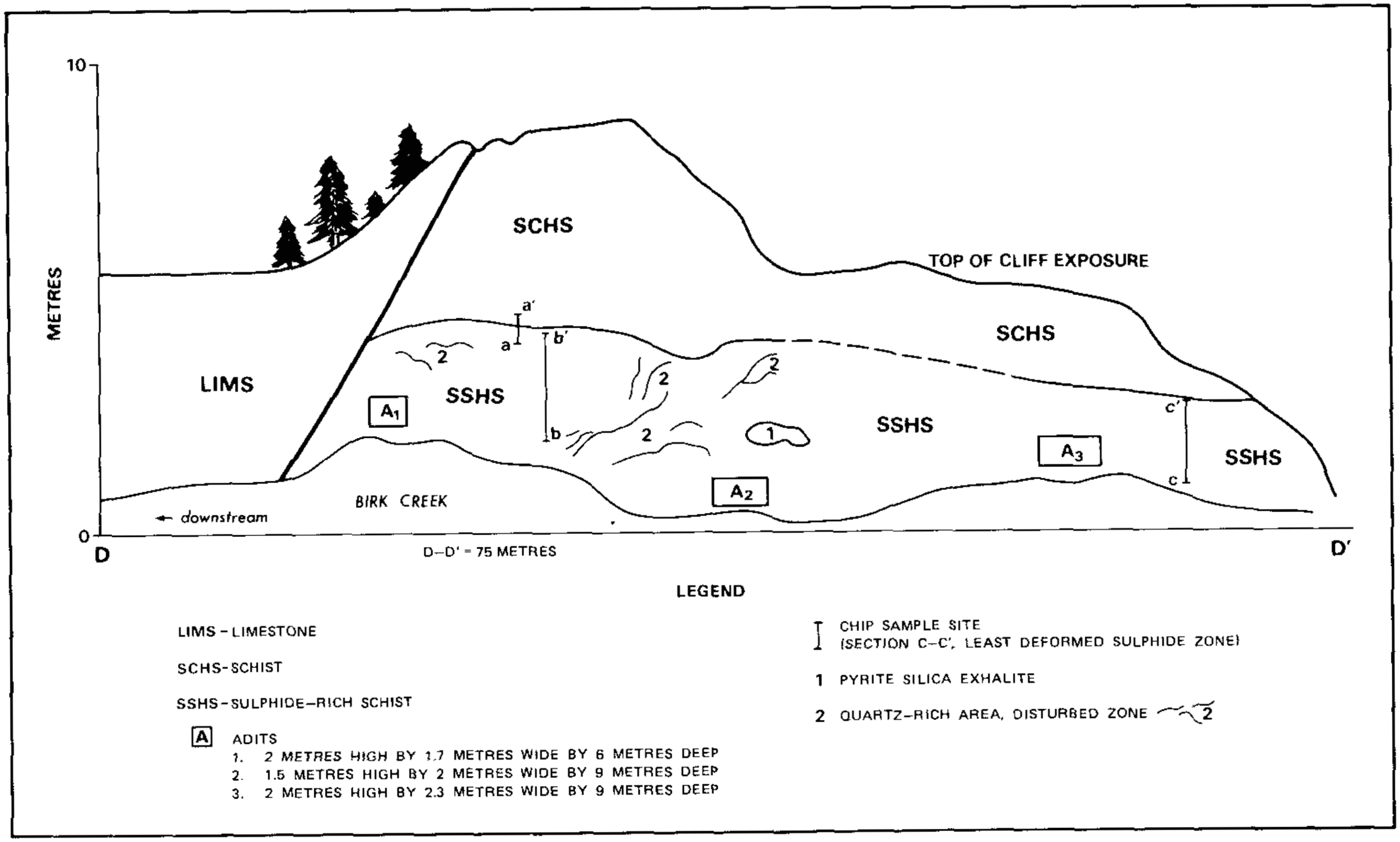

Figure 18. Sketch of section D–D', *looking* south, showing location of major lithologic units, sulphides, and adits.

mineralization, exposed in the centre of Figure 18 is composed mainly of well-formed but disrupted pyrite grains (average size, 2.5 millimetres across) with minor chalcopyrite in an ankeritic quartz matrix. This unit is interpreted to be a pyrite-silica exhalite.

Quartz-eye sericitic schist (with polycrystalline quartz-eyes up to 6 millimetres across) and carbonaceous quartz schist make up 20 per cent of the disturbed zone on Figure 18. Minor malachite stains the schists. In the western part of the section the sulphide horizons, with the same composition described previously, are well layered (layers are 8 centimetres thick over an exposed thickness of 3.5 metres). Attitudes of layering and coincident foliation are the same as those observed in the limestone.

The upper part of the cliff on Figure 18 is sulphide-poor sericite schist which is not as contorted as the underlying unit. Thus the exposed sulphide-rich section is about 4.5 metres thick (3 metres true thickness) from Birk Creek to the contact at the top of the cliff. Scant exposures north and south of the section on Figure 18 indicate that sericitic schist is abundant in the area. One other old working was observed 15 metres south of the cliff section. Dump material from this working contains traces of sphalerite, galena, and chalcopyrite in a vein-like quartz gangue. The relationship between the mineralization and the host schists cannot be defined because of poor exposure.

CONCLUSIONS

The three sections presented give an overview of the variety of lithologies and the general setting of the Birk Creek showings. The sections cannot be correlated closely but there are at least two silicified zones containing massive pyrite with minor chalcopyrite in a quartz sericite schist host. The sphalerite and galena that occur in quartz gangue are probably from veins.

In general, the units in section A-A' and B-B' dip to the northeast, whereas those in section C-C' and D-D' dip to the southeast. These dips define an east-west-trending antiform. The antiform is probably a late generation open fold with its axial plane parallel to a pronounced crenulation cleavage, similar to late structures identified by Preto (1979). Early, mesoscopic, recumbent isoclinal folds, with axial planes parallel to the pronounced schistosity, and axes plunging parallel to the mineral lineation, probably indicate larger structures which would control the distribution of the stratiform mineralized zones (Preto, personal communication, 1984).

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