HILTON MASSIVE SULPHIDE DISCOVERY (REA GOLD), JOHNSON CREEK-ADAMS LAKE AREA (82M/4W)

By G.P.E. White

INTRODUCTION

In October, 1983, prospectors A. Hilton and R. Nicholl, both of Kamloops, discovered a massive sulphide showing in the Adams Plateau area. The property was optioned to Rea Gold Corporation, and in turn to Corporation Falconbridge Copper. Work by Falconbridge has identified 120 000 drill-indicated tonnes grading 18.2 grams gold per tonne, 141.2 grams silver per tonne, 0.85 per cent copper, 4.11 per cent zinc, and 3.67 per cent lead from two massive sulphide lenses. The deposit is not fully outlined, therefore, additional reserves are considered possible.

The showing, which is on the AR-HN mineral claims, is located 98 kilometres northeast of Kamloops and 3.7 kilometres southwest of the west end of Johnson Creek, at an elevation of 1 475 metres. Access to the property is via logging roads one hour distant from the Barriere and Chase areas.

GENERAL GEOLOGY

The accompanying map (Fig. 19) of the area is underlain by 7 300 metres of apparent stratigraphic thickness of mafic to felsic volcanic rocks with intercalated sedimentary horizons. The regional schistosity strikes 140 degrees and dips 40 degrees to the northeast; the formations are overturned.

EAGLE BAY FORMATION (MISSISSIPPIAN AND OLDER)

The Eagle Bay Formation in the mapped area has been divided into two units by Schiarizza, *et al.* (1984): a Devonian and/or older mafic volcanic; and a Devonian and/or Mississippian felsic volcanic unit. Regional deformation increases in intensity on the eastern edge of the mapped area and the original nature of the mafic volcanic rocks is obscured at these localities.

Devonian (?) and/or Older (?) (EBG)

The lower unit in the mapped area consists of approximately 4 300 metres of mafic volcanic rocks; there is an increasing amount of intercalated limestone near the stratigraphic base of the section in the northeastern

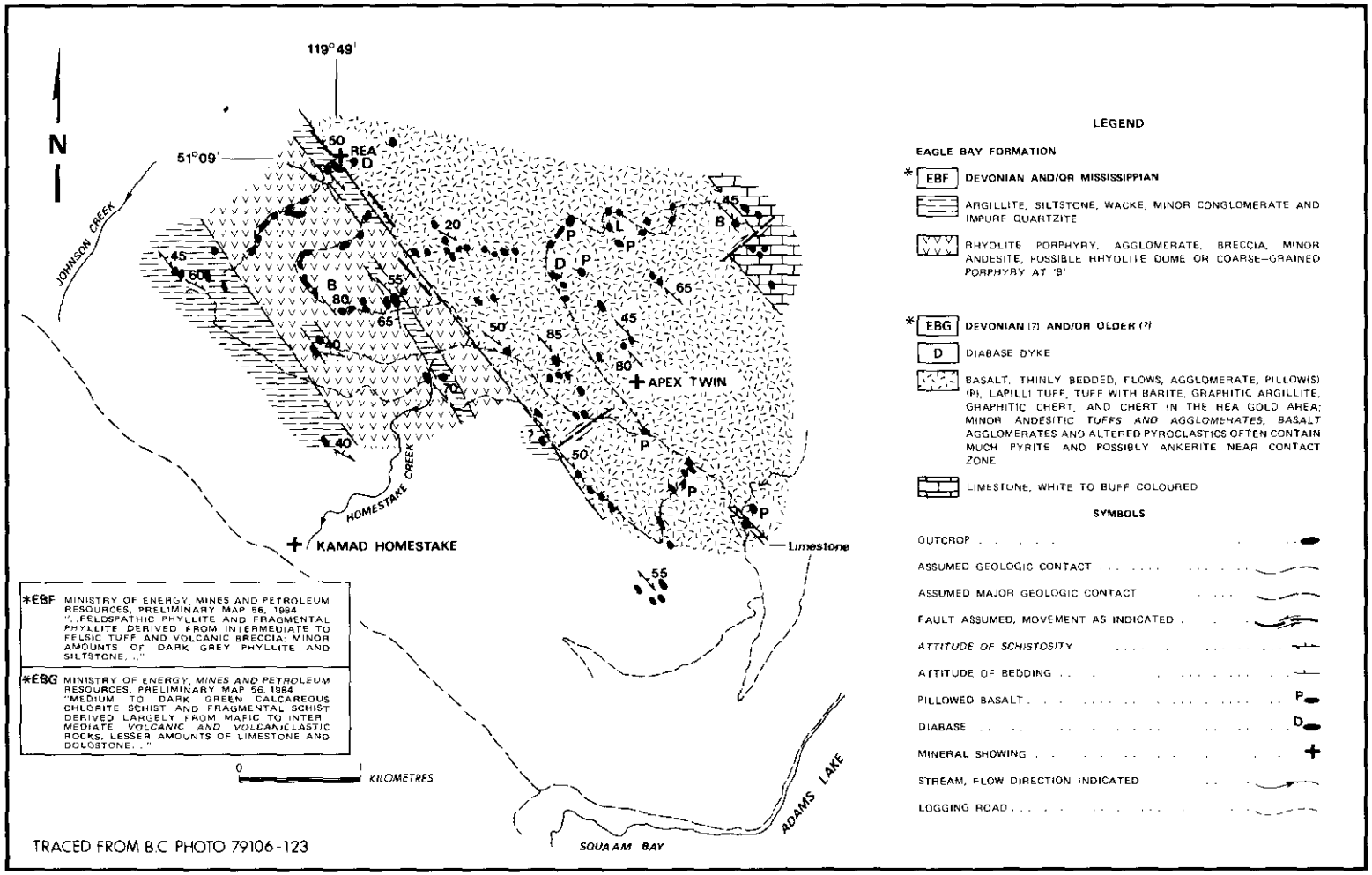

Figure 19. Geology of the Hilton-Rea-Falconbridge area.

part of the area. The limestone is white to buff, fine grained, and crystalline; it often forms prominent hills. The mafic volcanic rocks are chiefly pillow lavas, agglomerates, flows, and basaltic to andesitic tuffs. Near the stratigraphic top of this section layers have sharp contacts and are from 4 to 20 metres thick. During the late stages of volcanic activity, massive sulphides were deposited, along with pyritized flows and agglomerate beds which are commonly overlain by andesitic to basaltic tuff.

Diabase dykes with pyrite, and pyritic quartz veins were noted at the Hilton and at the Apex sites (Fig. 20).

Minor, localized depositional hiatuses may exist at the Hilton site between the mafic volcanic rocks and overlying sedimentary and felsic volcanic rocks, although no stratigraphic discordance was observed in the field.

Devonian and/or Mississippian (EBF)

Within the area mapped, this unit consists of approximately 3 000 metres of strata, of which 60 per cent is felsic volcanic rocks with some andesite, and 40 per cent is intercalated sedimentary rocks.

At the base, overlying unit EBG, is a sedimentary unit consisting of graphitic and commonly finely laminated argillite, wacke, conglomerate, and chert. The contact is locally gradational, commonly faulted, and perhaps locally disconformable. Soft sediment and slump features occur in the chert and argillite, which are in contact with andesite or basalt tuff of the underlying mafic unit.

The felsic volcanic part of the section consists of rhyolite breccia, agglomerate and tuff, some andesite agglomerate and breccia, intercalated argillite, siltstone, wacke, and some impure quartzite, the latter cropping out in the southwest corner of the area mapped.

The rhyolite units are usually feldspar porphyritic with frequent flow breccia. Breccia fragments are generally closely packed and fragments range up to 25 centimetres in maximum dimension. Andesite is commonly agglomeratic with sheared, elongated clasts.

HILTON SHOWING

The following descriptions refer to those rock units on the Hilton ground as seen in drill core, in trenches, and in surface outcrop. The complexity of the Hilton discovery is apparent in the abrupt mineralogical and lithological changes visible in trenches over a strike distance of roughly 300 metres, as well as in the variety of relationships observed between massive sulphides and overlying strata. A representative diagrammatic section of the massive sulphide setting is presented on Figure 20.

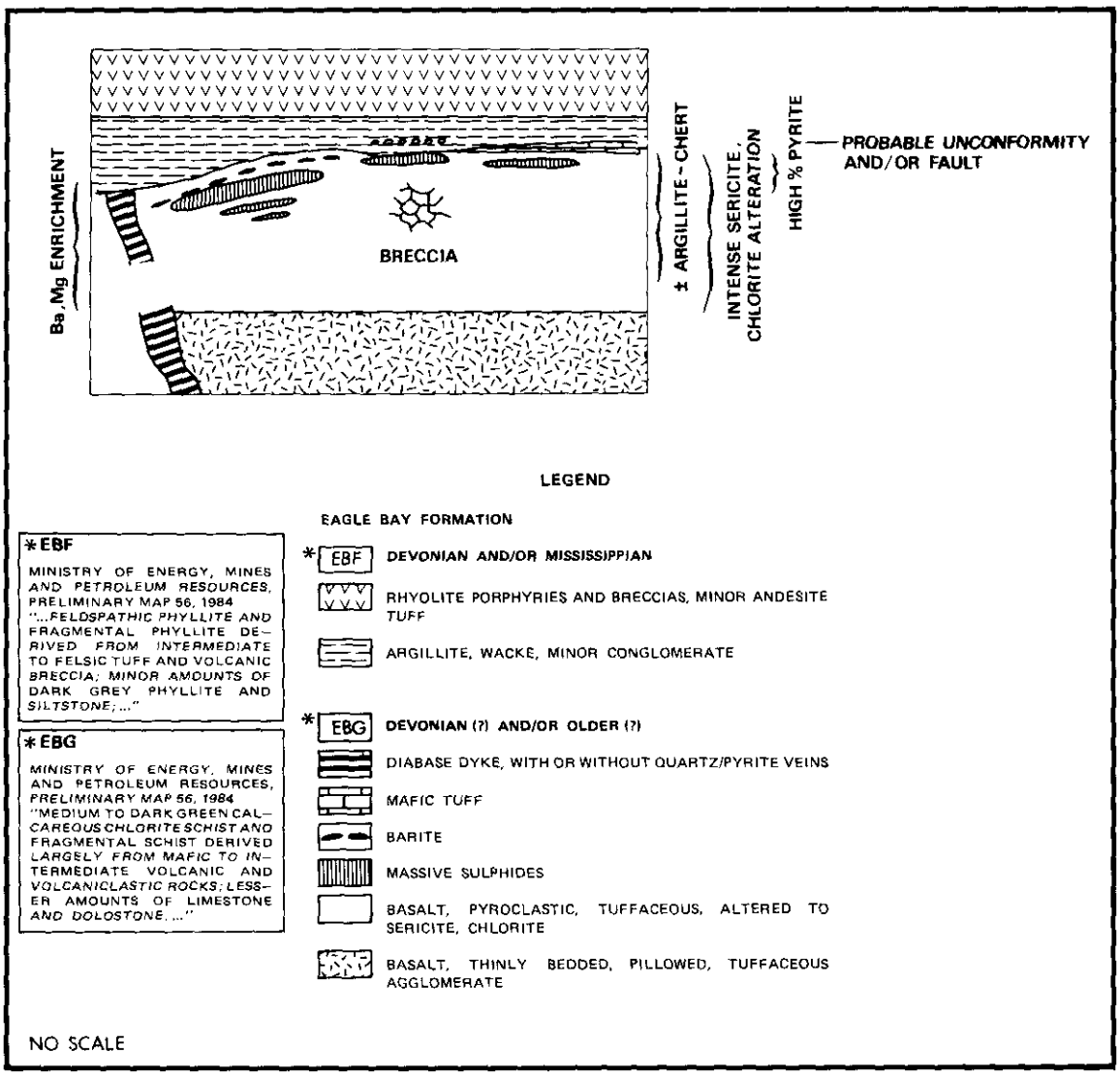

Figure 20. Diagrammatic vertical southeast-northwest section, Hilton-Rea-Falconbridge area.

The massive sulphides occur in two principal lenses, approximately at the same stratigraphic horizon; other narrow sulphide bands are usually present below the main sulphide bodies. The sulphides are hosted in mafic pyroclastic rocks which have been altered to sericite and chlorite schist. The schist has ubiquitous pyrite and may contain calcite, dolomite, and iron-rich magnesite. The sulphides are often underlain by crackle breccias with 0.5 to 4-centimetre-spaced fractures, commonly filled with pyrite, or a mixture of pyrite, arsenopyrite, galena, chalcopyrite, and sphalerite. Within the brecciated section, silicified argillite and graphitic chert are also present.

The sulphides range from fine grained, massive with a faint breccia texture, to medium grained and banded. Pyritic chert occurs stratigraphically above the massive sulphide lenses.

Minerals identified from the Hilton showing by field and laboratory methods are pyrite, arsenopyrite, sphalerite, galena, chalcopyrite, tetrahedrite-tennantite, albite, anglesite, jarosite, celsian, cymrite, barite, chlorite, goethite, and trace amounts of quartz and ilmenite. Gold has no obvious affinity with any unit; it occurs in the volcanic rocks, in barite, in the massive sulphides, and even as visible gold in fault gouge. Barite and silver commonly occur together while zinc, lead, and copper are generally associated with arsenic (I. Pirie, personal communication, 1984).

The ubiquitous pyrite occurs as fine, occasionally subhedral grains in a cherty matrix, as fine, 2-millimetre-wide stringers that are concordant with the regional schistosity, and as 3 to 4-millimetre-sized blebs also in a cherty matrix. Pyrite also occurs in 4 to 10-centimetre-long, rounded to serrate-edged fragments, that consist of agglomerated 1 to 2-millimetre pyrite grains, in a pyritiferous, altered basalt. The fragments, as well as the pyrite grains in them, are aligned in the plane of the regional schistosity. Pyrite occurs both above and below the massive sulphides but appears to be more abundant stratigraphically above the massive sulphide. In some cases, pyrite constitutes 70 per cent of the rock across 2 metres of stratigraphic thickness. The pyritiferous, altered volcanic rocks are up to 15 metres thick in the structural footwall (stratigraphic hangingwall).

One characteristic of the Hilton discovery is an abrupt change in mineralogy from trench to trench without apparent structural displacement. For example, in a trench at the southwest side of the property massive albite forms an amorphous white mass that measures 2 by 3 metres and underlies the massive sulphides; in the same trench, barite overlies the sulphides. Chert occurs more frequently in the trenches to the northwest. Celsian is not present in all trenches, and barite occurs either as individual grains or as a 3-metre-thick bed directly overlying the sulphides. Dolomite forms 1 to 2-centimetre-rounded blebs and veins in the encompassing altered volcanic rocks or with the sulphides. An iron-rich magnesite is also present throughout sections of the altered volcanic rocks as 1 to 2-millimetre-wide orange-coloured veins.

Emplacement of the massive sulphides at the end of the phase of mafic volcanic activity was accompanied by silicification, pyrite enrichment, soda enrichment (massive albite and paragonite), barite deposition (barite and celsian), and carbonatization (dolomite, iron-rich magnesite, and calcite). As indicated, the mineralogy varies over relatively short distances at the Hilton site. The brecciation and near total alteration of the hosting mafic volcanic rocks to sericite and chlorite may indicate proximity to a vent area from which extrusion of chemically varied fluids occurred within a relatively short time period.

Strata overlying the massive sulphides are as changeable as the mineralogy. For example, the massive sulphides are variably overlain by altered mafic tuff, by a grey tuffaceous mudstone, by barite, by graphitic argillite, and by 30 centimetres of fault gouge.

Sedimentary rocks overlying the mafic volcanic sequence consist of argillite, chert, wacke, and conglomerate. The argillite is frequently graphitic to thinly laminated, and the chert is graphitic with 1-millimetre or thinner, light-coloured bands. The chert is present close to the contact zone. Crossbedding in argillites and graded beds in conglomerates indicate tops to the southwest. The wacke and conglomerate beds have closely packed, rounded to subrounded, quartz and potassium feldspar grains with sericite, rutile, ankerite, plagioclase, chlorite, calcite, and paragonite in the matrix. Occasional 5-millimetre, angular clasts of argillite and occasional 4 to 5-millimetre blebs of pyrite or chalcopyrite are present in the conglomerate.

SUMMARY

On the Hilton property, an overturned, 450-metre-thick section of altered mafic volcanic rocks hosts the two massive sulphide lenses. The mineralization is accompanied by silicification or sericite, chlorite, and carbonate alteration with ubiquitous pyrite. The stratigraphic footwall is brecciated volcanic rock, and the hangingwall a sedimentary sequence that is at least 100 metres thick.

REGIONAL IMPLICATIONS

The contact between the mafic unit (EBG) to the northeast and the mainly felsic rocks to the southwest (EBF) is considered to be a prime exploration target. The Hilton deposit lies near the stratigraphic top of the mafic unit (EBG) which is commonly marked by closely packed, agglomerated fine-grained pyrite fragments in a sericite and chlorite-rich altered basalt matrix. These pyrite-enriched volcanic horizons are believed to represent the end phase of volcanic activity in the mafic volcanic unit and thus mark the stratigraphic position at which massive sulphides might have been deposited. Therefore intensely altered mafic volcanic rocks, particularly where brecciated and pyritic, are guides to exploration for similar deposits.

ACKNOWLEDGMENTS

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REFERENCE

Schiarizza, P., Preto, V. A., McLaren, G. P., Diakow, L. J., and Forster, D. (1984): Geology of the Adams Plateau-Clearwater Area (82L/13; 83M/3, 4, 5, 6, 12; 92P/1, 8, 9), *B.C. Ministry of Energy, Mines & Pet. Res.*, Preliminary Map 56.

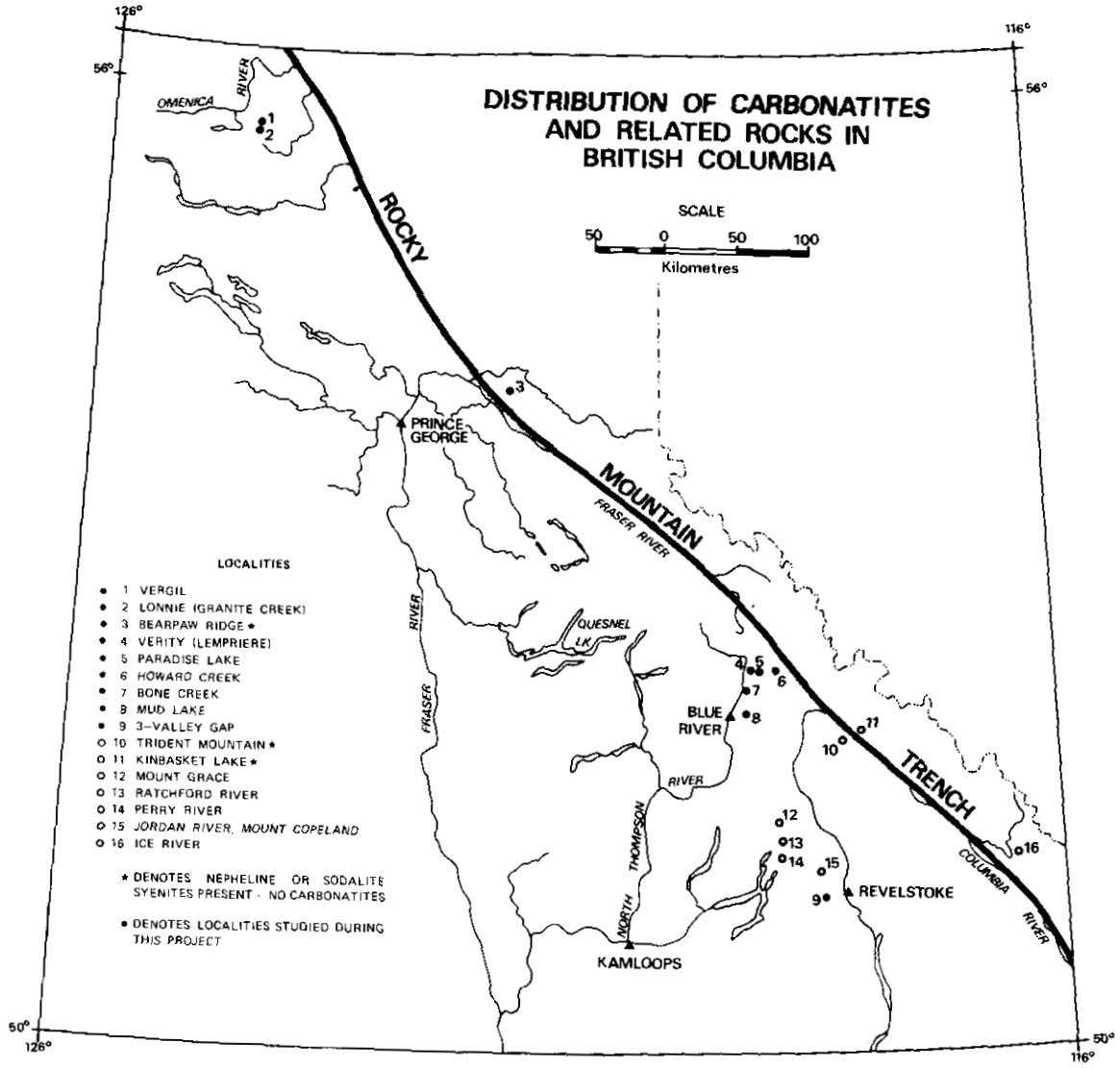

Figure 21. Distribution of carbonatites and related rocks in British Columbia.