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GEOLOGY OF THE HOPKINS PROPERTY INDIAN RIVER AREA SOUTHWESTERN BRITISH COLUMBIA (92G/11)

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INTRODUCTION

The Hopkins property is centred near latitude 49°38′ north, longitude 123°0′30″ west at the headwaters of the Indian and Stawamus Rivers (Figure 2-6-1). Access from Squamish is by 10 kilometres of logging road that parallels the Stawamus River. The Britannia mine is 12 kilometres to the west and Vancouver is 40 kilometres south of the project area. Mapping by the senior author in the summer of 1986 was concentrated in areas of volcanogenic and vein copper, lead, zinc, and gold mineralization.

Shortly after the first discoveries were made in the Britannia mine area about 1910, the ABC group was staked at the headwaters of the Indian River (Lisle, 1981). Little work was recorded until 1969-1970 when New Jersey Zinc Exploration Co. (Canada) Ltd. explored in the area and Croydon Mines Ltd. completed a Turam geophysical survey and drilled some anomalies (Lisle, 1981). In 1976 Harold Hopkins staked 84 units in 11 claims after finding copper-lead-zinc mineralization (Clendenan and Pentland, 1979). A short tunnel and trenching exposed sub-ore-grade stringer veins. In 1978 and 1979 the property was optioned to Placer Development Ltd. and work included mapping, geochemical and magnetic surveys, trenching, and drilling of 11 holes totalling 1320 metres (Drummond and Howard, 1985) mainly on the War Eagle claims (northwest corner of Figure 2-6-1). Placer dropped its option in May 1980 (Drummond and Howard, 1985).

International Maggie Mines Ltd. has continued work since 1980. This has included drilling 52 holes totalling 4960 metres (Drummond and Howard, 1985) and driving a short adit and raise. Recent work has been concentrated on the Mar claim (southwest corner of Figure 2-6-1) along two parallel quartz-chlorite veins that carry sulphides with anomalous gold and silver values.

REGIONAL GEOLOGY

The project area lies on the eastern edge of the Britannia-Indian River roof pendant. This pendant consists of a submarine volcanic and sedimentary sequence of pyroclastics, flows, cherts, and argillites tentatively assigned to the Lower Cretaceous Gambier Group. Metamorphism is up to lower greenschist facies but most rock textures are intact. Bedding and foliation generally strike northwest and dip southwest. Cretaceous granodiorite intrusions of the Coast Plutonic Complex surround and intrude the pendant.

Close proximity to the Britannia mine makes exploration within the pendant attractive. A string of properties along the Indian River valley parallels the poorly understood Britannia shear zone.

LOCAL GEOLOGY

There are four main units shown in Figure 2-6-1. From oldest to youngest they are: (1) intermediate tuffs and flows, (2) lower felsic tuffs and flows, (3) sediments and (4) upper felsic tuffs and flows. These units have been intruded by Cretaceous granodiorite intrusions, which are responsible for the development of large zones of hornfels and secondary biotite enrichment. Biotite alteration is generally noted in mineralized areas also characterized by silicification and propylitization.

Intermediate tuffs and flows consist mainly of green andesitic to dacitic rocks outcropping in the centre of the valley. The pyroclastic rocks vary from fine-grained tuffs (hard to distinguish from flows in outcrop and hand specimen) to fragmental tuffs containing fragments up to 15 centimetres long. Flows are often feldspar porphyritic and sometimes have a chlorite amygdaloidal texture. Chlorite and epidote alteration of felsic tuffs is common and local strong development of secondary biotite makes the upper contact of this unit gradational and indistinct.

Lower felsic tuffs and flows occur stratigraphically above and on either side of the intermediate tuffs and flows. They are rhyolitic to dacitic. Flows are difficult to distinguish from cherty tuffs, except where they exhibit flow banding. The well-bedded tuffs are composed of fragments and crystals 1 to 2 millimetres long, and contain numerous layers of fragments that are several centimetres long. Some poorly mineralized horizons may correlate with those intersected by drilling at portal one (Figure 2-6-1). The top of this unit interfingers with the overlying sediments.

Sediments are composed of chert and shale exposed west of the valley. Several depositional cycles, interbedded with tuffaceous units, are represented. Most sediments are very fine grained, but a few siltstone, sandstone and coarser fragmental tuff layers are present. Chert layers are commonly 1 to 2 centimetres thick, but they also occur as massive beds up to 2 metres in thickness. The shales are usually pyritic and siliceous. Bedding is well developed and often shows tops to the southwest.

Upper felsic tuffs and flows form a thick section. Fragments are up to 10 centimetres long. These rocks are similar to the lower felsic unit, except that tuffs are more abundant and fragments coarser. At portal two the tuffs hosting the veins are hornfelsed to a massive, brown, biotite-rich rock characterized by pale-coloured, resistant ovoids of cordierite and quartz 3 to 10 millimetres in diameter, that form up to 30 per cent of the rock. The original textures are destroyed within this hornfelsed zone. The spatial relationship of chalcopyrite-pyrite mineralization and hornfelsed zones suggests that vein development was controlled by the fracturing characteristics of the hornfels.

Intrusions include plutons, dykes and sills of granodiorite, andesite and basalt. The granodiorite is part of the Cretaceous Coast Plutonic Complex that surrounds the roof pendant. Numerous andesite and basalt dykes are present. An extensive sill of hornblende porphyry basalt contains up to 20 per cent hornblende phenocrysts in a groundmass of feldspar microlites. Its irregular outcrop pattern is caused by the variable topography. Several large andesite dykes occur near portal two.

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

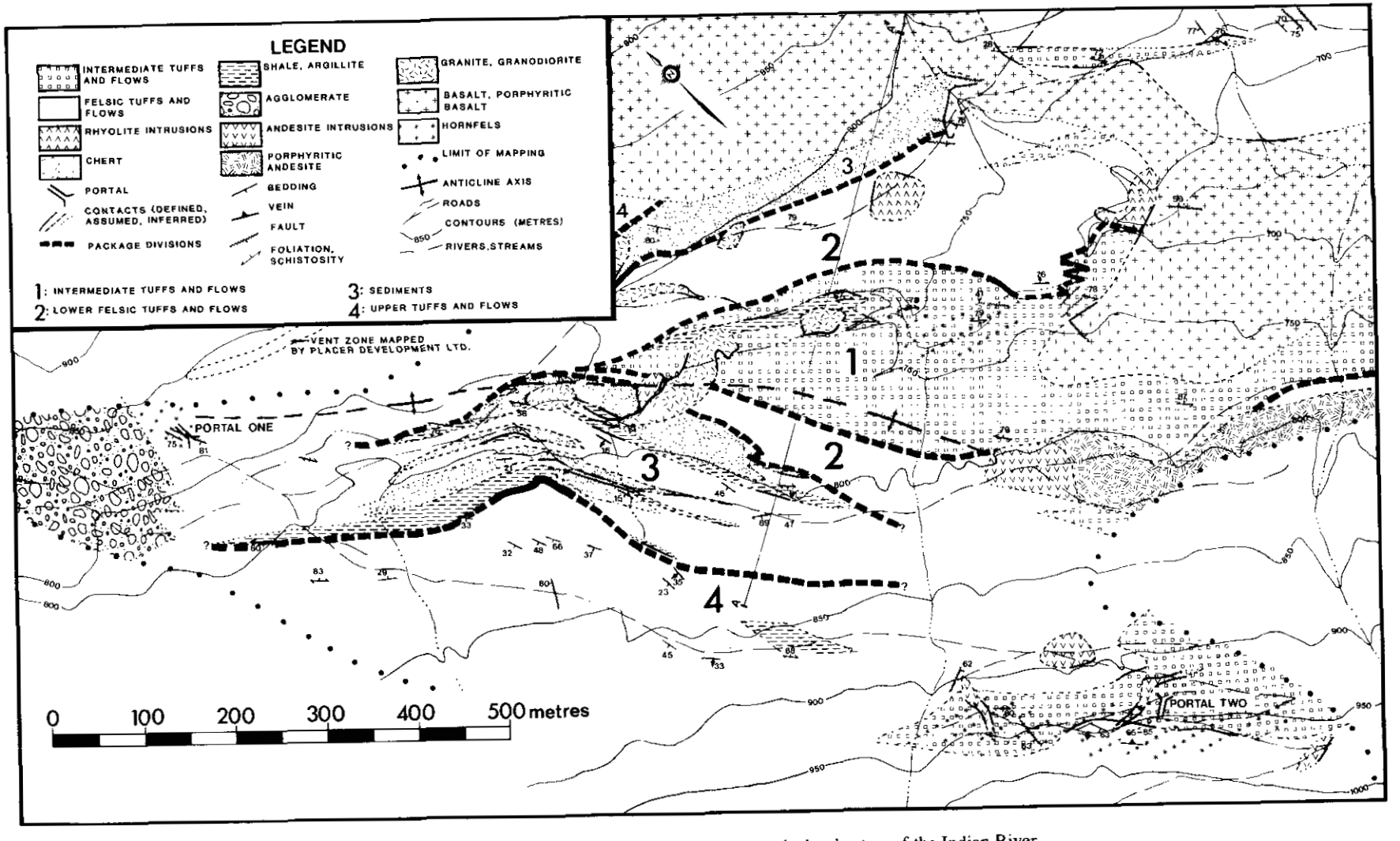

Figure 2-6-1. Geology map of the Hopkins property at the headwaters of the Indian River.

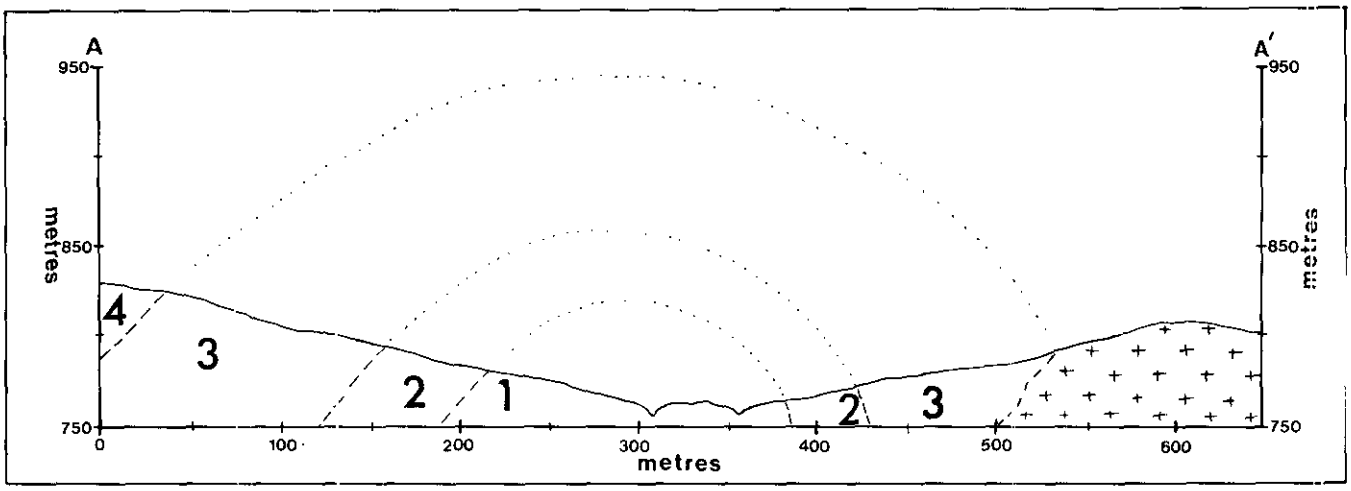

Figure 2-6-2. Cross-section A-A' of the Hopkins property. The section line is shown in Figure 2-6-1.

STRUCTURE

West of the Indian River bedding strikes northwest, dips southwest and shows numerous good tops facing southwest. Near portal one (Figure 2-6-1) bedding is flat to gently southwest-dipping. East of the Indian River bedding strikes northwest and dips steeply northeast. The dip reversal is interpreted as an anticline (Figure 2-6-2) that is tilted to the northeast. A pervasive axial plane cleavage strikes northwest and dips steeply to the southwest. Cleavage and bedding attitudes in the west half of the valley indicate the axis of the anticline lies to the northeast and has a shallow northwesterly plunge. Drill-hole data confirms this interpretation (Drummond and Howard, 1985).

A second cleavage striking north and dipping moderately to the west is axial planar to minor folds with steep northwesterly plunging axes.

Faults and shear zones generally strike north to northwest but northeast-trending structures have been mapped near portal two.

MINERALIZATION

Work on the property has been concentrated in the mineralized areas at portal one and portal two (Figure 2-6-1).

An adit has been driven from portal one along a zone of shearing approximately 50 centimetres wide and containing remobilized or stringer mineralization with average grades of 0.50 per cent copper, 0.35 per cent zinc, and 0.20 per cent lead (Clendenan and Pentland, 1979). Mineralization is interpreted to be volcanogenic; similarities to the Kuroko model include explosive volcanism, alteration, and stringer and stratiform ore that is dominantly pyrite with chalcopyrite, sphalerite and galena.

Mineralization at portal two consists of two quartz-chlorite veins containing up to 15 per cent sulphides including pyrite, chalcopyrite, sphalerite and traces of galena. Both veins carry significant values in gold and silver. The Main vein and East vein are parallel, striking northwest and dipping steeply to the northeast. They consist of a core of higher grade mineralization about 1 metre wide with lower grade material at the margins. The host rock is mainly massive, brown, biotite-rich pyritic hornfels.

The Main vein is 30 to 107 centimetres wide, over 70 metres long and averages 68.5 grams per tonnes (1.91 ounces per ton) gold over a 31-centimetre width (Drummond and Howard, 1985). The East vein, 9 metres to the northeast, is 30 to 198 centimetres wide and known to be at least 20 metres long (Drummond and Howard, 1985).

Two other areas of chalcopyrite-pyrite mineralization are shown in Figure 2-6-1. One is at the top and sides of a rhyolite dome 0.9 kilometre southeast of portal one. The rhyolite is pale green and contains quartz "eyes" and plagioclase crystals in a fine-grained groundmass. The second is in a hornfelsed zone exposed in the Indian River near the centre of the project area.

CONCLUSIONS

The Britannia-Indian River pendant is a highly productive and prospective volcano-sedimentary sequence containing the Britannia orebodies and a number of other mineralized occurrences. Bedded tuffs, flows, and sediments have been deformed into an anticline with a fold axis that plunges gently northwest. Mineralization on the Hopkins property includes: (1) a volcanogenic system with low-grade stratiform layers and some crosscutting stringer zones near portal one and (2) higher grade gold mineralization in quartz-chlorite veins cutting hornfels at portal two, which are the focus of current interest.

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