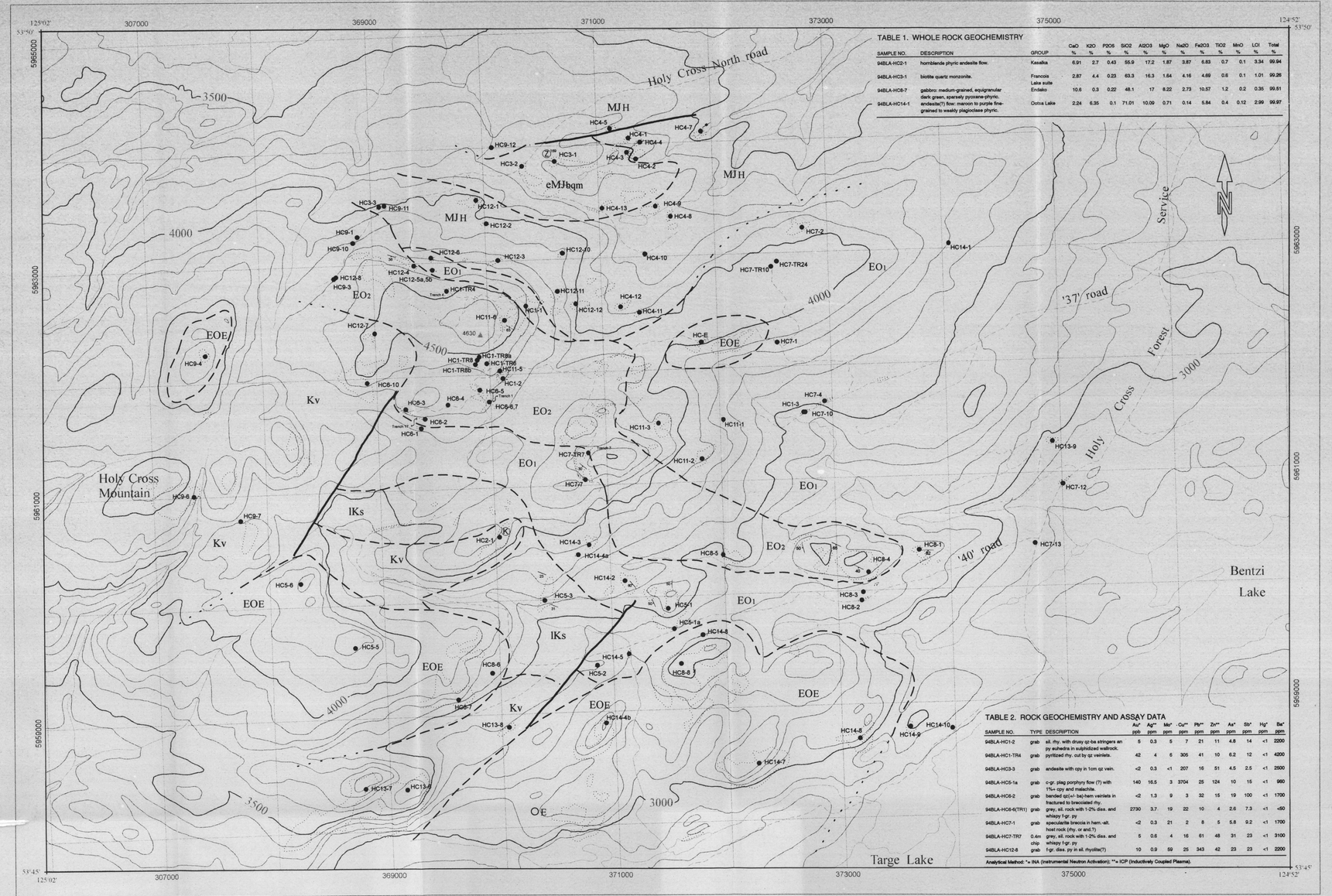

TABLE 1. WHOLE ROCK GEOCHEMISTRY

SAMPLE NO.	DESCRIPTION	GROUP	CaO %	K2O %	P2O5 %	SiO2 %	Al2O3 %	MgO %	Na2O %	Fe2O3 %	TiO2 %	MnO %	LOI %	Total %
94BLA-HC2-1	hornblende phyric andesite flow.	Kasalka	6.91	2.7	0.43	55.9	17.2	1.87	3.87	6.83	0.7	0.1	3.34	99.94
94BLA-HC3-1	biotite quartz monzonite.	Francois Lake suite	2.87	4.4	0.23	63.3	16.3	1.64	4.16	4.69	0.6	0.1	1.01	99.26
94BLA-HC6-7	gabbro: medium-grained, equigranular dark green, sparsely pyroxene-phyric.	Endako	10.6	0.3	0.22	48.1	17	8.22	2.73	10.57	1.2	0.2	0.35	99.51
94BLA-HC14-1	andesite(?) flow: maroon to purple fine-grained to weakly plagioclase phyric.	Ootsa Lake	2.24	6.35	0.1	71.01	10.09	0.71	0.14	5.84	0.4	0.12	2.99	99.97

TABLE 2. ROCK GEOCHEMISTRY AND ASSAY DATA

SAMPLE NO.	TYPE	DESCRIPTION	Au* ppb	Ag** ppm	Mo* ppm	Cu** ppm	Pb** ppm	Zn** ppm	As* ppm	Sb* ppm	Hg* ppm	Ba* ppm
94BLA-HC1-2	grab	sil. rhy. with druxy qz-ba stringers an py euhedra in sulphidized wallrock.	5	0.3	5	7	21	11	4.8	14	<1	2200
94BLA-HC1-TR4	grab	pyritized rhy. cut by qz veinlets.	42	4	6	305	41	10	6.2	12	<1	4200
94BLA-HC3-3	grab	andesite with cpy in 1cm qz vein.	<2	0.3	<1	207	16	51	4.5	2.5	<1	2500
94BLA-HC5-1a	grab	c-gr. pleg porphyry flow (?) with 1%+ cpy and malachite.	140	16.5	3	3704	25	124	10	15	<1	990
94BLA-HC6-2	grab	banded qz(+/- ba)-hem veinlets in fractured to brecciated rhy.	<2	1.3	9	3	32	15	19	100	<1	1700
94BLA-HC6-6(TR1)	grab	grey, sil. rock with 1-2% diss. and whispy f-gr. py	2730	3.7	19	22	10	4	2.6	7.3	<1	<50
94BLA-HC7-1	grab	specularite breccia in hem.-alt. host rock (rhy. or and.?)	<2	0.3	21	2	8	5	5.8	9.2	<1	1700
94BLA-HC7-TR7	0.4m chip	grey, sil. rock with 1-2% diss. and whispy f-gr. py	5	0.6	4	16	61	48	31	23	<1	3100
94BLA-HC12-8	grab	f-gr. diss. py in sil. rhyolite(?)	10	0.9	59	25	343	42	23	23	<1	2200

Analytical Method: * = INA (Instrumental Neutron Activation); ** = ICP (Inductively Coupled Plasma).

Legend

Eocene to Oligocene

Endako Group

EOe — dark green to black andesite to basalt flows and related diorite to gabbro plugs and necks.

Eocene to Late Cretaceous

Ootsa Lake Group

EO2 — maroon to pale-coloured flow-banded rhyolites and rhyolite breccias.

EO1 — maroon to purple andesitic volcanic flows.

Cretaceous

Kasalka Group equivalent(?)

Kv — green hornblende phyric andesite flows.

Skeena Group equivalent(?)

lKs — resistant, well-bedded chert-pebble conglomerate, minor argillite; recessive weathering maroon to pale green conglomerate, sandstone and mudstone.

Middle Jurassic

Hazelton Group

MJH — green andesitic plagioclase-phyric flows and reworked crystal tuffs.

Intrusive rocks

early Middle Jurassic

cMJbqm — biotite quartz monzonite.

Symbols

- Geological contact (defined, assumd, approximate)
- Fault
- Bedrock outcrop
- Trench
- HC3-1 — Sample station
- 31 — Bedding
- 50 — Flow-layering
- Dyke
- Age Determination (Method + age in Ma: Z = U-Pb zircon; K = K-Ar hornblende (in progress))
- Road

BEDROCK GEOLOGY NOTES

Introduction

The Holy Cross Mountain to Bentzi Lake area (parts of NTS 93F/14, 15), including the Holy Cross epithermal precious metal occurrence (Minfile 093F 029), was mapped over a two week period during the summer of 1994. The study area is 33 km south of Fraser Lake in the Nechako Plateau area of central British Columbia. It is accessible from each of three secondary logging roads that branch off the Holy Cross forest service road, a main haulage way that extends south from Fraser Lake. A 4-wheel-drive road extends west from the end of the "37" road to an abandoned exploration camp and several trenches.

Topography consists mostly of gently rolling to moderately steep slopes. Elevations range from 850 to 1410 metres. Outcrop is concentrated on ridges and steep south-facing slopes and covers 5 to 7% of the area. Road building has generated exposures and extensive logging has made out-crops in low-lying areas more obvious and accessible.

This work benefited from previous mapping in the area by Donaldson (1988) and Barber (1989), both of whom were working for Noranda Exploration Company, Limited.

Exploration History

The region was originally mapped by Howard Tipper between 1949 and 1953 as part of the Nechako River Map Area project (Tipper, 1963). Subsequent exploration has been sporadic, and has focused mainly on molybdenum occurrences north and east of the east end of Francois Lake (Endako and Nithi Mountain areas), and silver-gold ± base metal occurrences (e.g., Blackwater-Davidson, Capoose, Pawn, Trout, Wolf) south of Holy Cross Mountain.

Noranda Exploration Company, Limited explored the area during 1988 and 1989. The original claims covered lithogeochemical gold anomalies identified from rock chip samples of silica-flooded rhyolite (Donaldson, 1988). Exploration by Noranda included geochemical surveys, magnetometer and I.P. surveys, geological mapping and the excavation of 26 trenches (Donaldson, 1988; Barber, 1989). There is no record of prior exploration.

Local Geology

The map area covers about 4300 hectares. It is underlain by Mesozoic and Cenozoic volcanic, sedimentary and intrusive rocks. Jurassic "basement", exposed in a window through extensive Tertiary volcanic cover, is found in an area between Holy Cross Mountain and Bentzi Lake. Jurassic intermediate volcanic rocks, cut by Middle Jurassic intrusions, are unconformably overlain by Cretaceous (?), dominantly rudaceous, sedimentary rocks and intermediate volcanic flows. These are locally capped by Tertiary intermediate and acid volcanic rocks. Whole rock data for some of the units are reported in Table 1.

The oldest rocks exposed occur along north-facing slopes and in low-lying areas in the northern part of the study area. They consist of dull grey-green andesitic volcanic and epiclastic rocks of the Middle Jurassic Hazelton Group. Generally the rocks are quite massive and comprise flows. Locally, however, crystal-rich sections display weakly-defined graded bedding and are interpreted to be reworked crystal tuffs. These rocks are thermally metamorphosed (hornfelsed) to a fine-grained, mottled pale pink and green rock with relict plagioclase phenocrysts where intruded by an early Middle Jurassic biotite quartz monzonite plug.

Jurassic rocks are unconformably overlain by a younger sequence, tentatively assigned to the Cretaceous Skeena Group. It is dominated by two rock units: 1) very competent chert pebble conglomerate and 2) recessive weathering poorly lithified, pale green-grey to maroon-brown, conglomerate, grit and mudstone. The former is clast supported and clasts are cemented by a siliceous matrix. It forms several resistant outcrops in the west-central part of the map area. Locally, the conglomerate is weakly silicified and is cut by veinlets of quartz±pyrite. Included in it is a black, friable mudstone lens several metres thick. The latter is recessive weathering and may be a reworked version of the conglomerate. Typical bedding orientations are 112°/25SW and tops, defined by normally graded pebble to coarse sandstone beds, are up to the south. No fossils were recovered.

Pale grey-green hornblende phyric andesite flows, that may correlate with the Cretaceous Kasalka Group, are massive and magnetic, and overly the conglomerates with apparent conformity. Jet black, randomly oriented euhedral hornblende phenocrysts, up to 12 mm long, comprise 3-5% of the rock. Locally, they are chloritized. Subordinate plagioclase phenocrysts are partly replaced by pale green clay minerals (montmorillonite?). Amygdules are filled with calcite and rimmed by chlorite. Potassium-argon analyses of a hornblende separate from this unit is in progress.

Unconformably overlying all older rocks are Eocene Ootsa Lake Group maroon to cream-coloured (hematite-stained and variably argillically altered) plagioclase phyric andesitic to rhyodacitic flows and flow-banded rhyolites, rhyolite breccias, and associated lapilli and crystal tuffs. Flow banded rhyolite forms a row of prominent knobs that trend northwesterly across the map area and may, in part, be intrusive. The knobs are interpreted to be remnants of an eroded rhyolite flow dome sequence.

The flow banding has a general orientation ranging from about 300° to 330° with moderate to steep southeasterly dips. The rhyolite is typically very siliceous with many of the flow bands replaced by clear quartz. Secondary silica, evident as drusy cross-cutting quartz veinlets, was most likely derived from the degassing of the rhyolite pile as it "stewed in its own juices". Discontinuous wisps and fracture-fillings consist of earthy hematite and lesser specularite.

The youngest rocks in the area are andesite to basalt flows and related diorite to gabbro plugs and necks of the Tertiary Endako Group. They form prominent knobs that occupy the southern and a portion of the western region of the map area. Rocks of the Endako Group are unaltered and unmineralized.

Igneous Intrusion

Salmon coloured, medium grained, and equigranular to weakly porphyritic biotite quartz monzonite intruded and thermally altered Hazelton Group rocks in the northern part of the map area. The intrusive rock is generally fresh in appearance and consists of about 30% stubby white to pale green (saussertitized), euhedral plagioclase up to 4mm in length; 3% to 5% black, vitreous biotite up to 2mm across; about 1% grey translucent quartz, and; 3% xenoliths generally less than 2 cm in diameter. The phenocrysts and xenoliths are set in a pink, fine-grained to aphanitic groundmass that consists mostly of K-feldspar and less than 1% disseminated magnetite.

Three fractions of zircon from biotite quartz monzonite (sample HC3-1) were analyzed at the Geochronology Laboratory at the University of British Columbia. Two fractions are essentially concordant with a weighted average $^{207}Pb/^{206}Pb$ age of 169 ± 1.4 Ma (early Middle Jurassic). This suggests that the biotite quartz monzonite may be correlative with one of the early phases of the Francois Lake suite of monzonitic intrusions that crop out predominantly to the north.

Mineralization and Alteration

Two styles of mineralization occur within the area mapped. Firstly, epithermal gold mineralization occurs in several areas; each occurrence is hosted by altered Ootsa Lake Group rocks. The best gold values were obtained from trench 1 where an 8.5-metre section of brecciated and intensely silicified rhyolite with 1 to 2% very fine grained, disseminated pyrite averaged 0.51 g/t Au and 4.3 g/t Ag, including a 2-metre interval that graded 2.64 g/t Au and 9.7 g/t Ag (Donaldson, 1988). Manganese, limonite and hematite typically coat fractures in the massive grey cryptalline silica. Other anomalous areas (e.g., trench 17) contain banded translucent and/or hematitic cocks comb quartz veins and vein stockworks. Secondly, rare fracture-controlled copper mineralization, consisting of trace to 1% chalcopyrite in quartz-carbonate veinlets, is hosted in Hazelton Group volcanic rocks that are spatially, and may be genetically, related to the biotite quartz monzonite intrusion. However, chalcopyrite also occurs in quartz-carbonate veins in younger rocks spatially unrelated to the intrusion. Grab samples of typical mineralization and alteration were assayed and results are reported in Table 2.

Early, pervasive hematitic alteration has stained Eocene volcanic rocks to pale and dark maroon tones. Seams and clots of jasperoid and/or specularite have developed locally. Weakly developed argillic alteration followed and resulted in local zones of bleaching. Subsequent sulphidation resulted in the development of up to 4% medium to coarse-grained disseminated euhedral, or fracture-controlled subhedral, pyrite. Bleached envelopes, 1 to 3 times the width of pyrite mineralization, are typical.

Late stage (?) silica alteration is reflected in zones of intense, pervasive silicification that typically consist of massive pale grey silica. All original textures have been obliterated. Pyrite is the only sulphide observed and occurs as sparse fine-grained anhedral disseminations. Quartz vein and stockwork vein to breccia zones are commonly associated with weakly to moderately argillically altered wallrock.

References

Barber, R. (1989): Geological and Geochemical Report on the Holy Cross Property; *B.C. Ministry of Mines and Petroleum Resources*, Assessment Report 19627.

Donaldson, B. (1988): Geological and Geochemical Report on the Holy Cross Property; *B.C. Ministry of Mines and Petroleum Resources*; Assessment Report 17807.

Tipper, H. W. (1963): Nechako River Map-Area, British Columbia; *Geological Survey of Canada*, Memoir 324, 59 p.

BC Ministry of Energy, Mines and Petroleum Resources

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PRELIMINARY BEDROCK GEOLOGY, HOLY CROSS MOUNTAIN TO BENTZI LAKE, CENTRAL BRITISH COLUMBIA

parts of NTS 93F/14E and 15W

By R.A. Lane

Scale 1:15 000

0 — 2000 metres