BARRIERE LAKES – ADAMS PLATEAU AREA
(82L/13E, 82M/4, 5W; 92P/1E, 8E)

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INTRODUCTION

A geological survey of the Barriere Lakes–Adams Plateau region was begun during the 1978 field season. This project was aimed at better understanding the stratigraphy and structure of rocks along the western flank of the Shuswap Complex and their possible correlation with some of the known structural/lithologic units within the Complex. The study was also designed to achieve a better knowledge of the setting and nature of numerous base metal deposits, several of which are stratabound and appear to be of volcanogenic origin.

Mapping was carried out using 20-chain aerial photographs and 1:1320 interim maps, due to lack of better topographic coverage.

During the field season an area of approximately 900 square kilometres was covered (Fig. 11), most of it thoroughly but part only roughly. The area mapped extends from the southern contact of the Cretaceous Baldy batholith in the vicinity of Birk Creek and Harper Creek southeasterly to the Adams Plateau, and is underlain by rocks of the Eagle Bay Formation (Okulitch, 1974), Fennel Formation (Campbell and Tipper, 1971), and the Cretaceous Baldy batholith (Campbell, 1963).

LITHOLOGY

The Eagle Bay Formation is a very complex unit both structurally and lithologically. As previously indicated (Okulitch, 1974), its stratigraphy is very poorly known and, as presently outlined, the Eagle Bay might include units equivalent to parts of the Nicola Group, Sicamous, Tsalkom, and Silver Creek Formations. The status of the Eagle Bay as a formation, group, or otherwise is therefore far from clear at this time.

Between Barriere River and Johnson Creek (Fig. 11) the Eagle Bay Formation consists of a structurally lower and complexly folded sedimentary sequence of quartzite, impure quartzite, some grit, calcareous siltstone, impure limestone, and grey phyllite which is best exposed between Dixon Creek and Forest Lake (unit 3). This dominantly sedimentary package is interlayered with, and structurally overlain to the northeast by, a sequence of clearly recognizable basic pillow lavas, flows, breccias, and tuffs (unit 9) which in the vicinity of Johnson Creek are either infolded with, or grade northeasterly into, a sequence of black phyllite and interbedded grit, sandstone, siltstone, and argillite (unit 5) that in places displays sedimentary features indicative of a turbidite environment of deposition.

Northeast of Sinmax Creek, between Johnson Creek and Adams Lake, the structurally lowest Eagle Bay rocks are highly sheared and intensely foliated pyritic acid tuffs (unit 6) which are overlain by intermediate

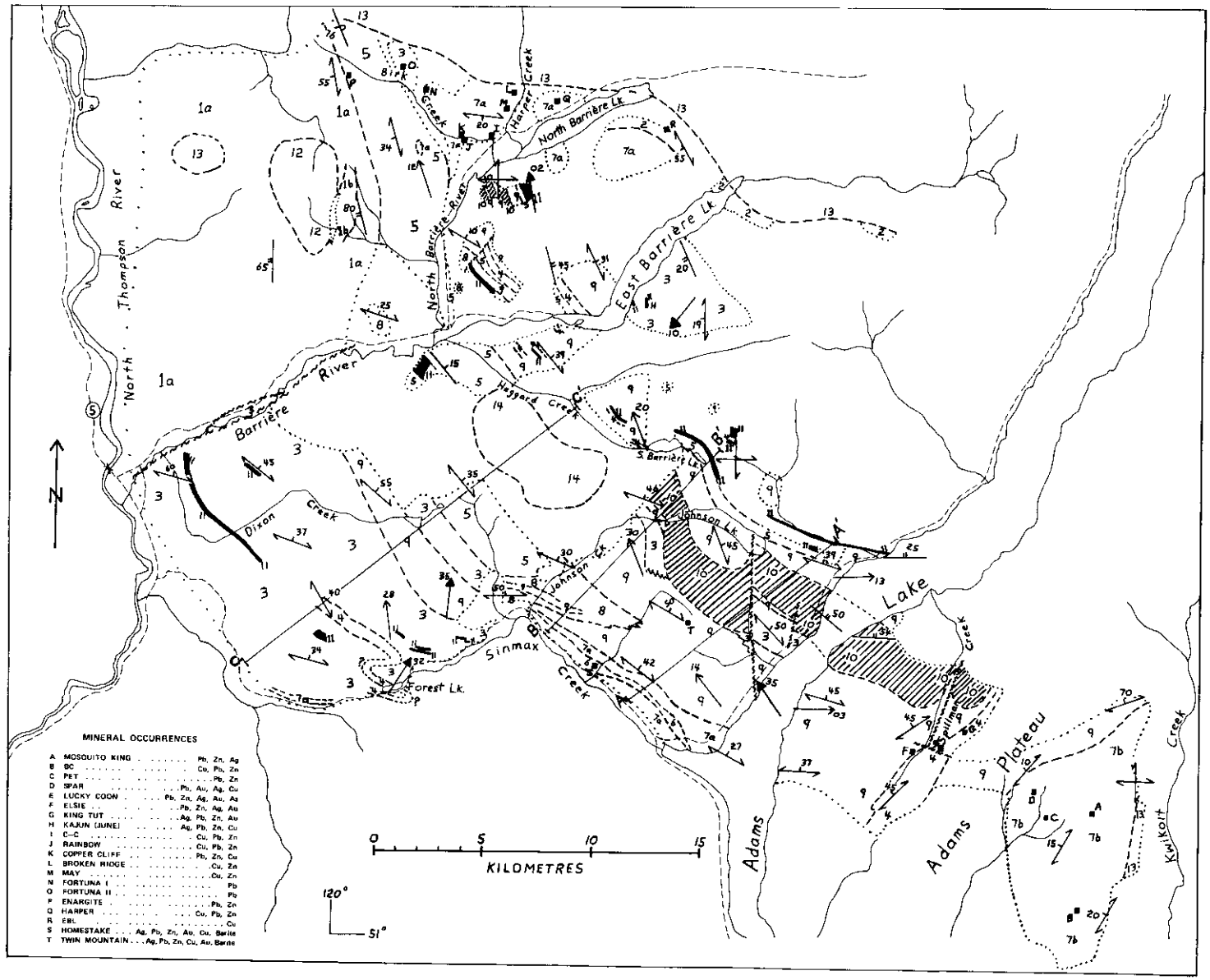

Figure 11. Generalized geological map of the Barriere Lakes—Adams Plateau area.

LEGEND

PLEISTOCENE AND/OR EARLIER

14 *OLIVINE BASALT FLOWS, MINOR INTERBEDDED MUDSTONE*

CRETACEOUS

13 BALDY BATHOLITH: BIOTITE QUARTZ MONZONITE AND GRANITE

JURASSIC OR TRIASSIC

12 DIORITE AND QUARTZ DIORITE

PRE–UPPER TRIASSIC (PROBABLY MISSISSIPPIAN)

EAGLE BAY FORMATION

11 LIMESTONE DARK GREY TO LIGHT GREY, BANDED, MINOR DOLOMITE

10 TSHINAKIN LIMESTONE: MASSIVE LIGHT GREY TO WHITE, FINELY CRYSTALLINE

9 GREENSCHISTS DERIVED FROM MAFIC MASSIVE AND PILLOWED FLOWS, BRECCIAS, AND TUFFS

8 *DACITIC TO RHYODACITIC LITHIC TUFF AND VOLCANIC BRECCIA*

7 (a) INTERMEDIATE TO FELSIC SCHIST DERIVED MOSTLY FROM TUFFS
(b) INTERLAYERED CHERTY TUFF, CHERT, CALC–SILICATE AND THIN LAYER OF IMPURE LIMESTONE

6 HOMESTAKE SCHIST: PLATY, LIGHT RUSTY YELLOW WEATHERING SERICITE – PYRITE – QUARTZ SCHIST

5 DARK GREY TO BLACK PHYLLITE; INTERBEDDED GRIT, SANDSTONE, SILTSTONE, AND ARGILLITE

4 RELATIVELY PURE, LIGHT GREY TO WHITE, MASSIVE QUARTZITE

3 INTERLAYERED GRIT, MICACEOUS QUARTZITE, PHYLLITE, CALCAREOUS QUARTZITE, IMPURE LIMESTONE, CALCAREOUS PHYLLITE, MINOR GREENSCHIST

2 AMPHIBOLITE, GARNET – BIOTITE – QUARTZ GNEISS

MISSISSIPPIAN (?)

SLIDE MOUNTAIN GROUP (?)

FENNEL FORMATION

1 (a) MASSIVE AND PILLOW BASALT, CHERT, CHERTY ARGILLITE AND PHYLLITE
(b) QUARTZ FELDSPAR PORPHYRY

SYMBOLS

BEDDING: TOPS KNOWN, OVERTURNED

BEDDING: TOPS NOT KNOWN

SCHISTOSITY: INCLINED, HORIZONTAL

PHASE 1 FOLD AXES

PHASE 2 FOLD AXES

INFERRED FAULT

GEOLOGICAL CONTACT

AREA OF PREDOMINANT OUTCROP

MINERAL OCCURRENCES

to acid tuffs (unit 7), and by acid, intermediate, and basic coarse volcanic breccias (units 8, 9). These grade upward into a thick sequence of pillow and massive lavas and breccias (unit 9) with large, laterally discontinuous intercalated lenses of impure quartzitic and calcareous sediments and some basic tuffs.

On Adams Plateau a rather monotonous but not very thick sequence of very fine-grained cherty tuff, calc-silicate, thin layers of impure limestone, and minor argillaceous sediments (unit 5a) is structurally overlain by a prominent sequence of basic, massive, and pillowed flows and associated breccias and tuffs (unit 9). Throughout the central and eastern part of the map-area, from South Barriere Lake to the northern part of Adams Plateau, the sequence of basic lavas is sharply overlain by a prominent, light grey to nearly white, massive, finely crystalline limestone several hundred metres thick that is informally known as the Tshinakin limestone (unit 10). Although this prominent carbonate is by far the most continuous and easily traced marker horizon encountered during the course of mapping, it suddenly disappears south of South Barriere Lake for reasons that are not well understood. North of Johnson Lake the Tshinakin limestone is structurally overlain by more basic volcanic rocks which are followed by a thin unit of grey phyllite and a thin, but apparently laterally continuous, grey limestone. Contrary to previously published maps (Okulitch, 1974) no evidence was found that this upper limestone is equivalent to the Tshinakin limestone and thus outlines a large east-west-trending recumbent fold. The two limestones are clearly distinct and separate as are the lithologies above and below them, and thus no such large fold structure is indicated in this area.

North of Barriere River, Eagle Bay rocks consist mainly of a prominent unit of black phyllite and interbedded grit, sandstone, siltstone, and argillite (unit 5) which are structurally overlain to the east by a sequence of acid tuffs (unit 7a), basic and intermediate tuffs and flows (unit 9), quartzite (unit 4), minor grey phyllite, a prominent, thick but discontinous, light grey to nearly white limestone (probably correlative with the Tshinakin limestone), and other different carbonate units. The whole succession in many aspects resembles the better exposed sequence north of Sinmax Creek but much detail here is missing because of poor and sparse outcrop. To the west the Eagle Bay rocks are flanked by rocks of the Fennel Formation (unit 1), and the contact has previously been regarded as being a low-angle fault (Campbell and Okulitch, 1976). A close examination of this contact during the current work revealed no evidence of a fault but rather, indicated a gradual change westward from phyllite through a transition zone of interbedded massive basalt, phyllite, chert, and intraformational chert breccia into a zone of massive and then pillowed basaltic flows. All indications are that the contact between the Fennel and Eagle Bay Formations in this area is conformable, but it is not clear which of the two formations is the youngest. Early Mississippian conodonts have been identified from a limestone unit interbedded with phyllite and turbiditic sediments of the Eagle Bay Formation a short distance south of the confluence of Barriere River and Haggard Creek (Campbell and Okulitch, 1973), but the Fennel Formation is also thought to be of Early Mississippian age and correlative with the Antler Formation of the Slide Mountain Group (Campbell and Tipper, 1971). Locally the stratigraphic relationships between the Fennel and Eagle Bay Formations are not clear. Although the contact appears to be conformable, the Fennel could either underlie or overlie the Eagle Bay. A gradual decrease in metamorphic grade and deformation westward from the east end of East Barriere Lake could either mean younging of the succession in this direction or be a function of the lithologies involved and of their relative position to a metamorphic high to the east. Bedding in the Fennel flows dips vertically or very steeply to the west with no reliable indications of tops. Within the phyllite unit the best exposures indicate that tops are to the east and that bedding is overturned to the west near the

contact with the Baldy batholith. Folding is also complex and strong in this unit. By tracing the lithologic succession northwestward from Adams Lake it appears that greenschists and intercalated quartzite and carbonate east of North Barriere River are roughly at the same structural position as the Tshinakin limestone and thus would overlie both structurally and stratigraphically the phyllite unit west of the river. This would therefore suggest that the Fennel Formation underlies the Eagle Bay phyllite and is a lateral equivalent of the thick succession of sediments with some interlayered pillow lavas which underlie a similar phyllite south of Barriere River. If this were the case then the thick pile of Fennel pillow and massive basalt would essentially represent the southern edge of a gigantic sea mound that is flanked to the south by a sedimentary basin of considerable thickness. The fault that is inferred along Barriere River would then mark the edge of such a basin. Although this interpretation requires some assumptions and correlations which cannot yet be rigorously documented, it is preferred by the writer as it best agrees with the available data.

Post-tectonic granitic rocks of the Cretaceous Baldy batholith (Campbell and Tipper, 1971) intrude Eagle Bay and Fennel Formation rocks north of North Barriere Lake. Metamorphic grade increases toward the batholith southeast of North Barriere Lake, and migmatitic and gneissic rocks occur near the east end of East Barriere Lake. This gradient does not appear to have been produced by the Baldy batholith but rather to be due to an older metamorphic high (Belik, 1973) which localized the intrusion.

Two smaller granitic and dioritic intrusions cut Fennel rocks north of Barriere River and a granitic stock and numerous northeast-trending dykes cut Eagle Bay rocks along and west of Kwikoit Creek. The age of these intrusions is not precisely known but all are post tectonic and probably correlative with the Thuya and Baldy batholiths (Campbell and Tipper, 1971).

A succession of flat-lying basaltic flows with some interbedded poorly indurated mudstone unconformably overlies Eagle Bay rocks in an area of poor exposures southwest of Haggard Creek. These strata are probably of Pleistocene or Late Tertiary age (Campbell, 1963).

STRUCTURE

Previous workers (Fyson, 1970; Campbell and Okulitch, 1973; Preto, 1977) have reported four phases of mesoscopic structures in rocks of the Eagle Bay Formation. The present work confirms this complex array of structures (Fig. 12). Earliest recognizable folds are generally tight, isoclinal mesoscopic structures with recumbent axial planes which are parallel to the schistosity and to the compositional layering of the various rock units. These structures usually have gentle to moderate plunges and trend anywhere from northwesterly to northeasterly. Although it is suspected that these folds may be related to larger nappe-like structures, none of these have yet been identified and only medium-scale structures a few hundred metres in maximum dimension, probably belonging to this generation, can be inferred by attempting to trace some local markers. A later phase of folds clearly warps the schistosity and has axes parallel to a pronounced and widespread crenulation lineation. These structures have been observed to range from a few centimetres to several scores of metres in maximum dimension and have generally upright axial planes parallel to a pronounced crenulation cleavage. Fold axes have gentle easterly and westerly plunges along Adams Lake and moderate northerly to northwesterly plunges in the rest of the map-area. Later broad northerly to northeasterly trending warps, kinks, and faults have been observed throughout the map-area and are commonly followed by post-tectonic granitic dykes.

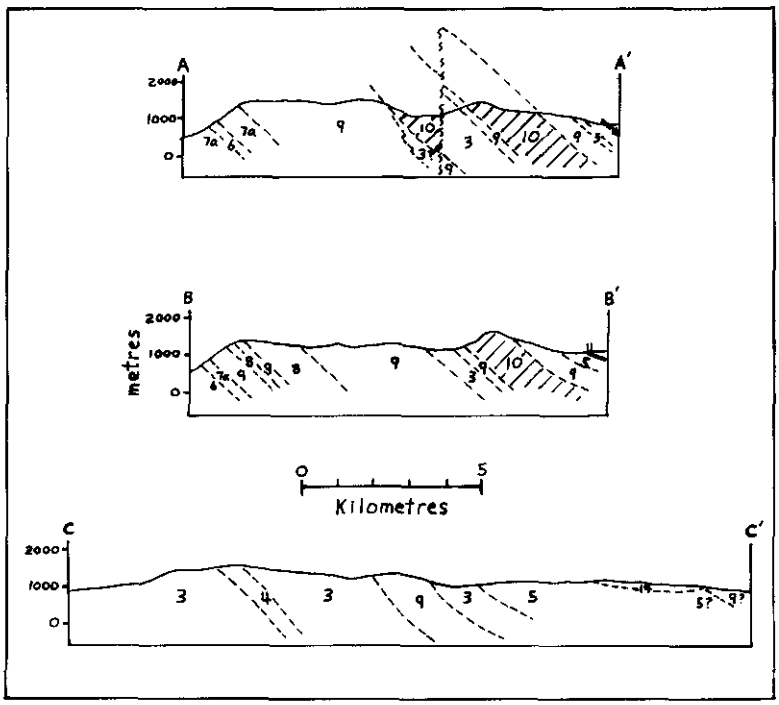

Figure 12. Cross-sections to accompany Figure 11.

MINERAL DEPOSITS

Numerous base metal occurrences, many of which are clearly stratabound massive sulphide deposits syngenetic with their host rock, occur throughout the map-area but are mainly concentrated in two camps. In the north, along Birk Creek and on both shores of North Barriere Lake, several massive sulphide occurrences are hosted in a pyritic quartz-eye sericite schist which was most probably derived from an acid tuff. Amongst these, the Rainbow and Copper Cliff showings on Birk Creek are in a unit of massive to semi-massive pyrite with minor copper, lead, and zinc values that is at least 4 to 5 metres thick and parallel to the main schistosity. Of these the Rainbow showing is structurally overlain by a pyritic metaconglomerate or breccia which contains pebbles and cobbles of the massive pyrite mineralization below. To the east, on both sides of North Barriere Lake, a similar schist hosts several occurrences of semi-massive pyrrhotite-pyrite-chalcopyrite mineralization with some lead and zinc values which are also stratabound. The EBL prospect is on the ridge between North and East Barriere Lake in an area of poor exposure. This prospect has been extensively drilled and is reported to contain a large tonnage of low-grade copper mineralization that is localized parallel to the schistosity in intermediate to felsic schists.

The Homestake mine occurs in highly pyritic quartz sericite schist along the north side of Sinmax Creek valley. Mineralization includes pyrite, tetrahedrite, galena, sphalerite, and ruby silver and occurs as quartz-barite infillings and/or shear zones which cut the schistosity at a small angle. Various estimates indicate that this deposit still contains 1 to 2 million tonnes of ore. Although the stopes mined to date were

in ore which clearly cuts across the schistosity, the types of ore and gangue involved and the setting of this deposit indicate that it may be part of a remobilized or intensely deformed massive sulphide body.

Numerous stratabound deposits of massive and semi-massive pyrite-pyrrhotite-chalcopyrite-galena and sphalerite occur in felsic tuff and in fine-grained cherty tuff on Adams Plateau. Although several of these deposits are of excellent grade, most are discontinuous, lensy, and very small in size. There is little doubt that most of these occurrences are volcanogenic massive sulphides, but it is not yet well known whether their small size and modest lateral continuity are original or due to later deformation. One of the largest of these deposits, the Lucky Coon, occurs at the head of Spillman Creek. Massive, semi-massive, and banded pyrite-arsenopyrite-galena-sphalerite-tetrahedrite-argentite mineralization occurs parallel to the main foliation in a felsic schist and locally attains a thickness in excess of 1 metre. The mineralized layer has been exposed in two stripped areas approximately 500 metres apart and reportedly has been traced intermittently for more than 1 kilometre. During 1977, 496 tonnes of ore was shipped from this deposit yielding 62 033 kilograms lead, 41 367 kilograms zinc, 222 669 grams silver, 274 grams gold, and 114 kilograms of cadmium.

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