PROJECT GEOLOGY

METALLIC INVESTIGATIONS

SOUTHERN BRITISH COLUMBIA

GEOLOGY OF THE MOYIE LAKE AREA, PURCELL MOUNTAINS, SOUTHEASTERN BRITISH COLUMBIA (82G)

By T. Höy and L. Diakow

INTRODUCTION

Geological mapping of the Moyie Lake area in the southern Purcell Mountains south of Cranbrook was initiated in the 1979 field season and continued in June and July 1980. The area is underlain by Purcell Supergroup rocks of Helikian to Hadrynian age and includes the Midway (MI 82G/SE-128*) and the St. Eugene (MI 82G/SW-25) mines and numerous small silver-lead-zinc vein occurrences. The project is a continuation of a regional study of the Purcell Supergroup in southeastern British Columbia. Two recently published preliminary maps with reports (Höy, 1979 and McMechan, 1979) describe the structure, stratigraphy, and depositional environment of Purcell rocks on the east side of the Rocky Mountain Trench. Results of the 1979–1980 field mapping of the Moyie Lake area will be released shortly, also in the form of a preliminary map.

Previous reconnaissance mapping by Schofield (1915) and Leech (1960) included virtually all the Moyie Lake area; the map by Leech provided an excellent base for the more detailed mapping of this study. The mapping concentrated on stratigraphy of the Aldridge Formation, location of the Lower/Middle Aldridge contact, the controls of vein mineralization, and the relationship of the Moyie fault to Precambrian and younger tectonics.

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STRATIGRAPHY

The oldest rocks in the map-area, the Aldridge Formation, are exposed on both sides of the Moyie fault in the western part of the area (Fig. 2). The Lower Aldridge comprises rusty weathering siltstone and quartzite, with some interbeds of silty argillite. Well-bedded, grey, graded quartzite layers similar to Middle Aldridge turbidite beds are common near the top of the Lower Aldridge, hence the contact between the

*MI 82G/SE-128 refers to the mineral deposit inventory classification number for this deposit.

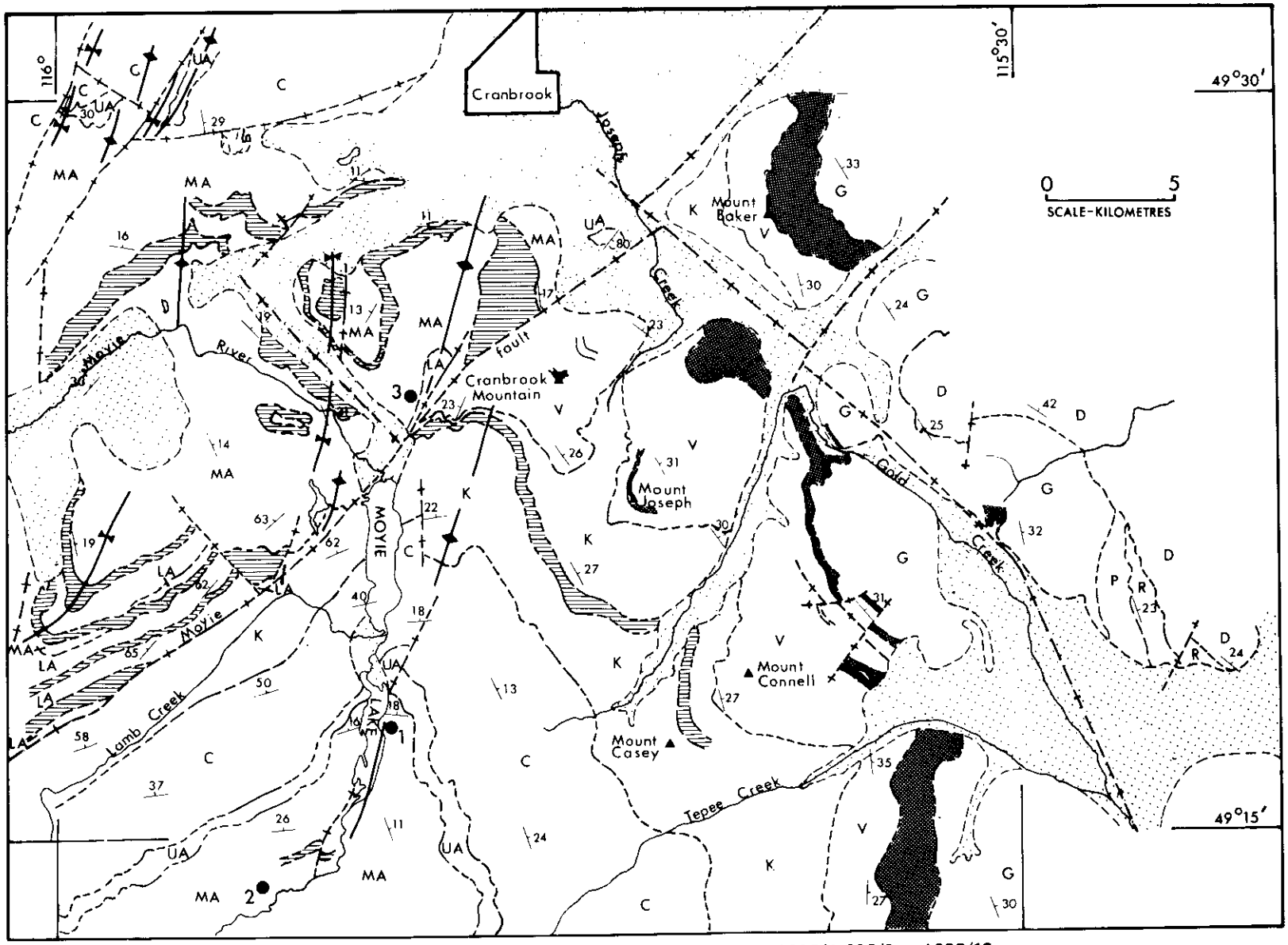

Figure 2. Geology of map-area 82G/5 (Moyie Lake) and parts of 82G/4, 82G/6, and 82G/12.

LEGEND

Pleistocene and Recent - till and alluvial deposits

D — Upper Devonian - grey fossiliferous limestone
Middle Devonian - polymictic conglomerate, dolomitic sandstone, dolomite

PROTEROZOIC PURCELL SUPERGROUP

Metagabbro sill

R — Roosville - grey-black argillite, green siltstone; dolomitic

P — Phillips - maroon argillite, siltstone, quartzite

G — Gateway - middle and upper - green, grey and purple siltstone and sandstone with green argillaceous interbeds; - lower - polymictic conglomerate; dolomite, commonly stromatolitic; green and purple siltstone and sandstone

Nicol Creek - green and purple amygdaloidal basalt; tuff; volcaniclastic sandstone

V — Van Creek - green and purple argillite and siltstone; minor grey argillaceous limestone

K — Kitchener - silty dolomite, dolomitic argillite, grey argillaceous limestone

C — Creston - grey, green and minor purple tinged siltstone and quartzite; minor dark argillite and massive grey quartzite

UA — Upper Aldridge - dark grey argillite, grey siltstone

MA — Middle Aldridge - grey to buff quartz wacke beds, interlayered laminated siltstone and argillite

LA — Lower Aldridge - rusty-weathering siltstone and quartzite, minor argillite

SYMBOLS

bedding attitude

geological contact - defined, approximate

fault

● mineral deposit or occurrence
1 - St. Eugene, 2 - Midway, 3 - Vine

anticline

syncline

Lower and Middle Aldridge is somewhat gradational. The boundary chosen indicates the level, where grey quartzite beds begin to predominate over the rusty weathering, irregular bedded siltstone. A complete and continuous Middle Aldridge section is not exposed in the map-area. Approximately 1 500 metres of the lower part of the Middle Aldridge is exposed just north of the Moyie fault (Fig. 2). It comprises thick grey quartz wacke beds with interlayered laminated siltstone layers, intruded by a number of regionally extensive metagabbro sills. In general, quartz wacke beds become thinner, less pure, and volumetrically less important upward in the Middle Aldridge section.

The upper part of the Middle Aldridge comprises a number of distinct cycles of massive, grey quartzite wacke beds at the base that grade upward into an interlayered sequence of quartzite, argillite, and siltstone, capped by siltstone and argillite. The contact with the Upper Aldridge is placed above the last bed of massive grey quartzite.

A number of the diorite sills have been discovered to be reliable markers in the thick Middle Aldridge section. They allow correlation of Middle Aldridge stratigraphy across faults, and will permit a composite thickness estimate for the Middle Aldridge. Locally the 'sills' cut across stratigraphy and provided zones of weakness which localized late fault movements. A prominent sill, approximately 1 200 metres above the Lower/Middle Aldridge contact, thickens dramatically as it approaches the Moyie fault in the northwestern part of the map-area just north of Cranbrook Mountain (Fig. 2).

The Upper Aldridge comprises several hundred metres of laminated dark grey argillite and lighter grey siltstone.

A thick, generally massive grey quartzite commonly marks the base of the overlying Creston Formation. It is overlain by dark argillite containing lenticular green siltstone layers with rare mud cracks, then interlayered grey-green siltstone and dark argillite. The bulk of the Creston Formation overlying the dark argillite comprises grey, green, and minor purple-tinged siltstone and quartzite that contains abundant mud-chip breccias, cross-laminations, and mud cracks. The Kitchener Formation includes generally buff to grey-weathering silty dolomite, dolomitic argillite, and grey limestone. The base of the overlying 'Van Creek Formation' (formally unit 5a of Leech, 1960; McMechan, Höy, and Price, in press) is commonly a conspicuous red-coloured siltstone. In general, the Van Creek Formation comprises interbedded olive green and purple shale and siltstone.

The Nicol Creek Formation (McMechan, Höy and Price, in press) includes the Purcell lavas and intercalated clastic and volcaniclastic rocks that separate the Van Creek Formation from the lithologically similar Gateway Formation. In the Moyie Lake area, the Nicol Creek Formation includes purple and green amygdaloidal basalt flows, tuff beds, volcanic breccias, and purple volcaniclastic sedimentary rocks.

The Gateway Formation unconformably overlies the Nicol Creek Formation. Its base is locally marked by a fluviatile conglomerate. Elsewhere, a stromatolitic dolomite, quartzite, and dolomitic siltstone sequence forms the basal part of the Gateway Formation. The Upper Gateway consists of intercalated sandstone and purple argillite, and a thick monotonous sequence of finely laminated green and purple siltstone. The overlying Phillips Formation consists primarily of thin-bedded maroon and red argillite, siltstone, and sandstone. It is overlain by black argillite in the basal part of the Roosville Formation, which grades upward into green argillite and locally purple argillite in the Upper Roosville.

Numerous sedimentary structures indicate a shallow marine to intertidal environment for the Van Creek, Gateway, Phillips, and Roosville Formations. They include mud-chip breccias, cross-laminations, ripple

marks, and mud cracks. Salt crystal casts found in the Middle/Upper Gateway Formation are diagnostic of this formation.

Middle Devonian grey-white and purplish red dolomite and maroon dolomitic sandstone unconformably overly Upper Purcell strata. Locally a fluviatile conglomerate marks the base of the Devonian strata. It crops out on a ridge east of Gold Creek, and in the immediate footwall of the Moyie fault at the north end of Moyie Lake and in a number of localities north of Lamb Creek. The dolomite is overlain by dark grey fossiliferous limestone of Late Devonian age.

STRUCTURE

The Moyie anticline dominates the structure south of the Moyie fault. It is a northeast-plunging, upright anticlinal fold. North of the fault, Lower and Middle Aldridge rocks are folded into moderately tight to open, north to northeast-trending folds that are outlined by the metagabbro sills. In the hangingwall, immediately adjacent to the Moyie fault, folds are tight and locally overturned. The Lower Aldridge is exposed in two overturned anticlinal folds just west of the north end of Moyie Lake and west of Cranbrook Mountain (Fig. 2). Fold structures are more complex in the northwest corner of the map-area, where detailed mapping of the upper part of the Aldridge and lower part of the Creston has outlined a number of tight overturned folds that trend north-northwest and plunge variably to the north and locally to the south.

Late northeast and northwest-trending faults are conspicuous. Complex fold structures and a number of splay faults were recognized in the hangingwall of the Moyie fault. An important north to northeast-trending fault occurs along the western border of the map-area and truncates Lower and Middle Aldridge rocks as well as a large synclinal fold north of Lamb Creek.

MINERALIZATION

The St. Eugene mine on Moyie Lake comprises a northwest-trending silver-lead-zinc vein structure that cuts across Middle Aldridge, Upper Aldridge, and Creston stratigraphy. Total production, until its closure in 1929, amounted to 1.46 million tonnes containing approximately 8 per cent lead, 1 per cent zinc, 125 grams silver per tonne, and 0.5 gram gold per tonne. Between 1936 and 1962, the Midway mine, a small quartz vein deposit in the Middle Aldridge, produced 1 168 tonnes containing 9 042 grams gold and 85 534 grams silver. Vine, a recently discovered lead-zinc-silver showing near the north end of Moyie Lake, is a northeast-trending massive sulphide zone, generally less than 2 metres thick, that cuts across quartzite-wacke beds near the base of the Lower Aldridge. Small silver-lead-zinc veins are common in Middle Aldridge metasedimentary rocks and numerous small copper showings are associated with the metagabbro sills.

REFERENCES

Höy, T. (1979): Geology of the Estella-Kootenay King Area, Hughes Range, Southeastern British Columbia, *B.C. Ministry of Energy, Mines & Pet. Res.*, Preliminary Map 36.

Leech, G. B. (1960): Geology, Fernie (West Half), Kootenay District, British Columbia, *Geol. Surv., Canada*, Map 11-1960.

McMechan, M. E. (1979): Geology of the Mount Fisher-Sand Creek Area, *B.C. Ministry of Energy, Mines & Pet. Res.*, Preliminary Map 34.

McMechan, M. E., Höy, T., and Price, R. A. (in press): Van Creek and Nicol Creek Formations (new), A Revision of the Stratigraphic Nomenclature of the Middle Proterozoic Belt, Purcell Supergroup, Southeastern British Columbia, Bull., *Cdn. Assoc. Pet. Geol.*

Schofield, S. J. (1915): Geology of the Cranbrook Area, *Geol. Surv., Canada,* Mem. 76, 245 pp.