Regional mapping at a scale of 1:25 000 of an area centred on Moyie Lake in the Purcell Mountains in southeastern British Columbia was initiated in 1979. The area is underlain primarily by rocks of the Purcell Supergroup of Helikian/Hadrynian age. The project is a continuation of a regional study of the Purcell Supergroup that is emphasizing the depositional environment of these rocks in order to determine the relationships between sedimentation, tectonics, and stratiform sulphide deposits. Two recently published preliminary maps with reports have been released describing the structure, stratigraphy, and depositional environment of Purcell rocks in the Hughes and Lizard Ranges on the east side of the Rocky Mountain Trench. The first, by McMechan (1979), includes the area south of the Wild Horse River; the second (Hoy, 1979), located north of Wild Horse River, is an extension of a previously released map (Hoy, 1978).

The Moyie Lake project will continue in 1980 and will extend mapping north to Cranbrook, east to Gold Creek, and south to approximately 49 degrees 10 minutes north. It will concentrate on subdivision of the Aldridge Formation, location of the Lower—Middle Aldridge contact, and the relationship of the Moyie fault to Precambrian and younger tectonics. Detailed stratigraphic section measurements and studies of lead-zinc deposits (such as the St. Eugene deposit) will augment the project.

REFERENCES


INTRODUCTION

The Bews Creek area (Fig. 3) is located southeast of the confluence of Bews Creek and Perry River, 25 kilometres west-northwest of Revelstoke. Access to the western part of the area is provided by a logging road that follows the Perry River, while the southern part is reached by a logging road along Crazy Creek. The area was mapped in eight days; two days of logging road geology and a six-day fly-camp.

The area was investigated in order: (1) to attempt to tie together, both stratigraphically and structurally, the Jordan River area (Fyles, 1970) with the Perry River area (McMillan, 1973); (2) to attempt to confirm the structural and stratigraphic interpretation of the Jordan River area by Hoy and McMillan (1979); and (3) to assess the potential for stratabound lead-zinc and carbonatite occurrences which occur elsewhere along the margins of Frenchman Cap gneiss dome.

The Bews Creek area is underlain by gneissic rock which correlates with core gneisses of Frenchman Cap gneiss dome (units A and B of Wheeler, 1965), and an overlying succession constituting a basal quartzite, a calc-silicate gneiss unit, a second quartzite, and finally a mixed pelitic and calcareous sequence. This succession correlates reasonably well with those established elsewhere in the mantling rocks of the dome.

STRATIGRAPHY

Unit 1 comprises well-layered hornblende gneiss, minor amounts of amphibolite and biotite gneiss, and rare calc-silicate gneiss. A granitic orthogneiss occurs in the vicinity of the interference fold structure shown on Figure 4. Unit 1 is continuous in the southeast part of the map area with unit 10 of Fyles (1970). Unit 10 of Fyles was tentatively correlated with core gneisses (Hoy and McMillan, 1979, Fig. 8) and this correlation is in accord with the present study.

A white, relatively pure quartzite (unit 2) overlies unit 1. It is several hundred metres thick north of Eagle Pass Mountain (Fig. 3) but thins to only a few metres near Bews Creek, 8 kilometres to the northwest. A prominent quartz pebble conglomerate occurs near its base and micaceous quartzite layers are common in the Eagle Pass Mountain area.

Diopside-rich calc-silicate gneiss, biotite gneiss, impure marble, and a granular, calcite-cemented quartzite (unit 3) overlie the basal quartzite. Unit 3 is overlain by a second quartzite (unit 4), that is lithologically similar to unit 2, then by a heterogeneous succession comprising quartz feldspar gneiss and pelitic schist with minor amounts of calc-silicate gneiss and quartzite (unit 5).

Overlying pegmatite-laced rocks (unit 6; unit E of Wheeler, 1965) consist of well-layered biotite-hornblende gneiss, pelitic gneiss, quartz feldspar gneiss, and minor quartzite, calc-silicate gneiss, and marble. Unit 6 rocks are tectonically separated from the underlying metasedimentary rocks by a southwest-dipping fault (as predicted by R. L. Brown, personal communication, 1979).
Figure 3. Regional geology of an area southeast of Bews Creek and Perry River, along the southern margin of Frenchman Cap gneiss dome (northeast corner after Fyles, 1970).
Unit 7, described as a porphyritic granite gneiss by Fyles (1970), was not visited. Its eastern contact is taken from Fyles (1970) and its southwestern contact from Wheeler (1965).

Correlation of the Bews Creek succession with sequences established elsewhere along the margin of Frenchman Cap dome is relatively straightforward. The succession, consisting of basal quartzite, calc-silicate gneiss and biotite gneiss, a second quartzite, and an overlying somewhat pelitic and calcareous sequence, is recognized on the northwestern margin (Höy, 1979a), western margin (McMillan, 1973), and eastern margin (Brown and Psutka, 1979). A similar stratigraphic succession is inferred (Höy and McMillan, 1979) in the more complex Jordan River area (Fyles, 1970).

The core gneisses may represent Lower Proterozoic Aphebian crystalline basement. Samples of both core paragneiss and orthogneiss from the eastern side of Frenchman Cap, collected by R. L. Brown, have yielded dates of approximately 2.1 Ga (R. L. Armstrong, personal communication, 1979). A basal quartzite, locally containing quartz pebble conglomerate, overlies core gneisses around the entire margin of the dome. Furthermore, in one locality fragments of gneissic rocks believed to be core gneiss clasts lie in the quartzite near its base (Fig. 5). The margins of these fragments are diffuse and the only recognizable structure within them is the penetrative mineral foliation, parallels that of both the surrounding quartzite and underlying gneiss. The fragments are inferred to have a sedimentary origin, but it is possible that they have a structural origin. They could represent a fragmented impure sedimentary layer near the base of the quartzite or perhaps a fragmented early fold nose. There are no features typical of boudinaging adjacent to the fragments and it is suggested that they are clasts of basement gneiss incorporated in the quartzite during its deposition.

The age of basal quartzite and overlying metasedimentary succession is not known. They may be correlative with the Middle and Upper Proterozoic Purcell Supergroup as suggested by Read (1979), or with the Upper Proterozoic Windermere Group or the Lower Paleozoic platformal succession exposed to the east as suggested by a number of authors including Wheeler (1965), Fyles (1970), and Höy and McMillan (1979). They do not closely resemble any of these successions. Based on the platformal nature of the Frenchman Cap succession, correlation with the Upper Purcell Supergroup or the Lower Paleozoic seems most likely.

STRUCTURE

The axial surface of an anticlinal fold trends west-northwest through the area. It is the western extension of an early fold described by Höy and McMillan (1979) that opens in the south and closes to the north in the Jordan River area. Unit 1, correlated with core gneisses, occurs in its core and the overlying succession is, in part, repeated on its limbs.

Minor structures are common in all outcrops. Mineral lineations plunge at varying angles to the southwest throughout the area. They are interpreted to parallel fold axes of the earliest recognized folds and in the instances where early folds can be clearly documented by interference structures mineral lineations lie parallel to the early fold axes. The prominent foliation is axial planar to these early (phase 1 ?) minor folds. Relatively open to very tight (phase 2 ?) minor folds that deform the foliation are present in most outcrops. Their axes generally trend southwesterly subparallel to the phase 1 (?) mineral lineations and their axial surfaces are upright to west dipping. Interference patterns between phase 1 and phase 2 folds, which are common on outcrop scale (Fig. 5), may also occur at map scale (Fig. 4).
Figure 4. Detailed geological map showing complex interfoliation of core gneiss and basal quartzite; map centre is located approximately 2 kilometres north-northeast of Eagle Pass Mountain.
Figure 5. Detail of interference of Phase 1 and Phase 2 minor folds involving core gneiss (no pattern) and basal quartzite (unit 2). Note sharp contact between core and quartzite and clasts (?) of core gneiss near base of quartzite (see discussion in text).
SUMMARY

A succession of metasedimentary rocks overlies with apparent conformity gneissic rocks correlative with core gneisses of Frenchman Cap dome. Both core gneisses and the overlying succession are complexly interfolded by at least two phases of deformation. An early (?) northwest-trending anticlinal fold dominates the structure of the area, repeating the stratigraphic succession in the south, but phase 2 minor folds are the most conspicuous folds on outcrop scale.

Stratabound lead-zinc deposits and showings occur elsewhere at a number of horizons within the metasedimentary cover rocks (Høy and McMillan, 1979; Høy, 1979b). The calcareous succession immediately above the basal quartzite (unit 3) hosts the Cottonbelt (Høy, 1979a) and King Fissure (Boronowski, 1976) deposits further north, but no lead-zinc mineralization was seen in this succession in the Bews Creek area. A stratiform carbonatite layer containing anomalous concentrations of niobium and other rare earths occurs in the Perry River (McMillan and Moore, 1974) and Cottonbelt (Høy, 1979b) areas within rocks correlative with unit 3. Nepheline syenite and syenite intrusions occur in Perry River and Jordan River areas. Neither the carbonatites nor the nepheline syenites were seen in the Bews Creek area.

ACKNOWLEDGMENTS

I was ably and cheerfully assisted in the field by Peter Mustard. W. J. McMillan spent several days in the field with me, and many ideas presented in this note developed through discussion with him, and as a consequence of our joint paper in Geological Fieldwork, 1978.

REFERENCES

CK PROSPECT
SHUSWAP METAMORPHIC COMPLEX
(82M/13E)

By T. Hoy

INTRODUCTION

The CK property includes a number of lead-zinc showings apparently confined to one stratigraphic layer. It is located between Ritchie Creek and Raft River, 37 kilometres north of Vavenby. The area is accessible by a well-maintained logging road branching north from Highway 5, 3 kilometres east of Clearwater and following Raft River.

The Main Boulder and part of the New showings were discovered by Andy Horne, the present owner, in 1973 and optioned by Rio Tinto Canadian Exploration Limited in 1974. A regional soil sampling program by Rio Tinto in 1974 led to the discovery of a massive sulphide exposure, the North showing, and outlined an anomalous zone in the New showing and Main Boulder area. The North showing was explored by geophysical methods and subsequently drilled. Four short holes in the Main Boulder area and one in the New showing failed to intersect significant massive sulphide mineralization (Assessment Report 5192). Two additional holes in the North showing intersected some lead-zinc mineralization; the better assayed intersection returned 3.98 per cent zinc, 0.71 per cent lead, 0.01 per cent copper, 0.18 ounce per tonne silver, and 0.007 ounce per tonne gold over an approximate 1-metre thickness (Assessment Report 5631).

Cominco Ltd. optioned the property in 1978 and carried out geochemical and geophysical surveys and trenching which led to the discovery of mineralized exposures in the Main Boulder, New, and Mist areas. The company drilled 20 holes in 1978 and an additional 18 in 1979. This drill program concentrated on the New showing and to a lesser extent on the Main Boulder showing.

Five days were spent on the property in August 1979, visiting the showings and logging the core drilled to that time (drill hole 79-12). During this time I was cheerfully assisted by Peter Mustard. The cooperation and hospitality of Cominco Ltd. is gratefully appreciated. Access to its maps and reports proved most useful, and discussions with Mike Murrel, G. Benvenuto, and Fred Gill were both stimulating and informative.

GEOLOGY

The area is underlain by metasedimentary rocks of the Shuswap Metamorphic Complex (Campbell, 1963). These include quartz feldspar-hornblende gneiss, amphibolite, calc-silicate gneiss and minor quartzite, and marble of unknown but probable Paleozoic age. Pegmatite is abundant. A fine to medium-grained granitic intrusive rock is present in the west part of the area (Fig. 6, personal communication, G. White).

The general succession in the area includes well-layered hornblende gneiss and amphibolite exposed in canyons in the creek west of Raft River (Fig. 6) which are structurally overlain by a calcareous succession that includes the sulphide layer, and then by a quartz feldspar gneiss and pelite schist succession exposed in scattered outcrops on the hills east of the New showing (personal communications with Cominco geologists). The Main Boulder showing is assumed to be the same sulphide layer that occurs in the New showing, inferring the presence of a fault in the creek separating them.
The general structure of the area appears to be relatively simple with an east-facing succession folded into a broad open, east-plunging (phase 3?) synformal structure with the New showing trending southeast on the southern limb and the North and Mist trending northeasterly on the northern limb. However, at outcrop scale and drill-section scale structures are very complex resulting in local dip reversals and repetition and omission of lithologies. These complexities are due primarily to relatively late (phase 2 and phase 3) folding and late faulting. Minor folds related to the late (phase 3?) structure have upright axial planes and plunge variably to the east and west. Earlier, southeast-plunging (phase 2?) folds are noticeable at outcrop scale. They have a pronounced lineation parallel to their fold axes, are relatively open to quite tight, and postdate the regional metamorphism. These folds are responsible for the flattening and apparent thickening of the sulphide layer at the New showing (see drill section, Fig. 7) and may be important elsewhere in locally thickening the sulphide layer. An earlier syn-metamorphic deformation (phase 1) is indicated by the parallelism of a regional foliation with bedding. Its effect on the distribution of lithologies is not known.
The calcareous succession structurally above the sulphide layer consists primarily of quartz-diopside calc-silicate gneiss invaded by abundant pegmatite (Fig. 7). In some drill sections, several relatively pure white marble layers up to several tens of metres thick, but generally considerably thinner, occur within this overlying succession. Micaceous schist and quartz feldspar gneiss are also common. Beneath the sulphide layers these schists and gneisses predominate and calc-silicate gneiss is relatively less important.

Figure 7. Vertical sections through drill holes CK 78-1, 78-3, 78-14, 78-15, and 78-16. New showing area, viewed to north. For location, see Figure 8.
The sulphide layer in the New showing is generally less than 1 metre thick and appears to be continuous, with perhaps minor structural breaks and offsets, for a distance of at least 1 300 metres from drill holes 78-8 to 78-19 (Fig. 8). It is also intersected in holes 79-11, 78-14, and 78-15, a further 800 metres to the north. It consists of massive sphalerite and pyrrhotite, minor galena, and trace chalcopyrite. Gangue quartz, diopside, calcite, amphibole, and plagioclase are common. Fluorite and vesuvianite occur locally. The contacts of the sulphide layer may be sharp or gradational through several metres of siliceous marble containing disseminated sphalerite and pyrrhotite. In a few holes a thin, well-layered diopside-bearing quartzite occurs structurally beneath the sulphide layer.

A 20 to 30-centimetre-thick sulphide layer at the North showing is on strike with a similar layer at the Mist showing several hundred metres to the southwest. Structural complexities at the Boulder showing hinder tracing a small trenched outcrop of massive sulphides for more than a few metres. It was not intersected in any of the holes drilled here.

Assays of both chip and grab samples of the sulphide layer and of a sample of mineralized marble from the Boulder showing are presented in the accompanying table. Average grades of the massive sulphide layer and immediate wallrocks reported by Cominco Ltd. range between 1 to 3 per cent lead and <5 to 15 per cent zinc. The lead/lead + zinc ratio varies from 0.1 to 0.2. Silver and gold are present in only trace amounts, copper varies from 0.02 to 0.057 per cent and cadmium from <0.01 to 0.025 per cent.

<table>
<thead>
<tr>
<th>Showing</th>
<th>Sample Type</th>
<th>Pb per cent</th>
<th>Zn per cent</th>
<th>Fe per cent</th>
<th>Cu ppm</th>
<th>Cd ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Boulder</td>
<td>grab sample (1974)</td>
<td>1.45</td>
<td>5.8</td>
<td>-----</td>
<td>&lt;0.001</td>
<td>-----</td>
</tr>
<tr>
<td>Main Boulder</td>
<td>grab sample (1974)</td>
<td>4.50</td>
<td>27.1</td>
<td>-----</td>
<td>0.045</td>
<td>-----</td>
</tr>
<tr>
<td>Main Boulder</td>
<td>grab sample</td>
<td>6.31</td>
<td>23.37</td>
<td>7.76</td>
<td>247</td>
<td>252</td>
</tr>
<tr>
<td>Main Boulder</td>
<td>0.6 metre chip</td>
<td>4.88</td>
<td>23.45</td>
<td>14.34</td>
<td>423</td>
<td>260</td>
</tr>
<tr>
<td>New</td>
<td>0.6 metre chip</td>
<td>4.19</td>
<td>25.20</td>
<td>12.24</td>
<td>408</td>
<td>295</td>
</tr>
<tr>
<td>New</td>
<td>0.6 metre chip</td>
<td>4.41</td>
<td>21.85</td>
<td>20.84</td>
<td>568</td>
<td>203</td>
</tr>
<tr>
<td>North</td>
<td>0.6 metre chip</td>
<td>0.81</td>
<td>8.95</td>
<td>19.44</td>
<td>515</td>
<td>87</td>
</tr>
<tr>
<td>Mist</td>
<td>0.6 metre chip</td>
<td>2.66</td>
<td>20.79</td>
<td>11.33</td>
<td>512</td>
<td>230</td>
</tr>
</tbody>
</table>

**SUMMARY**

Sphalerite, pyrrhotite, and minor galena occur in a massive sulphide layer generally less than 1 metre thick but locally may be several metres in thickness. This layer appears to be continuous for at least 1 300 metres and probably considerably further. Local structural complexities and lack of outcrop hinder tracing the layer between showings. Surrounding rocks include a dominantly calc-silicate gneiss, micaceous schist, and quartz feldspar gneiss succession, leached by pegmatite.

The CK showings are similar in many aspects to other Shuswap lead-zinc deposits. They are thin layers but commonly very continuous and occur in a calcareous and pelitic succession. Quartzite and marble, common associated lithologies in the Cottonbelt, Jordan River, and Big Ledge successions, are less common at CK and Ruddock Creek.

**REFERENCES**


Figure 8. Drill sites in New showing and Main Boulder area (based after Cominco Ltd. data).