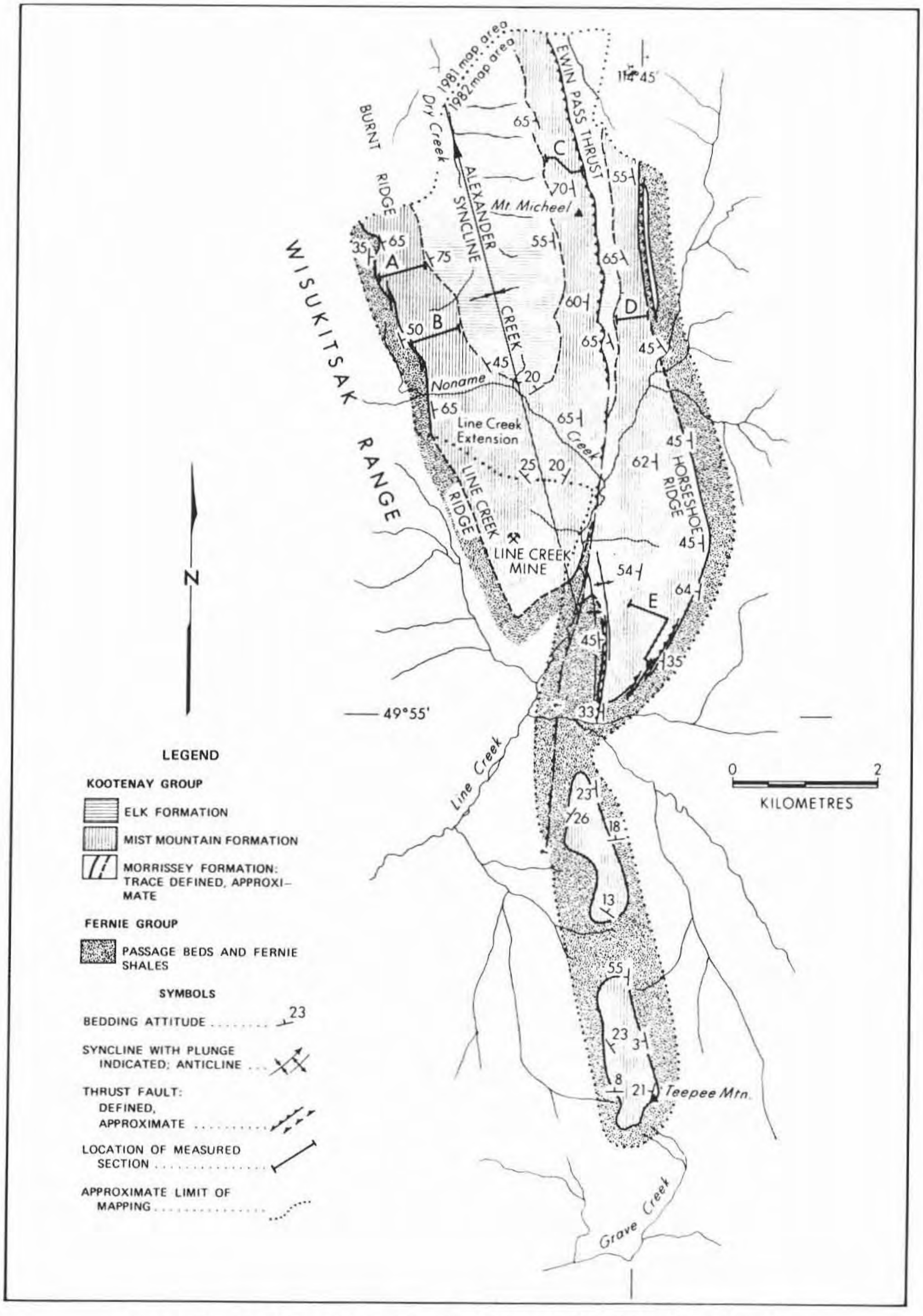

Figure 7. Geology of the Line Creek area, Elk Valley Coalfield.

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LINE CREEK AND CROWN MOUNTAIN AREAS
ELK VALLEY COALFIELD
(82G/10, 15)

By D. A. Grieve and Janine M. Fraser

INTRODUCTION

The study area is in the south half of the Elk Valley Coalfield and adjoins the Mount Banner area, which was mapped in 1981 (Grieve, 1982). It includes the Crows Nest Resources Limited Line Creek minesite (not mapped) and several other properties, including Burnt Ridge, Mount Michael, Line Creek extension, Horseshoe Ridge, Teepee Mountain, and Crown Mountain (Figs. 7 and 8). With the exception of Burnt Ridge, which is freehold land with coal rights held by B.C. Coal Ltd., coal rights in the study area are held under licence and lease by Crows Nest Resources Limited.

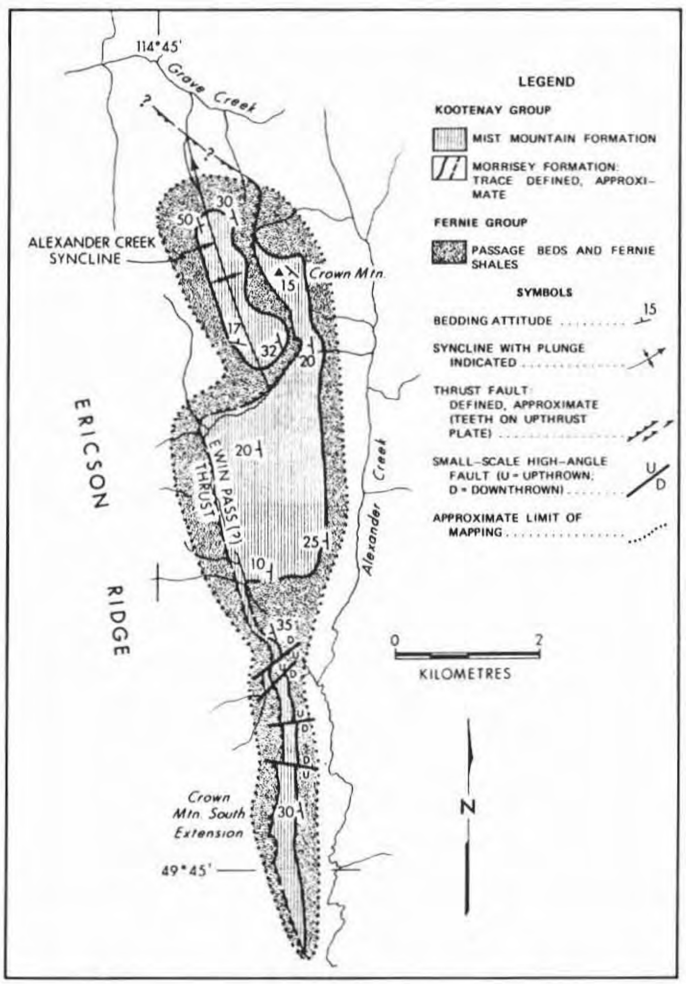

Figure 8. Geology of the Crown Mountain area, Elk Valley Coalfield.

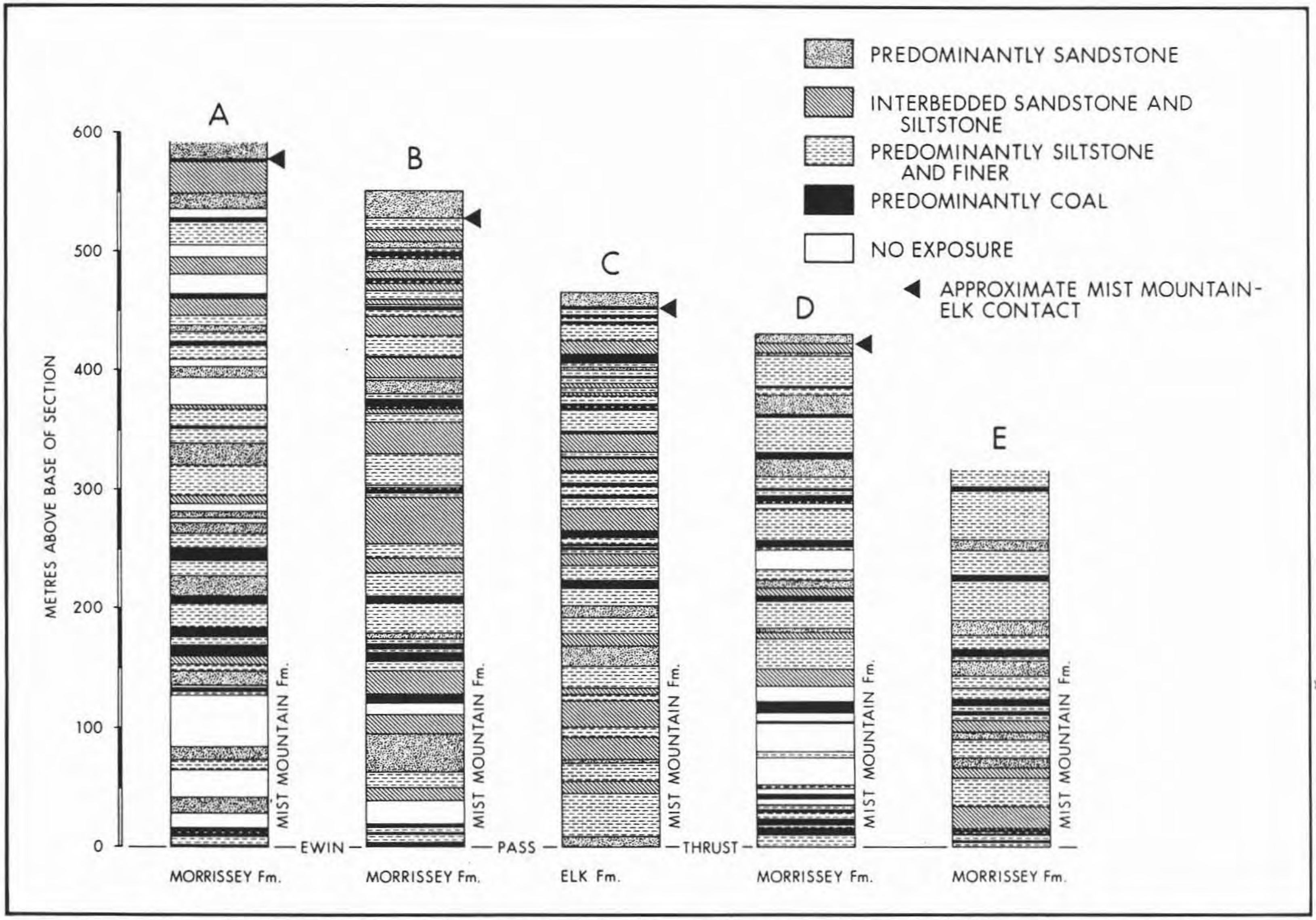

Figure 9. Generalized stratigraphic columns of the Mist Mountain Formation in the Line Creek area. Coal seams thinner than 1 metre are not indicated. See Figure 7 for locations.

Crows Nest Resources Limited began processing and shipping coal from Line Creek mine in February, 1982. The company has been actively seeking additional coal reserves adjacent to the minesite, and has undertaken detailed exploration on the north part of Line Creek Ridge (Line Creek extension), Horseshoe Ridge, and Mount Michael. Moreover, most of the study area has received some level of exploration during the past three years.

Line Creek minesite, which is 24 kilometres north-northeast of Sparwood, is accessible from the Sparwood-Elkford Highway. Good access is available into all parts of the study area using exploration, mine, and forestry roads. Elevations in the area range from 1 500 to 2 500 metres.

FIELDWORK

Field data collected was plotted directly onto British Columbia government air photographs; it will be transferred later to 10 000-scale orthophotos for publication to augment results from the last two field seasons (Grieve, 1981, 1982). Stratigraphic sections of the coal-bearing rocks were measured using pogo stick or chain and clinometer. Grab and channel coal samples were collected for petrographic analysis. Results will be included with the 1:10 000 geologic maps when they are published.

STRATIGRAPHY

Sedimentary rocks of the Jurassic-Cretaceous Kootenay Group comprise the southeast British Columbia coalfields. The Kootenay Group, as defined by Gibson (1979), consists of the Morrissey, Mist Mountain, and Elk Formations.

The basal Morrissey Formation is a prominent, cliff-forming sandstone unit that consists of the Weary Ridge and Moose Mountain members. Previously unrecorded occurrences of a pebble conglomerate facies of Moose Mountain member were noted at the south end of Burnt Ridge and on Teepee Mountain. A recessive interval of 3 metres thickness, which includes a carbonaceous zone, occurs 8 metres below the top of the Moose Mountain member at the south end of Burnt Ridge. It probably corresponds to a thin carbonaceous shale and coal parting that occurs within the Moose Mountain member at Line Creek mine. Although it is of no economic significance, it may affect stability of a mine slope or a wall formed of the basal sandstone.

The overlying Mist Mountain Formation, which consists of interbedded sandstone, siltstone, mudstone, shale and coal, is on the order of 500 metres thick in the study area (Fig. 9). Two complete sections measured west of the trace of the Ewin Pass thrust (A and B on Fig. 9) are 587 and 550 metres respectively in thickness. The one complete section measured east of the Ewin Pass thrust (D on Fig. 9) is only 430 metres in thickness. This contrast is similar to that reported from north of the study area (Grieve, 1982).

A 217-metre zone with no coal seams forms the immediate hangingwall of the Ewin Pass thrust at section C on Mount Michael (Fig. 9). Correlation between the barren zone in section C and sections A and B is uncertain because no comparable zone occurs in these sections. North and south of section C, where the fault is locally lower in the stratigraphy, a thickened coal seam of up to 20 metres apparent thickness occurs. Approximately 12 coal zones, including multiple seams, occur in the upper 250 metres of Mist Mountain Formation in section C, sections A and B have fewer comparable seams.

There are also striking contrasts between section C, in the hangingwall, and section D, in the footwall of the Ewin Pass thrust, respectively. The upper plate on Mount Michael is readily distinguished from the lower plate because there are numerous coal seams in the top 150 to 250 metres of the upper plate.

No complete Mist Mountain sections are exposed on Horseshoe Ridge, Teepee Mountain, or Crown Mountain. Horseshoe Ridge contains an estimated 350 to 400 metres of section, of which the lowest 311 metres were measured (E on Fig. 9). A resemblance to the lowest 250 metres of section on Mount Michael (D on Fig. 9) is apparent, although significant facies changes have occurred between the two sites.

Similarly, there are no complete Elk Formation sections in the study area. In the Mount Banner area to the north, the Elk Formation is estimated to be on the order of 300 metres in thickness. Strata of the Elk Formation are similar in most respects to those of the Mist Mountain Formation. The presence of Elk coal, an alginite-rich cannel coal, is used to distinguish the Elk Formation from the Mist Mountain Formation. Other criteria include a lack of coal seams greater than about 1.5 metres in thickness in the Elk, a greater number of sandstone units, and the presence of a pebble conglomerate, which crops out in the core of the Alexander Creek syncline to the east of section B.

The contact between the Mist Mountain and Elk Formations is generally placed either at the first occurrence of needle coal or at a locally mappable, resistant sandstone unit which appears to separate strata of the two formations. For example, a very prominent series of resistant channel sandstones defines the contact immediately north of Noname Creek.

STRUCTURE

The study area is part of the Lewis thrust plate; the Alexander Creek syncline is the dominant structure. In the north part of the area the fold axis plunges to the north down Dry Creek (Fig. 7) as it passes between Burnt Ridge (west limb) and Mount Michael (east limb). South of Noname Creek it passes through the east slope of Line Creek Ridge, where it separates Line Creek minesite (west limb) from Horseshoe Ridge (east limb). Near Line Creek the axis is truncated by the Ewin Pass thrust. Its trace beneath (east of) the thrust is not clear, although two very thin remnants of Kootenay Group on Teepee Mountain are in a general but irregular synclinal configuration (Fig. 7).

Alexander Creek syncline is well defined in the upper plate of the major thrust at Crown Mountain (Fig. 8). The lower plate at this point is a west-dipping monocline.

The second major structure in the study area is the west-dipping Ewin Pass thrust (Fig. 7). Its most significant effect was to emplace Mist Mountain Formation over Elk Formation on Mount Michael with approximately 600 metres of vertical displacement. As a result, numerous coal seams occur in a setting that is suitable for open-pit mining. Contrasts in thickness and lithologies of Mist Mountain Formation sections above and below the Ewin Pass thrust fault (C and D on Fig. 9) suggest that there was a significant horizontal displacement.

To the south of Mount Michael the Ewin Pass thrust cuts down-section with loss in elevation. South of Line Creek it must be within the Fernie Group. It is not entirely clear at this time if the thrust at Crown Mountain is also the Ewin Pass thrust; it emplaced the top part of the Fernie Group and basal part of the Kootenay Group over the basal part of the Kootenay Group with approximately 200 metres vertical displacement (Figs. 7 and 8).

Aside from stratigraphic evidence, the Ewin Pass thrust is also recognizable in the field because of associated complex, small-scale deformation features including drag folds, overturned zones, and thickened and sheared coal seams. Similar features also characterize numerous smaller thrust zones in various parts of the study area, particularly in the east limb of the Alexander Creek syncline. Other smaller scale structural complications in the area include a faulted, tight syncline affecting the Morrissey and basal Mist Mountain Formations at the south end of Horseshoe Ridge; it may also be related to movement on the Ewin Pass thrust. Of note are numerous thrust-related displacements and repetitions of the Morrissey Formation (Fig. 7), and a series of post-thrusting, crosscutting block faults in the Crown Mountain area (Fig. 8). The significant overturned panel found on Burnt Ridge (west limb) to the north (Grieve, 1982) does not extend into the study area.

ACKNOWLEDGMENTS

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