COAL INVESTIGATIONS

ELK VALLEY COALFIELD

(82J/2)

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INTRODUCTION

Systematic 1:7 000 scale mapping of Elk Valley Coalfield started in the 1979 field season on the Greenhills Range and adjacent areas. Kaiser Resources Ltd. has freehold rights to the southern portion of the area and Fording Coal Limited holds the northern part under licence. During the latter part of the field season coal sampling and 1:50 000 scale mapping of the entire Elk Valley Coalfield was undertaken to produce a preliminary rank map and define major tectonic features of the coalfield.

GREENHILLS RANGE

South Greenhills Range is structurally complicated by gentle folding, thrust faulting, and late gravity (normal) faulting. Despite these complications, thick seams of coal exist in attractive open-pit mining situations.

The basal seam, directly overlying the basal sandstone in this area, has a mean reflectance ($\bar{R}_o$ max.) of 1.14 per cent. All other seams in the area are therefore essentially high-volatile bituminous coals. In the core of the Greenhills syncline the highest exposed coal seams have vitrinite reflectances of 0.88 per cent and 0.66 per cent. The lower seams are inertinite rich and the upper seams are bright and vitrinite rich, as is typical of the East Kootenay Coalfields (Cameron, 1972; Pearson and Grieve, 1978). However, the overlying Elk member is not exposed on South Greenhills.

A late gravity fault, here referred to as the Greenhills fault, downthrows the western part of the coal measures about 100 metres on the Kaiser property. Its sinuous trace is shown on Figure 27. At the south end of the property at 'A,' the fault is essentially vertical; to the east of the triangular-shaped outcrop pattern of the upper seams, the fault surface dips westerly at 25 degrees to 35 degrees, and actually displaces the axial trace of the small syncline about 170 metres. The fault therefore appears to postdate the syncline, rather than being its cause. Further to the north the fault again steepens and appears to join the Fording fault, which also downthrows to the west.

Between the Greenhills Forest Service lookout and the Fording—Kaiser property boundary approximately 100 metres of overlying Elk member is exposed.

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During the latter part of the field season 1:50 000 scale reconnaissance mapping and sampling were done to provide data for a coal rank distribution map of the Elk Valley Coalfield (Fig. 28). Despite this considerable

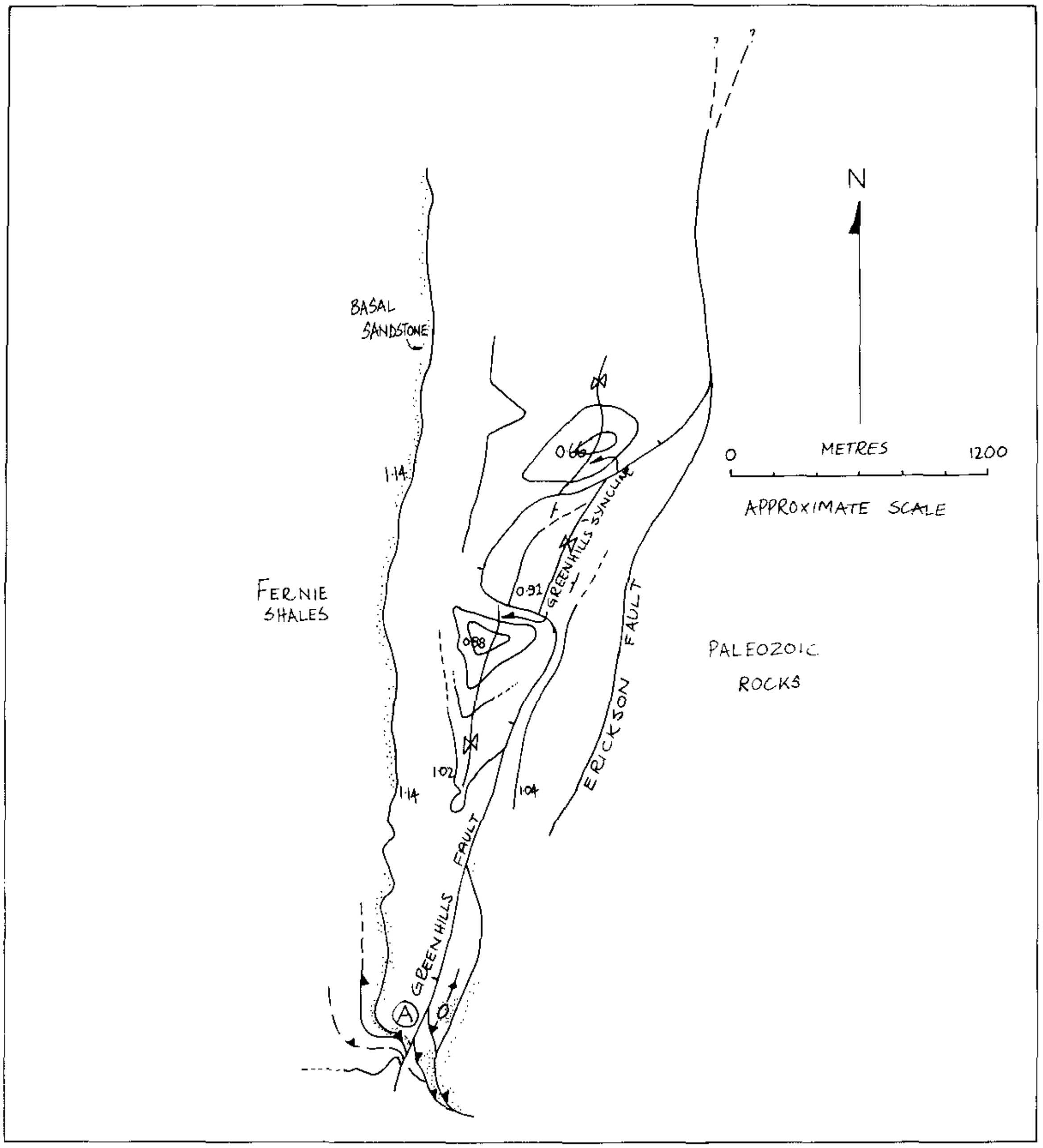

Figure 27. Geological sketch map of south Greenhills (Kaiser Resources') property, showing main structural elements and some rank data.

field effort and subsequent rank analysis on over 100 coal samples some major structural problems remain unresolved. The rank distribution shown on Figure 28 is nevertheless reasonably accurate.

Analysis of the rank map reveals that considerable resources of high-volatile coal ($\bar{R}_o$ max. <1.12 per cent) are present in this coalfield, with only a small amount of low-volatile coal ($\bar{R}_o$ max. >1.5 per cent).

A description of some of the main structures of the coalfield follows.

ALEXANDER CREEK SYNCLINE

This syncline, which is also known locally as the Fording syncline, is named for a south-flowing creek in the Crowsnest Pass (Dahlstrom, *et al.*, 1962). The fold appears to be continuous along the length of the coalfield. Careful mapping of the base of the Elk member and occurrences of the overlying quartzite cobble-bearing Cadomin Formation conglomerate reveals a number of plunge depressions and culminations along the axis of this structure, as shown on Figures 28 and 29. In this paper we define the base of the Elk member as the *first appearance* of needle coal, a coal type actually rich in the liptite maceral alginite. Inasmuch as algal coal deposition was probably dependent on specific environmental conditions, this definition of the base of the Elk member will probably prove to be generally applicable.

The east limb of the syncline is structurally thickened between Eagle Mountain and Ewin Pass by the Ewin Pass fault. Since the fault repeats and thickens the succession it is interpreted as a thrust fault. Between Line Creek and Ewin Pass, coals with a rank of $\bar{R}_o$ max. = 1.05 per cent overlie Elk coals with a rank of 0.71 per cent $\bar{R}_o$ max. Further north, however, at 2 440 metres on Ewin Pass Ridge (section D on Fig. 28), the rank of the base of the Elk member is 0.83 per cent. This contrasts with rank of the base of the Elk on Burnt Ridge, north Line Creek, and east of the Cadomin conglomerate in the Fording Bridge depression, which have vitrinite reflectances of about 0.70 per cent despite a lower elevation of 2 070 metres. We interpret this as evidence of normal movement on the Ewin Pass thrust, as normal faulting in the East Kootenay Coalfields occurred after coal ranks had been achieved (Pearson and Grieve, 1979). The differences in rank between the west and east sides of the syncline are very small in the vicinity of Eagle Mountain and we interpret this to imply aggregate movement approaching zero. Despite this sag effect, produced by the relative amounts of normal movement on the fault, we believe the Fording Bridge depression is primarily related to the syncline and was later emphasized by the normal movement.

In general, there is a northward increase in the rank of the basal seam exposed along the east side of the Alexander Creek syncline, from 1.2 per cent in the vicinity of Ewin Pass to 1.3 per cent in the Chauncey-Todhunter; 1.4 per cent at Henretta Creek to 1.5 per cent in the Mount Veits—Weary Ridge area. It is therefore anomalous to find only high-volatile coal ($\bar{R}_o$ <1.12 per cent) in the area north of Cadorna Creek. [Graham, *et al.* (1977) report only two of 66 reflectance analyses in this area greater than 1.12 per cent.] For this reason we speculate that a normal fault with about 400 to 500 metres of downthrow to the west separates these areas at the north end of the coalfield.

FORDING MOUNTAIN ANTICLINE

The prominent scarp slope of Greenhills Range defines the east limb of the Fording Mountain anticline. In the vicinity of the Greenhills lookout a pronounced change in strike occurs in the lower portions of the succession, so that individual beds dip shallowly to the north which corresponds with the fold hinge. The west limb crops out between Bingay Creek and Forsyth Creek on the west bank of the Elk River, where

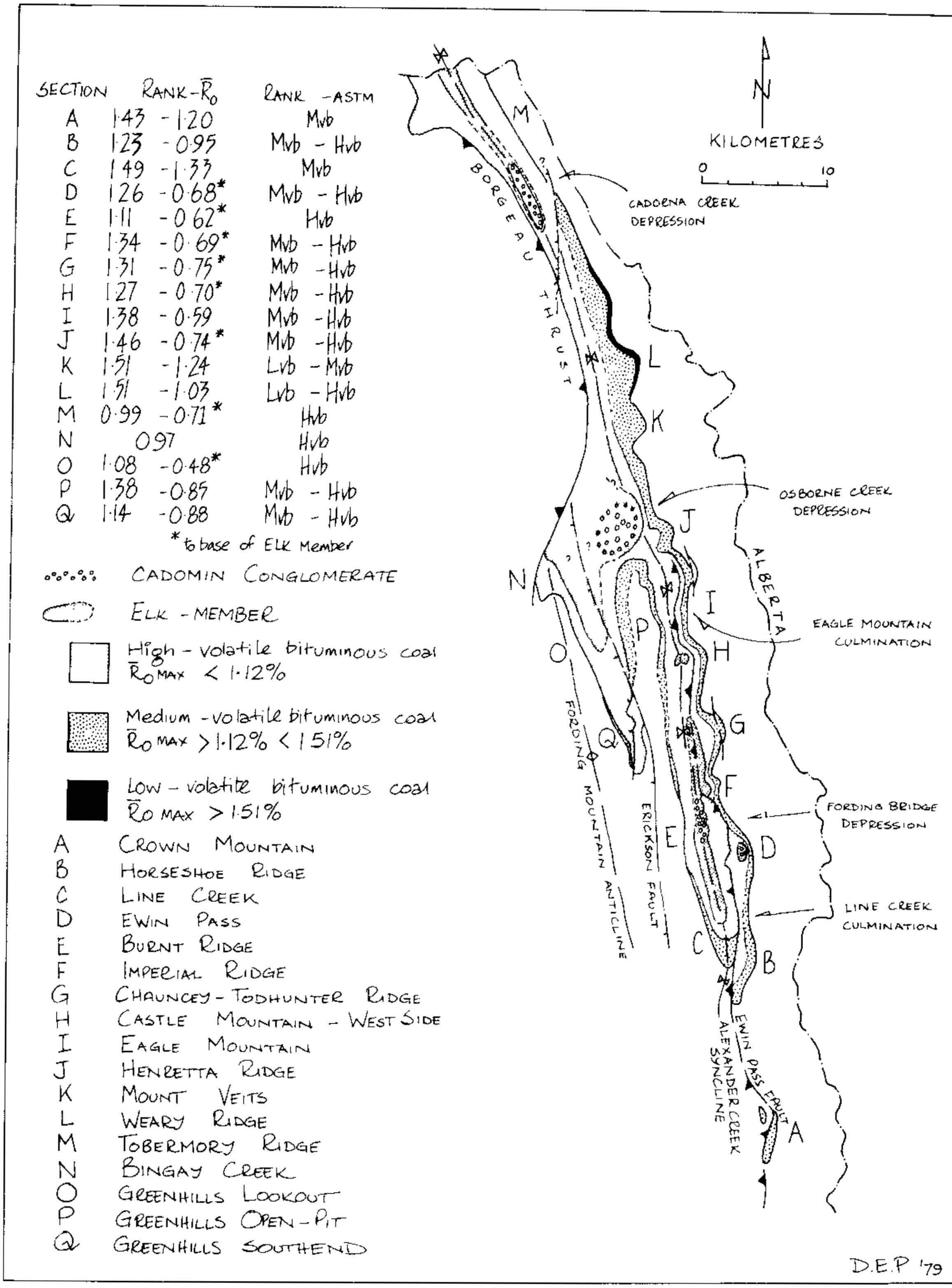

Figure 28. Distribution of low, medium, and high-volatile bituminous coals over Elk Valley Coalfield. Ranges in vitrinite reflectance data at specific locations represent coals overlying the basal sandstone to either the highest exposed coal in that section or to the first Elk member coal in that section.

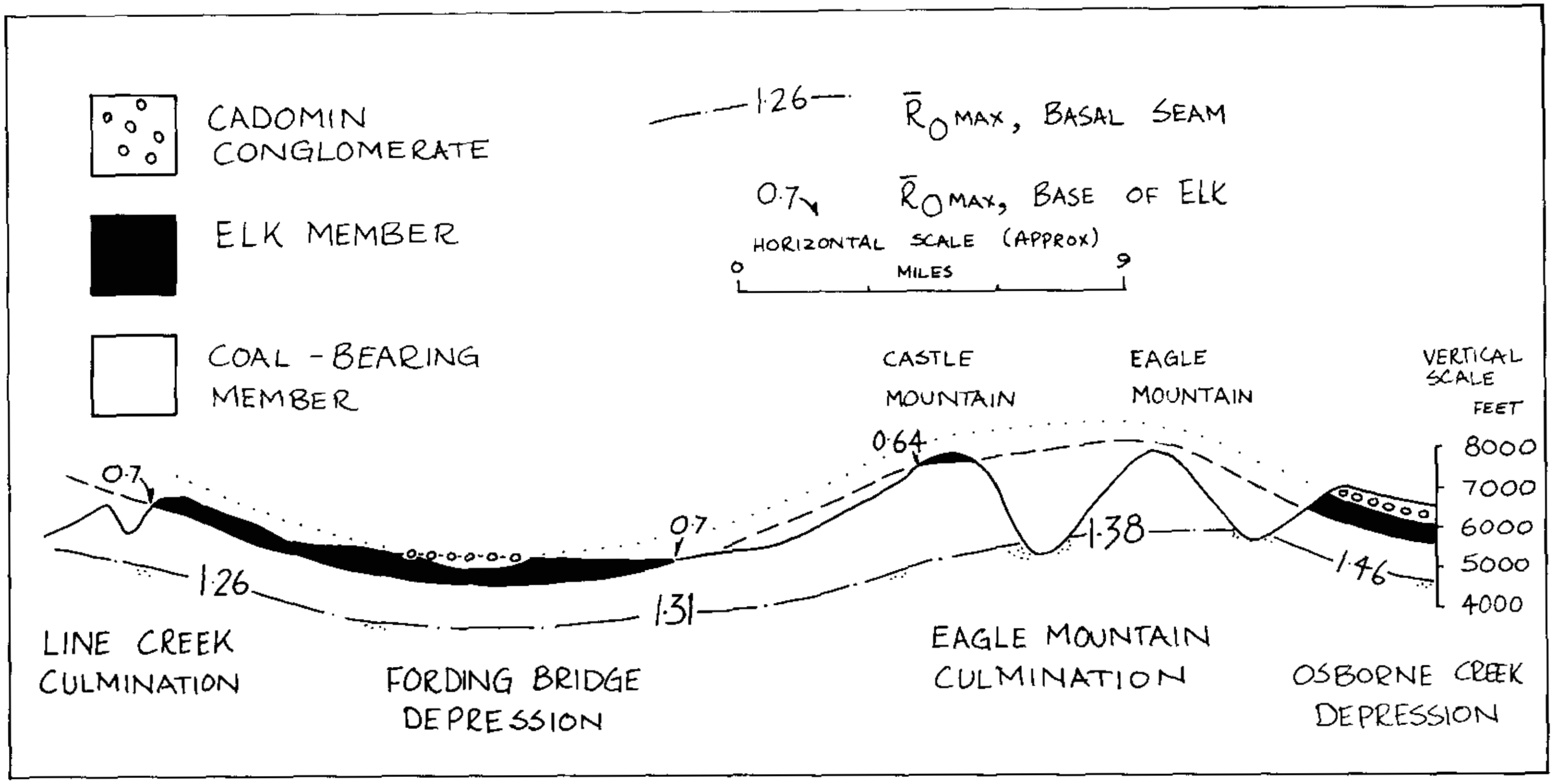

Figure 29. Geological cross-section along the axis of the Alexander Creek syncline, showing in diagrammatic form, plunge depression and culminations and some rank data.

coal measures are exposed in a tight northerly plunging syncline. The numerous resistance sandstone units exposed at this locale represent the lower part of the succession. The single coal sample taken from an old exploration trench here is of high-volatile rank ($\bar{R}_o$ max. = 0.97 per cent).

ERICKSON FAULT

The trace of the Erickson fault, which juxtaposes coal-bearing Kootenay Formation with Paleozoic carbonates along the east margin of Kaiser Resources' Greenhills property, is difficult to follow northward because of poor exposure. The rank of the basal seam in the Fording Greenhills open pit is, however, 1.38 per cent $\bar{R}_o$, similar to the highest rank from Eagle Mountain (Clode pit). Both are distinctly higher than the 1.08 per cent $\bar{R}_o$ recorded from the basal seam on the scarp face of Greenhills, 4 000 metres west of the Greenhills open pit. With an average rank gradient for this area of 0.09 per cent R_o per 100 metres, such a reflectance disparity suggests that 330 metres downthrow to the west for this fault. Its trace is apparently west of the Greenhills pit, but east of the ridge crest.

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