881941
Coal
92G
Fernie

GENERAL GEOLOGY OF THE FERNIE AREA

Stratigraphic setting

Three distinct sedimentary provinces are represented:

a) older (Helikian through Triassic) miogeoclinal prism sediments, deposited westward from the North American continental margin;

b) younger (Jurassic and Cretaceous) synorogenic clastic wedge sediments shed eastward into a foredeep;

c) Tertiary sediments deposited adjacent to normal faults in the Rocky Mountain Trench and Flathead Valley.

The first two of these are shown schematically in Fig. 1, along with numerous unconformities. This area differs from that shown, in having only thin middle Cambrian sediments, and no Windermere, upper Cambrian, Ordovician or Silurian sediments. Fig. 46 is a fairly representative stratigraphic section.

Structural setting

The area lies within the Foreland Fold and Thrust Belt, which is bounded on the west by the Rocky Mountain Trench. Specifically we are near three major structural features:

a) the Trench, here apparently formed by Tertiary normal faulting (Eocene (?) and younger in this region) along a zone of crustal weakness;

b) western ranges of the Rocky Mountains, here characterised by west dipping folded thrust faults which produce three plates visible from the highway (Broadwood, Wigwam and Hosmer in ascending order); and

c) the Fernie Basin, a broad synform feature, roughly 35 miles by 20 miles at its maximum dimensions.

The east wall of the Trench and the western ranges are here formed by Proterozoic (Purcell) and Paleozoic rocks. The Fernie Basin is predominantly composed of Mesozoic rocks, with the coal-bearing Kootenay Formation outlining it. The underlying Fernie shales are a zone of decollement which obliterate any structural continuity between the thrust plates and the Fernie Basin. They are characteristically intensely deformed, and the lower part of the Kootenay Formation is usually affected to a lesser degree. Visits to Morrissey and Kaiser's open pit provide evidence of this deformation.

Figure 47, p. 334, and the geologic maps indicate the relationship between various structural elements.

Coal/

Coal measures geology

Figure 50 is an idealized profile of the Kootenay Formation, with the Fernie area on the extreme left. Coal generally comprises about 10% of a 2000-foot section in this area. This "coal-bearing" member is underlain by a thin sandstone unit ("basal sandstone member") and overlain by a coarse clastic unit ("Elk member"). The coal-bearing and Elk members thin drastically eastward, in fitting with a clastic wedge concept. The sediment source was fairly proximal, including the western ranges and Purcells, and was an area of episodic tectonic activity, as evidenced by numerous conglomerate beds. (These are unique to the Fernie area.)

Compared with other coalfields, those of the Kootenay Formation pose special problems to exploration and mining. In addition to structural complications, there are numerous rapid facies changes which involve seam pinching and splitting. In addition there are numerous rock mechanics and strata control problems inherent in folded rocks.

Coal mining

Underground mining began in 1898 at Coal Creek near Fernie, in 1899 at Michel, in 1902 at Morrissey, and in 1908 at Hosmer and Corbin. Production of both coking and thermal coal has continued until the present, with the Coal Creek and Michel collieries being the only ones to survive to the modern era (Coal Creek closed in 1958). The Kaiser operation today operates the Michel colliery, along with the enormous open pits on Harmer Ridge above Michel Creek. Byron Creek Collieries recently reopened the old Corbin site, while Fording Coal operates a new site to the north of the Fernie Basin.

As discussed above, underground mining has met with many problems, which have led to numerous disasters over the years. The mines at Coal Creek were at one time regarded as among the most dangerous in the world, due to the frequent occurrence of bumps and outbursts. The Morrissey colliery was plagued with outbursts, a factor which contributed to its short life.

Room-and-pillar mining has been the most common technique, with some pillar extraction and caving, and a minor amount of longwall. Kaiser today operates an innovative hydraulic operation at Michel.

Surface mining dates back to 1913 at Corbin, and today accounts for well over 90% of the production from the area.

The coal

Being bituminous in rank much of the Fernie Basin coal has a potential for coke-making. Where oxidised the coal has only thermal capability - similarly in the case of coals of the highest rank (eg. Morrissey Creek section, and presumably much of the unexposed central portion of the Basin). As/

As you would expect, coal rank decreases upward in the stratigraphic section, and also varies for individual seams depending on structural setting (Fig. 19). Compositionally the coals vary systematically within the section - coals from the top of the section are less inert (and more reactive) than those from the bottom.

Coal from Kaiser and Fording mines, and presently proposed mines, are of similar quality - relatively rich in inert constituents with a medium-volatile bituminous rank.

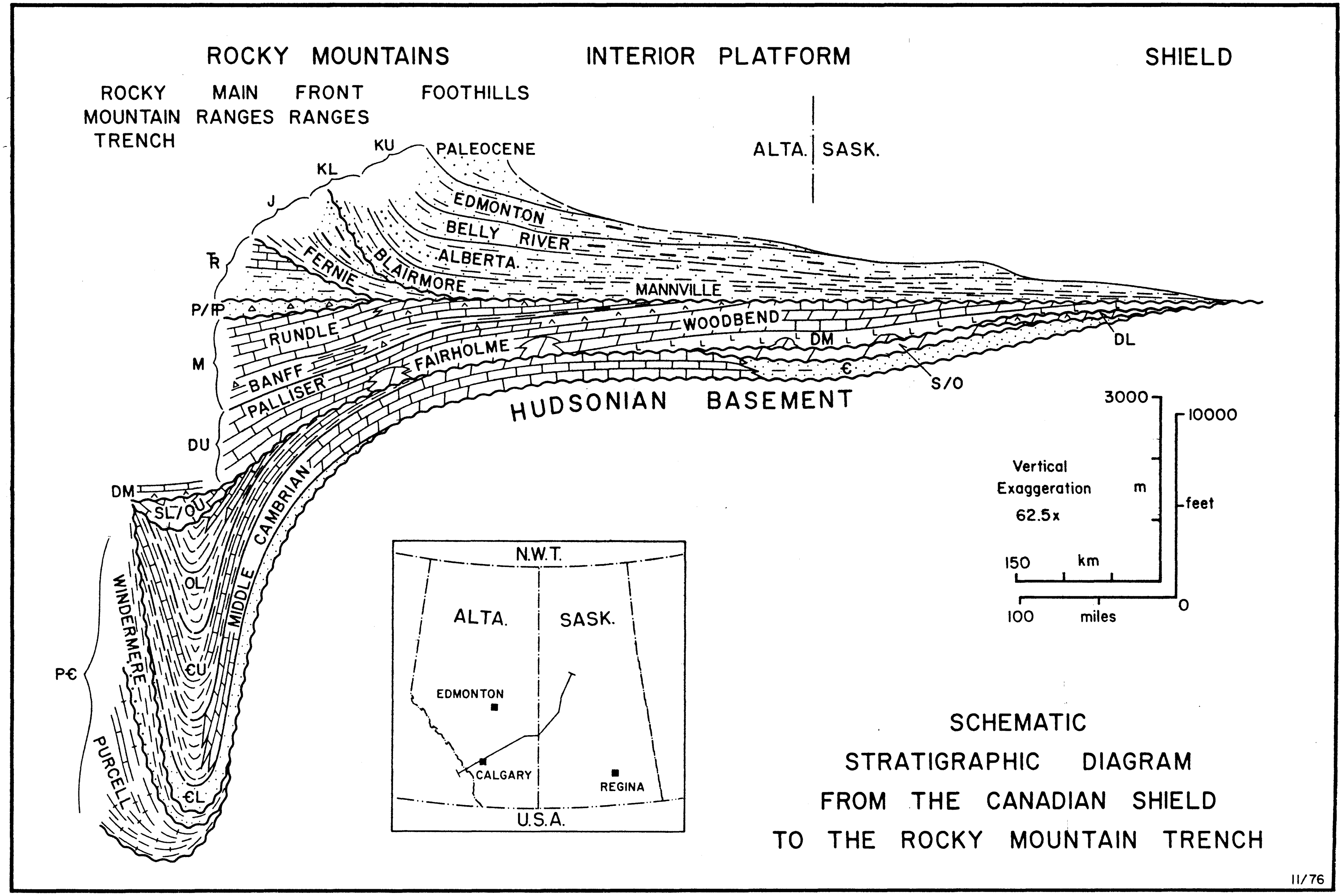

ROCKY MOUNTAINS
INTERIOR PLATFORM
SHIELD
ROCKY MOUNTAIN TRENCH
MAIN RANGES
FRONT RANGES
FOOTHILLS
ALTA. | SASK.
KU
KL
J
PALEOCENE
EDMONTON
BELLY RIVER
ALBERTA
FERNIE
BLAIRMORE
MANNVILLE
P/IP
M
DU
DM
RUNDLE
BANFF
PALLISER
FAIRHOLME
WOODBEND
DM
DL
S/O
€
HUDSONIAN BASEMENT
SL/OU
OL
€U
€L
MIDDLE CAMBRIAN
WINDERMERE
PURCELL
P€
N.W.T.
ALTA.
SASK.
EDMONTON
CALGARY
REGINA
U.S.A.
Vertical Exaggeration 62.5x
3000
m
150 km
10000
feet
100 miles
0
SCHEMATIC STRATIGRAPHIC DIAGRAM FROM THE CANADIAN SHIELD TO THE ROCKY MOUNTAIN TRENCH
11/76

Figure 1

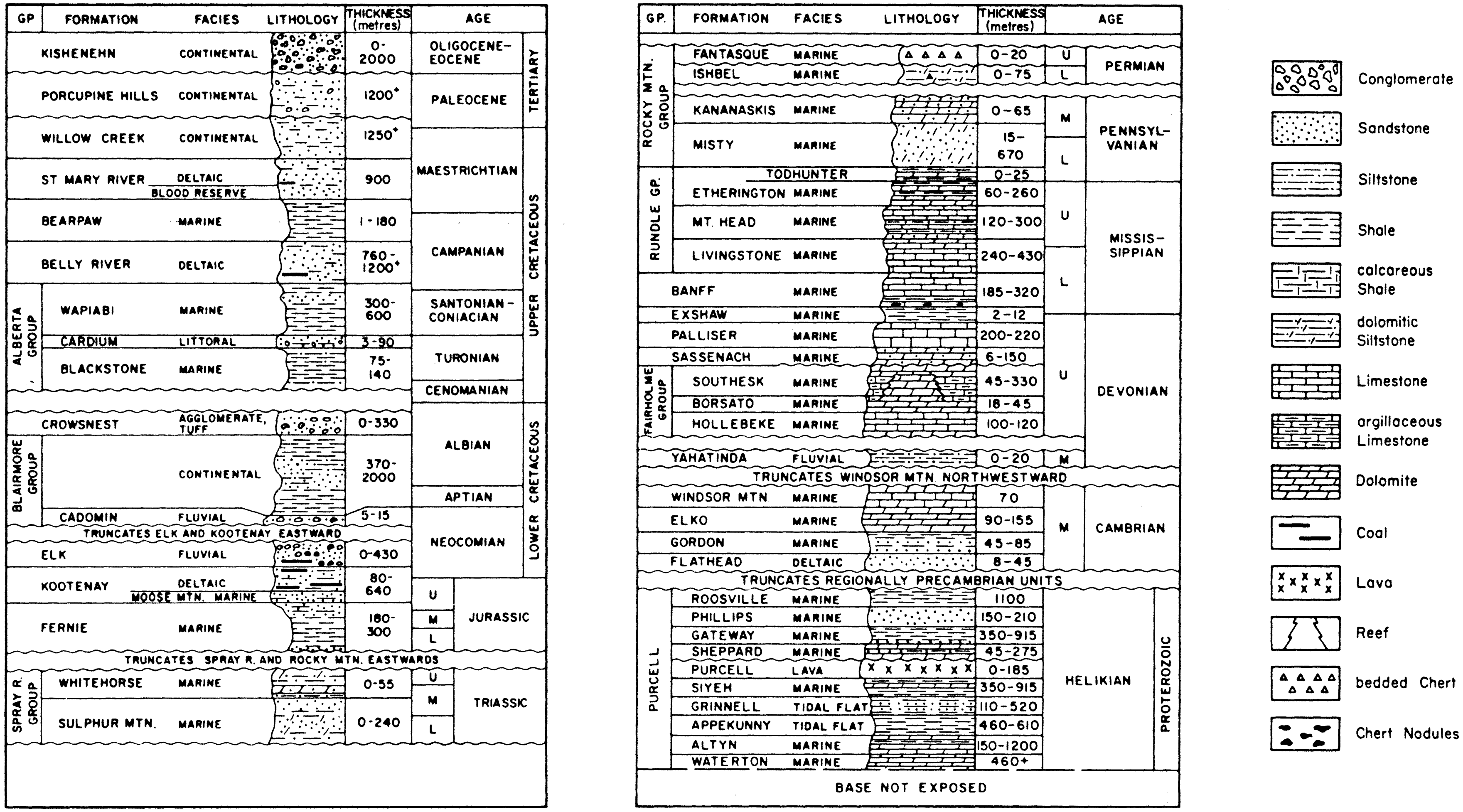
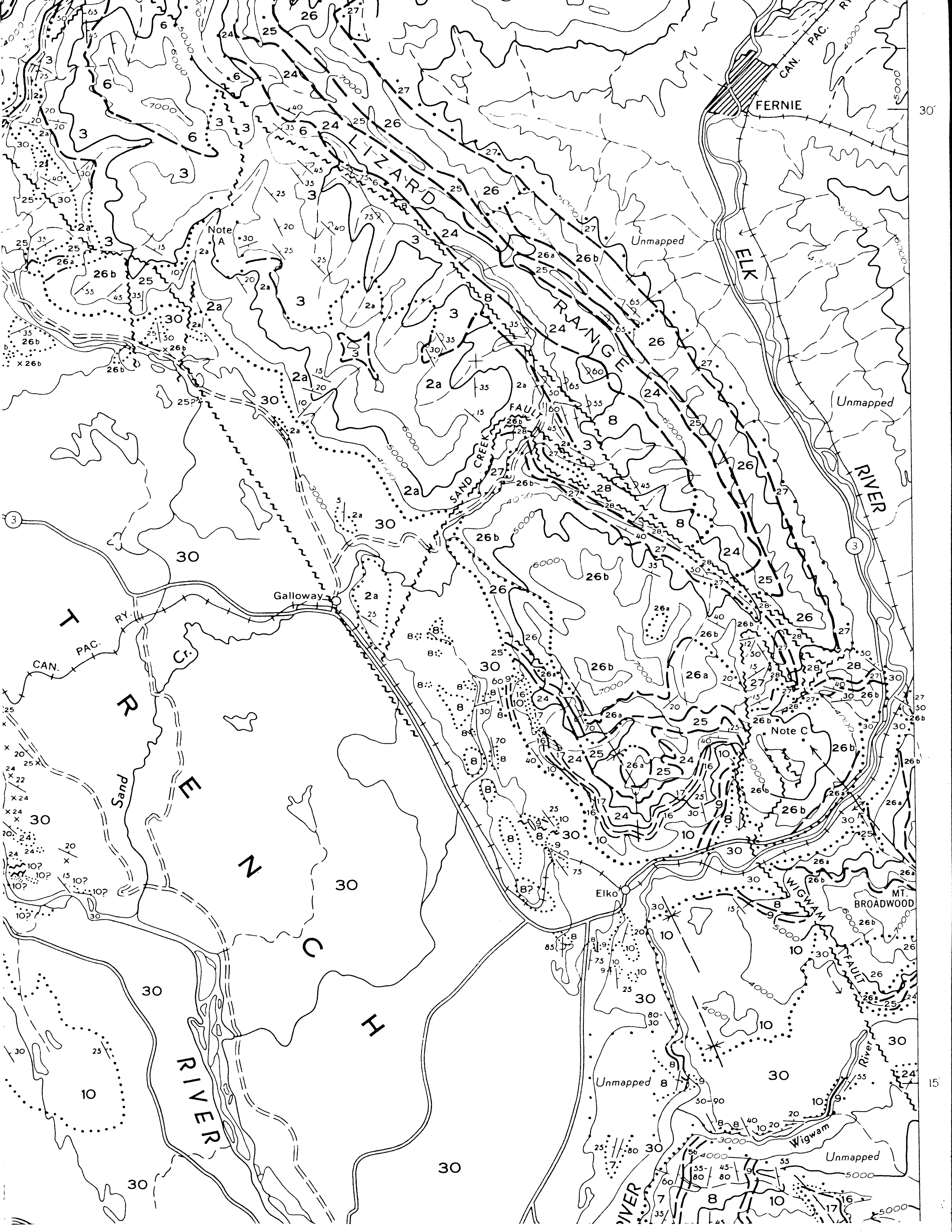
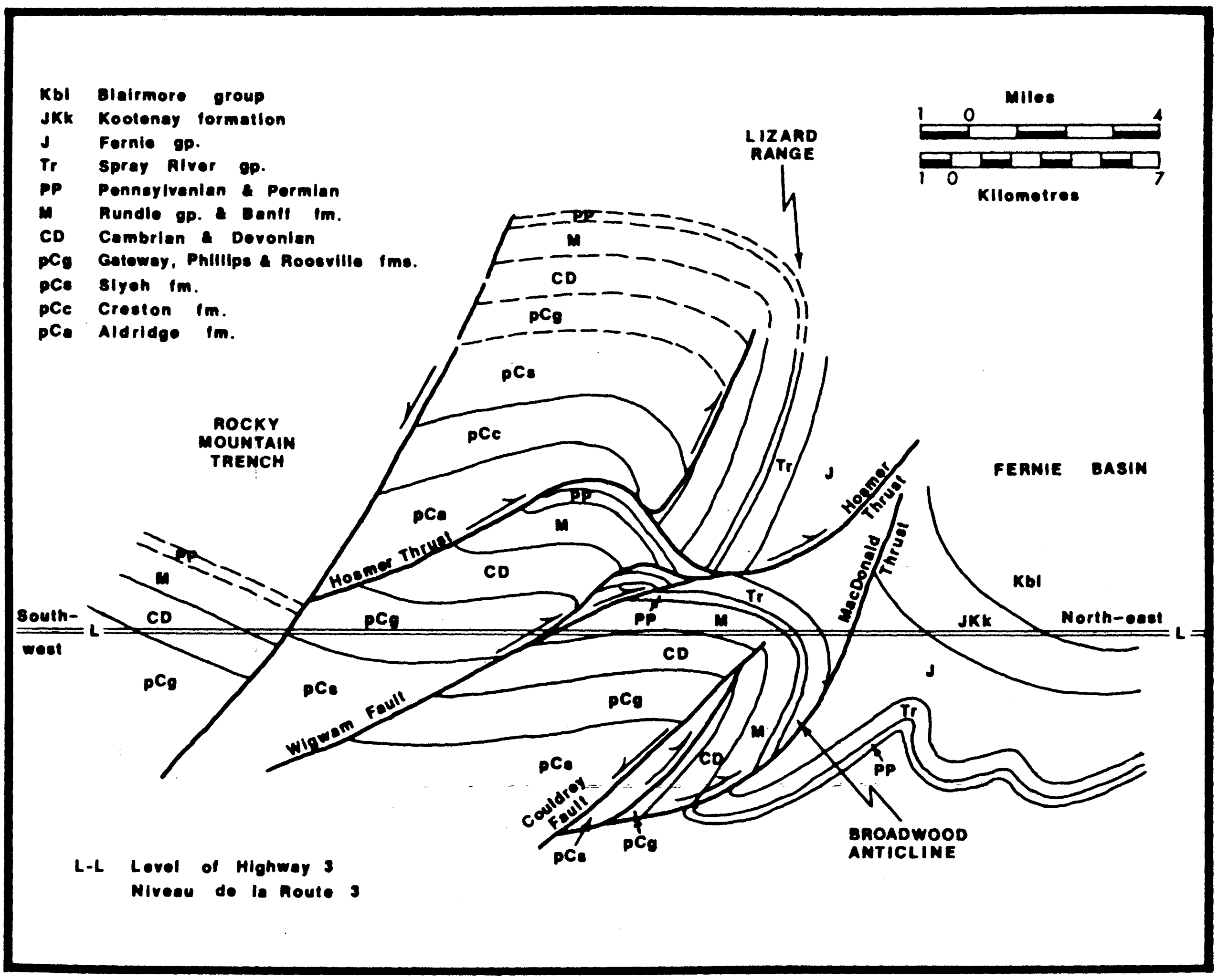


Figure 46 **Columnar Stratigraphic Diagram, Crowsnest Pass Area, Alberta and British Columbia**

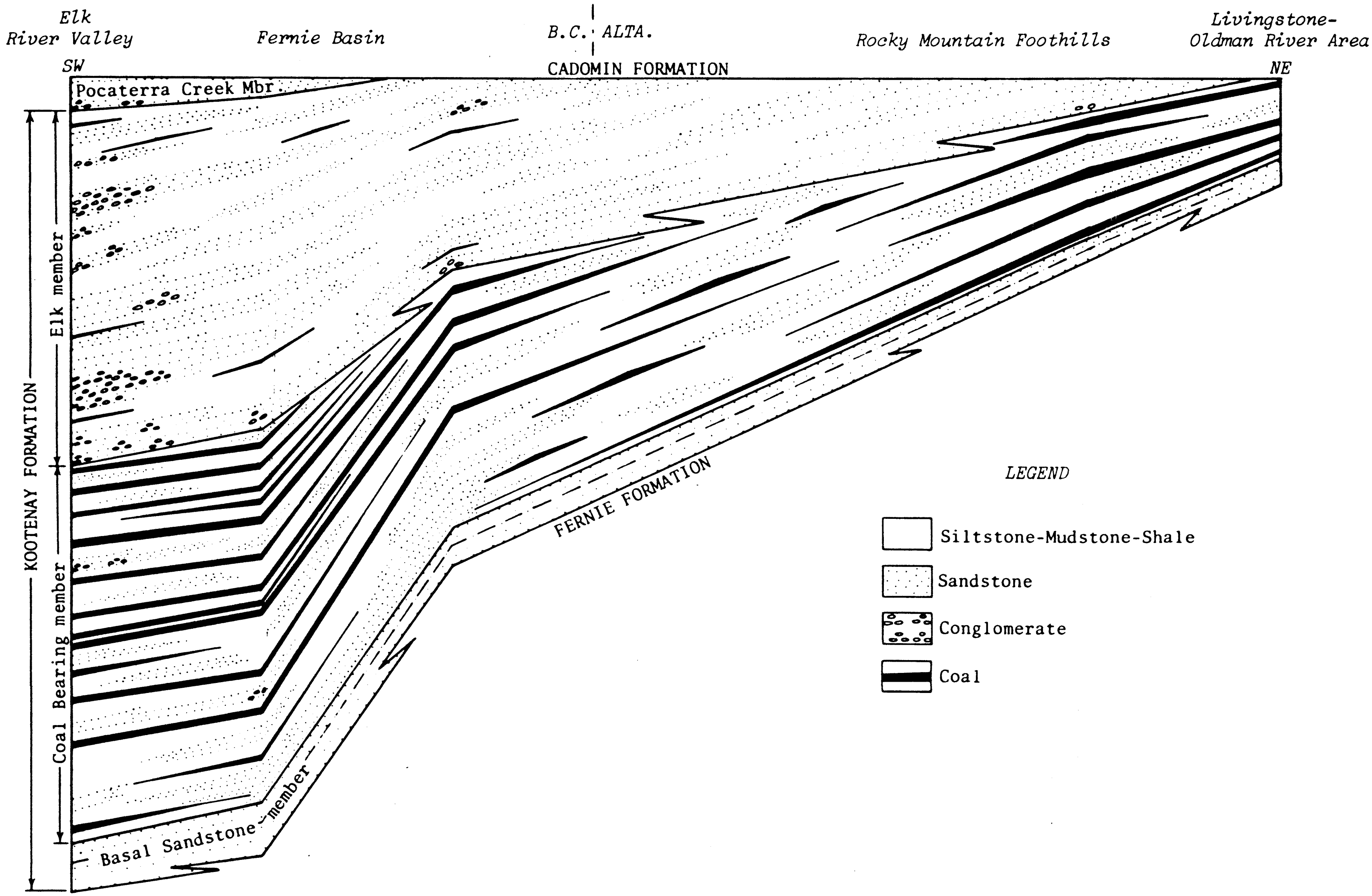
(D.K. Norris in D.K. Norris & A.W. Bally, 1972)


FERNIE
CAN. PAC. RY.
LIZARD RANGE
ELK RIVER
Unmapped
Note A
Note C
SAND CREEK FAULT
Galloway
CAN. PAC. RY.
Sand Cr.
TRENCH
RIVER
Elko
WIGWAM FAULT
MT. BROADWOOD
Wigwam River
30′
15′



Sketch by R.A. Price

Figure 47 Schematic Section through the "Hosmer Nappe" and its Underlying Structures
(down plunge projection into a common plane)



Schematic Diagram of the Kootenay Formation
illustrating lithofacies and stratigraphic relationships between the Elk River Valley/Fernie Basin area of British Columbia and the Livingstone/Oldman River area of the Rocky Mountain Foothills of Alberta.
(D.W. Gibson, 1977: Fig. 3)

Figure 50

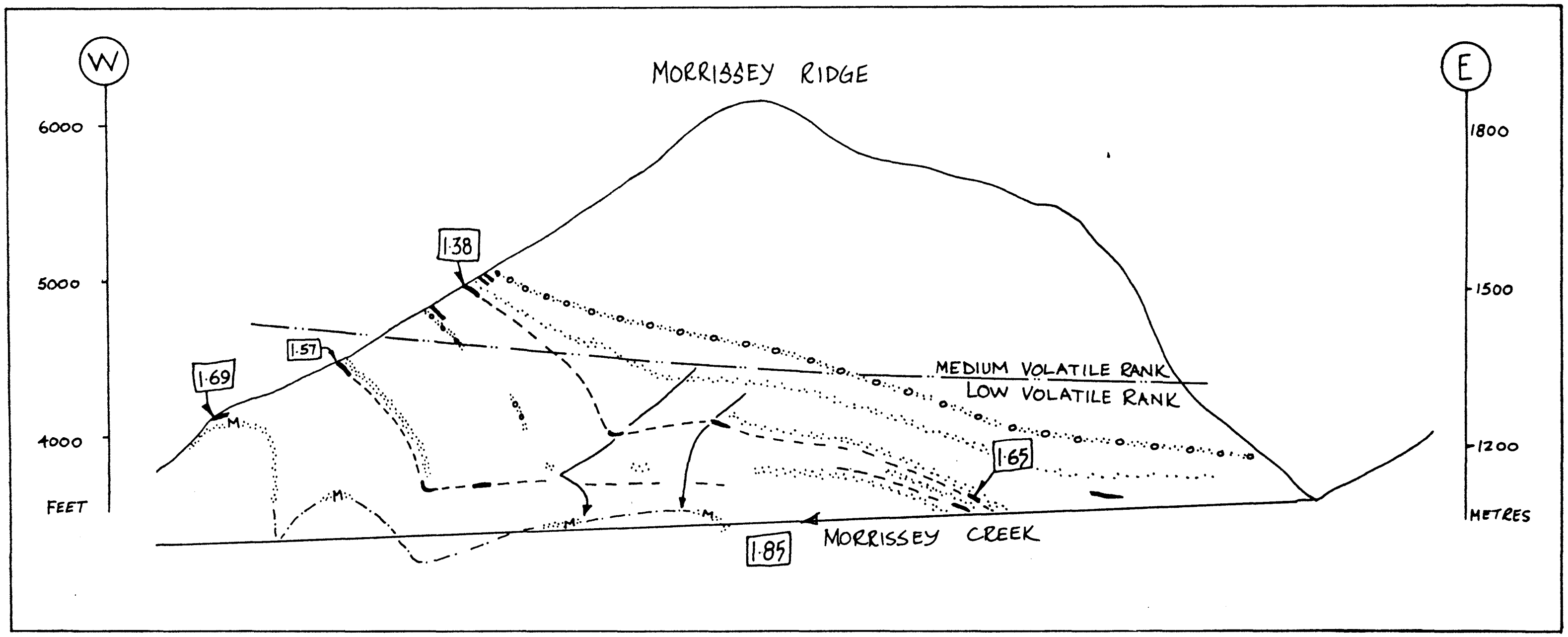


Figure 19. Side-view of Morrissey Ridge looking north from Morrissey Creek, showing vitrinite reflectance data for five localities. Iso-reflectance line separating medium from low-volatile coals dips shallower than the bedding and thus coal rank increases eastwards in all seams.

GEOLOGICAL COMPILATION

CROWSNEST ~ FERNIE BASIN
FLATHEAD VALLEY

ALBERTA - BRITISH COLUMBIA

prepared for

THE A.S.P.G. FOURTEENTH ANNUAL FIELD CONFERENCE

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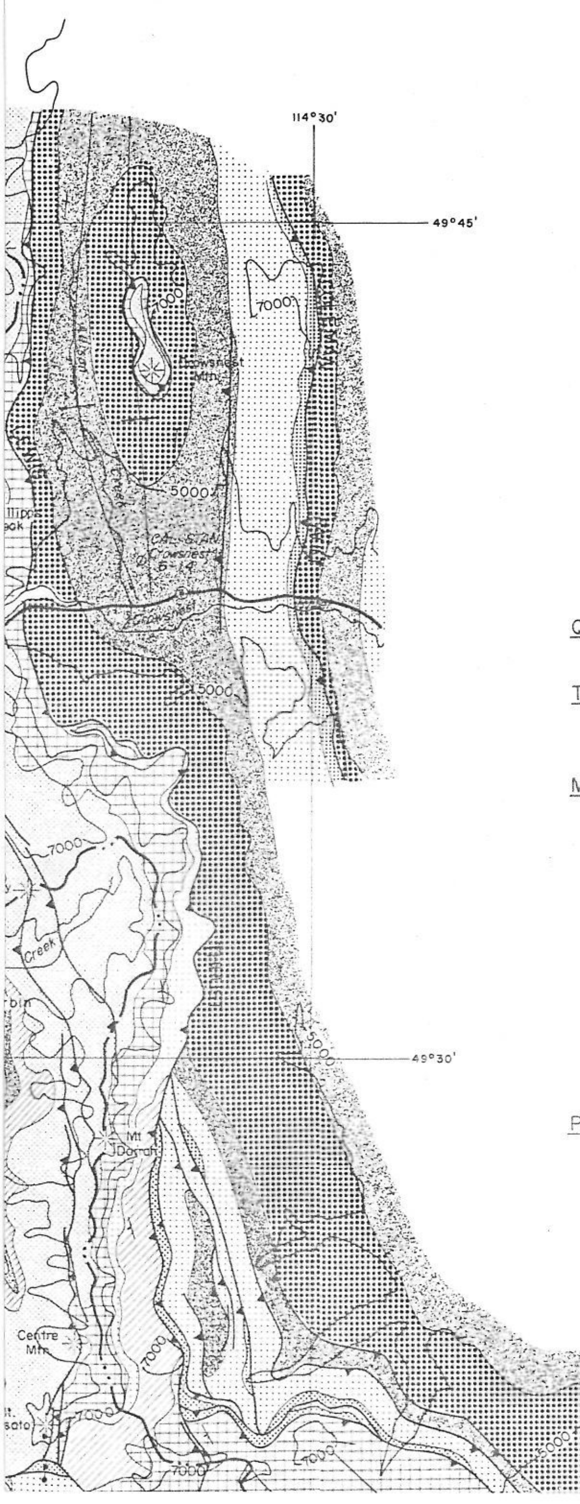
DRAFTING BY: GEOPHOTO SERVICES, CARTER MAPPING, SHELL, BRITISH AMERICAN, TEXACO EXPLORATION, CALIFORNIA STANDARD.



SCALE : 1 inch = 4 miles

4 3 2 1 0 2 4 6

MAPPED ROCK UNITS

QUATERNARY
- Quaternary Undivided

TERTIARY
- EOCENE and/or OLIGOCENE
  - Kishenehn

MESOZOIC
- UPPER CRETACEOUS
  - Belly River Formation
  - Alberta Group
- LOWER CRETACEOUS
  - Blairmore Group and Crowsnest Formation
  - Kootenay Formation
- JURASSIC
  - Fernie Group
- TRIASSIC
  - Spray River Formation

PALEOZOIC
- PERMIAN - PENNSYLVANIAN
  - Rocky Mountain Group
- MISSISSIPPIAN
  - Includes Rundle Group, Banff & Exshaw Formations
- UPPER DEVONIAN
  - Includes Palliser & Alexo Formations, Fairholme Group
- LOWER, MIDDLE and/or UPPER CAMBRIAN
  - Includes Elko, Burton and Flathead Formations

PRECAMBRIAN
- UPPER PURCELL
  - Includes Roosville, Phillips and Gateway Formations. Equivalent to A,B,C, and D Members of Kintla Formation
- LOWER PURCELL
  - Includes Kitchener, Siyeh, Creston and Aldridge in West
  - Includes Purcell Lava, Siyeh, Grinnell, Appekunny, Altyn and Waterton in East

INTRUSIVES