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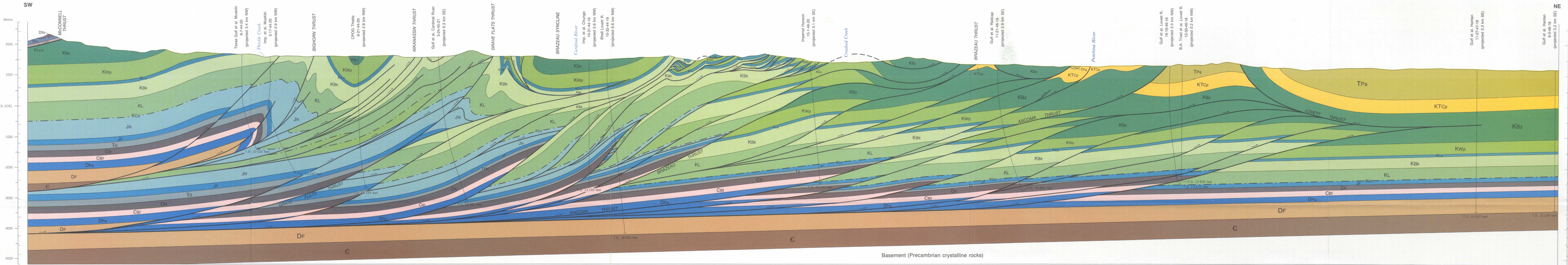
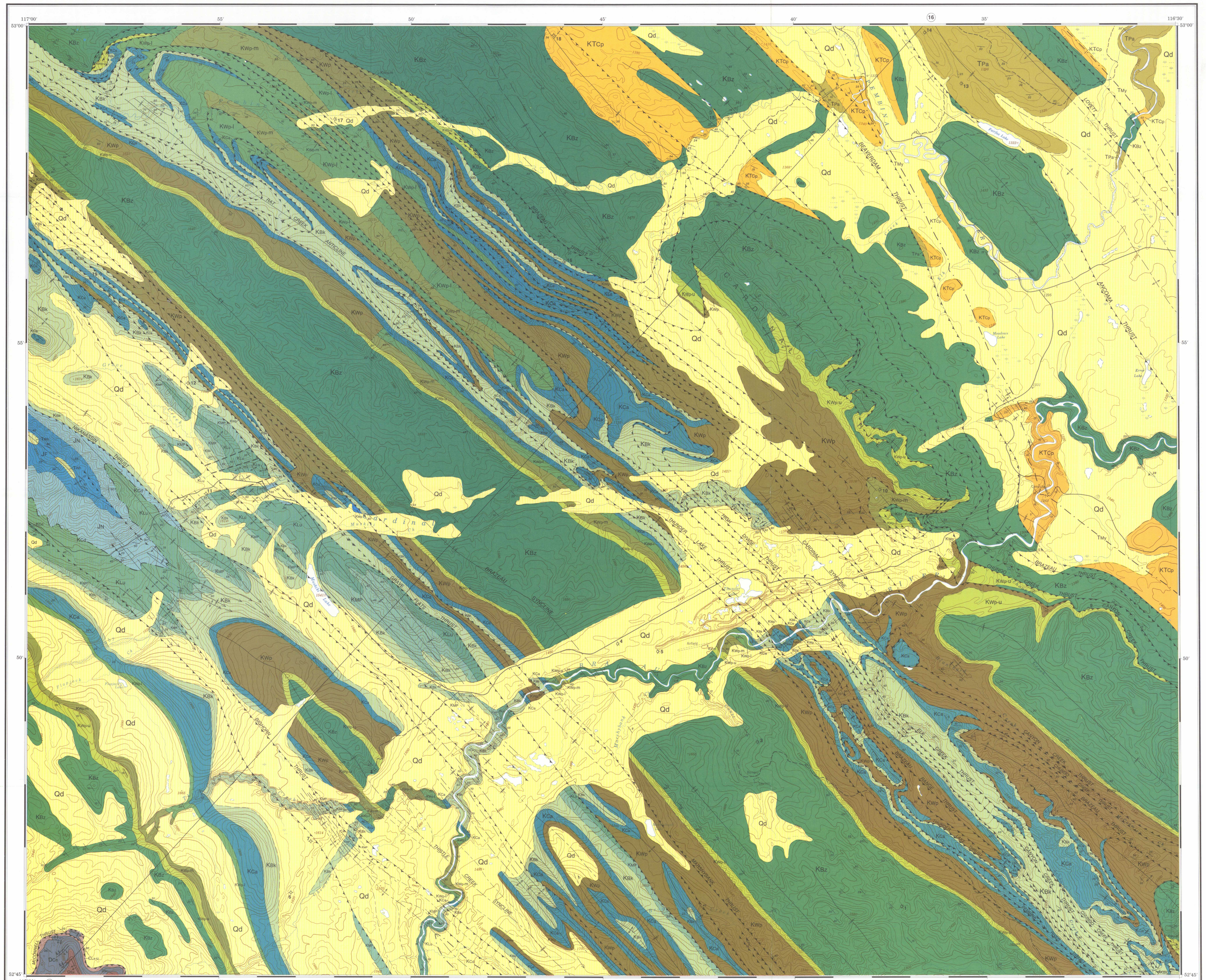
GEOLOGICAL SURVEY OF CANADA   COMMISSION GÉOLOGIQUE DU CANADA



Structure cross-section 16

N.T.S. Map 83C/15 | N.T.S. Map 83 F/2 (geological map not published)



Copies of this map may be obtained from the Geological Survey of Canada:
601 Booth Street, Ottawa, Ontario K1A 0E8
3303-33rd Street, N.W., Calgary, Alberta T2L 2A7
100 West Pender Street, Vancouver, B.C. V6B 1R8

Published 1993

LEGEND

CENOZOIC

QUATERNARY
PLEISTOCENE AND RECENT
- Qd — Till, alluvium, colluvium

TERTIARY
PALEOCENE
SAUNDERS GROUP (KBz-TPa)
- TPa — *PASKAPOO FORMATION; greenish grey sandstone, conglomeratic sandstone, shale, minor coal seams*

CRETACEOUS AND TERTIARY
UPPER CRETACEOUS AND PALEOCENE
- KTCp / TMy — *COALSPUR FORMATION: alternating units of sandstone, mudrock and bentonite, coal seams; top is the highest thick coal seam (Val d'Or seam); Entrance conglomerate and coarse grained sand at the base.*
TMy - Mynheer coal seam (included in the Coalspur Formation)
Note: the base of the Mynheer seam represents the Cretaceous-Tertiary boundary

MESOZOIC

CRETACEOUS
UPPER CRETACEOUS
- KBz — *BRAZEAU FORMATION: greenish grey sandstone, conglomeratic sandstone, shale; minor volcanic tuff and coal seams*

ALBERTA GROUP (KBk-KWp-u)
WAPIABI FORMATION (KWp-l-KWp-u)
- KWp-u — *Nomad Member: dark grey, rusty weathering shales grading into olive-brown to greenish brown shales, argillaceous siltstone and sandstone*
Chungo Member: fine grained, brown weathering sandstone
- KWp-m — *Hanson Member: blocky to rubbly, sideritic, rusty weathering, concretionary shales*
Thistle Member: fissile to platy, dark grey to black, grey weathering, calcareous shales
- KWp-l — *Dowling Member: concretionary, sideritic shales*
Marshybank Member: massive, argillaceous siltstone
Muskiki Member: rubbly and flaky, sideritic shales
- KWp — *WAPIABI FORMATION: Muskiki, Marshybank, Dowling, Thistle and Hanson members*
Note: KWp is equivalent to KWp-l on Map 1830A, Mountain Park
- KWp — ALBERTA GROUP — *WAPIABI FORMATION: undivided (structure section only)*
- KCa — *CARDIUM FORMATION: grey sandstone, siltstone, shale, and conglomerate*
- KBk — *BLACKSTONE FORMATION: dark grey shales and siltstone with minor beds of argillaceous limestone, sandstone, and bentonite*

LOWER CRETACEOUS
LUSCAR GROUP (KCd-KMP)
- KMP — *GATES FORMATION (Mountain Park Member): massive, green sandstone and conglomeratic sandstone; shale and silty shale*
- KLu — *GLADSTONE, MOOSEBAR and GATES formations (excluding KMP): massive, greenish grey sandstone and conglomeratic sandstone; grey sandstone; green and grey shale; coal seams*
- KCd — *CADOMIN FORMATION: chert- and quartzite-pebble conglomerate*
- KL — *LUSCAR GROUP: undivided (structure section only)*

JURASSIC AND CRETACEOUS
JURASSIC AND (?)LOWER CRETACEOUS
- JN — *NIKANASSIN FORMATION: grey, fine grained sandstone; fissile dark grey shale; thin coal seams*

JURASSIC
- JF — *FERNIE FORMATION: dark grey to black shale; dark grey sandstone and siltstone; dark grey, silty, argillaceous limestone; brown, limonitic, quartz sandstone*

TRIASSIC
SPRAY RIVER GROUP (TSM-TWh)
- TWh — *WHITEHORSE FORMATION: dolomitic, light grey siltstone and sandstone; red, green, and brown mudstone and siltstone; limestone and dolomite breccia*
- TSM — *SULPHUR MOUNTAIN FORMATION: dark grey and brown, thin bedded siltstone and sandstone; silty mudstone, shale and dolomitic siltstone (subsurface only)*
- TS — *SPRAY RIVER GROUP: undivided (structure section only)*

PALEOZOIC

CARBONIFEROUS
- CR — *RUNDLE GROUP: limestone and argillaceous dolomite; skeletal calcarenite and calcarenitic limestone; cherty limestone; dolomite (structure section only)*
- CBf — *EXSHAW and BANFF formations: dark grey, finely crystalline, thin bedded limestone; dark brownish grey shale; brown, argillaceous siltstone; argillaceous and cherty, skeletal, calcarenitic limestone; argillaceous dolomite. Dark brown shale at the base (structure section only)*

DEVONIAN
UPPER DEVONIAN
- DPa — *PALLISER FORMATION: thick bedded and massive, mottled, dolomitic limestone; grey, dense limestone; greyish brown dolomite (structure section only)*

FAIRHOLME GROUP (DCn-DSx)
- DSx — *SOUTHESK FORMATION: massive, light grey, crypto- to fine-crystalline limestone; in part calcarenitic; dolomite*
- DCn — *CAIRN FORMATION: massive to thick bedded, dark brownish grey, medium crystalline dolomite with **Amphipora** and stromatoporoid beds; dark grey limestone, dolomitic limestone and dolomite in the lower part; minor chert and breccia*
- DF — *FAIRHOLME GROUP: undivided (structure section only)*

CAMBRIAN
UPPER CAMBRIAN
LYNX GROUP
- €Lx-u — *Upper part: dolomite, mainly grey mottled, microcrystalline, silty, grading to dolomitic siltstone; commonly laminated, thin to thick bedded; chert nodules*
- € — CAMBRIAN — *Undivided (structure section only)*

Outcrop
Geological boundary (defined, approximate, assumed)
Geological boundary (assumed projection under cover of younger deposits)
Bedding, tops known (horizontal, inclined, vertical, overturned)
Bedding, tops unknown (vertical)
Fault (direction of displacement unknown)
Thrust fault (defined, approximate, assumed)
Thrust fault (assumed projection under cover of younger deposits)
Anticline (defined, approximate, arrow indicates plunge)
Syncline (defined, approximate, arrow indicates plunge)
Anticline and syncline (overturned)
Anticline and syncline (assumed projection under cover of younger deposits)
Change in mapping precision; stratigraphic subdivisions are amalgamated at dotted line (KWp; KWp-l, KWp-m)
Line of section (16 — 16)
Well (dry and abandoned, suspended gas)

Geology by R.J.W. Douglas and D. Lebel, based on fieldwork by B.R. MacKay (1938-1939), and fieldwork and studies of vertical air photographs by R.J.W. Douglas (1953-1954) and D. Lebel (1985-1987) with contributions by E.W. Mountjoy (1985-1987). Geology of the northeastern area is partly based on unpublished exploration drillhole information from Luscar-Sterco (1977) Ltd. Structure cross-section by D. Lebel (1987) with contributions by E.W. Mountjoy. Acknowledgments by D. Lebel to P. Fermor and T. Jerzykiewicz for helpful discussions.

SCHEDULE OF WELLS

1. *Chevron et al. Blackstone 11-7-44-18; surface location: 15-1-44-19W5*
2. *Plateau Chungo 7-23-44-19; surface location: 7-23-44-19W5*
3. *Chevron et al. Blackstone 3-27-44-19; surface location: 13-22-44-19W5*
4. *Imperial et al. Chungo 10-31-44-19; surface location: 10-31-44-19W5*
5. *Shell Lovett River 10-32-44-19; surface location: 6-32-44-19W5*
6. *Texas Gulf et al. Muskiki 8-7-44-20; surface location: 2-7-44-20W5*
7. *Imperial et al. Muskiki 3-17-44-20; surface location: 4-17-44-20W5*
8. *Canadian Hunter Thistle 6-21-44-20 and CPOG Thistle 6-21-44-20; surface location: 5-21-44-20W5*
9. *Chevron et al. Brown Creek 4-3-45-18; surface location: 4-3-45-18W5*
10. *Shell et al. Cardinal River 10-13-45-19; surface location: 6-13-45-19W5*
11. *Gulf et al. Cardinal River 3-24-45-21; surface location: 5-13-45-21W5*
12. *Gulf Union Poc Thistle 12-25-45-21; surface location: 8-26-45-21W5*
13. *Gulf et al. Lovett River 16-19-46-18; surface location: 16-19-46-18W5*
14. *B.A. Triad et al. Lovett River 12-30-46-18; surface location: 12-30-46-18W5*
15. *Gulf et al. Redcap 11-21-46-19; surface location: 4-21-46-19W5*
16. *Imperial Hanson 15-1-46-20; surface location: 7-1-46-20W5*
17. *Gulf et al. Hanson 2-20-46-20; surface location: 3-20-46-20W5*
18. *TPOC et al. Redcap 11-25-46-20; surface location: 11-25-46-20W5*
19. *Gulf AEC Mountain 15-3-46-21; surface location: 6-3-46-21W5*

On structure-section only
(projected from Foothills map area - NTS 83 F/2)

20. *Gulf et al. Hanlan 11-27-47-18; surface location: 6-27-47-18W5*
21. *Gulf et al. Hanlan 6-3-48-18; surface location: 6-3-48-18W5*

NOTE

A regional detachment within the upper part of the Nikanassin Formation is inferred from the subsurface geology; the displacement observed on faults cutting through the Paleozoic level is smaller than the displacements observed at the surface. This detachment is interpreted as being cut by later and lower thrust faults.

Geological cartography by J.H. Waddell, Institute of Sedimentary and Petroleum Geology, Geological Survey of Canada

Any revisions or additional geological information known to the user would be welcomed by the Geological Survey of Canada

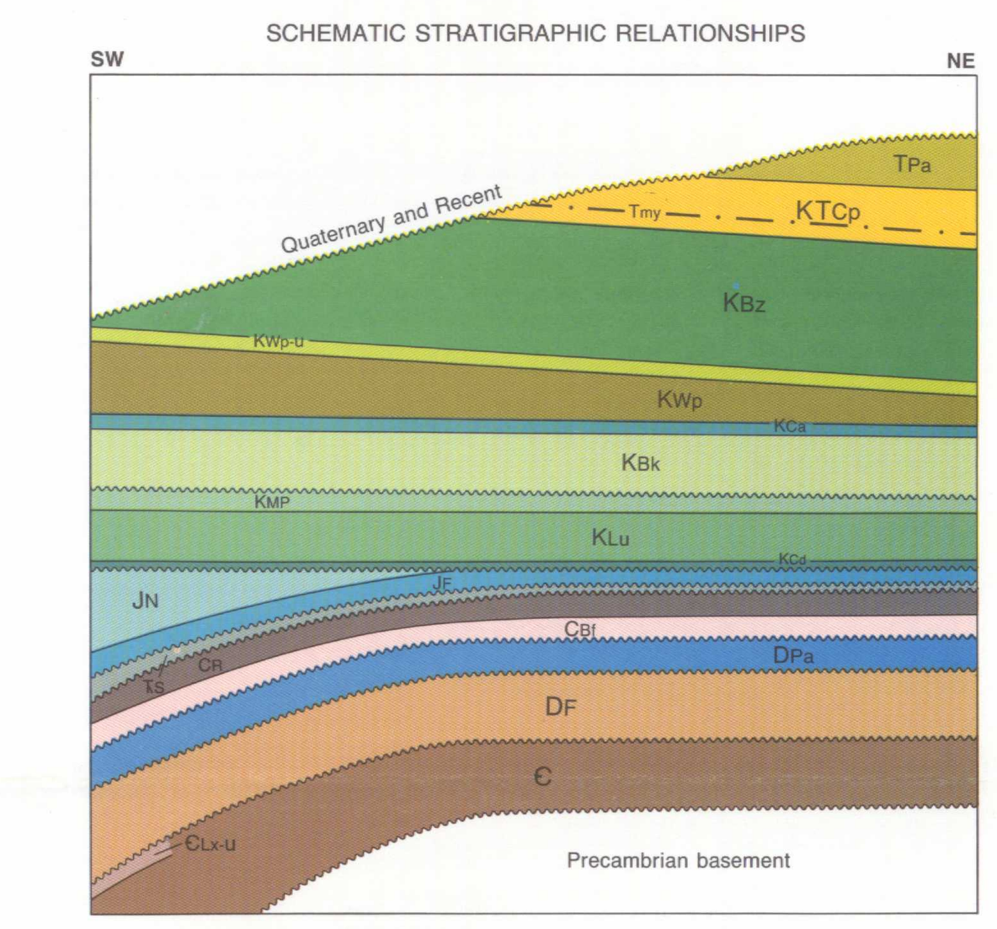
Base map at the same scale published by the Surveys and Mapping Branch in 1978

Copies of the topographical edition of this map may be obtained from the Canada Map Office, Department of Energy, Mines and Resources, Ottawa, Ontario, K1A 0E9

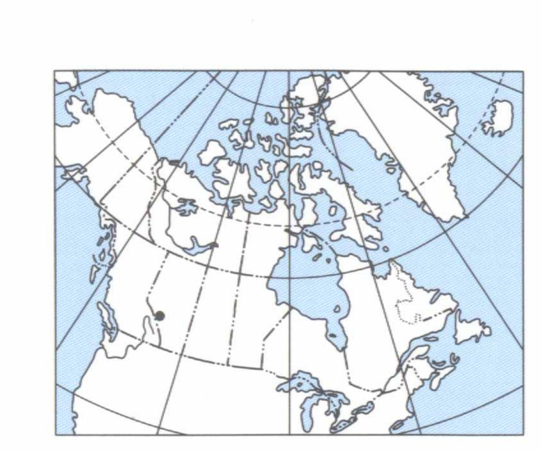
Approximate magnetic declination 1992, 21°06'E, decreasing 8.3' annually

Elevations in metres above mean sea level

SCHEMATIC STRATIGRAPHIC RELATIONSHIPS



Unconformity



INDEX MAP

MAP 1828A
GEOLOGY
CARDINAL RIVER
WEST OF FIFTH MERIDIAN
ALBERTA

Scale 1:50 000 - Échelle 1/50 000

Kilometres 1 0 1 2 3 4 Kilomètres

Universal Transverse Mercator Projection
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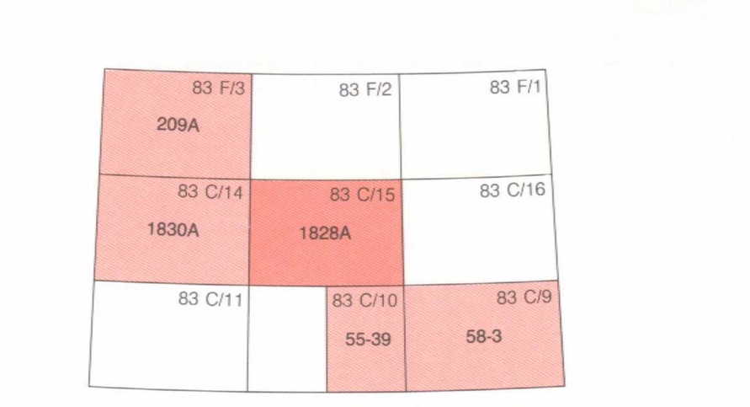

NATIONAL TOPOGRAPHIC SYSTEM REFERENCE AND INDEX TO ADJOINING GEOLOGICAL SURVEY OF CANADA MAPS

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1993: Geology and structure cross-section, Cardinal River, Alberta; Geological Survey of Canada, Map 1828A, scale 1:50 000.

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