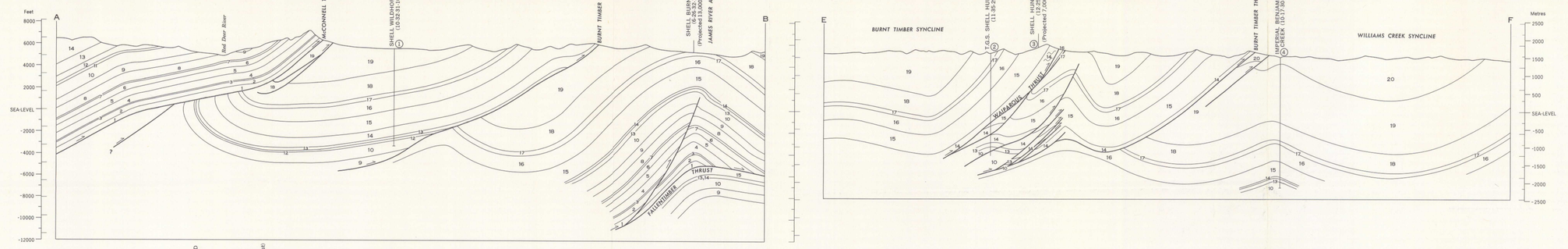
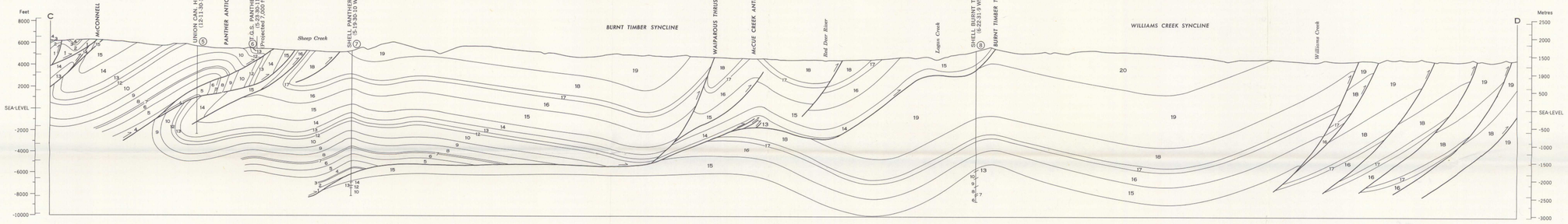
GEOLOGICAL SURVEY OF CANADA
DEPARTMENT OF MINES AND TECHNICAL SURVEYS



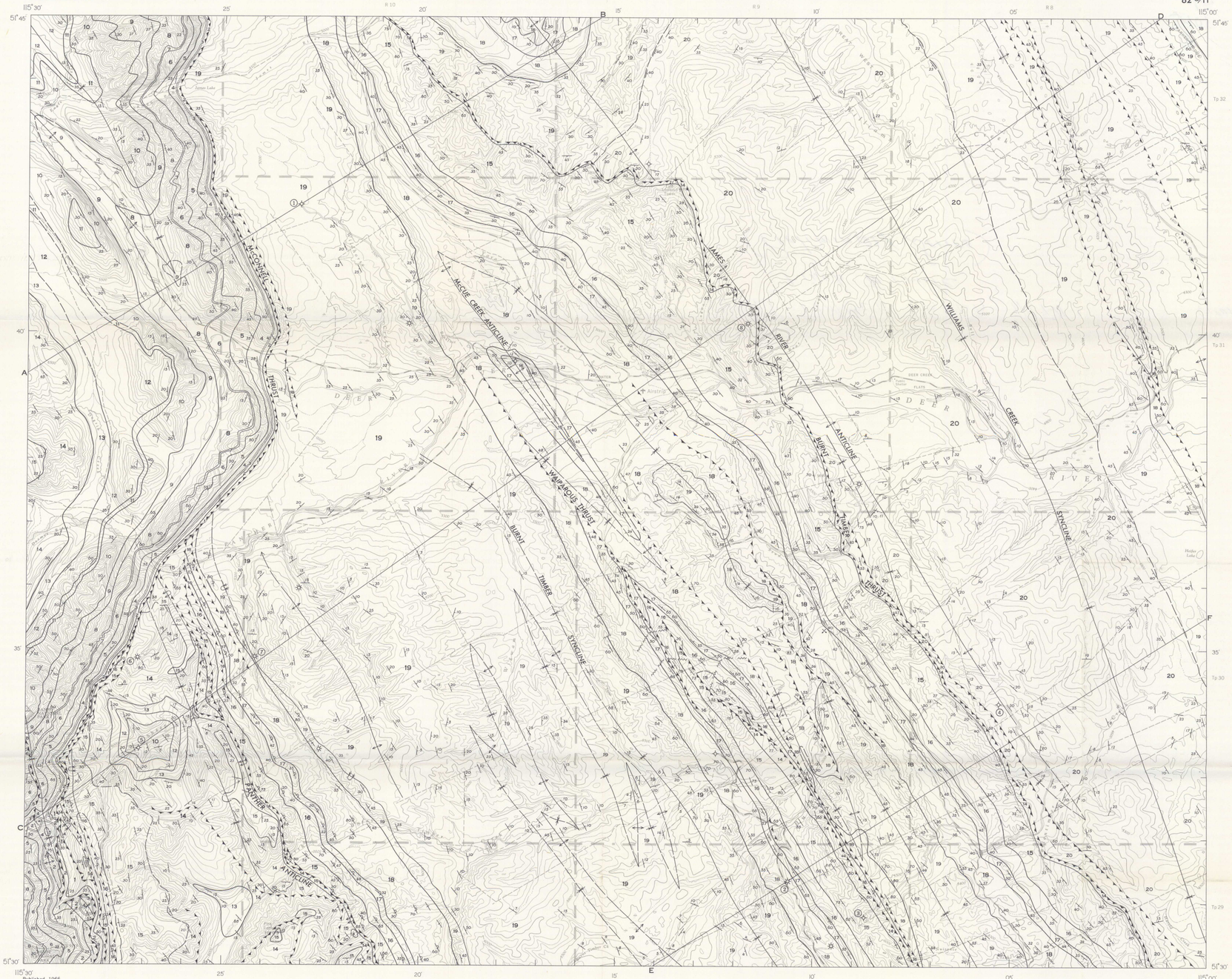


Sections along lines A-B, E-F, C-D

Note: Number on wells in sections identifies position of wells on map

PRELIMINARY SERIES

82 O/11



Published, 1966

Copies of this map may be obtained from the Director, Geological Survey of Canada, Ottawa

Printed by the Surveys and Mapping Branch

LEGEND

CENOZOIC

TERTIARY
PALEOCENE

20 PASKAPOO FORMATION: massive, greenish grey and grey, brown weathering sandstone; green and grey siltstone; rubbly green and grey mudstone; fine-grained, grey, calcareous sandstone; minor grey silty shale; minor conglomerate lenses

MESOZOIC

CRETACEOUS
UPPER CRETACEOUS

19 BRAZEAU FORMATION: massive, greenish grey and grey, brown weathering sandstone; greenish grey and grey siltstone; rubbly (locally shaly) green and grey mudstone; conglomerate; minor coal and bentonite

ALBERTA GROUP

18 WAPIABI FORMATION: silty, dark grey shale and mudstone; grey to dark grey siltstone and argillaceous siltstone; common concretionary shale and mudstone; minor sandstone; minor pebbly layers; bentonite seams

17 CARDIUM FORMATION: very fine to fine-grained grey sandstone; grey to dark grey siltstone and silty shale (locally concretionary); minor pebbly layers and conglomerate

16 BLACKSTONE FORMATION: dark grey shale, including silty shale, rubbly shale, calcareous shale and local concretionary shale; grey to dark grey siltstone; sandstone; bentonite seams; minor pebble layers

LOWER CRETACEOUS

15 BLAIRMORE GROUP: massive, coarse, greenish grey sandstone, siltstone, and rubbly mudstone; minor grey and black shale; minor red mudstone; minor conglomerate and conglomeratic sandstone underlain by calcareous grey siltstone, grey and black, locally carbonaceous shale; grey sandstone; minor coal seams; rare limestone. Chert, quartz and quartzite pebble-conglomerate, conglomeratic sandstone and grey sandstone of Cadomin Formation at base

LOWER CRETACEOUS AND JURASSIC

14 KOOTENAY FORMATION: grey and black, commonly carbonaceous and limonitic sandstone; grey and black siltstone; black, carbonaceous shale; minor coal

JURASSIC

13 FERNIE GROUP: dark grey to black shale; dark grey siltstone and sandstone; local concretions; dark grey, platy, silty, argillaceous limestone at the base (Nordegg Member)

TRIASSIC

12 SPRAY RIVER FORMATION: platy, grey and brownish grey, dolomitic siltstone; hard, grey siltstone and very fine grained sandstone at the top

PALAEOZOIC

PERMIAN AND (?) PENNSYLVANIAN

11 ROCKY MOUNTAIN GROUP: brownish grey sandstone; chert breccia; chert

MISSISSIPPIAN

10 RUNDLE GROUP: fine-grained to dense, yellowish brown and grey dolomite; cherty dolomite; light grey, coarse-grained crinoidal limestone and dolomitic limestone; minor calcarenite, oolite, chert and collapse breccia; some siltstone and minor green shale at the top

9 BANFF FORMATION: platy and banded calcareous siltstone and silty, argillaceous limestone; black chert layers. Crinoidal, silty and argillaceous limestones; dolomite; dolomitic limestone; minor shale and chert occur at the top. Includes black shales of the Exshaw Formation at the base

DEVONIAN
UPPER DEVONIAN

8 PALLISER FORMATION: grey-brown dolomite; mottled dolomitic limestone; limestone

7 "ALEXO" FORMATION: recessive, brownish grey, bedded dolomite; sandstone; intraformational conglomerate and breccia

6 FAIRHOLME GROUP
SOUTHESK FORMATION: massive to thick-bedded, light to medium grey, fine to coarsely crystalline dolomite; some medium to dark brownish grey dolomite; minor local breccia

5 CAIRN FORMATION: massive, dark brownish grey and grey, medium crystalline dolomite with *Amphipora* and stromatoporoid beds; dark grey (light grey weathering) limestone, dolomitic limestone and calcareous dolomite in the lower part; minor breccia and chert

CAMBRIAN
UPPER CAMBRIAN

4 LYNX FORMATION: dolomite, silty dolomite and dolomitic siltstone; minor shale, calcarenite, oolite and chert

MIDDLE CAMBRIAN

3 ARCTOMYS FORMATION: recessive, platy dolomitic siltstone and shale; ripple-marks and desiccation structures; minor evaporitic breccia

2 PIKA FORMATION: thin-bedded, commonly banded, brown and grey dolomitic siltstone and limestone; silty dolomite; flat pebble conglomerate; calcarenite and oolite

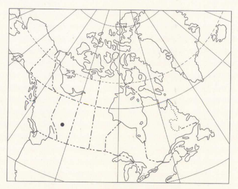
1 ELDON FORMATION: massive grey limestone; mottled dolomitic limestone; calcareous dolomite and dolomite; minor calcarenite, calcirudite and oolite (upper part only exposed)

Geological boundary (approximate, assumed)
Bedding, tops known (horizontal, inclined, vertical, overturned)
Fault (approximate)
Thrust fault (teeth in direction of dip; approximate, assumed)
Anticline (approximate, assumed; arrow indicates direction of plunge)
Syncline (approximate, assumed)
Overturned anticline (approximate, assumed)
Overturned syncline (approximate, assumed)
Gravel pit
Gas well
Show of gas
Abandoned well

Geology by N. C. Ollerenshaw, 1962, 1963

Geological cartography by the Geological Survey of Canada, 1965

Note: Contacts in cross-sections are approximate or assumed



INDEX MAP

MAP 11-1965

GEOLOGY

BURNT TIMBER CREEK

WEST OF FIFTH MERIDIAN

ALBERTA

Scale 1:63,360
1 inch to 1 mile

Miles 1 0 1 2 3 Miles

Kilometres 1 0 1 2 3 4 5 Kilometres

Road, all weather
Other roads
Bulldozed track or seismic line
Cut line or trail
Park boundary
Intermittent stream
Marsh
Contours (interval 100 feet)
Height in feet above mean sea-level

Base-map compiled and drawn by the Surveys and Mapping Branch, 1963 (with minor modifications by N. C. Ollerenshaw 1964)

Approximate magnetic declination 22°34' East, decreasing 0.35 annually

DESCRIPTIVE NOTES

The Burnt Timber Creek map-area lies in the southern Foothills of Alberta and includes a narrow strip of the Front Range of the Rocky Mountains along its western edge.

The area may be divided into three principal structural units, underlain from west to east by the McConnell, Burnt Timber and Fallentimber thrusts respectively.

McConnell thrust underlies the eastern edge of the mountains. Subsidiary folding and faulting are locally evident in the Palaeozoic strata above the thrust.

Beneath the McConnell thrust, Mesozoic and Palaeozoic strata of the Burnt Timber thrust sheet are strongly overturned in the Panther anticline. The axis of this anticline trends northwest. A culmination along it, in the vicinity of Sheep Creek, deforms the McConnell thrust as well. The trace of the latter swings southwest and then south around this structural high, which has been referred to as the "Panther Dome". The overturned northeast limb of the Panther anticline is cut by several thrust faults which are probably splays from the underlying Burnt Timber thrust. The broad, somewhat box-shaped Burnt Timber syncline lies northeast of the Panther anticline. Northeast of the syncline, the Waiparous thrust splays from the Burnt Timber thrust in the core of an anticline. Several additional folds and faults occur between the Waiparous and Burnt Timber thrusts. The Waiparous thrust dies out towards Red Deer River, but continues strongly for many miles southwest towards Ghost River.

Fallentimber thrust sheet comprises the James River anticline adjacent to the surface trace of Burnt Timber thrust with the broad Williams Creek syncline farther northeast. In the Shell Burnt Timber (6-26-32-10W5) well on James River, just north of Burnt Timber Creek area, Cambrian beds overlie Cretaceous strata along the Fallentimber fault; at the surface it expresses itself as a series of splay faults on the eastern flank of Williams Creek syncline and across the Fallentimber area to the east.

Eldon Formation (1) is thinned by the McConnell thrust and is typically partially buried by talus. Less than 150 feet are exposed. The Eldon Formation is transitional upwards into the Pika Formation (2), which is 200 to 300 feet thick. The only Cambrian fossils collected occur in the lower part of the Pika Formation. The Arctomys Formation (3) is 70 feet thick, rests conformably on the underlying Pika and passes transitionally into the overlying Lynx Formation (4). The latter consists of a lower part, about 100 feet thick, that is slightly recessive towards the top and an upper part that is more resistant and thicker bedded. The total thickness varies from 450 to 600 feet locally. The contact between the basal Devonian unit and the Lynx Formation is an erosion surface, commonly with a relief of a few inches to a few feet, with scattered, conglomerate-filled channels up to 50 feet or more in depth. The basal Devonian unit is typically 0 to 20 feet thick; it consists of thin-bedded dolarenites and dolomite, locally silty and sandy and may be Middle and/or Lower Devonian. For mapping purposes it is not separated from the Cairn and Lynx Formations.

The Upper Devonian Fairholme Group is represented by the carbonate facies, comprising the Cairn (5) and Southesk (6) Formations; 550 feet and 530 feet thick respectively on the ridge between Sheep Creek and the Panther River. In contrast with the typical dark dolomites, limestone predominates in the basal 50 feet of the Cairn Formation, increasing to 200 feet between the Panther and Red Deer Rivers. A limestone breccia zone occurs near the base of this unit. The Cairn Formation is transitional up into the Southesk.

The recessive interval referred to as the "Alexo" Formation (7) is 135 feet thick. About 20 feet of sandstone occur in the lower part and locally fill channels in the underlying dolomite. The upper part consists of dark, bedded dolomites that grade into the basal Palliser Formation (8). The latter, about 700 feet thick, is more recessive than farther south, with abundant dark dolomite zones. Fossiliferous limestones at the top probably represent the Costigan Member. The Palliser-Exshaw contact is gently undulating, with a visible relief of up to 1 foot noted in the ridge north of Sheep Creek.

The Exshaw Formation, 25 feet thick on the ridge north of Sheep Creek, thins to 16 feet north of Eagle Lake. It consists of black shale, with a thin bentonite seam at the base and has been grouped with the Banff Formation (9) on the map. The Banff is divisible into three units: a lower, relatively resistant zone of siltstone, 40 feet thick; a middle zone of platy siltstones, 400 feet thick; and an upper zone of fossiliferous and argillaceous limestones, 250 feet thick, transitional to the Rundle Group above. The Rundle Group (10), more than 1,000 feet thick in the McConnell thrust sheet, thins eastwards to about 700 feet in the Fallentimber thrust sheet. It is divisible into Pekisko, Shunda, Turner Valley, Mount Head and Etherington Formations.

The Rocky Mountain Group (11) is present only in the McConnell thrust sheet and has been attributed a thickness of between 100 and 200 feet. The contact with the Rundle Group is probably disconformable. The contact with the overlying Spray River Formation (12) is disconformable, hummocky, with a visible relief of up to one foot. Identification of the Rocky Mountain Group and the Spray River Formation is based entirely on lithology and appearance. The Spray River Formation, estimated to be 500 feet thick in the west, thins progressively eastwards and is absent in the Fallentimber thrust sheet. Both the Whitehorse and Sulphur Mountain Members are present in the McConnell thrust sheet and the Panther anticline.

Fernie Group (13) strata are poorly exposed, but are estimated to be 990 feet thick in the McConnell thrust sheet, thinning to 500 feet in the Panther anticline and probably 100 feet in subsurface in the Fallentimber thrust sheet. The Nordegg Member is recognizable in the Panther anticline and becomes relatively predominant eastwards as the overlying part of the group thins. The Nordegg Member contains a Pliensbachian fauna[1] on Limestone Mountain, a few miles to the north. The transitional, Fernie-Kootenay contact is placed at the base of a prominent and persistent ridge-forming sandstone unit 50 to 60 feet thick.

[1] Fossils identified by Dr. H. W. Frebold (personal communication, 1965).

The Kootenay Formation (14) is commonly folded and faulted, with rather poor exposure. Graphic calculations indicate a thickness of 3,500 feet in the McConnell thrust sheet, 1,500 feet in the Panther anticline, thinning to 100 feet or less in the Fallentimber thrust sheet. Minor coal seams are present.

The Cadomin Formation of the Blairmore Group (15) overlies the Kootenay Formation on an erosional disconformity and is 30 to 50 feet thick. It consists typically of conglomerate, but changes to a sandstone with minor phenoclasts locally. The remainder of the Blairmore Group overlies the Cadomin conformably and consists of two main divisions. The lowermost division is about 780 feet thick and consists of thin-bedded, calcareous grey siltstone, with shales and minor coal seams and is typically folded and faulted. The upper division is 800 to 880 feet thick and consists of very different greenish grey sandstones and rubbly mudstones. A conglomerate zone, up to 50 feet thick, containing chert, quartzite and igneous phenoclasts, occurs locally in the lower part of the upper division, particularly on the Panther anticline.

The contact between the Blairmore Group and the Blackstone Formation (16) is probably an erosion surface, visibly uneven locally, with the Blackstone shales variously resting on sandstones and mudstones. The Alberta Group is unusually well exposed on Burnt Timber Creek above the Waiparous thrust. The Blackstone Formation is 1,400 feet thick and is transitional to the overlying Cardium Formation (17). The latter is about 300 feet thick and comprises two to three relatively clean, resistant sandstone units, separated by recessive sandstones, siltstones and shales. Local lenses of conglomerate occur. The formation forms conspicuous, sharp ridges.

The Wapiabi Formation (18) overlies the Cardium conformably (although the uppermost bed of the latter is commonly slightly undulating). It is 1,900 feet thick and is noticeably more concretionary than the Blackstone. Bentonite seams are very common throughout the Alberta Group.

The Brazeau Formation (19) commonly fills small channels cut into the underlying Wapiabi, but is essentially conformable with it. The Brazeau Formation consists of about 5,000 feet (graphic estimate) of non-marine strata. Sandstones in the formation are commonly lenticular and pass laterally into siltstones and mudstones. Pebbly sandstones and lenses of conglomerate are conspicuous in the basal 1,000 feet, commonly with a strong conglomerate zone about 500 feet above the base.

The Paskapoo Formation (20), overlies the Brazeau without any apparent break and there is essentially no difference between the Brazeau and lower Paskapoo strata, although higher in the Paskapoo a distinctive zone of fine-grained, calcareous sandstone occurs. The contact between the two formations is located only approximately, on the basis of scattered fossil collections. Only the lowermost 3,000 feet of the Paskapoo Formation are exposed. Sandstone zones are commonly lenticular and scattered stream channels occur.

A total of 16 wells have been drilled to date in four separate groups. Each group has revealed the presence of gas and 8 of the wells have been capped as potential gas producers. The reservoir rocks are of Mississippian and Devonian age. Shell Panther River No. 1 well (5-19-30-10W5) is remarkable in having tested at about 86 per cent hydrogen sulphide.

MAP 11-1965
BURNT TIMBER CREEK
ALBERTA
82 O/11