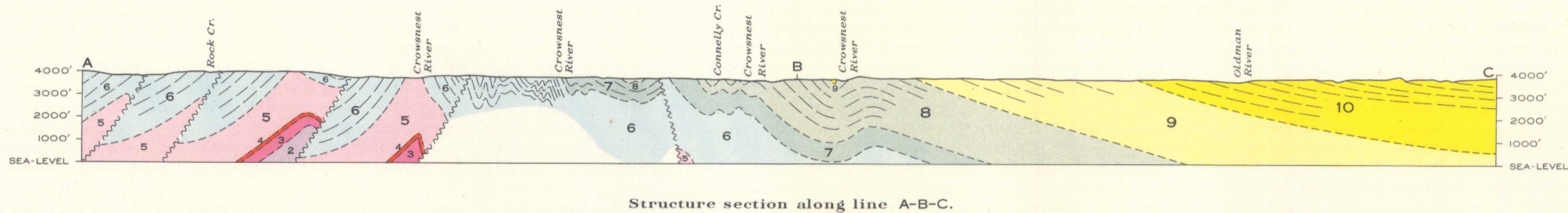


CANADA
DEPARTMENT OF MINES AND RESOURCES
MINES AND GEOLOGY BRANCH
BUREAU OF GEOLOGY AND TOPOGRAPHY



Structure section along line A-B-C.

LEGEND

CENOZOIC

TERTIARY

PALEOCENE

10

PORCUPINE HILLS FORMATION: buff weathering crossbedded sandstone interbedded with light and dark grey shale; thin coaly beds in basal part

9

WILLOW CREEK FORMATION: maroon, reddish brown, and grey shale containing numerous irregular calcareous concretions and interbedded with soft grey sandstone

CRETACEOUS

UPPER CRETACEOUS

8

ST. MARY RIVER FORMATION: brown weathering coarse to fine grained crossbedded sandstone, interbedded with grey shale and carbonaceous shale; coal

7

BEARPAW FORMATION: dark grey marine shale with calcareous concretions

6

BELLY RIVER FORMATION: grey crossbedded sandstone, grey shale with concretions, bentonitic shale, thin carbonaceous beds; coal seams in upper part

5

WAPIABI (Upper Alberta) FORMATION: dark grey shale and sandy shale with hard limy beds and brown weathering ironstone concretions

4

BIGHORN (Cardium) FORMATION: pink quartzitic sandstone, shale, sandy shale, pebble conglomerate

3

BLACKSTONE (Lower Alberta) FORMATION: dark grey and silvery grey shale, sandy shale, sandstone

LOWER CRETACEOUS

2

BLAIRMORE GROUP: grey and greenish-grey sandstone; grey, green, and red shale; conglomerate; limestone. Also includes some CROWNEST FORMATION of Upper Cretaceous (?) age

1

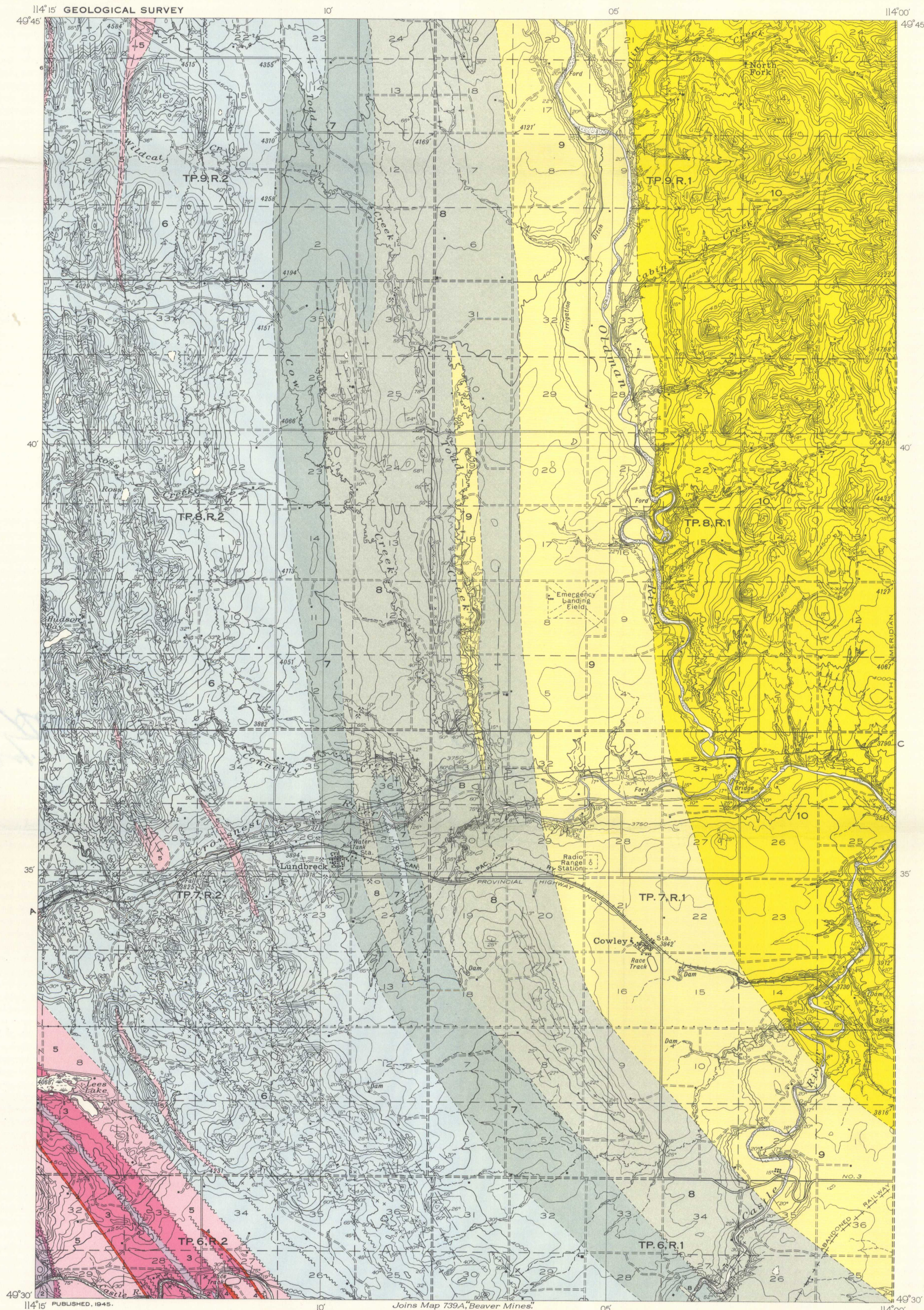
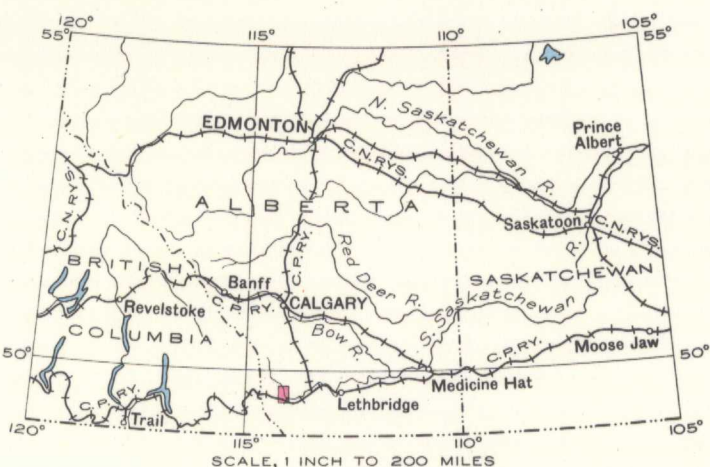
KOOTENAY FORMATION: dark grey and black shale, brown sandstone, coal

Rock outcrop
Bedding (inclined, overturned)
Anticlinal axis
Synclinal axis
Fault (arrow indicates direction of dip)
Well drilled for oil and gas (abandoned)
Coal pit or mine

Provincial highway
Road and buildings
Road not well travelled
Road along township boundary
Power transmission line
Church
School
Post Office
Cemetery
Township boundary
Section line
Intermittent lake and stream
Marsh
Sand or gravel
Contours (interval 50 feet)
Depression contour
Height in feet above mean sea-level

Geology by C.O. Hage, 1941, 1942.

Base-map compiled by the Topographical Survey, 1942, from aerial photographs taken in August and September, 1939. Cartography by the Drafting and Reproducing Division, 1944.



MAP 816A
COWLEY
WEST OF FIFTH MERIDIAN
ALBERTA

Scale, 63,360 or 1 Inch to 1 Mile
Approximate magnetic declination, 23°0' East.

DESCRIPTIVE NOTES

The topographic features afford a noteworthy expression of the character and structure of the bedrock formations. The high, eastern part of the map-area is underlain by gently east-dipping beds of the Porcupine Hills formation, characterized by strata of hard, thick sandstone. The two main valleys in the central part of the area are mostly in shales of the Bearpaw and Willow Creek formations, whereas the low ridge separating them consists mainly of hard, resistant St. Mary River sandstone beds. The western, more elevated part of the map-area is underlain, predominantly, by Belly River strata composed of sandstone members alternating with grey, poorly stratified shale.

The KOOTENAY FORMATION (1) is partly exposed above a thrust fault in the southwestern part of the map-area. The section above the fault consists of about 100 feet of coarse, dark brown sandstone interbedded with dark grey to black shale, and contains several coal seams. West of the map-area the formation is 350 feet thick, but it thins somewhat towards the east.

The BLAIRMORE GROUP (2) is partly exposed in the southwestern part of the map-area, where outcrops are limited to a few hundred feet of the upper and lower parts of the group. The basal strata consist of a uniformly distributed sandstone, 35 to 50 feet thick, carrying scattered quartzite and chert pebbles and overlain by dark grey and greenish shales and interbedded sandstones. Thin beds of limestone and thinly bedded, hard, limy shales carry freshwater pelecypod fossils at 150 to 200 feet above the base. The uppermost strata are of light greenish grey, bentonitic shale, underlain by light grey, medium-grained sandstone. The bentonitic shale is believed to represent the Crownest formation of the adjoining Beaver Mines map-area to the south. Blairmore strata are well exposed in that area on Mill Creek (sec. 25, tp. 5, rge. 2) where they have an aggregate thickness of 1,630 feet, of which the uppermost 460 feet includes tuff beds of the Crownest formation intercalated with greater thicknesses of sandstones and shales similar to upper Blairmore strata.

The BLACKSTONE (Lower Alberta) FORMATION (3) as exposed along Castle River in secs. 27 and 28, tp. 6, rge. 2, has a thickness of about 400 feet. The lower 100 feet consists of dark brown shale and sandy shale with large brown concretions and a number of thin beds of fine-grained sandstone. One of the beds, 50 feet above the base, contains small black chert pebbles; another, at the top, is 4 feet thick and is overlain by a 12-inch bed of bentonite. A succeeding zone of silvery grey shales, about 100 feet thick, contains abundant Inoceramus labiatus and, in turn, is overlain by black and brown fissile shale and sandy shales containing limestone beds.

The BIGHORN (Cardium) FORMATION (4) is thin and may lose its identity before reaching the eastern boundary of the area. Along Castle River (sec. 27, tp. 6, rge. 2) it consists of 10 feet of sandy shale and sandstone with a bed of small chert pebbles at the top.

The WAPIABI (Upper Alberta) FORMATION (5) is faulted, and thickness determinations within the map-area are not reliable. Farther south, on Mill Creek, the formation is 1,500 to 1,600 feet thick.

The BELLY RIVER FORMATION (6) has a thickness of about 2,600 feet, increasing to the west of the area. It consists of alternating beds of sandstone and shale, mostly of freshwater origin. Within the formation are several distinctive assemblages of beds. The basal 153 feet is transitional from the marine Wapiabi and consists of dark grey shale alternating with beds of fine- to medium-grained, grey, brown weathering sandstone that increase in thickness from the base upwards. Overlying strata comprise about 550 feet of beds of thick, coarse, light grey, crossbedded sandstone with minor amounts of interbedded shale. A succeeding zone, 1,100 feet thick, is composed of almost equal amounts of sandstone and shale. The sandstone beds are fine- to medium-grained, grey, and brown weathering. They are 40 to 50 feet thick at the base and 10 to 20 feet thick higher in the section. The shales are grey and show no bedding. The overlying zone, 30 feet thick, contains several concretionary layers separated by sandstone beds up to 20 feet thick. One of these layers, near the base, carries brown weathering concretions; another, near the top, holds light grey, limy concretions and interbeds of light grey, bentonitic shale. Just below the upper layer are several thin beds of dark grey, fissile shale. The uppermost zone is composed of about 500 feet of alternating sandstone and light grey, bentonitic shale. Several coal seams lie near the top of the formation in the vicinity of Lundbreck.

The BEARPAW FORMATION (7) consists of dark grey marine shale with some reddish brown concretions up to 18 inches in diameter. Along Crowsnest River, in L.S. 16 and 17, sec. 26, tp. 7, rge. 2, about 600 feet of these beds are represented in a continuous section. The basal strata are contorted and partly concealed. As exposed on Crowsnest River, the Bearpaw has an estimated thickness of about 800 feet.

The ST. MARY RIVER FORMATION (8) has a thickness of about 2,500 feet on Crowsnest River. It may be divided into two parts separated by a coal seam, which is overlain by a thick oyster bed. The lower part is 118 feet thick and composed of dark grey shale alternating with hard, grey, brown weathering sandstone in beds that range in thickness from a few inches to several feet. It expresses a transition from underlying marine Bearpaw shales to overlying freshwater shales and sandstones. The upper and larger part of the formation consists of hard, grey, brown weathering sandstone beds interstratified with light and dark grey shale and carbonaceous beds. Coal seams occur near and at the base. The sandstone beds are from 5 to 25 feet thick, fine- to medium-grained, highly calcareous, and usually minutely crossbedded. Small, irregular, calcareous concretions are present in the upper shale beds, which also contain some bentonite.

The WILLOW CREEK FORMATION (9) has a thickness of about 2,760 feet on Oldman River. It consists of light and dark grey, maroon, and reddish brown shale alternating with light grey, fine-grained, calcareous, soft sandstone beds. Colour banding is distinct in the larger outcrops and the formation, as a whole, has a pinkish hue. Distinctive features of the Willow Creek are the reddish brown and maroon shales, with numerous, irregular, calcareous concretions, and light grey, concretionary pellets that occur in the sandstone.

The PORCUPINE HILLS FORMATION (10) the youngest in the map-area, has a maximum thickness of about 3,500 feet. It is composed of light and dark grey shale interbedded with fine- to coarse-grained, grey, limy sandstone in fairly well indurated beds from 20 to 50 feet thick. The basal beds are gradational into underlying Willow Creek strata. Sandstones at the base contain detrital coal fragments and a few calcareous pellets, and the light grey shale carries calcareous concretions.

The area is divisible into two structural units—an eastern one of gently east-dipping beds representing almost the entire western limb of the Alberta syncline, and a western one of folded and faulted strata, characterized by westerly dipping thrust faults typical of the Foot Hills. The latter unit is made up of at least three fault blocks that, in turn, are broken by many subsidiary thrusts. The extreme southwestern corner of the area is part of the Livingstone thrust block. East of this is the smaller Mill Creek thrust block, named from an anticline along its eastern border in Beaver Mines map-area. The third block occupies a belt about 3 miles wide lying east of the Mill Creek fault. It contains an anticlinal structure (Lundbreck anticline) whose axis lies about a mile west of the east side of the fault block. The fault underlying this block crosses Crowsnest River in L.S. 9, sec. 27, tp. 7, rge. 2. It was encountered in drilling Marjor Lundbreck No. 1 well, just north of the map-area (L.S. 3, sec. 4, tp. 10, rge. 2), at a depth of 5,480 feet and, in consequence, is estimated to have a westerly dip of 55 degrees. The strata for 3 miles east of the Lundbreck fault block are folded into numerous anticlines and synclines in rather soft incompetent beds of sandstone and shale of the upper Belly River, Bearpaw, and St. Mary River formations. These surface folds may represent a thrust fault at depth.

Coal seams are present in the Kootenay, Belly River, and St. Mary River formations. The upper part of the Kootenay contains coal seams of medium-volatile bituminous rank, which are being worked in adjacent areas to the south and west. In the upper 150 feet of the Belly River formation are several coal seams. At Lundbreck, where they have been worked, the seams are up to 7 feet thick. The coal is of high volatile bituminous rank. The lowest coal seam of the St. Mary River underlies an oyster bed, 4 to 6 feet thick, about 100 feet above the base. The seam varies from 18 to 24 inches in thickness and is of high volatile bituminous rank. Approximately 100 feet above this seam is a carbonaceous shale zone containing several coal seams, one of which has been mined.

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