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GEOLOGY AND COAL RESOURCES OF SOUTHEASTERN ALBERTA

by
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by
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1978

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

ABSTRACT

Investigations of relatively deep coal resources of southeastern Alberta show that four Upper Cretaceous coal zones are of interest. Two zones in the Foremost Formation, the McKay and overlying Taber, are widespread throughout the area. Seams are generally thin although coal beds in the Taber zone are locally thick in the Lake Newell, Medicine Hat and Pakowki Lake areas.

The Lethbridge zone, a prominent coal horizon at the top of the Oldman Formation, is present on both east and west flanks of the Sweetgrass Arch. It shows significant development for commercial interest only on the west flank of the structure, in the Lethbridge area.

Coal seams associated with the Horseshoe Canyon Formation are thick in a region north of Tp. 17.

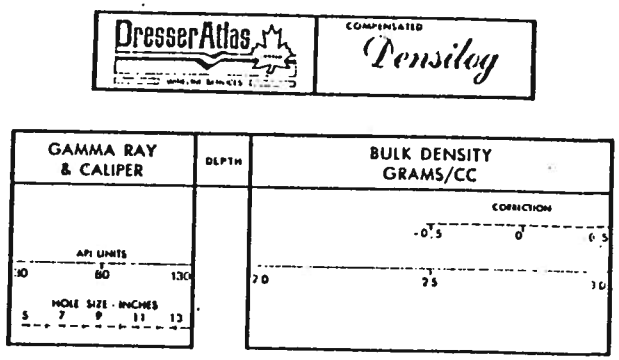
Cross sections illustrate structural and stratigraphic relationships of the Upper Cretaceous strata, emphasizing the character of the included coal zones. Coal seam thickness maps are presented including indications of the best seam thickness and the aggregate footages of all seams 3 feet or more thick, in each testhole.

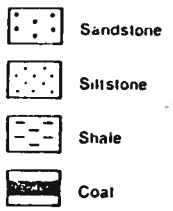
INTRODUCTION

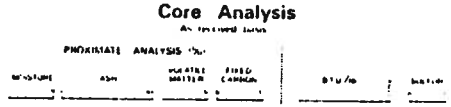
A study of coal resources of southeastern Alberta was carried out in 1976 as part of a continuing coal exploration program sponsored by Alberta Energy and Natural Resources. The area of study was defined as occurring between Tps. 1 to 23 and R. 1 to R. 25 W4 (Fig. 1). A total of 77 testholes were drilled to depths of between 400 and 1000 feet at a standard spacing of one hole per township. In addition, three preliminary testholes drilled in 1975 afforded support information. The resultant data for the total program included gamma-ray, density, acoustic, neutron, self potential and dual induction focused logs. Drill cuttings were also collected and described at each site. Six testholes were cored and selected coal samples were submitted for analyses. The typical assemblage of data for the principal coreholes is provided in figure 2.

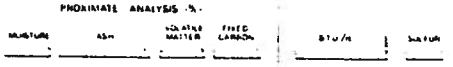
In 1977, ten additional testholes were drilled in southeastern Alberta to further evaluate the coal resources of the 1976 study area.


EDMONTON
CALGARY
Medicine Hat
Lethbridge
50 0 50 100 Miles
50 0 50 100 150 Kilometres









CORE DESCRIPTION

Alberta Research TH 16-76
NE 35-9-22W4
Grd Elev 3022 KB Elev 3027.5

CORE DESCRIPTION

Alberta Research TH 65-76
NE 20-23-20W4
Grd Elev 2800 KB Elev 2804

FIGURE 2. Core Descriptions

ACKNOWLEDGEMENTS

Capable technical support was supplied to the program by C.L. Bredin, R.J. Leduc, J.W. Dowhaniuk, R.J. Melin and L.G. Rindero. Supervision of drilling was very effectively handled by A. Bosman.

Drilling operations were efficiently performed by Hi-Rate Drilling Co. Ltd. and Satellite Drilling Ltd. Dresser Industries Inc. supplied excellent geophysical logging services. Analytical work on coal samples was carried out by Chemical and Geological Laboratories Ltd.

Clerical and secretarial duties were provided by B.E. Kapler and L.C. Kennedy.

J.R. Yurko supplied geological expertise during the initial stages of the program.

REGIONAL GEOLOGY AND NOMENCLATURE

Parts of three Upper Cretaceous units were evaluated during the 1976 program; the Foremost, Oldman and Horseshoe Canyon Formations. A summary of stratigraphic nomenclature used herein is presented in figure 3.

The Oldman and Foremost Formations are subdivisions of the Belly River Group and several changes in the nomenclature have taken place over the years. The older Belly River terminology was first applied by Dawson (1883) to what he described as "a series of pale, generally greyish arenaceous beds ..... which were found underlying the Pierre (Bearpaw) shales, along the Belly and Bow Rivers." Dawson (1884) informally divided his Belly River series into a "pale upper portion" and a "yellow and banded lower portion." Dowling (1917) later applied the name "Pale beds" to the upper division and introduced the name "Foremost beds" for the lower division. In addition, he included the underlying Pakowki and Milk River Formations in the Belly River series.

In 1930, Williams and Dyer reviewed and revised the stratigraphic nomenclature of the southern plains. They redefined Dawson's Belly River series as containing only the brackish water and continental deposits of the Pale beds and Foremost beds, excluding the Pakowki and Milk River beds.

Further studies of the units were carried out by Russell and Landes (1940), resulting in the name Oldman Formation being substituted for the term "Pale beds" of Dawson and Dowling. However, these workers continued the use of the term Foremost for the lower beds.

Crockford (1949) and Crockford and Clow (1965) observed that the Oldman and Foremost Formations together comprise an easily recognizable stratigraphic unit in southern Alberta but found difficulty defining the contact between the two. Further to the west in the southern Alberta Foothills, definition of a boundary was not considered possible. Therefore, the strata were

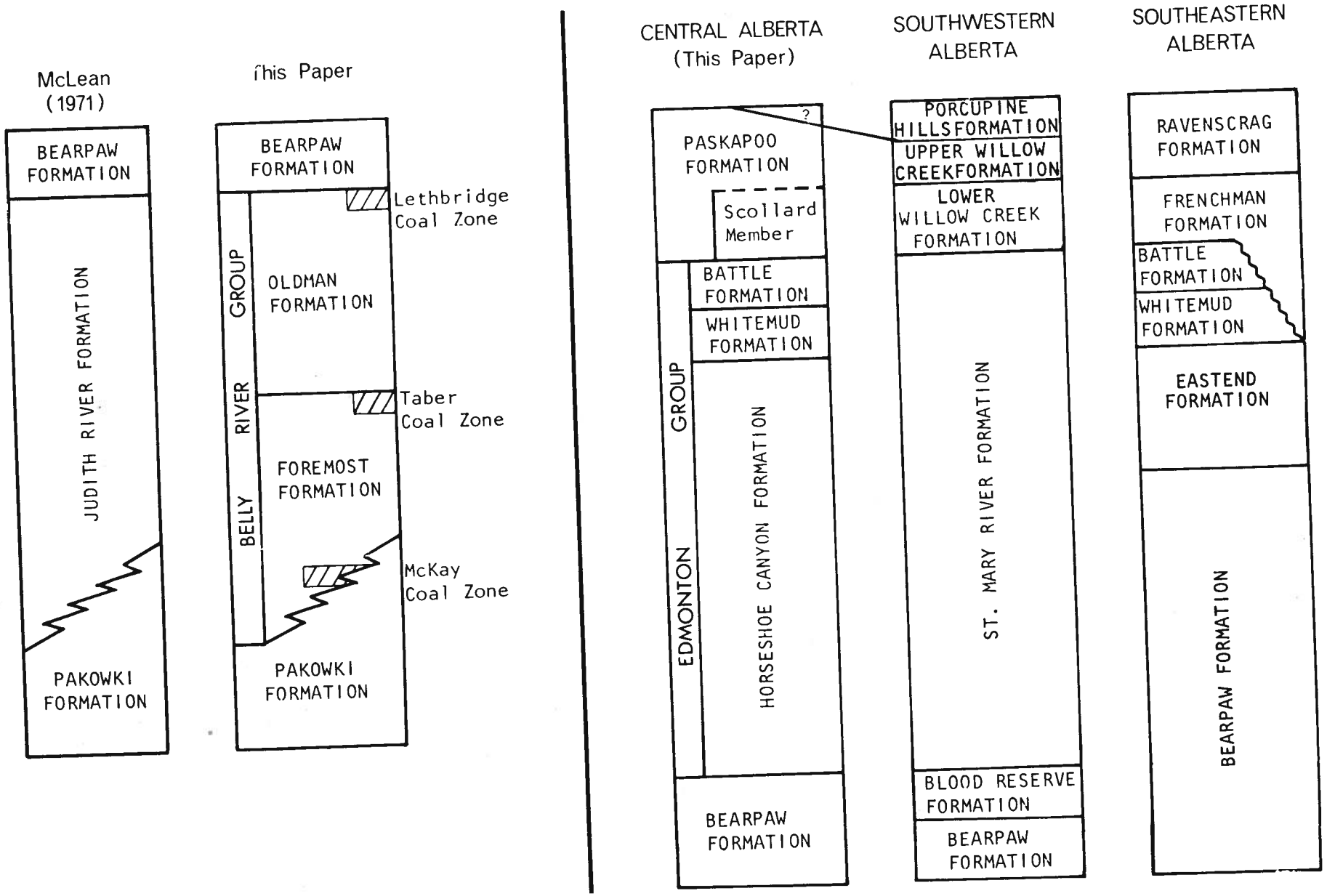


FIGURE 3. Stratigraphic Table

collectively referred to as the Belly River Formation.

McLean (1971) comments on work by Lerbekmo (1961), stating, "The name 'Belly River' is used by Lerbekmo as a group designation for the Oldman and Foremost Formations in the plains region, an interpretation which he indicates is generally accepted by geologists." McLean (1971) observes that "the names 'Belly River' or 'Oldman' and 'Foremost" were applied to the same lithostratigraphic unit as 'Judith River' (Hayden, 1871), although in different regions. Precedence in use of the name 'Judith River,' ambiguity in the application of the other names, and the proven lateral continuity of this lithostratigraphic unit justify retention of the name 'Judith River' to the exclusion of the others, and its application throughout the area, including south-central, southeastern and east-central Alberta, and all regions of Saskatchewan in which the formation is present."

In spite of such a proposal some problems in the nomenclature remain unresolved. For example, there is no significant evidence that the term Judith River finds greater acceptance than the usage of Belly River. If the latter term is retained it is presently used in a formational sense in areas where the Oldman and Foremost cannot be separated, and as group status otherwise. Although this is acceptable it seems less than satisfactory for the Belly River to share a dual role in the nomenclature.

The Oldman and Foremost Formations together form an eastward-thinning sedimentary wedge, the strata of which are composed predominantly of shales, siltstones and sandstones deposited in a non-marine, deltaic environment. It is overlain by the Bearpaw Formation and underlain by the Pakowki (Lea Park) Formation. Both are westward and northward thinning wedges of marine siltstones and shales.

The Foremost Formation consits of a series of shale, siltstone, and sandstone beds with abundant carbonaceous material, concretions and coal seams. It is brackish water in origin, and has minor intercalations of freshwater

and marine beds. Lithologic variations give the formation a distinctive, banded appearance in outcrop, which is especially noticeable from a distance. Light gray sandstones, dark gray shales, black carbonaceous shales and coal seams, pale yellow silts, and rusty-colored concretionary bands form a variable succession. The beds vary in thickness from a fraction of an inch to many feet, and some persist laterally for several miles.

Crockford (1949) indicates that four zones can be recognized within the formation. He states: "In many places, the formation is divisible on lithological grounds into members or zones. At the top there is generally a zone composed of coal seams and carbonaceous shales. This zone ranges from 80 to 220 feet in thickness, and is given such local names as Taber coal horizon, Grassy Lake lignite member, Bow Island coal member and Redcliff coal zone."

"The second zone is composed of sandstones, shales, Ostrea and Corbula beds with a few beds of carbonaceous shale. This zone is 100 to 150 feet thick. On the west flank of the Sweetgrass Arch this is underlain by another coal zone approximately 30 feet thick. This lowest zone is called the McKay coal horizon and loses its identity eastward as it passes into marine equivalent of the Pakowki Formation. The McKay coal horizon is underlain by the basal Foremost sandstone locally called the Verdigris sandstone from its occurrence in Verdigris Coulee near the town of Milk River."

The Oldman Formation, also known as the Pale Beds, is typically composed of light-colored sandstones and shales. Although the color of individual beds range from pale gray to dark brown, the general tone of outcrops, seen from a distance, is light greenish gray. The coarser beds commonly show striking crossbedding and other evidence of stream deposition, and are rather lenticular. Fossil invertebrates are almost exclusively fresh and brackish water forms and are confined to the very top of the formation.

The Formation may be divided into two members according to Crockford (1949): an upper coaly and carbonaceous member mainly of brackish-water origin varying in thickness from a few feet to 80 feet or more and commonly referred to as the Lethbridge Member, and a lower member which consists essentially of sandstones and shales. The lower sandstone and shale member makes up the majority of the Oldman Formation. The sandstones are generally poorly cemented by clay minerals and are easily weathered. They are usually fine-to medium-grained and very lenticular with poor lateral persistency. Individual sandstone lenses up to 15 to 20 feet thick are common and are typically brown weathering.

Considerable discussion has been generated regarding the contact between the Oldman and Foremost beds. Dowling (1917) states, "The contact of the Foremost beds with the Pale beds (Oldman Formation) is gradational rather than abrupt and cannot be used as a horizon for detailed mapping." In early mapping the color change between the Pale beds (Oldman Formation) and the Yellow beds (Foremost Formation) was used, however, this is not a useful method in subsurface work. Crockford (1949) says of his cross sections across the southern plains: "The varying stratigraphic position of the Oldman-Foremost contact is placed at the top of the uppermost prominent carbonaceous bed and at the place where the color change in sediments is most apparent."

McLean (1971) lists the characteristics for differentiation of the Oldman and Foremost Formations. The most significant differences include:

a. Oldman strata are generally lighter-colored.
b. Coal and carbonaceous beds are more prevalent throughout the Foremost beds, whereas coal is common only in the uppermost portion of the Oldman Formation.
c. Cross-bedding is more common in the Oldman Formation.
d. Fossils, mainly brackish-water types are common in the Foremost Formation, while fresh-water types prevail in the Oldman Formation.

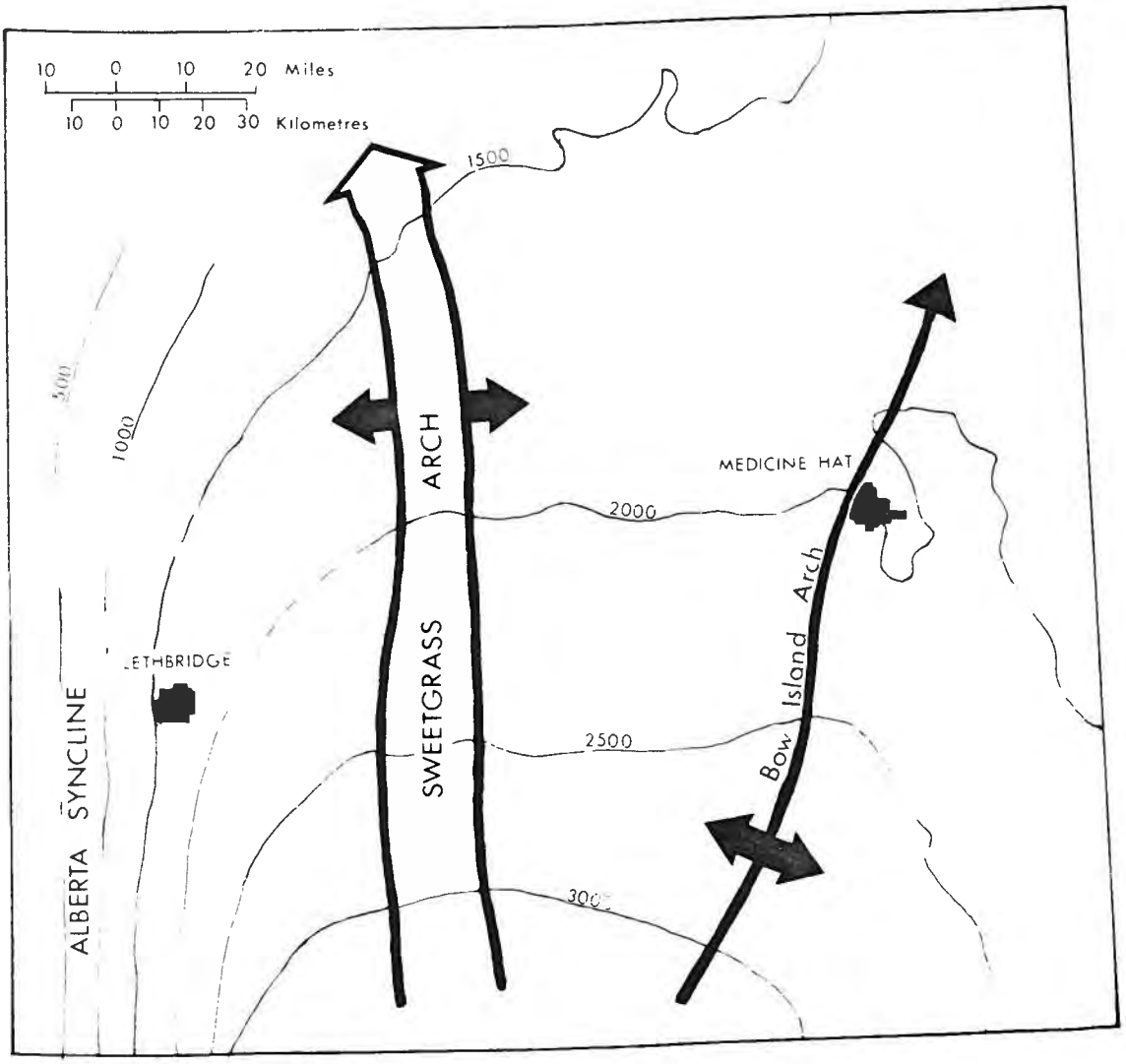
For the purpose of this report the contact is placed immediately above the top of the Taber coal horizon and below basal Oldman sandstones. As will be shown later, this horizon is relatively easy to recognize, remains at a consistent stratigraphic position, and is not dependent upon coloration parameters for definition.

The contact of the Bearpaw and Oldman Formations is ordinarily sharp and easy to identify whereas the contact between the Foremost and Pakowki beds is not always obvious. Crockford (1949) placed the basal contact of the Foremost at the base of the lowest prominent sandstone below the lowest carbonaceous bed, and above marine shales.

The Horseshoe Canyon formational terminology is derived from Irish (1970). A generalized description of the stratigraphy and historical development of nomenclature for this unit is included in Holter, Chu and Yurko (1975). The 1976 drilling program, as applied to investigation of the Horseshoe Canyon Formation is, in fact, an extension of this work. South of the area in which drilling was carried out the nomenclature changes. The St. Mary River Formation (Dawson, 1884), together with the underlying massive sandstones of the Blood Reserve Formation (Russell, 1932), are equivalent to the Horseshoe Canyon and occur immediately above the marine Bearpaw Formation.

The predominant structure within the area is the Sweetgrass Arch, a north plunging anticline which trends north-northeast (Fig. 4). Its southern culmination is the uplift of Little Belt Mountains, southeast of Great Falls, Montana, within which Paleozoic and older rocks are brought to surface. In Alberta the arch is broader and the axis bifurcates to also form a northeast trending branch called the Bow Island Arch (Tovell, 1958; McLean, 1971). The anticlinal plunge averages 20 to 30 feet to the mile to the north, although southerly bedding dips are very exceptional. Essentially, the southern Alberta plains are structurally part of the northern flank of the Kevin-Sunburst dome.

The Sweetgrass Arch in southern Alberta bears a number of subsidiary folds. Along the western margin of the area the dips increase to between 50 to 100 feet per mile and this continues to the axis of the Alberta syncline which lies west of the arch. Subsidiary folds also occur on the flanks of the Alberta syncline, most of them having a trend that parallels the axis of the main structure. Many small local structures are present within the study area and these are documented by Russell and Landes (1940).


10 0 10 20 Miles
10 0 10 20 30 Kilometres
1500
1000
500
2000
2500
3000
MEDICINE HAT
LETHBRIDGE
ALBERTA SYNCLINE
SWEETGRASS ARCH
Bow Island Arch

COAL MINES

A number of small mines formerly produced subbituminous coal within the study area and figure 5 illustrates the distribution of the mines (including some parcels licensed for mining) in relationship to the regional geology. The mine information is derived from Campbell (1964) and locations are plotted to no greater detail than whole sections enclosing the individual mines.

Abandoned Foremost mines are widely scattered throughout the area (see Campbell, 1964, 1974). Mines near Taber (Tp. 10, R. 16 W4) were operating until recently. Coal mining operations of note were also active south of Brooks (Tp. 14, R. 13 W4), south of Suffield (Tp. 12, R. 10 W4) and at Medicine Hat.

Coal mines producing from the Lethbridge Member of the Oldman Formation were centred in two main regions. Considerable mining was formerly carried out in the Lethbridge area, almost exclusively by underground methods. Detailed information on the coal field is available in Crawford (1947). The Bow City area (Tp. 17, R. 17 W4) has been active until the present with strip mining being carried out to meet the light demands for a local domestic coal supply.

The most important Horseshoe Canyon mines were located in the McGregor Lake - Travers Reservoir areas (particularly Tp. 14, R. 21 W4). Significant mine sites were also located near Vulcan (Tp. 15, R. 23 W4), Cluny (Tp. 21, R. 21 W4), and Bassano (Tp. 20, R. 19 W4). More detailed descriptive information is available from Campbell and Almadi (1964).

FOREMOST FORMATION COAL SEAMS

The lateral persistence of the Foremost coal seams has been demonstrated to some extent by Crockford (1949) between an area south of Lethbridge to Medicine Hat, and between Farrow (Tp. 20, R. 25 W4) and McNeill (Tp. 20, R. 1 W4). Considerable useful detail was furnished from outcrop studies along the South Saskatchewan River between Bow Island (Tp. 11, R. 11 W4) and Medicine Hat.

Shallow occurrences of Upper Cretaceous coals in southeastern Alberta were investigated and reported on by Campbell (1974). An emphasis was placed on the study of Foremost coals and comprehensive shallow drilling coverage is provided in the report. No specific studies were devoted to correlation of the zones but the widespread distribution of seams is apparent.

Structure cross sections 1 to 5 (Figs. 7 to 10) illustrate the relationships of coal zones along an east-west line across the study area.

The McKay zone shows significant development over much of the area and varies from 70 to 90 feet in thickness. As many as eight thin seams have been noted within this unit. The zone normally occurs 200 to 250 feet below the Taber zone. To the east the McKay is not present due to lateral facies changes to deltaic sandstone and Pakowki marine shales. The shales occur progressively higher in the stratigraphic section towards the east to such an extent that the McKay disappears and the Taber zone is located immediately above the Pakowki Formation within the southeastern portion of the study area.

The Taber zone is the highest indication of coal in the Foremost and varies between 60 and 100 feet thick where it is not influenced by post-Cretaceous erosion. As many as five seams are present in the zone, although few exceed three feet in thickness. Along the lines of section

chosen for study the Taber zone is consistently developed with the exception of a region between Tps. 13 and 15. Extensive erosion has removed the upper part of the Foremost Formation here.

Section A-B (Fig. 11) confirms the existence of the Taber zone towards an area south of Medicine Hat. The additional 1977 drilling in the extreme southeast corner of the province, in townships 2 and 3, range 1 to 3 west of fourth meridian, indicates thinning of the Taber zone in this direction.

Only very minor stringers of coal were noted between the Taber and McKay zones throughout the area.

OLDMAN FORMATION COAL SEAMS

The upper part of the Oldman Formation was penetrated in several testholes on the west flank of the Sweetgrass Arch along a line between the Magrath area (Tp. 4, R. 21 W4) and the Bassano region (Tp. 22, R. 17 W4; see figures 6, 12, 13 and 14). The major coal seams associated with the formation occur in the Lethbridge Member, as delineated by Russell and Landes (1940). The member underlies the Bearpaw Formation and is up to 80 feet thick. For the purpose of this report only that portion of the member that includes all the significant coal seams and carbonaceous beds is outlined and is herein called the Lethbridge coal zone. In most cases the zonal and member units are approximately the same. The zone is present across the entire area and may include up to 60 feet of strata including as many as four coal seams. The seams are generally thin and lack lateral persistence except in the Lethbridge area. The major seam in the Lethbridge area has been referred to as the Lethbridge (Crawford, 1947) or Galt seam and is readily traceable between Tps. 7 and 12. North of this area seams are thin and erratically developed with the exception of Tps. 16 and 17 where the coal beds are locally thick.

One supplementary testhole was drilled in 1977 in the north central region of the study area (Tp. 20, R. 15 W4). In this testhole (12-77) a four-foot seam of the Lethbridge coal zone was encountered. The 1976 testhole to the west of hole 12-77 (76-76) showed two and three-foot seams, which may suggest an eastward thickening of the Lethbridge zone in this area. Further drilling to the east of this hole 12-77 could provide valuable information about the Lethbridge zone, however, due to the restrictions on drilling in the Suffield gas block, no holes were drilled in this area.

The Lethbridge coal zone was tested on the eastern flank of the Sweetgrass Arch at three locations (THs. 102, 103 and 107-76). The zone is prominently developed but considerably thinner than to the west. The included seams are thin and erratic. Supplementary test drilling on this eastern flank in 1977 (THs. 2, 4, 6, 7, and 8-77) confirmed the eastward thinning of the Lethbridge coal zone.

HORSESHOE CANYON FORMATION COAL SEAMS

A drilling pattern was established between Hussar (Tp. 24, R. 20 W4) to Lethbridge to evaluate the Horseshoe Canyon coal seams. Well control and lines of section are shown in figure 6. Cross sections H to K (Figs. 16, 17 and 18) illustrate correlative units between the study area of Holter, Chu and Yurko (1976; TH 95-75, NE Sec. 20-24-20 W4) and the southern limits of coal occurrences. The coal-bearing intervals adopted herein are similar to those employed in this previous study. They are arbitrary groupings of seams and stringers separated by relatively barren sections of strata.

Relationships between the well-documented Drumheller area and the region of testhole 95-75 are poorly understood because of the general absence of coal in the intervening area. Between one and four coal-bearing intervals are defined within the study area to as far south as Tp. 13. To the south of this area the coal is largely absent due to nondeposition.

The more prominent coal seams occur within approximately 150 feet of stratigraphic section 30 to 300 feet above the underlying Bearpaw Formation.

COAL RESOURCES

The widespread nature of the drilling program limits the degree to which specific estimates of coal reserves can be carried out. Several generalizations can be made, however, with regards to the distribution of coal and the areas of better development of the seams. Figure 19 shows the thickness and depth parameters for the best (thickest) coal seam in each of the testholes. The values given on the map include the thicknesses of shale partings. Data on the aggregate thickness of coal penetrated at each drill site is presented on figure 20.

Coal seams in the Foremost Formation are generally thin, seldom exceeding 4 feet in thickness. The only areas which contain significant coal beds as delineated by this study are: south and east of Lake Newell (Tps. 12 to 14, R. 15 and 16 W4), south and west of Medicine Hat (Tps. 6 to 8, R. 11 to R. 13 W4) and north of Pakowki Lake (Tp. 7, R. 7 W4).

Aggregate thicknesses of seams are greatest in the same areas as those outlined for the "best" seams. The numbers of seams 3 feet thick or greater present in any given testhole may vary between one and four. A table listing individual seam thicknesses and depths is provided with figure 20.

Thick seams of coal within the Lethbridge zone are restricted to a limited area west and north of Lethbridge. The maximum amount encountered was 10 feet in the Galt seam in TH 29-76 (NE 11-8-11-21 W4). Because of the relatively abrupt change in dip towards the west the depth to the zone increases sharply away from the subcrop region. Seams of commercial thickness are undoubtedly present west of R. 23 W4 but no efforts were made to evaluate such deep western occurrences. No individual Lethbridge zone seams of commercial thickness were encountered elsewhere within the area.

The thicknesses of the best coal seams associated with the Horseshoe Canyon Formation may be as much as 14 feet (TH 56-76, NE 21-18-23 W4). Average values are much lower, however, and thicknesses of 5 feet or slightly greater are confined to Tp. 15, R. 22 W4 and areas immediately north and south of the Crowfoot Indian Reserve (Tps. 19 to 23). The depths of these seams are highly variable, ranging from 189 to 877 feet.

CONCLUSIONS

Four prominent Upper Cretaceous coal-bearing units are recognized within the study area; the McKay and Taber zones of the Foremost Formation, the Lethbridge zone of the Oldman Formation, and the Horseshoe Canyon Formation. The north plunging Sweetgrass Arch divides the study area into two structural regions. The Taber zone is more or less uniformly developed across the entire area whereas the McKay zone disappears to the east due to the lateral change of basal Foremost beds to marine facies of the underlying Pakowki Formation. Seams in both zones are generally thin and of limited economic significance. Some thick coal beds are found in the Taber zone, however, and these are located in the Lake Newell, Medicine Hat and Pakowki Lake areas.

The Lethbridge coal zone is recognized on both sides of the arch but is of greatest commercial interest on the western flank, particularly in the Lethbridge area.

Coal seams in the Horseshoe Canyon Formation are well developed in the northwest part of the study area, on the west side of the Sweetgrass Arch.

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LEGEND

TERTIARY AND CRETACEOUS

- Tc Cypress Hills Formation
- TKr Ravenscrag Formation
- TKp Paskapoo Formation
- TKw Willow Creek Formation

CRETACEOUS

- Ksm St. Mary River Formation
- Kbo Blood Reserve Formation
- Khc Horseshoe Canyon Formation (including Whitemud and Battle Formations)

CRETACEOUS (cont.)

- Kwb Whitemud and Battle Formations
- Ke Eastend Formation
- Kbp Bearpaw Formation
- Kom Oldman Formation } Belly River Formation
- Kfm Foremost Formation } Belly River Formation
- Kpk Pakowki Formation
- Kmr Milk River Formation

Geology after : Irish, 1968; Russell, 1940; and Stewart, 1943

FIGURE 5

COAL MINES *

SYMBOLS

- Horseshoe Canyon Formation Coal Mines
- Oldman Formation Coal Mines
- Foremost Formation Coal Mines
- •64 1976 Test Hole ■98 1975 Test Hole •16C Core Hole
- Rock Unit Boundary ▲3 1977 Test Hole

SCALE

5 0 5 10 15 20 MILES

5 0 5 10 15 20 25 30 KILOMETRES

To accompany Alberta Research Council Report by M.E. Holter and M. Chu

Alberta RESEARCH COUNCIL

* including mines and land licensed for mining

LEGEND

TERTIARY AND CRETACEOUS

- Tc Cypress Hills Formation
- TKr Ravenscrag Formation
- TKp Paskapoo Formation
- TKw Willow Creek Formation

CRETACEOUS

- Ksm St. Mary River Formation
- Kbo Blood Reserve Formation
- Khc Horseshoe Canyon Formation (including Whitemud and Battle Formations)

CRETACEOUS (cont.)

- Kwb Whitemud and Battle Formations
- Ke Eastend Formation
- Kbp Bearpaw Formation
- Kom Oldman Formation } Belly River Formation
- Kfm Foremost Formation } Belly River Formation
- Kpk Pakowki Formation
- Kmr Milk River Formation

Geology after: Irish, 1968; Russell, 1940; and Stewart, 1943

FIGURE 6

AREA OF STUDY AND LINES OF CROSS SECTION

SYMBOLS

- $\bullet^{64}$ 1976 Test Hole
- $\blacksquare^{98}$ 1975 Test Hole
- $\bullet^{16C}$ Core Hole
- Rock Unit Boundary
- $\blacktriangle^{3}$ 1977 Test Hole

SCALE

5 0 5 10 15 20 MILES

5 0 5 10 15 20 25 30 KILOMETRES

To accompany Alberta Research Council Report by M.E. Holter and M. Chu

Alberta RESEARCH COUNCIL

FIGURE 7

STRUCTURAL CROSS SECTION 1-2

SCALE 1:250,000

Miles 5 0 5 10 15 20 Miles

Kilometres 5 0 5 10 15 20 25 30 Kilometres

ALBERTA RESEARCH
TH 43 - 76
NE 16 - 17 - 22 W4
SURF. ELEV. 3055 FT.
K.B. ELEV. 3060.5 FT.
TOTAL DEPTH 569 FT.

ALBERTA RESEARCH
TH 41 - 76
NE 3 - 17 - 21 W4
SURF. ELEV. 2950 FT.
K.B. ELEV. 2954 FT.
TOTAL DEPTH 888 FT.

ALBERTA RESEARCH
TH 44 - 76
NE 22 - 17 - 20 W4
SURF. ELEV. 2925 FT.
K.B. ELEV. 2929 FT.
TOTAL DEPTH 808 FT.

ALBERTA RESEARCH
TH 45 - 76
NE 16 - 17 - 19 W4
SURF. ELEV. 2798 FT.
K.B. ELEV. 2802 FT.
TOTAL DEPTH 587 FT.

ALBERTA RESEARCH
TH 78 - 76
NE 34 - 16 - 18 W4
SURF. ELEV. 2670 FT.
K.B. ELEV. 2674 FT.
TOTAL DEPTH 405 FT.

ALBERTA RESEARCH
TH 77 - 76
NE 22 - 16 - 17 W4
SURF. ELEV. 2530 FT.
K.B. ELEV. 2534 FT.
TOTAL DEPTH 645 FT.

DEPTH (ABOVE MEAN SEA LEVEL)
METRES FEET

QUATERNARY

UPPER CRETACEOUS

HORSESHOE CANYON FM.

BEARPAW FM.

LETHBRIDGE ZONE

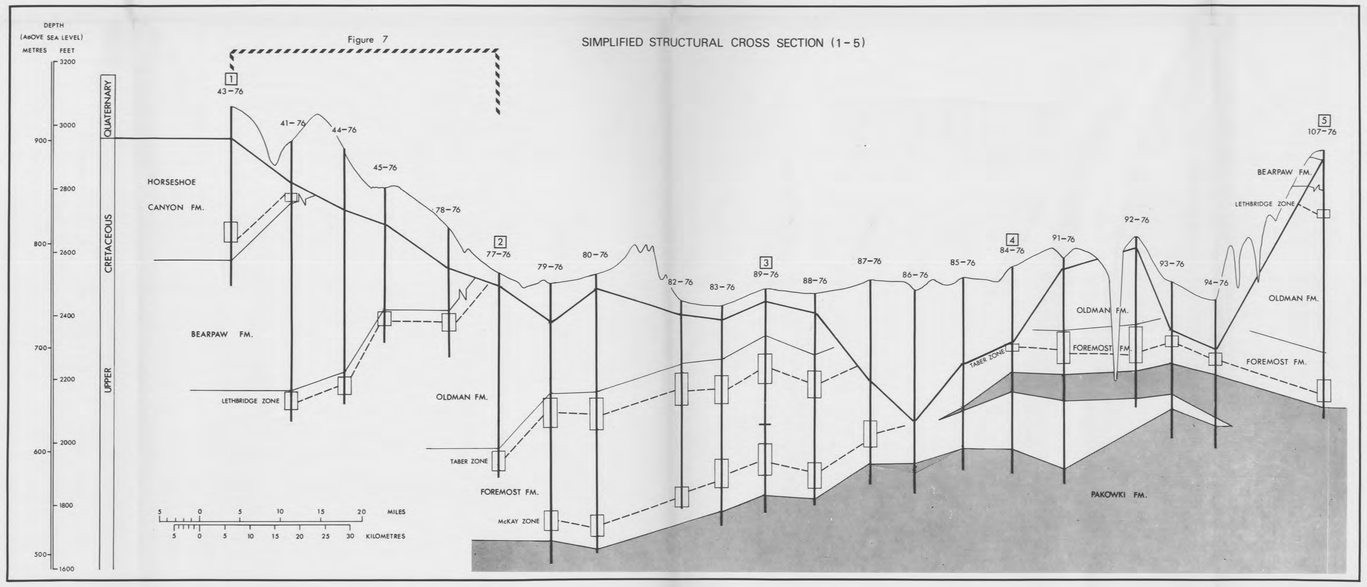
OLDMAN FM.

TABER ZONE

FOREMOST FM.

Figure 7

SIMPLIFIED STRUCTURAL CROSS SECTION (1-5)



Gravel

Drift

Sandstone

Siltstone

Shale

Shale, carbonaceous

Concretionary bed (hard ledge)

Coal

8 Coal drill cuttings sample

Cored interval

Top of bedrock

Formation boundary

Coal seam correlation (definite, uncertain)

Coal zone and/or coal-bearing interval

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by M.E.Holter and M.Chu

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FIGURE 8

STRUCTURAL CROSS SECTION 2-3

ALBERTA RESEARCH
TH 77 - 76
NE 22 - 16 - 17 W4
SURF. ELEV. 2530 FT.
K.B. ELEV. 2534 FT.
TOTAL DEPTH 645 FT.

ALBERTA RESEARCH
TH 79 - 76
NE 10 - 16 - 16 W4
SURF. ELEV. 2497 FT.
K.B. ELEV. 2502.5 FT.
TOTAL DEPTH 883 FT.

ALBERTA RESEARCH
TH 80 - 76
NE 21 - 16 - 15 W4
SURF. ELEV. 2528 FT.
K.B. ELEV. 2533.5 FT.
TOTAL DEPTH 886 FT.

ALBERTA RESEARCH
TH 82 - 76
NE 23 - 15 - 14 W4
SURF. ELEV. 2440 FT.
K.B. ELEV. 2445.5 FT.
TOTAL DEPTH 652 FT.

ALBERTA RESEARCH
TH 83 - 76
NE 15 - 15 - 13 W4
SURF. ELEV. 2428 FT.
K.B. ELEV. 2432 FT.
TOTAL DEPTH 691 FT.

ALBERTA RESEARCH
TH 89 - 76
NE 23 - 15 - 14 W4
SURF. ELEV. 2480 FT.
K.B. ELEV. 2485.5 FT.
TOTAL DEPTH 705 FT.

DEPTH
(ABOVE MEAN SEA LEVEL)
METRES FEET

QUATERNARY

UPPER CRETACEOUS

OLDMAN FM.

TABER ZONE

FOREMOST FM.

McKAY ZONE

PAKOWKI FM.

SIMPLIFIED STRUCTURAL CROSS SECTION (1 - 5)

DEPTH
(ABOVE SEA LEVEL)
METRES FEET

QUATERNARY

UPPER CRETACEOUS

1 43-76
41-76
44-76
45-76
78-76
2 77-76
79-76
80-76
82-76
83-76
3 89-76
88-76
87-76
86-76
85-76
4 84-76
91-76
92-76
93-76
94-76
5 107-76

HORSESHOE CANYON FM.

BEARPAW FM.

LETHBRIDGE ZONE

OLDMAN FM.

TABER ZONE

FOREMOST FM.

McKAY ZONE

PAKOWKI FM.

Figure 8

5 0 5 10 15 20 MILES
5 0 5 10 15 20 25 30 KILOMETRES

SCALE 1:250,000

Miles 5 0 5 10 15 20 Miles
Kilometres 5 0 5 10 15 20 25 30 Kilometres

- Gravel
- Drift
- Sandstone
- Siltstone
- Shale
- Shale, carbonaceous
- Concretionary bed (hard ledge)
- Coal

8 Coal drill cuttings sample

Cored interval

Top of bedrock

Formation boundary

Coal seam correlation (definite, uncertain)

Coal zone and/or coal-bearing interval

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FIGURE 9

STRUCTURAL CROSS SECTION 3-4

ALBERTA RESEARCH
TH 89 - 76
NE 23 - 15 - 14 W4
SURF. ELEV. 2480 FT.
K.B. ELEV. 2485.5 FT.
TOTAL DEPTH 705 FT.

ALBERTA RESEARCH
TH 88 - 76
NE 21 - 15 - 11 W4
SURF. ELEV. 2470 FT.
K.B. ELEV. 2474 FT.
TOTAL DEPTH 669 FT.

ALBERTA RESEARCH
TH 87 - 76
NE 21 - 14 - 11 W4
SURF. ELEV. 2465 FT.
K.B. ELEV. 2470.5 FT.
TOTAL DEPTH 646 FT.

ALBERTA RESEARCH
TH 86 - 76
NE 21 - 14 - 10 W4
SURF. ELEV. 2475 FT.
K.B. ELEV. 2479 FT.
TOTAL DEPTH 636 FT.

ALBERTA RESEARCH
TH 85 - 76
NE 22 - 13 - 10 W4
SURF. ELEV. 2520 FT.
K.B. ELEV. 2525.5 FT.
TOTAL DEPTH 609 FT.

ALBERTA RESEARCH
TH 84 - 76
NE 22 - 13 - 9 W4
SURF. ELEV. 2553 FT.
K.B. ELEV. 2557 FT.
TOTAL DEPTH 651 FT.

DEPTH
(ABOVE MEAN SEA LEVEL)
METRES FEET

QUATERNARY

UPPER CRETACEOUS

OLDMAN FM.

TABER ZONE

FOREMOST FM.

McKAY ZONE

PAKOWKI FM.

TABER ZONE

SCALE 1:250,000
Miles 5 0 5 10 15 20 Miles
Kilometres 5 0 5 10 15 20 25 30 Kilometres

SIMPLIFIED STRUCTURAL CROSS SECTION (1-5)

DEPTH
(ABOVE SEA LEVEL)
METRES FEET

QUATERNARY

UPPER CRETACEOUS

1 43-76
41-76
44-76
45-76
78-76
2 77-76
79-76
80-76
82-76
83-76
3 89-76
88-76
87-76
86-76
85-76
4 84-76
91-76
92-76
93-76
94-76
5 107-76

HORSESHOE CANYON FM.

BEARPAW FM.

LETHBRIDGE ZONE

OLDMAN FM.

TABER ZONE

FOREMOST FM.

McKAY ZONE

PAKOWKI FM.

Figure 9

5 0 5 10 15 20 MILES
5 0 5 10 15 20 25 30 KILOMETRES

- Gravel
- Drift
- Sandstone
- Siltstone
- Shale
- Shale, carbonaceous
- Concretionary bed (hard ledge)
- Coal

8 — Coal drill cuttings sample

Cored interval

- Top of bedrock
- Formation boundary
- Coal seam correlation (definite, uncertain)
- Coal zone and/or coal-bearing interval

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FIGURE 10

STRUCTURAL CROSS SECTION 4-5

DEPTH (ABOVE MEAN SEA LEVEL)

METRES FEET

900 3000 · 850 2800 · 800 2700 · 750 2600 · 700 2500 · 650 2400 · 600 2300 · 550 2200 · 2100 · 2000 · 1900 · 1800

QUATERNARY

CRETACEOUS — UPPER

TABER ZONE

FOREMOST FM.

PAKOWKI FM.

ALBERTA RESEARCH
TH 84 - 76
NE 22 - 13 - 9 W4
SURF. ELEV. 2553 FT.
K.B. ELEV. 2557 FT.
TOTAL DEPTH 651 FT.

ALBERTA RESEARCH
TH 91 - 76
NE 22 - 13 - 8 W4
SURF. ELEV. 2580 FT.
K.B. ELEV. 2584 FT.
TOTAL DEPTH 710 FT.

OLDMAN FM.

ALBERTA RESEARCH
TH 92 - 76
NE 8 - 12 - 7 W4
SURF. ELEV. 2652.0 FT.
K.B. ELEV. 2657.5 FT.
TOTAL DEPTH 540 FT.

FOREMOST FM.

ALBERTA RESEARCH
TH 93 - 76
NE 22 - 11 - 7 W4
SURF. ELEV. 2485 FT.
K.B. ELEV. 2489 FT.
TOTAL DEPTH 469 FT.

ALBERTA RESEARCH
TH 94 - 76
NE 9 - 11 - 6 W4
SURF. ELEV. 2450 FT.
K.B. ELEV. 2454 FT.
TOTAL DEPTH 467 FT.

BEARPAW FM.

LETHBRIDGE ZONE

OLDMAN FM.

FOREMOST FM.

TABER ZONE

PAKOWKI FM.

ALBERTA RESEARCH
TH 107 - 76
SE 3 - 11 - 4 W4
SURF. ELEV. 2927 FT.
K.B. ELEV. 2931 FT.
TOTAL DEPTH 849 FT.

SPONTANEOUS POTENTIAL — Millivolts — 10 — 0 — +10

GAMMA RAY & CALIPER — API UNITS 30 80 130 — HOLE SIZE INCHES 5 7 9 11 13

BULK DENSITY GRAMS/CC — CORRECTION -.05 0 +.05 — 2.0 2.5 3.0

CONDUCTIVITY — Millimhos/m — INDUCTION CONDUCTIVITY 40' SPACING 1000 500 0

RESISTIVITY — Ohms m² / m — FOCUS RESISTIVITY 0 20 200 — INDUCTION RESISTIVITY 40' SPACING 0 20 200

SIMPLIFIED STRUCTURAL CROSS SECTION (1-5)

DEPTH (ABOVE SEA LEVEL)

METRES FEET

900 3000 · 800 2800 · 700 2600 · 600 2400 · 2200 · 2000 · 1800 · 500 1600

QUATERNARY

CRETACEOUS — UPPER

1 43-76 · 41-76 · 44-76 · 45-76 · 78-76 · 2 77-76 · 79-76 · 80-76 · 82-76 · 83-76 · 3 89-76 · 88-76 · 87-76 · 86-76 · 85-76 · 4 84-76 · 91-76 · 92-76 · 93-76 · 94-76 · 5 107-76

HORSESHOE CANYON FM.

BEARPAW FM.

LETHBRIDGE ZONE

OLDMAN FM.

TABER ZONE

FOREMOST FM.

McKAY ZONE

PAKOWKI FM.

5 0 5 10 15 20 MILES

5 0 5 10 15 20 25 30 KILOMETRES

Figure 10

SCALE 1:250,000

Miles 5 0 5 10 15 20 Miles

Kilometres 5 0 5 10 15 20 25 30 Kilometres

- Gravel
- Drift
- Sandstone
- Siltstone
- Shale
- Shale, carbonaceous
- Concretionary bed (hard ledge)
- Coal

8 — Coal drill cuttings sample

Cored interval

- Top of bedrock
- Formation boundary
- Coal seam correlation (definite, uncertain)
- Coal zone and/or coal-bearing interval

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ALBERTA RESEARCH
TH 93 - 76
NE 22 - 11 - 7 W4
SURF. ELEV. 2485 FT.
K.B. ELEV. 2489 FT.
TOTAL DEPTH 469 FT.

ALBERTA RESEARCH
TH 96 - 76
NE 21 - 9 - 7 W4
SURF. ELEV. 2875.0 FT.
K.B. ELEV. 2880.5 FT.
TOTAL DEPTH 588 FT.

ALBERTA RESEARCH
TH 97 - 76
NE 21 - 8 - 7 W4
SURF. ELEV. 3058 FT.
K.B. ELEV. 3062 FT.
TOTAL DEPTH 651 FT.

ALBERTA RESEARCH
TH 98 - 76
NE 10 - 7 - 7 W4
SURF. ELEV. 2925.0 FT.
K.B. ELEV. 2930.5 FT.
TOTAL DEPTH 507 FT.

ALBERTA RESEARCH
TH 99 - 76
NE 20 - 5 - 6 W4
SURF. ELEV. 2945 FT.
K.B. ELEV. 2949 FT.
TOTAL DEPTH 448 FT.

ALBERTA RESEARCH
TH 100 - 76
NE 9 - 4 - 5 W4
SURF. ELEV. 3135 FT.
K.B. ELEV. 3140.5 FT.
TOTAL DEPTH 625 FT.

VERTICAL SCALE METRES FEET

UPPER CRETACEOUS — QUATERNARY

OLDMAN FM.

FOREMOST FM.

TABER ZONE

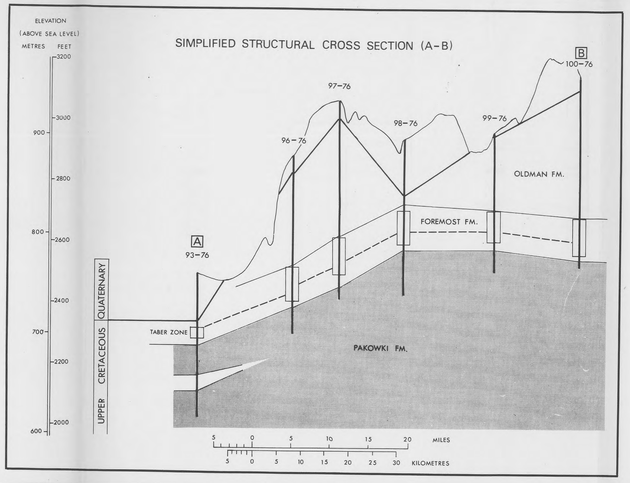
Datum

PAKOWKI FM.

FIGURE 11

CROSS SECTION A-B

Datum: Top of Pakowki Formation



Gravel
Drift
Sandstone
Siltstone
Shale
Shale, carbonaceous
Concretionary bed (hard ledge)
Coal

Coal drill cuttings sample
Cored interval
Top of bedrock
Formation boundary
Coal seam correlation (definite, uncertain)
Coal zone and/or coal-bearing interval

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SCALE 1:250,000
Miles 5 0 5 10 15 20 Miles
Kilometres 5 0 5 10 15 20 25 30 Kilometres

ALBERTA RESEARCH
TH 72 - 76
NE 21 - 22 - 17 W4
SURF. ELEV. 2530 FT.
K.B. ELEV. 2534 FT.
TOTAL DEPTH 568 FT.

ALBERTA RESEARCH
TH 74 - 76
NE 9 - 22 - 18 W4
SURF. ELEV. 2578 FT.
K.B. ELEV. 2583.5 FT.
TOTAL DEPTH 547 FT.

ALBERTA RESEARCH
TH 75 - 76
NE 22 - 20 - 18 W4
SURF. ELEV. 2670 FT.
K.B. ELEV. 2675.5 FT.
TOTAL DEPTH 603 FT.

ALBERTA RESEARCH
TH 53 - 76
NE 22 - 19 - 19 W4
SURF. ELEV. 2902 FT.
K.B. ELEV. 2906 FT.
TOTAL DEPTH 823 FT.

ALBERTA RESEARCH
TH 48 - 76
NE 8 - 18 - 19 W4
SURF. ELEV. 2960 FT.
K.B. ELEV. 2964 FT.
TOTAL DEPTH 823 FT.

SPONTANEOUS POTENTIAL
GAMMA RAY & CALIPER
BULK DENSITY GRAMS/CC
CONDUCTIVITY
RESISTIVITY

VERTICAL SCALE 1 in. = 75 ft.

METRES FEET

BEARPAW FM.

LETHBRIDGE ZONE

Datum

SIMPLIFIED STRUCTURAL CROSS SECTION (C-G)

DEPTH (ABOVE SEA LEVEL)

METRES FEET

Figure 12

C 72-76 · 74-76 · 75-76 · D 48-76 · 53-76 · 45-76 · 39-76 · 36-76 · 35-76 · E 30-76 · 26-76 · 29-76 · 23-76 · F 16-76 · 17-76 · ST MARY RIVER SECTION · 18-76 · G 21-76 · 19-76

QUATERNARY

UPPER CRETACEOUS

BEARPAW FM.

LETHBRIDGE ZONE

OLDMAN FM.

MILES

KILOMETRES

FIGURE 12

CROSS SECTION C-D

Datum: Top of Oldman Formation

SCALE 1:250,000

Miles / Kilometres

- Gravel
- Drift
- Sandstone
- Siltstone
- Shale
- Shale, carbonaceous
- Concretionary bed (hard ledge)
- Coal

- Coal drill cuttings sample
- Cored interval

- Top of bedrock
- Formation boundary
- Coal seam correlation (definite, uncertain)
- Coal zone and/or coal-bearing interval

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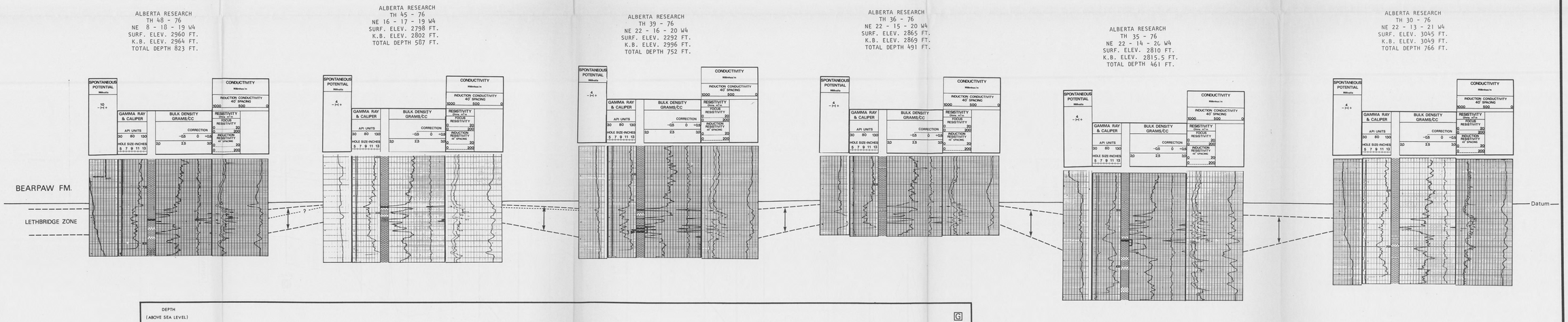

SIMPLIFIED STRUCTURAL CROSS SECTION (C-G)

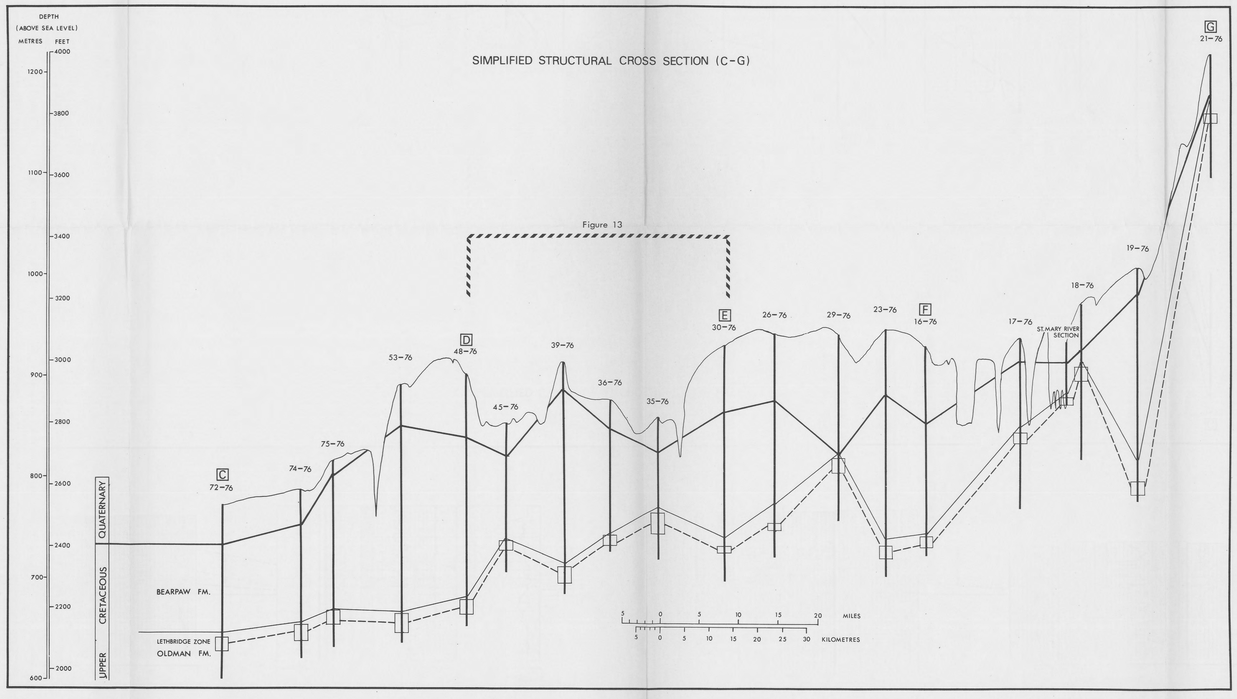

FIGURE 13

CROSS SECTION D-E

Datum: Top of Oldman Formation

SCALE 1:250,000

Miles 5 0 5 10 15 20 Miles

Kilometres 5 0 5 10 15 20 25 30 Kilometres

- Gravel
- Drift
- Sandstone
- Siltstone
- Shale
- Shale, carbonaceous
- Concretionary bed (hard ledge)
- Coal

8 Coal drill cuttings sample

Cored interval

Top of bedrock

Formation boundary

Coal seam correlation (definite, uncertain)

Coal zone and/or coal-bearing interval

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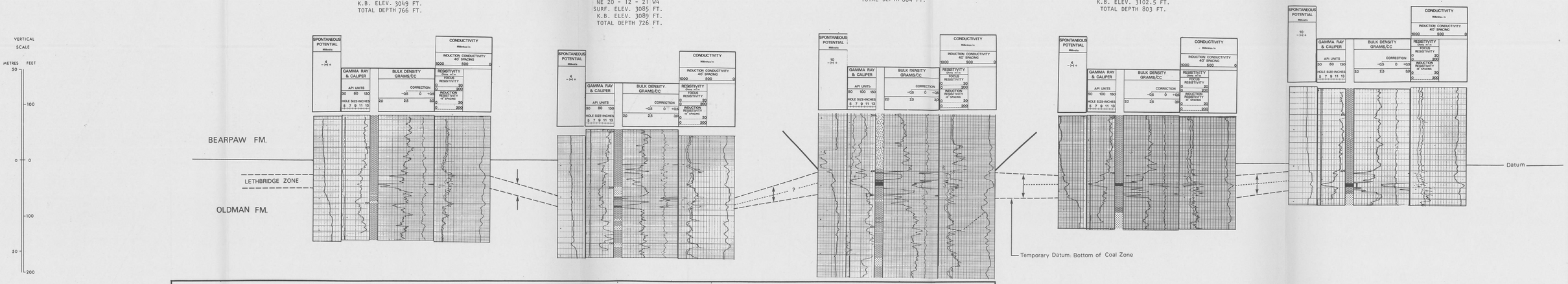
ALBERTA RESEARCH
TH 30 - 76
NE 22 - 13 - 21 W4
SURF. ELEV. 3045 FT.
K.B. ELEV. 3049 FT.
TOTAL DEPTH 766 FT.

ALBERTA RESEARCH
TH 26 - 76
NE 20 - 12 - 21 W4
SURF. ELEV. 3085 FT.
K.B. ELEV. 3089 FT.
TOTAL DEPTH 726 FT.

ALBERTA RESEARCH
TH 29 - 76
NE 8 - 11 - 21 W4
SURF. ELEV. 3079 FT.
K.B. ELEV. 3083 FT.
TOTAL DEPTH 604 FT.

ALBERTA RESEARCH
TH 23 - 76
NE 21 - 20 - 22 W4
SURF. ELEV. 3097 FT.
K.B. ELEV. 3102.5 FT.
TOTAL DEPTH 803 FT.

ALBERTA RESEARCH
TH 16 - 76
NE 35 - 9 - 22 W4
SURF. ELEV. 3022 FT.
K.B. ELEV. 3027.5 FT.
TOTAL DEPTH 664 FT.



SIMPLIFIED STRUCTURAL CROSS SECTION (C-G)

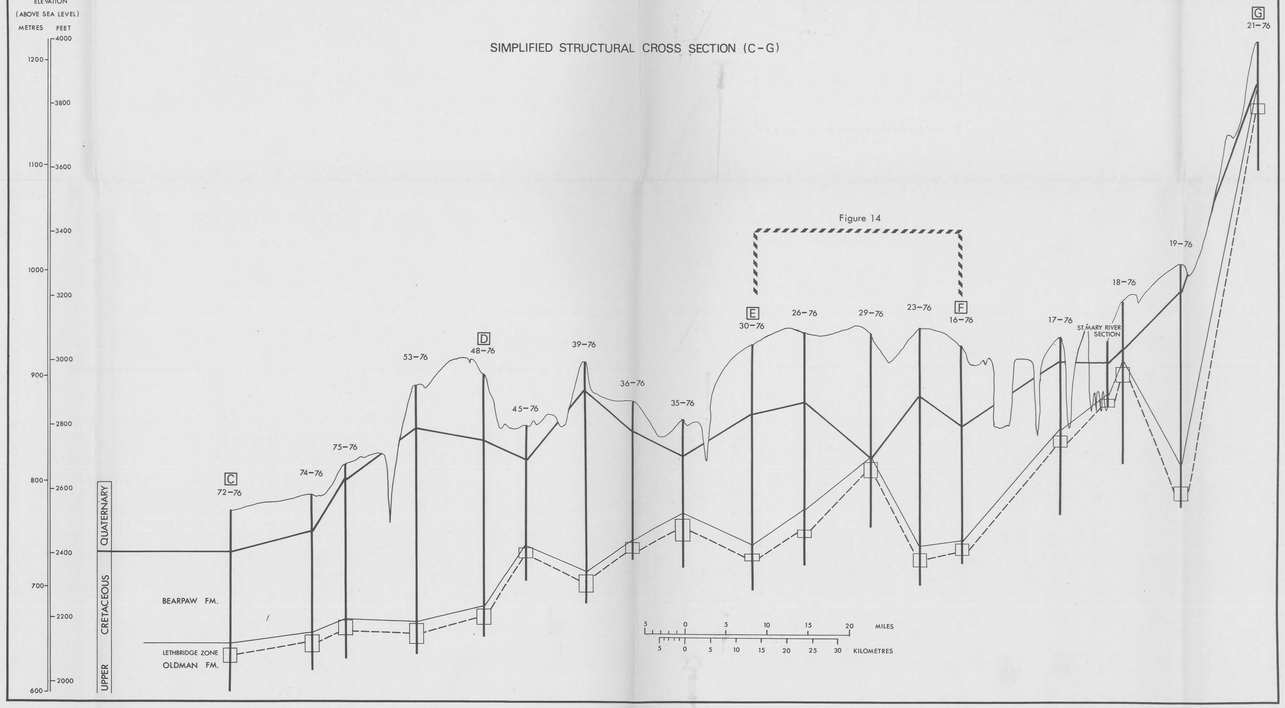


FIGURE 14

CROSS SECTION E-F

Datum: Top of Oldman Formation

SCALE 1:250,000
Miles / Kilometres

- Gravel
- Drift
- Sandstone
- Siltstone
- Shale
- Shale, carbonaceous
- Concretionary bed (hard ledge)
- Coal

8 ► Coal drill cuttings sample

Cored interval

Top of bedrock

Formation boundary

Coal seam correlation (definite, uncertain)

Coal zone and/or coal-bearing interval

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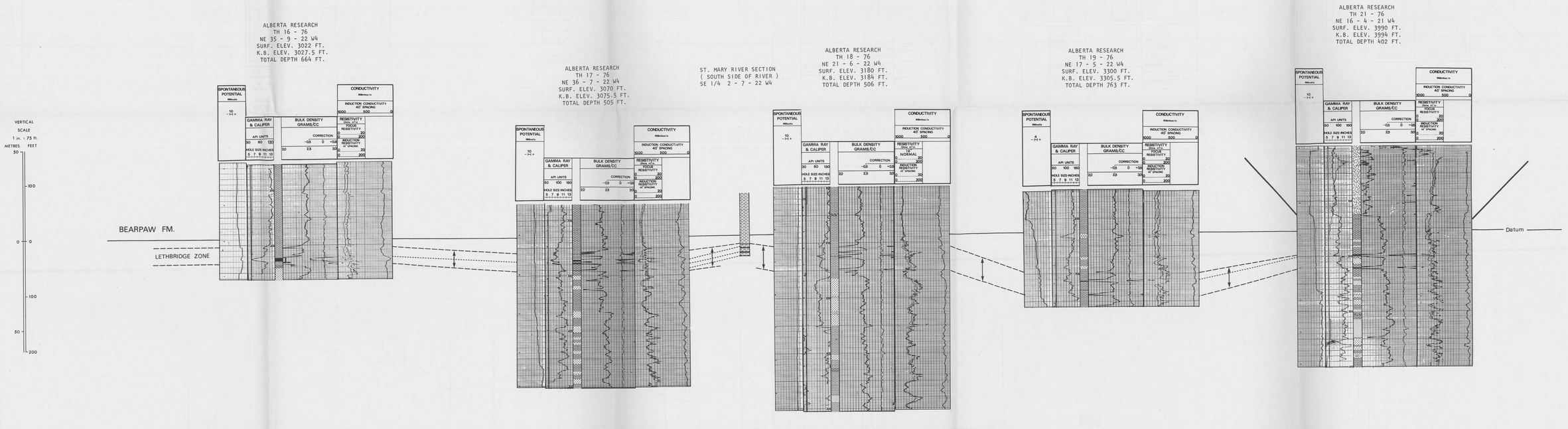

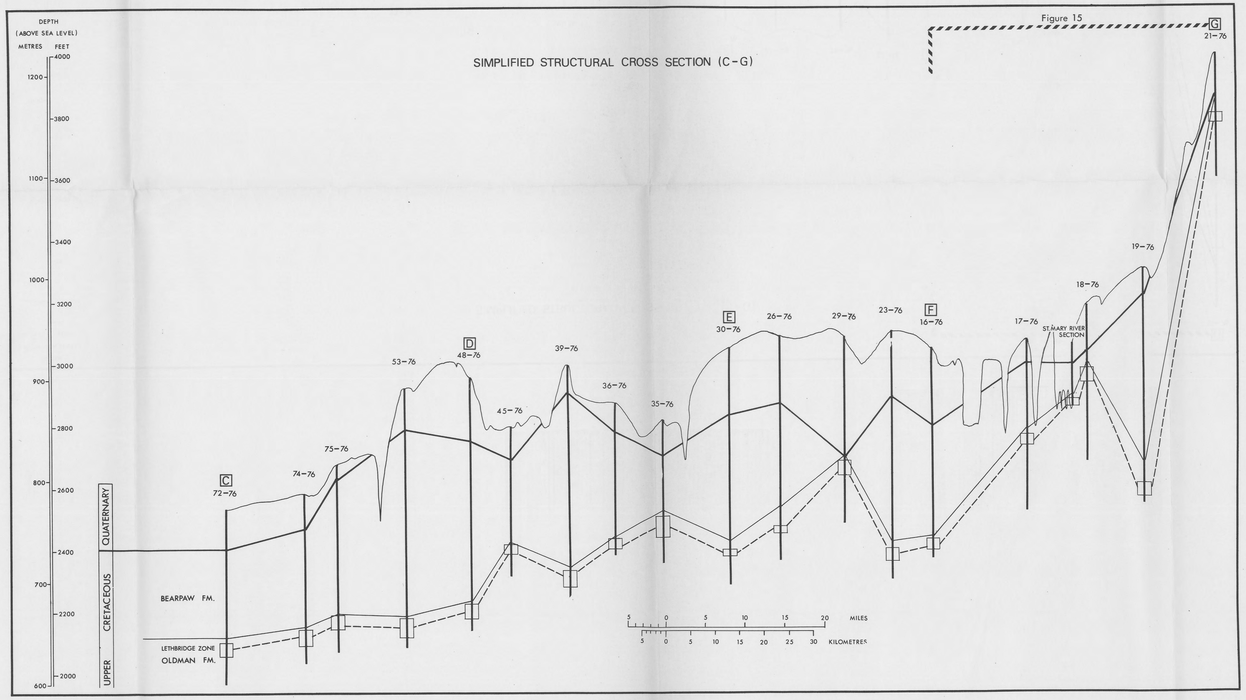

FIGURE 15

CROSS SECTION F-G

Datum: Top of Oldman Formation

SCALE 1:250,000

Miles / Kilometres

- Gravel
- Drift
- Sandstone
- Siltstone
- Shale
- Shale, carbonaceous
- Concretionary bed (hard ledge)
- Coal

- 8 ▶ Coal drill cuttings sample
- Cored interval
- Top of bedrock
- Formation boundary
- Coal seam correlation (definite, uncertain)
- Coal zone and/or coal-bearing interval

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ALBERTA RESEARCH
TH 95 - 75
NE 20 - 24 - 20 W4
SURF. ELEV. 2925 FT.
K.B. ELEV. 2929 FT.
TOTAL DEPTH 742 FT.

ALBERTA RESEARCH
TH 65 - 76
NE 20 - 23 - 20 W4
SURF. ELEV. 2800 FT.
K.B. ELEV. 2804 FT.
TOTAL DEPTH 569 FT.

ALBERTA RESEARCH
TH 62 - 76
NE 22 - 22 - 21 W4
SURF. ELEV. 3078 FT.
K.B. ELEV. 3082 FT.
TOTAL DEPTH 887 FT.

ALBERTA RESEARCH
TH 57 - 76
NE 10 - 22 - 22 W4
SURF. ELEV. 2940 FT.
K.B. ELEV. 2945.5 FT.
TOTAL DEPTH 786

ALBERTA RESEARCH
TH 60 - 76
NE 21 - 20 - 22 W4
SURF. ELEV. 2995 FT.
K.B. ELEV. 2999 FT.
TOTAL DEPTH 832 FT.

ALBERTA RESEARCH
TH 55 - 76
NE 10 - 20 - 21 W4
SURF. ELEV. 2830 FT.
K.B. ELEV. 2834 FT.
TOTAL DEPTH 505 FT.

DEPTH
METRES FEET

QUATERNARY
UPPER CRETACEOUS
HORSESHOE
CANYON FM.
BEARPAW FM.

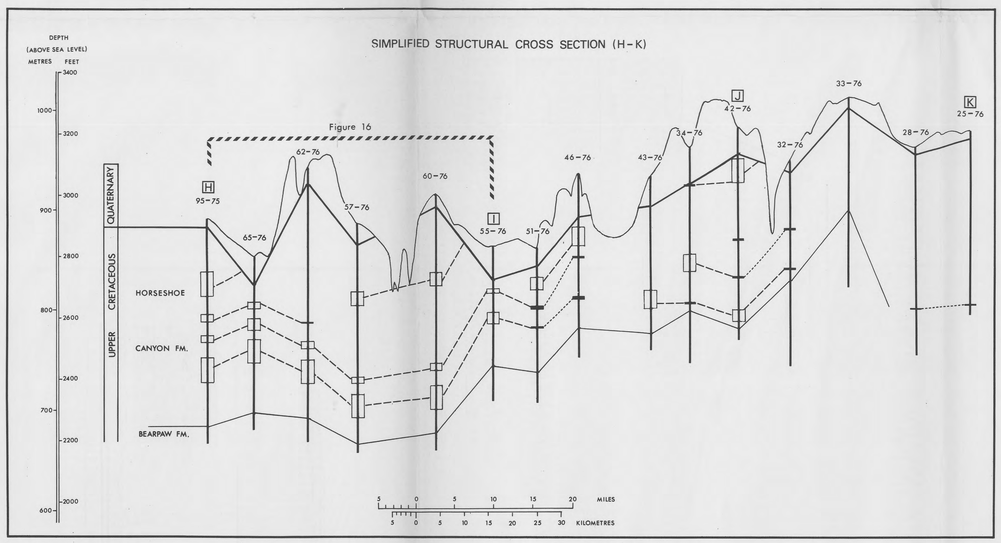
SPONTANEOUS POTENTIAL
GAMMA RAY & CALIPER
BULK DENSITY GRAMS/CC
CONDUCTIVITY
RESISTIVITY

FIGURE 16

CROSS SECTION H-I

Datum: Ground Level

SIMPLIFIED STRUCTURAL CROSS SECTION (H-K)



Gravel
Drift
Sandstone
Siltstone
Shale
Shale, carbonaceous
Concretionary bed (hard ledge)
Coal

Coal drill cuttings sample
Cored interval

Top of bedrock
Formation boundary
Coal seam correlation (definite, uncertain)
Coal zone and/or coal-bearing interval

SCALE 1:250,000
Miles
Kilometres

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Alberta RESEARCH COUNCIL

ALBERTA RESEARCH
TH 55 - 76
NE 10 - 20 - 21 W4
SURF. ELEV. 2830 FT.
K.B. ELEV. 2834 FT.
TOTAL DEPTH 505 FT.

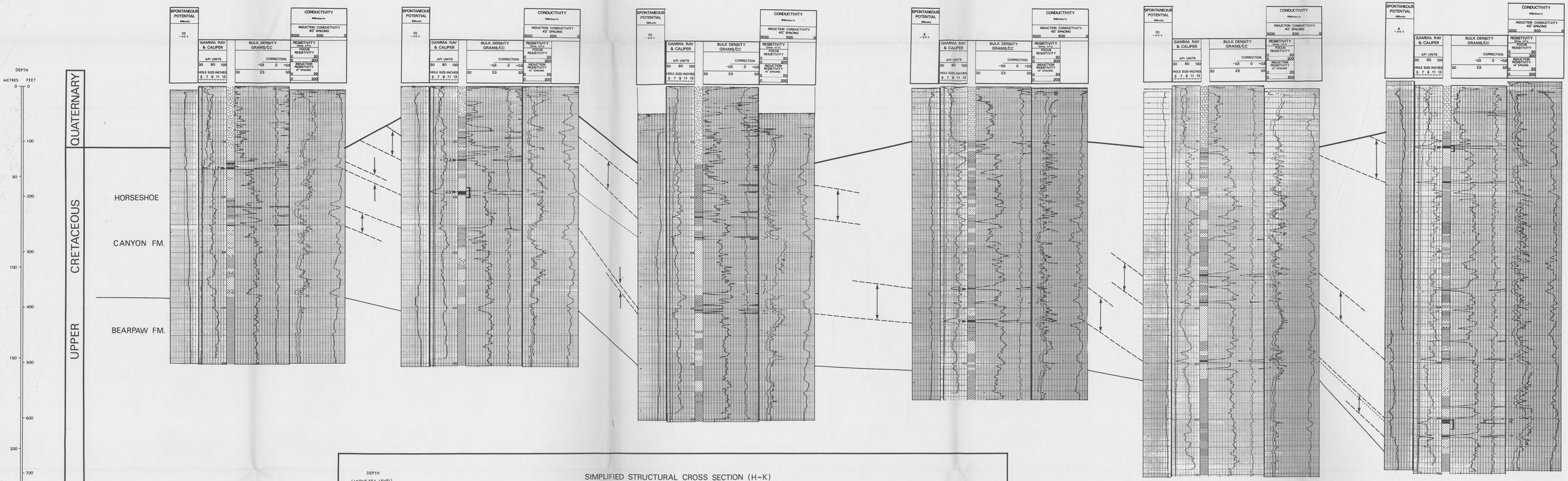
ALBERTA RESEARCH
TH 51 - 76
NE 17 - 19 - 21 W4
SURF. ELEV. 2823 FT.
K.B. ELEV. 2827 FT.
TOTAL DEPTH 506 FT.

ALBERTA RESEARCH
TH 46 - 76
NE 21 - 18 - 21 W4
SURF. ELEV. 3070 FT.
K.B. ELEV. 3075.5 FT.
TOTAL DEPTH 603 FT.

ALBERTA RESEARCH
TH 43 - 76
NE 16 - 17 - 22 W4
SURF. ELEV. 3055 FT.
K.B. ELEV. 3060.5 FT.
TOTAL DEPTH 569 FT.

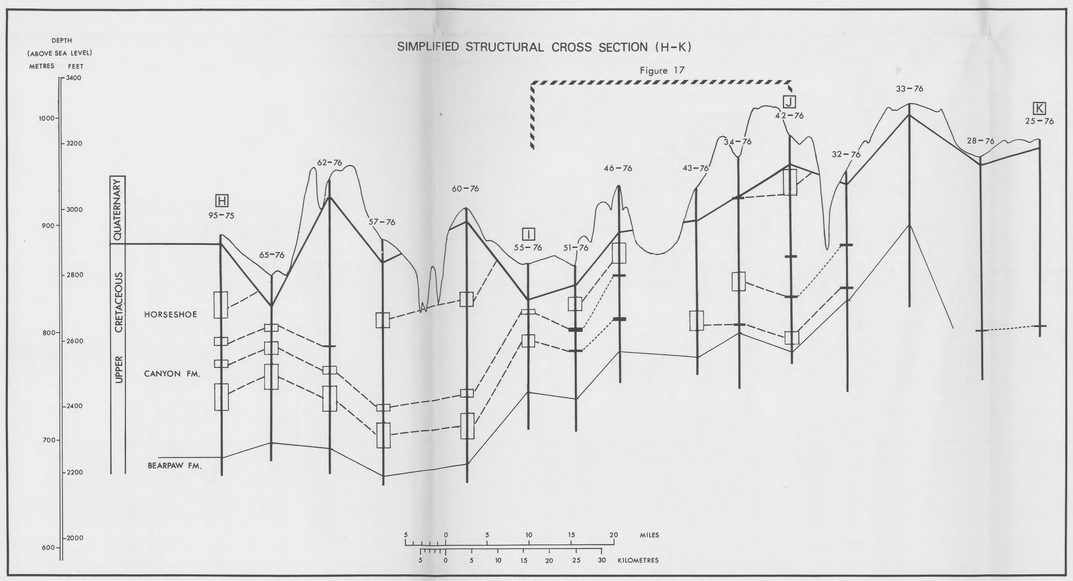
ALBERTA RESEARCH
TH 34 - 76
NE 22 - 16 - 22 W4
SURF. ELEV. 3150 FT.
K.B. ELEV. 3155.5 FT.
TOTAL DEPTH 703 FT.

ALBERTA RESEARCH
TH 42 - 76
NE 20 - 15 - 22 W4
SURF. ELEV. 3218 FT.
K.B. ELEV. 3223.5 FT.
TOTAL DEPTH 701 FT.



SIMPLIFIED STRUCTURAL CROSS SECTION (H-K)

Figure 17



Gravel
Drift
Sandstone
Siltstone
Shale
Shale, carbonaceous
Concretionary bed (hard ledge)
Coal

8 Coal drill cuttings sample
Cored interval

Top of bedrock
Formation boundary
Coal seam correlation (definite, uncertain)
Coal zone and/or coal-bearing interval

SCALE 1:250,000
Miles 5 0 5 10 15 20 Miles
Kilometres 5 0 5 10 15 20 25 30 Kilometres

FIGURE 17

CROSS SECTION I-J

Datum: Ground Level

To accompany Alberta Research Council Report
by M.E.Holter and M.Chu

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ALBERTA RESEARCH
TH 42 - 76
NE 20 - 15 - 22 W4
SURF. ELEV. 3218 FT.
K.B. ELEV. 3223.5 FT.
TOTAL DEPTH 701 FT.

ALBERTA RESEARCH
TH 32 - 76
NE 22 - 14 - 22 W4
SURF. ELEV. 3100 FT.
K.B. ELEV. 3104 FT.
TOTAL DEPTH 663 FT.

ALBERTA RESEARCH
TH 33 - 76
NE 16 - 13 - 22 W4
SURF. ELEV. 3310 FT.
K.B. ELEV. 3315.5 FT.
TOTAL DEPTH 646 FT.

ALBERTA RESEARCH
TH 28 - 76
LSD 14 - 16 - 12 - 23 W4
SURF. ELEV. 3153 FT.
K.B. ELEV. 3157 FT.
TOTAL DEPTH 681 FT.

ALBERTA RESEARCH
TH 25 - 76
NE 9 - 11 - 23 W4
SURF. ELEV. 3200 FT.
K.B. ELEV. 3204 FT.
TOTAL DEPTH 603 FT.

DEPTH
METRES FEET

QUATERNARY

UPPER CRETACEOUS

HORSESHOE CANYON FM.

BEARPAW FM.

SPONTANEOUS POTENTIAL
Millivolts

GAMMA RAY & CALIPER
API UNITS
HOLE SIZE-INCHES

BULK DENSITY GRAMS/CC
CORRECTION

RESISTIVITY
FOCUS RESISTIVITY
INDUCTION RESISTIVITY 16" SPACING

CONDUCTIVITY
Millimhos/m
INDUCTION CONDUCTIVITY 40" SPACING

SIMPLIFIED STRUCTURAL CROSS SECTION (H-K)

Figure 18

DEPTH
(ABOVE SEA LEVEL)
METRES FEET

H 95-75
65-76
62-76
57-76
I 55-76
60-76
51-76
46-76
43-76
J 42-76
34-76
32-76
33-76
28-76
K 25-76

QUATERNARY
UPPER CRETACEOUS
HORSESHOE CANYON FM.
BEARPAW FM.

MILES
KILOMETRES

Gravel
Drift
Sandstone
Siltstone
Shale
Shale, carbonaceous
Concretionary bed (hard ledge)
Coal

Coal drill cuttings sample
Cored interval

Top of bedrock
Formation boundary
Coal seam correlation (definite, uncertain)
Coal zone and/or coal-bearing interval

SCALE 1:250,000
Miles
Kilometres

FIGURE 18

CROSS SECTION J-K

Datum: Ground Level

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LEGEND

TERTIARY AND CRETACEOUS

- Tc Cypress Hills Formation
- TKr Ravenscrag Formation
- TKp Paskapoo Formation
- TKw Willow Creek Formation

CRETACEOUS

- Ksm St. Mary River Formation
- Kbo Blood Reserve Formation
- Khc Horseshoe Canyon Formation (including Whitemud and Battle Formations)

CRETACEOUS (cont.)

- Kwb Whitemud and Battle Formations
- Ke Eastend Formation
- Kbp Bearpaw Formation
- Kom Oldman Formation } Belly River Formation
- Kfm Foremost Formation } Belly River Formation
- Kpk Pakowki Formation
- Kmr Milk River Formation

Geology after: Irish, 1968; Russell, 1940; and Stewart, 1943

FIGURE 19

THICKNESS OF BEST SEAM

Area of Potential Coal Development
Coal Seam 5 Feet or Greater

6 ← Best Interval of Coal, in Feet
269 ← Depth to Coal, in Feet

* Figures taken from technologist's litholog

•64 1976 Test Hole ■98 1975 Test Hole •16C Core Hole

Rock Unit Boundary ▲3 1977 Test Hole

SCALE

5 0 5 10 15 20 MILES

5 0 5 10 15 20 25 30 KILOMETRES

To accompany Alberta Research Council Report
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Alberta Research Council

TH	THICKNESS/DEPTH
16-76	6/623
23-76	5/718
29-76	10/419
31-76	3/137
34-76	3/339 3/494
35-76	3/353
41-76	3/185
42-76	6/108 3/173 6/603
43-76	4/422
47-76	3/453
50-76	12/584 4/678
51-76	6/189
52-76	6/269
54-76	3/58 3/251
55-76	3/147
56-76	14/877
57-76	6/555 5/594 4/629 5/655
60-76	3/259 7/641 3/693
62-76	3/558 3/575 5/625 4/649 3/672
63-76	5/553 3/575
64-76	3/374
65-76	3/289 5/305 5/322
73-76	3/297
79-76	3/367
80-76	3/445
81-76	5/391
82-76	4/241 4/303 3/580
83-76	5/226 3/289
88-76	3/247
89-76	4/205
90-76	3/260 3/302 3/617
91-76	3/297 3/301
92-76	6/313 4/366
94-76	7/167
96-76	6/439
97-76	4/531
98-76	4/253 8/291
99-76	3/288
100-76	3/521 3/541
102-76	4/409
103-76	3/457
104-76	3/596
106-76	3/430
99-75	3/705
2-77	3.5/309
3-77	4/229
7-77	3/234
12-77	4/210

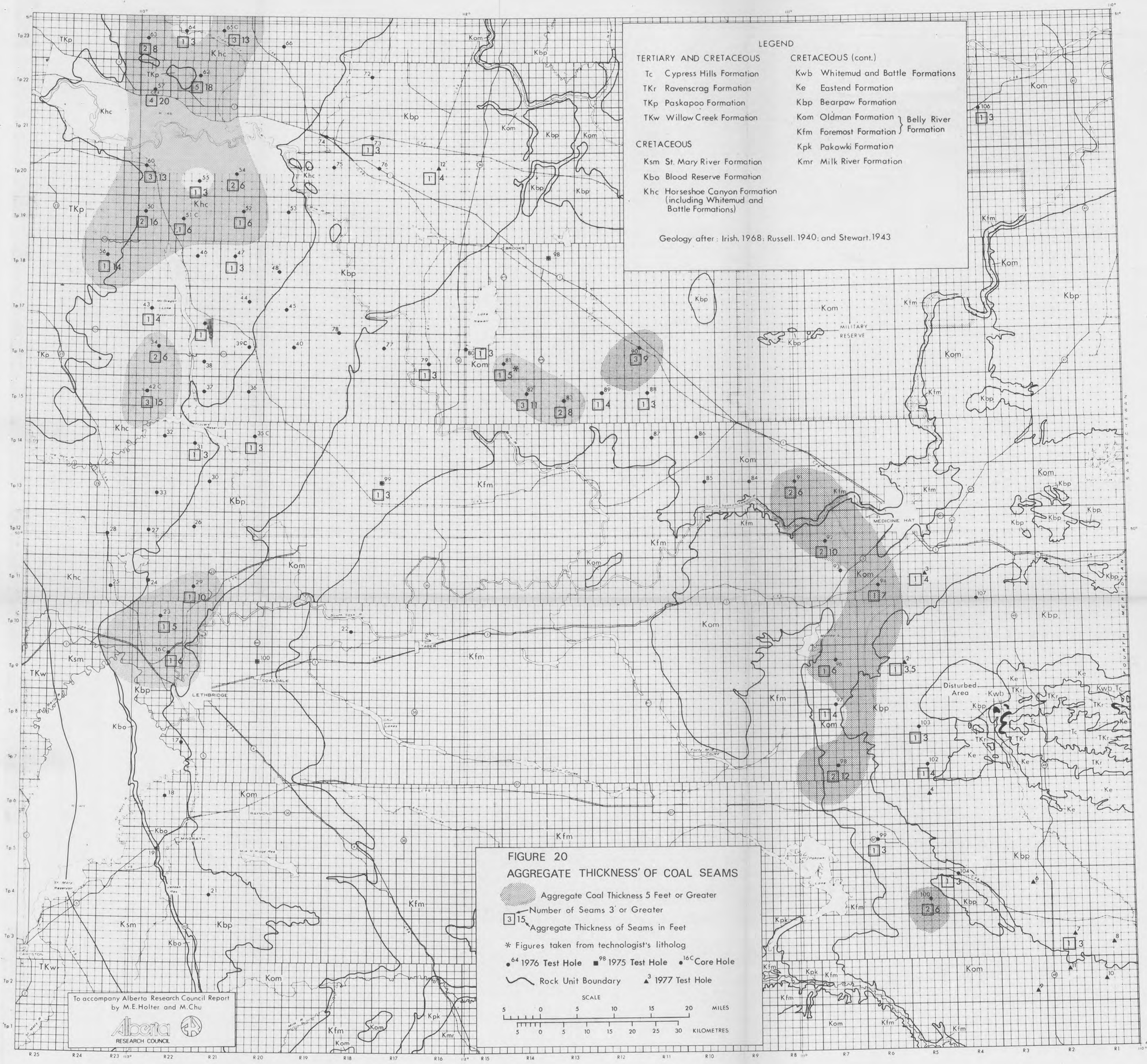

FIGURE 20
AGGREGATE THICKNESS OF COAL SEAMS

Aggregate Coal Thickness 5 Feet or Greater

3 15 — Number of Seams 3′ or Greater; Aggregate Thickness of Seams in Feet

* Figures taken from technologist's litholog

•64 1976 Test Hole ■98 1975 Test Hole •16C Core Hole

Rock Unit Boundary ▲3 1977 Test Hole

SCALE
5 0 5 10 15 20 MILES
5 0 5 10 15 20 25 30 KILOMETRES

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