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DEPARTMENT OF MINES AND TECHNICAL SURVEYS

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PAPER 56-1

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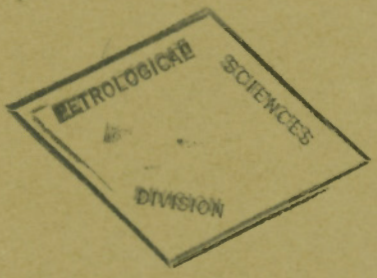
By

D. F. Stott



OTTAWA
1956

Price, 25 cents

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This report is a preliminary account of a detailed stratigraphic study of the Upper Cretaceous Alberta group within the Alberta foothills from the International Boundary to the fifty-fourth parallel of latitude, a distance of 400 miles. Descriptions are given of several sections between Clearwater River and Smoky River in the northern half of the area.

ACKNOWLEDGMENTS

This study was begun in the summer of 1954 under the supervision of R. J. W. Douglas of the Geological Survey of Canada. Some of the lithological descriptions used in this report were furnished by Douglas and D. C. Pugh, also of that organization.

Valuable assistance was given during the 1954 field season by R. H. Dawson, J. Hawryszko, and J. N. Arthur, and during 1955 by J. W. Murray.

The many courtesies extended by the forestry rangers and residents of Caroline, Nordegg, and Entrance are gratefully acknowledged. M. Warren, forestry ranger at Brûlé, Carl Luger of Entrance, and C. St. Denys of Caroline are especially thanked for their generous assistance.

BIBLIOGRAPHY

Gleddie, J.
(1954): Upper Cretaceous in Western Peace River Plains, Alberta. Western Canada Sedimentary Basin; R. L. Rutherford Memorial Volume, Amer. Assoc. Pet. Geol.

Hake, B. F., Willis, R., and Addison, C. C.
(1942): Folded Thrust Faults in the Foothills of Alberta; Bull. Geol. Soc. Amer., vol. 53, pp. 291-334.

Hume, G. S.
(1930): The Highwood-Jumpingpound Anticline with Notes on Turner Valley, New Black Diamond, and Priddis Valley Structures, Alberta; Geol. Surv., Canada, Sum. Rept. 1929, pt. B, pp. 6B-10B.

Irish, E. J. W.
(1951): Pierre Greys Lakes Map-Area, Alberta; Geol. Surv., Canada, Mem. 258.

Malloch, G. S.
(1911): Bighorn Coal Basin, Alberta, Geol. Surv., Canada, Mem. 9E.

McLearn, F. H.
(1919): Cretaceous, Lower Smoky River, Alberta; Geol. Surv., Canada, Sum. Rept. 1918, pt. C, pp. 1-6.

Scott, J. C.
(1951): Folded Faults in Rocky Mountain Foothills of Alberta, Canada; Bull. Amer. Assoc. Pet. Geol., vol. 35, pp. 2316-2347.

Stelck, C. R.
(1955): Cardium Formation of the Foothills of Northeastern British Columbia; Trans. Can. Inst. Mining Met., vol. LVIII, pp. 132-139.

Webb, J. B., and Hertlein, L. G.
(1934): Zones in the Alberta Shale (Benton Group) in Foothills of Southwestern Alberta; Bull. Amer. Assoc. Pet. Geol., vol. 18, pp. 1387-1416.

GENERAL GEOLOGY

The nomenclature used in this report follows that in general usage by the Geological Survey of Canada. The Alberta group (Hume, 1930; see also Webb and Hertlein, 1934) includes the Blackstone, Bighorn, and Wapiabi formations (Malloch, 1911). The zonal divisions of the Blackstone formation used in 1934 by Webb and Hertlein are followed with some modification. From the base, these are the Barren, Inoceramus labiatus, Rusty Shale and Concretionary Shale zones. In the Wapiabi formation, the zonal divisions used by Webb and Hertlein (1934), by Hake, Willis and Addison (1942), and by Scott (1951) have been followed with the addition of a zone that has been recognized in the lower part of the formation. These zones are, from the base upwards, Striped, Lower Concretionary Siltstone, Lower Concretionary shale, Platy Shale, Upper Concretionary Shale, Upper Concretionary Siltstone or Solomon sandstone, and Transition. Terms used by the different workers in the area are compared in Table I. Table II is a correlation chart showing the relationships between formations of the central Foothills of Alberta and those of the Peace River area of northeastern British Columbia and northwestern Alberta.

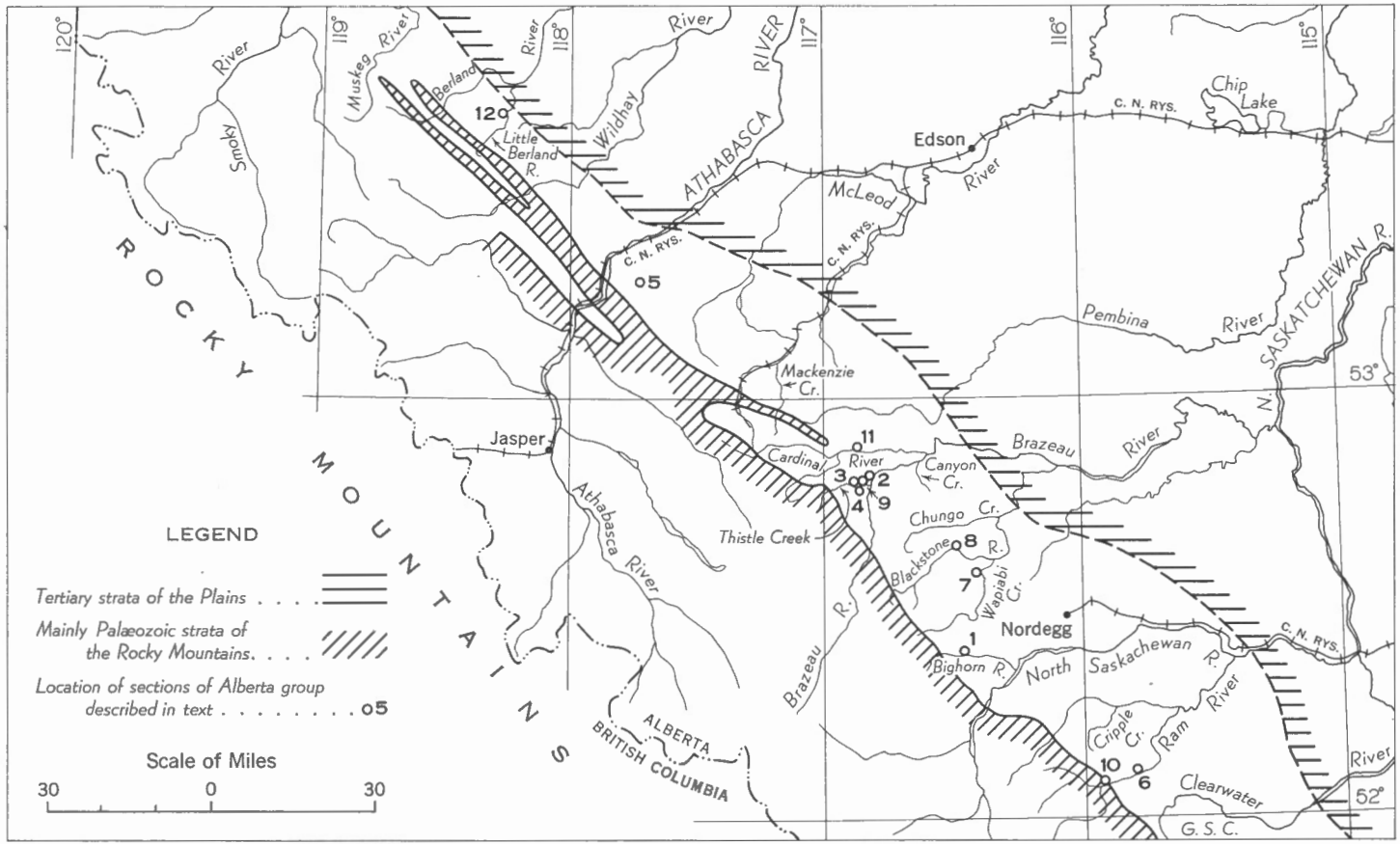
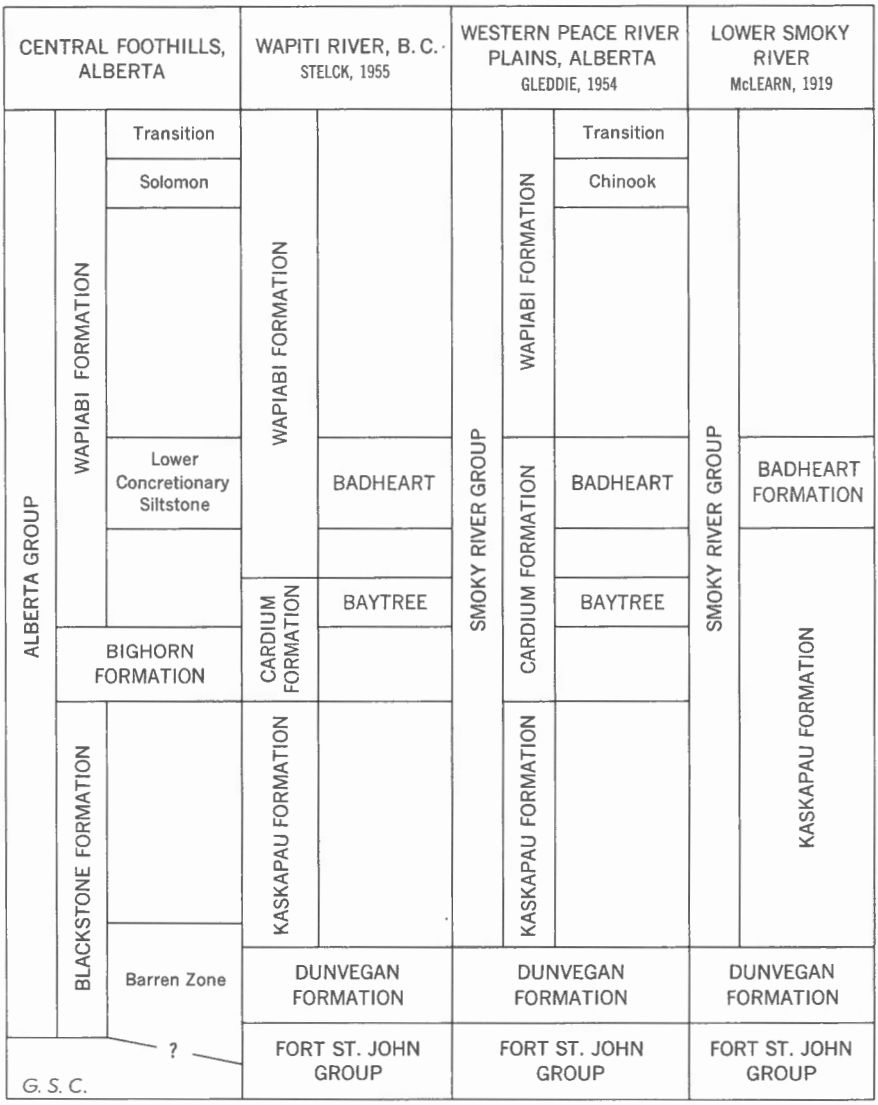


Figure 1. Map of Foothills Belt of Central Alberta

Table I.
Comparison of Nomenclature of Alberta Group used in Central Foothills

MALLOCH 1911	WEBB AND HERTLEIN 1934		HAKE, WILLIS AND ADDISON 1942		SCOTT 1950		STOTT 1956	
WAPIABI	WAPIABI	Transition Zone	WAPIABI		WAPIABI	Transition Zone	WAPIABI	Transition Zone
		Upper Concretionary Shale Zone		Blocky Zone		Siltstone Zone		Solomon or Upper Concretionary Siltstone Zone
				Upper Concretionary Zone		Upper Concretionary Zone		Upper Concretionary Shale Zone
		Platy Shale		Platy Shale Zone		Platy Shale Zone		Platy Shale Zone
		Lower Concretionary Shale Zone		Lower Concretionary Zone		Lower Concretionary Shale Zone		Lower Concretionary Shale Zone
								Lower Concretionary Siltstone Zone
				Striped Zone				Striped Zone
BIGHORN	CARDIUM		BIGHORN		CARDIUM		BIGHORN	
BLACKSTONE	BLACKSTONE	Transition Zone			BLACKSTONE	Transition Zone	BLACKSTONE	Concretionary Shale Zone
		Rusty Shale Zone	BLACKSTONE	Hydrogen Sulphide Zone		Rusty Shale		Rusty Shale Zone
		Inoceramus Labiatus Zone		*Inoceramus Labiatus* Zone		*Inoceramus Labiatus* Zone		*Inoceramus Labiatus* Zone
G. S. C.		Barren Zone		Barren Zone		Barren Zone		Barren Zone

Table II.
Correlation Chart



Blackstone Formation

The Blackstone formation lies disconformably and locally with erosional unconformity on the Mountain Park formation. It consists mainly of dark grey to black shales, thin sandstone and limestone beds, and rare grit beds. The most complete exposures of the formation are found on the most southerly branch of Wapiabi Creek, Bighorn River (See Index Map, Section 1), and Ram River, although only the Bighorn River section is relatively free from repetitions due to faulting. In this section, the thickness is 1,734 feet. Sections 2 and 3 in the Thistle Creek area may be combined to give a composite section.

The Barren zone at the base of the formation is not as commonly exposed as the overlying zones. The shales of this zone are rusty weathering and platy to fissile. Beds of chert grit may occur near the base. Large kettle concretions are also typical of this zone. A single unfaulted section, having a thickness of 426 feet, is known on Brazeau River (Section 2), although apparently only minor breaks occur in the well exposed sections on Littlehorn River and on Bighorn River (Section 1). Variations in thickness are therefore not known, but the Barren zone appears to have a maximum thickness of 631 feet in the region of the Bighorn and Brazeau Rivers. Within the region of the Berland and Smoky Rivers the Barren zone appears to grade into the Dunvegan formation and Fort St. John group but exact relationships are unknown at present.

The Inoceramus labiatus zone overlies the Barren zone and maintains its lithological characteristics throughout the region. The shales are somewhat calcareous, vary from fissile to platy, and typically weather silver-grey. Some variations from shale in the more easterly part of the Foothills to thin platy sandstones in the west have been noted. Argillaceous limestone bands, a minor though characteristic feature, divide the zone into several smaller units that are apparently correlative. The zone varies in thickness from 605 feet on Bighorn River (Section 1) to 554 feet on Thistle Creek (Section 3).

The Rusty Shale zone consists of rubbly rusty-weathering shale which becomes siltier and more platy along the western margin of the Foothills. A few large buff-weathering argillaceous limestone concretions may be present. In a northwest to southeast direction, the variation in thickness of the Rusty Shale zone is from 179 feet on Little Berland River to 250 feet on Ram River. Variation in thickness across the regional strike is from 326 feet on upper Wapiabi Creek to 137 feet downstream.

The Concretionary Shale zone has been called the Transition zone by Webb and Hertlein because it grades upwards into the Bighorn formation. The shales within this zone are rubbly

to platy and weather a rusty colour. Orange-weathering ironstone concretions occur throughout. Towards the top of the zone, minor sandstone beds increase in quantity, and the contact with the Bighorn formation is gradational. Good exposures of this zone and of the Rusty Shale zone are common where the Bighorn formation is exposed.

Bighorn Formation

The Bighorn formation consists of a variable number of sandstone units separated by marine and non-marine shale. South of North Saskatchewan River, three to four sandstone units are present. To the north, only two appear on the eastern side of the Foothills belt although three to four appear to the west, as shown on Thistle Creek (Section 4). However, the basal sandstone appears to be continuous from Ram River to Muskeg River, and the upper sandstone from Ram River to the Athabasca River. In the central Foothills, as described in Section 7, the lower sandstone may be overlain by some brackish to non-marine beds which in turn lie below a massive siltstone unit. In a few of the most westerly sections, a second brackish to non-marine unit occurs towards the top of the formation. On Maskuta Creek, south of Brûlé, a very coarse-grained sandstone is present above the basal fine-grained sandstone, but farther north toward Muskeg River, only the basal unit is well developed. On Muskeg River some sandstone beds, mapped as part of the Bighorn formation by Irish (1951) and which are separated from the basal sandstone and overlying brackish to non-marine beds by approximately 300 feet of marine shale, are considered to represent the development of a sandstone unit within the Wapiabi formation. Its stratigraphic position would suggest correlation with the Badheart formation of the Peace River area.

From the Clearwater-Nordegg Forestry road well exposed sections may be reached on Ram River, Blackstone River, Chungo Creek, and Canyon Creek. Other well exposed sections are found on Littlehorn River, Wapiabi Creek (Section 7), Thistle Creek (Section 4), Cardinal River, MacKenzie Creek, and MacLeod River. North of Athabasca River, exposures are not particularly good but on Little Berland and Muskeg Rivers measurable sections with few covered intervals may be obtained.

Wapiabi Formation

The Wapiabi formation has a sharp contact with the underlying Bighorn formation. With rare exceptions, a basal zone of pebbles or concretionary grit is present. In several sections pebbles have been found that resemble the sandstone of the Bighorn formation. Some dark grey shales of the Wapiabi formation are

rusty weathering, and within the shales, orange-weathering ironstone concretions are a prominent feature. Good exposures of the complete Wapiabi formation may be seen on Wapiabi Creek, Blackstone River (Section 8), and Thistle Creek (Section 9). Partial sections or less well exposed sections are present on Muskeg River, Little Berland River, and Cripple Creek.

The Striped zone is so named because of the interbedding of hard platy siltstones and less resistant shales. The whole zone weathers a rusty colour. Concretions occur in abundance in the thicker more westerly sections but towards the eastern edge of the Foothills these become less numerous. A maximum thickness of 276 feet was measured on Thistle Creek (Section 9) and a minimum of 145 feet of Blackstone River (Section 8).

A massive siltstone overlies the Striped zone. This unit, the Lower Concretionary Siltstone zone, contains large orange-weathering concretions. It has a consistent development from Ram River to Athabasca River and is thought to occupy a stratigraphic position within the Wapiabi formation equivalent to that of the Badheart formation of the Smoky group (Table II). As mentioned previously, a sandstone on Muskeg River apparently occurs in a similar position. A maximum thickness of 136 feet has been measured on Thistle Creek (Section 9).

The Lower Concretionary Shale zone contains silty rusty-weathering shales and orange-weathering concretions. This unit decreases in thickness in a general easterly direction, and varies from 351 feet on Thistle Creek (Section 9) to 101 feet on Blackstone River (Section 8).

Thinly interbedded shale and platy siltstone are typical of the Platy zone. Some of the greatest lithological changes in the Wapiabi appear in this zone, which becomes much sandier as well as thicker along the western limits of the area. The typical concretions of the Wapiabi formation are missing from this unit, but beds of buff-weathering argillaceous limestone are characteristic. On Thistle Creek (Section 9) the Platy shale has a thickness of 734 feet and on Blackstone River (Section 8) it is 328 feet thick.

In some sections the Upper Concretionary Shale zone has a rather gradational contact with the Platy zone, but is marked by the presence of orange-weathering concretions. Its shales, being somewhat platy and dark grey, are similar to those of the other concretionary zones. This zone has a maximum measured thickness of 232 feet on Thistle Creek and a minimum of 135 feet on Blackstone River. It grades upward into the Upper Concretionary Siltstone.

The Upper Concretionary Siltstone is an easterly facies of the Solomon sandstone which is developed in the western part of the region. Because of this correlation the Solomon sandstone is assigned to the Wapiabi formation as suggested by Gleddie (1954). The Solomon sandstone is a thick unit of fine-grained sandstone that reaches a maximum of 280 feet in sections nearest the mountains. A minimum thickness of 188 feet was measured on Blackstone River. Sections may be seen on South Ram River (Section 10), Blackstone River (Section 8), Cardinal River (Section 11), Pembina River, and Little Berland River (Section 12). One of the best sequences, which show the lithological variation from east to west, is found along Blackstone River.

The Transition zone overlies the Solomon sandstone or Upper Concretionary Siltstone zone and grades upwards into the basal sandstone of the Brazeau formation. The lower part commonly contains rusty-weathering shales resembling typical Wapiabi shales. Towards the top these shales grade into thinly bedded, greyish green, carbonaceous shales, siltstones, and sandstones resembling those in the Brazeau formation. The contact between the Transition zone and the Brazeau formation is placed at the base of the lowest massive, coarse-grained sandstone bed, generally 10 to 30 feet thick. The Transition zone varies in thickness between 95 and 130 feet.

Section 1. Blackstone Formation, Bighorn River below Junction of Littlehorn River, Bighorn Map-Area, Alberta.

Bed	Lithology	Thickness (feet)	Height above base (feet)
	Bighorn Formation		
11	Overlying beds not completely exposed. Sandstone, fine-grained, grey, massive, homogeneous to laminated, knobbly in interval 11 - 13' thick	15	81
10	Poorly exposed; appears to be sandstone as above	4	66
9	Sandstone, fine-grained, grey, tan weathering, slightly calcareous; beds 3 - 6" thick; a few concretionary zones near base	14	62
8	Sandstone, fine-grained, grey, slightly calcareous, knobbly, worm burrows, irregularly bedded	10	48
7	Sandstone, fine-grained, homogeneous to slightly laminated, beds 4 - 6"	6	38
6	Siltstone, shaly, bedded, weathers yellowish tan, few thin concretions	6	32
5	Shale, platy to rubbly, rusty weathering, few concretions and concretionary bands at base	6	26
4	Shale, platy, rusty weathering, concretionary bands at 3'	7	20
3	Siltstone, argillaceous, sandy	2	13
2	Sandstone, fine-grained, grey, rusty tan weathering, slightly calcareous, laminated with a suggestion of cross-bedding, beds 2 - 4" thick, concretionary zones	6	11
1	Sandstone as above, and 40% shale	5	5

Bed	Lithology	Thickness (feet)	Height above base (feet)
	Blackstone Formation		
	Concretionary Shale Zone		
101	Shale, very silty, blocky; few concretionary bands and sandstone lenses at top, rusty weathering	8	1734
100	Covered. Some dark grey, platy to rubbly shale with concretions exposed near base	49	1725
99	Sandstone, fine-grained, bluish grey, tan to brownish grey weathering, flaggy, somewhat concretionary, beds 1/2 - 6" thick; shale 5 - 10%	15	1676
98	Siltstone, sandy, dark grey, well indurated, massive to bedded, grey weathering, with concretions 4" x 1'	25	1661
97	Siltstone, argillaceous, hard at top becoming slightly more shaly and blocky towards base, bedded appearance; concretions 4 x 1" to bands	18	1636
96	Siltstone, argillaceous, to shale, blocky, dark grey; becoming more shaly towards base, dark grey, slightly rusty weathering; concretions and concretionary bands	38	1618
95	Shale, platy, dark grey, rusty weathering; siltstone, 40% at top, decreasing downward to 20%; few small concretions and thin concretionary bands at top	25	1580
	Rusty Shale Zone		
94	Shale and 50% siltstone, platy, rusty weathering	9	1555

Bed	Lithology	Thickness (feet)	Height above base (feet)
93	Shale, platy to rubbly, and 25% siltstone; rusty weathering, 1" bentonitic shale at base	12	1546
92	Shale and 40% siltstone, rusty weathering	18	1534
91	Shale, platy; and 10% siltstone	10	1516
90	Shale and siltstone; 40% siltstone at top decreasing to 20% at base; rusty weathering; a few 6" x 2' limestone concretions, yellowish weathering	31	1506
89	Shale and siltstone; 50% siltstone decreasing to 25%; rusty weathering; rare limestone concretions, bentonite band at 5'	20	1475
88	Shale and 20% siltstone, platy, rusty weathering	11	1455
87	Shale and 30% siltstone, rusty weathering; large limestone concretions, yellow weathering	9	1444
86	Shale and 40% siltstone, laminated in 1/2 - 1" bands, rusty weathering	21	1435
85	Shale and 15% siltstone	3	1414
84	Shale and 50% siltstone, 1/2 - 2" beds, laminated, platy, rusty weathering; yellow sulphur stains	20	1411
83	Shale and 30% siltstone	13	1391
82	Shale and 50% siltstone, platy, rusty weathering	24	1378
81	Shale and siltstone: 40% siltstone at top decreasing to 25% at base; rusty weathering	43	1354

Bed	Lithology	Thickness (feet)	Height above base (feet)
80	Shale and 40% siltstone, beds up to 2" thick	7	1311
79	Shale, platy at top becoming more rubbly below 35', dark grey, rusty weathering; 20% siltstone, bedded appearance	68	1304
	Inoceramus labiatus Zone		
78	Limestone, dense, argillaceous, bluish grey, yellow weathering, laminated, massive	1	1236
77	Shale, platy, black, calcareous, somewhat rusty weathering; some thinly bedded siltstone	14	1235
76	Shale, platy to rubbly, slightly rusty weathering	14	1221
75	Shale and 30% thinly bedded siltstone, black to dark grey; limestone lenses at top and base	20	1207
74	Siltstone, 60%, and shale; platy, dark grey, calcareous	21	1187
73	Limestone, shaly, platy, yellowish weathering	0.5	1166
72	Shale, platy, silty, dark grey	8	1165.5
71	Shale, very silty, platy; 6" of extremely silty shale at top, dark grey, silver grey weathering; 2" laminated calcareous siltstone at base; a few small concretions	24	1157.5
70	Shale, platy to rubbly, dark grey, silver grey weathering	13	1133.5
69	Limestone, shaly, platy	1	1120.5

Bed	Lithology	Thickness (feet)	Height above base (feet)
68	Shale, silty, platy, dark grey, silver grey weathering; a few limy siltstone bands	28	1119.5
67	Limestone, dense, argillaceous, laminated, yellowish weathering	0.5	1091.5
66	Shale, platy, and 40% siltstone 1/2 - 2" bands	16	1091
65	Shale, platy, disc-shaped concretions; few thinly bedded limestone beds near base	21	1075
64	Shale, very calcareous, almost shaly limestone, platy, some yellowish weathering	1	1054
63	Shale, platy, dark grey to black, calcareous; 20% thin siltstone, a few thin limy bands; distinct break at base	18	1053
62	Shale and 40% siltstone, as above; 3" limestone band at base	26	1035
61	Shale, platy; 20% thinly bedded siltstone; a few limy bands, silver grey weathering	49	1009
60	Shale, platy, calcareous, dark grey; 1' lensy limestone at top and base and thin limestone bands scattered throughout. Across river part of whole interval is limestone	5	960
59	Shale, platy; 30% thinly bedded siltstone; a few limy 1" bands and 6 - 12" disc-shaped concretions	4	955
58	Shale, platy to fissile, dark grey to black, calcareous, silver grey weathering; basal 1' very rubbly, rusty weathering	27.5	951

Bed	Lithology	Thickness (feet)	Height above base (feet)
57	Shale and 30% siltstone; a few limy bands; some shale is rusty weathering	12	923.5
56	Siltstone, very calcareous to silty limestone; yellowish weathering	0.5	911.5
55	Shale, platy; 40% thinly bedded siltstone, 25% at base; calcareous, dark grey to black, silver grey weathering; 6 - 12" disc-shaped concretions in upper 5'	21	911
54	Shale, platy, calcareous, with 1' lensy limestone bands at top and in base 1'; bands are 2 - 6" thick	6	890
53	Shale and 50% siltstone decreasing to 25%, dark grey, silver grey weathering	18	884
52	Limestone, dense, argillaceous, bluish grey, massive, laminated, yellowish weathering	1	866
51	Shale, dark grey, platy; 20% siltstone at top; shale becomes more fissile toward base, silver grey weathering, a few limestone lenses	52	865
50	Limestone zone with 50% shale	0.5	813
49	Shale, platy to fissile; few thin siltstones in basal 4'	34.5	812.5
48	Limestone zone with 60% shale, very silty	2	778
47	Shale, platy; 30% siltstone; few disc-shaped concretions	5	776
46	Shale and 25% siltstone	9	771

Bed	Lithology	Thickness (feet)	Height above base (feet)
45	Shale, soft, fissile, dark grey, silver grey weathering	12	762
44	Shale, platy, dark grey, silver grey weathering, calcareous; 30% thinly bedded siltstone; limy bands with 3" band at top	29	750
43	Limestone zone; beds 2 - 6", 25% shale; limestone is dense, argillaceous, bluish grey, yellowish weathering, laminated	2	721
42	Shale, platy, and 20% thinly bedded siltstone; 2" limestone concretionary band at 32'	39.5	719
41	Limestone, dense, argillaceous, bluish grey, laminated, yellowish weathering	0.5	679.5
40	Shale, platy, dark grey and disc-shaped limestone concretions	8	679
39	Shale, platy; a few limestone concretions	23	671
38	Shale, platy to fissile	11	648
37	Shale, fissile, topped by limestone concretions, 1 x 4'	6	637
	Barren Zone		
36	Shale, platy to papery, with 30% siltstone; 1 - 2" bands in upper 5", calcareous; row of limestone concretions at 18', slightly rusty weathering	42	631
35	Shale, platy; 50% siltstone at top decreasing to 30% at base; rusty weathering, few concretions, 4 x 6"; siltstone in 1/2 - 1 1/2" bands; grades into	38	589

Bed	Lithology	Thickness (feet)	Height above base (feet)
34	Shale and 10% siltstone, platy to rubbly at base, rusty weathering	23	551
33	Shale and 50% siltstone, rusty weathering, a few concretions	14	528
32	Shale and 35% siltstone, rusty weathering; limy zone at top with 1 x 5' limestone concretions, and 1 x 3' concretions at base	7	514
31	Shale, rubbly, rusty weathering; a few thin siltstones	14	507
30	Shale, and 50% siltstone in 1/2 - 2" beds, rusty weathering	18	493
29	Shale, fissile, soft, dark grey to black, yellowish grey weathering	12	475
28	Shale, fissile, soft, grey, with 2" limy band at top and disc-shaped concretions at 8'	11	463
27	Shale, rubbly, rusty weathering	7	452
26	Shale, grey, fissile, soft, yellowish grey weathering	13	445
25	Shale, as above, and 20% siltstone	7	432
24	Shale, platy to rubbly, with 10% to 20% thin siltstone, rusty weathering	43	425
23	Shale and 50% siltstone, siltstone decreasing to 25% at base, rusty weathering; 1 x 6' concretion near top	24	382
22	Shale, platy to rubbly, rusty weathering	12	358

Bed	Lithology	Thickness (feet)	Height above base (feet)
21	Shale and siltstone: siltstone platy, 50% at top decreasing to 30%, rusty weathering; 2 x 5' limestone concretions at base, some limy bands	20	346
20	Shale and 15% siltstone, rusty weathering, rubbly at base; large 1 x 3' - 4' limestone concretions, yellow weathering	25	326
19	Shale, rubbly, large limestone concretions	8	301
18	Shale, platy at top, becoming rubbly towards base, rusty weathering	24	293
17	Shale, platy to rubbly	8	269
16	Inaccessible. Shale, platy, rusty weathering, some 6 x 18" concretions; minor contortion near base	63	261
15	Shale, rubbly, rusty weathering; 2" limestone band at top; rare limestone concretions	12	198
14	Shale, platy; 25% siltstone; rusty weathering	16	186
13	Shale, rubbly, rusty weathering	3	170
12	Shale and 20% siltstone	6	167
11	Shale, rubbly, rusty weathering	4	161
10	Shale and siltstone, 25% siltstone at top decreasing to 10% at base	16	157
9	Shale, rubbly; a few thinly bedded siltstones	17	141

Bed	Lithology	Thickness (feet)	Height above base (feet)
8	Sandstone to grit; concretionary with cone-in-cone structure; 30% shale	1	124
7	Shale and 40% siltstone to sandstone; rusty weathering	7	123
6	Shale, rubbly, rusty weathering	22.5	116
5	Limestone	0.5	93.5
4	Shale, platy to rubbly, rusty weathering; 2 x 6" limestone concretions	31	93
3	Siltstone, argillaceous, shaly, platy, bedded, dark grey	23	62
2	Limestone zone. Limestone in 2 x 4' concretionary form; dense, argillaceous, bluish grey, yellow weathering	2	39
1	Shale, platy, to siltstone; dark grey, rusty weathering, more rubbly at base	37	37
	Fault Contact; displacement small		
	Mountain Park Formation		
	Sandstone, medium-grained, silty, greenish grey, with 6" silty shale at base	3	16.5
	Sandstone, medium-grained, greenish grey, brown to greenish grey weathering, massive	3	13.5
	Siltstone, greenish to brownish grey, rubbly	2.5	10.5
	Siltstone, argillaceous, massive, dark grey, brownish grey weathering, carbonaceous	3	8
	Siltstone, argillaceous, rubbly, blocky, dark grey, greenish to brownish weathering	5	5

Section 2. Barren Zone, Blackstone Formation, Grave Flats Map-Area, Alberta, Brazeau River, Upstream from Lightning Flats, Sec. 26, Tp. 44, R. 20, W. 5. Described by R. J. W. Douglas.

Bed	Lithology	Thickness (feet)	Height above base (feet)
	Inoceramus labiatus Zone		
40	Shale, black, fissile	3	504
39	Limestone, in 2" beds with 1 - 2" shale partings. Limestone is finely crystalline, dark grey, finely laminated, silty, argillaceous	1	501
38	Shale, fissile, black, with 2" limestone at base; some fine silt laminae in the shale	2	500
37	Shale, fissile, black	13	498
36	Shale, with 3" limestone concretions and small Inoceramus labiatus in the shale	2	485
35	Shale	5	483
34	Covered	15	478
33	Shale, fissile, black, with silt laminations and a few 2" silty limestone bands at base; single limestone concretion near base	8	463
32	Shale, fissile, black, with single limestone concretion	5	455
31	Shale, fissile, black, similar to above but weathering rusty at top of exposure	24	450
	Barren Zone		
30	Siltstone, fine-grained, grey, thinly bedded; interbedded gradationally with 50% silty shale in 1/2 - 2" bands; rusty weathering	8	426

Bed	Lithology	Thickness (feet)	Height above base (feet)
29	Shale and 20% siltstone as above; 1/2" bands	5	418
28	Shale and 30% siltstone	5	413
27	Siltstone and 60% shale, 1/2 - 1" alternating bands	19	408
26	Covered	9	389
25	Siltstone and shale; 60% shale at top, becoming less silty in basal 14', 80% shale	22	380
24	Shale and 40% thin siltstone bands; several flat limestone concretions, 4" x 1', brown weathering; sharp contact at top and base	12	358
23	Shale, fissile, grey, rusty weathering; rare 2" grey concretions	16	346
22	Shale and 30% siltstone; gradational into overlying beds	11	330
21	Shale, fissile, grey, rusty weathering; rare 1/2" siltstone bands	21	319
20	Shale and 20% siltstone; rare 4" concretions	11	298
19	Shale with about 5% siltstone; fairly sharp contact at base	9	287
18	Shale and siltstone, siltstone 30% in top 5' decreasing to 10% at base. Single large kettle, 8" x 2' at base	16	278
17	Shale and 20% siltstone; decreasing downward	14	262
16	Shale and 20% siltstone; siltstone decreasing downward, 6 x 2" limestone slabs in base	15	248

Bed	Lithology	Thickness (feet)	Height above base (feet)
15	Siltstone and 50% shale; shale decreasing downward, somewhat gradational with underlying beds; siltstone bands are 1 - 3" thick at top and 1" thick at base; rusty weathering	15	233
14	Shale, fissile, rusty weathering; several 4" x 1' concretions	37	218
13	Shale, fissile; 15% thin 1/2" siltstone bands, and 2 x 4' kettle concretions	7	181
12	Shale, fissile, grey, rusty weathering, with a few flat 2" x 1' concretions; thin siltstones, less than 5%; and 1" bands of brown weathering iron stain	36	174
11	Siltstone, argillaceous, rubbly, massive bedded, with 2" fine-grained sandstone 2' below top, and line of 2 x 6' kettles 6' below top, greenish grey weathering	14	138
10	Shale, silty, with several 1 - 2" siltstone bands	4	124
9	Shale, fissile, grey, rusty weathering, with some 2 x 6" concretions	16	120
8	Siltstone, argillaceous, massive, with 2" band of concretions near top; 4 x 8' to 6 x 6' zone of kettles below; grades into underlying beds	20	104
7	Shale, banded	35	84
6	Siltstone, argillaceous, massive; alternating shale beds, 1/2 - 3" thick; 70% siltstone fine-grained, finely laminated, decreasing downward	20	49
5	Shale, fissile, dark grey; fine silt laminae	6	29

Bed	Lithology	Thickness (feet)	Height above base (feet)
4	Shale, fissile, softer than overlying and underlying beds	2	23
3	Shale, fissile, dark grey, more massive	8	21
2	Shale, fissile, dark grey	6	13
1	Shale, silty; and siltstone; rusty weathering	7	7
	Mountain Park Formation		
	Shale, greenish brown weathering, rubbly	7	18
	Sandstone, thins down slope from 25 to 1'	2.5	11
	Shale, green, thinly bedded with 4" x 1' concretions	2.5	8.5
	Sandstone; massive	6	6

Section 3. Blackstone Formation, Grave Flats Map-Area, Alberta, Thistle Creek, Sec. 24, Tp. 44, R. 21, W. 5.

Bed	Lithology	Thickness (feet)	Height above base (feet)
	Overlying beds - Bighorn Formation; See Section 4		
	Blackstone Formation		
	Concretionary Shale Zone		
55	Shale, silty, platy; 40% sandstone, fine-grained, bluish grey, laminated	8	985
54	Shale, silty, platy, with a few sandstone bands, 5%	18	977
53	Sandstone, 60%, 2 - 4" beds, fine-grained, bluish grey, laminated; silty shale	4	959
52	Shale, silty; few concretions, bedded	9	955
51	Sandstone, 40%, 1/2 - 1" beds; shale	6	946
50	Shale, silty, blocky, dark grey	14	940
49	Shale, less silty, more rubbly	4	926
48	Shale, silty, blocky; becoming less silty towards base with concretionary bands and concretions, 2" thick; some 1/2 - 1" sandstone bands	47	922
47	Siltstone, sandy, irregularly bedded, dark grey; some concretions	12	875
46	Shale, very silty, grading into argillaceous siltstone, platy, bedded appearance, dark grey; rare bands 1/2 - 1" of harder siltstone	35	863

Bed	Lithology	Thickness (feet)	Height above base (feet)
45	Siltstone, argillaceous, platy, dark grey, rusty weathering, finely laminated; few concretionary zones, concretions are 4" x 1'; rusty orange weathering, some dark grey, 2 x 3"	13	828
	Rusty Shale Zone		
44	Shale, silty, dark grey, grading into siltstone at top, platy; a few bands of laminated siltstone near base with 6" siltstone at base	18	815
43	Shale, silty, rubbly, with thin lenses of siltstone; unit has striped appearance; some yellow sulphur stains	35	797
42	Shale, silty, rubbly to platy, with 1/2 - 1" band of laminated siltstone, 10%	26	762
41	Shale, blocky to rubbly, dark grey, rusty weathering; some yellow sulphur stains; bedded appearance, with a few harder silty bands; less silty towards base	27	736
40	Shale, silty, blocky to rubbly, with bands of laminated siltstone in upper 4', 10%; unit is rusty weathering, yellow sulphur stains, more banded than above; some platy, papery shale in basal 2'	26	709
39	Shale, rubbly, rusty weathering, yellow stains, papery towards base with limestone concretions 1 x 5' at top	63	683
38	Shale, silty, blocky to rubbly, with thin 1/2 - 1" hard bands siltstone, 10%	20	620
37	Shale, blocky to rubbly, bedded appearance, rusty weathering, yellow stains	21	600

Bed	Lithology	Thickness (feet)	Height above base (feet)
36	Shale, silty, blocky; more massive appearance with a few hard siltstone bands; rusty weathering; somewhat less silty towards base	25	579
	Inoceramus labiatus Zone		
35	Shale, platy, silty, somewhat rusty weathering	5.5	554
34	Limestone, dark bluish grey, laminated, yellowish tan weathering, massive, dense	2.5	548.5
33	Shale, silty, papery to platy, dark grey, slightly rusty weathering	18	546
32	Limestone, yellow tan weathering, dark bluish grey, more thinly bedded, lensy	1	528
31	Shale, calcareous, platy, papery, dark grey, slightly rusty weathering	8	527
30	Limestone, yellow tan weathering, lensy	0.5	519
29	Shale, calcareous, silty; interbedded siltstone, laminated, platy, grey weathering	32.5	518.5
28	Shale, calcareous, less silty than overlying bed, bedded appearance, grey weathering	53	486
27	Limestone, laminated, yellow tan weathering	1	433
26	Shale, calcareous, platy, silty, rusty grey weathering	27	432
25	Limestone, dark bluish grey, dense, laminated	0.5	405

Bed	Lithology	Thickness (feet)	Height above base (feet)
24	Shale, calcareous, papery to somewhat blocky, dark grey, slightly rusty weathering	34.5	404.5
23	Limestone, dark bluish grey, laminated, yellow tan weathering	1	370
22	Shale, calcareous, silty, platy, with finely laminated siltstone; less silty towards base, grey weathering; some concretions	27	369
21	Shale, silty, platy, papery to rubbly, dark grey, slightly rusty weathering; more platy in basal 6'	25	342
20	Limestone, with 3" shale in centre	1	317
19	Shale, with silty laminae, calcareous, dark grey, grey weathering; concretions in upper 10'	53	316
18	Limestone, dark bluish grey, laminated, yellow tan weathering	0.7	263
17	Shale, platy, silty laminae, calcareous, dark grey, grey weathering; less silty towards base; concretions in upper 4'	27.3	262.3
16	Shale, platy to papery, dark grey, calcareous, grey weathering; less silty than overlying beds; Inoceramus labiatus	31	235
15	Shale, silty, platy with silty laminae and hard calcareous siltstone bands 1/2 - 1"	11	204
14	Limestone and 50% shale	1	193
13	Shale, platy, dark grey, silty laminae; 5% bands of calcareous siltstone; hard, dense, bluish grey, laminated; unit weathers rusty towards base	36	192

Bed	Lithology	Thickness (feet)	Height above base (feet)
12	Limestone, argillaceous, bluish grey, laminated, yellow tan weathering	1	156
11	Shale, platy to papery, grey weathering; concretions in upper 5'	24	155
10	Limestone, argillaceous, bluish grey	0.5	131
9	Shale, platy, few limestone lenses	30	130.5
8	Limestone	0.5	100.5
7	Shale, platy; a few concretions towards base	39	100
6	Limestone, laminated, yellow tan weathering	0.5	61
5	Shale, silty, platy to papery	11.5	60.5
4	Limestone	1	49
3	Shale, silty, platy	7	48
2	Limestone	1	41
	Barren Zone		
1	Shale, platy to blocky, dark grey, somewhat rusty weathering	40	40
	Underlying beds - Barren zone, contorted; See Section 2 for nearby continuation		

Section 4. Bighorn Formation, Grave Flats Map-Area, Alberta, Thistle Creek, western flank of syncline, Sec. 20, Tp. 44, R. 21, W. 5.

Bed	Lithology	Thickness (feet)	Height above base (feet)
	Wapiabi Formation (See section 9)		
	Shale, silty, blocky, dark grey, rusty, weathering; pebbles 1/4 - 3/4" diameter in a band at base	14	20
	Siltstone, argillaceous to silty, dark grey, gritty in some zones; concretions, 2 x 6", and grit lenses; some pelecypod fragments; a few pebbles at base with one boulder 6 x 4 x 3"	6	6
	Contact with Bighorn formation. Surface is irregular with scattered 1/4 - 1/2" pebbles, a few thin silty partings in sandstone		
	Bighorn Formation		
36	Sandstone, medium- to fine-grained, light grey, homogeneous, massive with 3" concretion band containing some laminated, fine, light grey sandstone	17	235
35	Sandstone, light grey, homogeneous, massive, fine-grained; trace of pelecypods	8.5	218
34	Sandstone, laminated, crossbedded, fine-grained, light grey; a few poorly developed concretionary zones, massive bedded, with Cardium on basal surface	2.5	209.5
33	Sandstone, silty, brownish grey, laminated, crossbedded, thinly bedded; 30% shale, silty; silty concretions	4	207

Bed	Lithology	Thickness (feet)	Height above base (feet)
32	Sandstone, fine-grained, dark grey, calcareous, homogeneous, argillaceous, hard; beds 2 - 4" with interbedded shale, 20%, silty; some tracks and trails	3	203
31	Sandstone, fine-grained, laminated, crossbedded, massive, brownish grey; a few concretionary zones	4	200
30	Sandstone, fine-grained, grey laminated, crossbedded, thinly bedded in upper 1'; 10" silty shale and thinly bedded sandstone at top	3	196
29	Sandstone, 50%, fine-grained, brown, laminated, argillaceous; some poorly developed concretionary zones; and shale, silty, dark grey	9	193
28	Conglomerate; chert pebbles and cobbles 1/4 - 4", well rounded, green, black, and white; cobbles more abundant at base	5	184
27	Grit, sandstone, and conglomerate; conglomerate is more abundant at base; some coaly fragments	1.5	179
26	Sandstone, fine-grained, laminated, massive, brownish grey, reddish buff weathering; 2" conglomerate at base; pebbles are 1/4 - 1/2"	20.5	177.5
25	Partially covered. Shale, silty, dark grey	12	157
24	Sandstone, fine-grained, light grey, homogeneous, massive, fairly clean appearance	3	145
23	Sandstone, calcareous, medium-fine to medium-grained, brownish grey, massive, somewhat laminated; becoming thinner bedded at base	5	142

Bed	Lithology	Thickness (feet)	Height above base (feet)
22	Sandstone, fine-grained, brownish grey, very slightly calcareous; thinly bedded with shale in upper 2'	7	137
21	Siltstone, 60%, and shale: hard, platy; a few concretionary zones, 1 x 3" to bands	14	130
20	Shale, silty, blocky; concretionary bands, rusty weathering	15	116
19	Shale, somewhat rubbly at top, increasing in silt content towards base grading into siltstone; some concretions, 6 x 3"	19	101
18	Sandstone, fine-grained, medium-grey, homogeneous, massive bedded, calcareous; a few thin shale partings 1/2 - 1"; bed thins to 2' upslope	5	82
17	Sandstone, calcareous, fine-grained, laminated, light grey, crossbedded with shale partings; softer at base. This appears to lie unconformably on lower beds and cuts off 6' of interbedded sandstone and shale with narrow coal streak towards base	14	77
16	Shale, greenish, dirty with 6" coaly shale at base	1.5	63
15	Shale, silty, blocky	1	61.5
14	Sandstone, medium-grey, medium-grained, massive, homogeneous, calcareous	3	60.5
13	Shale, silty, greenish grey, soft, blocky	2.5	57.5
12	Shale, dark grey, silty; coaly in basal 1'	3	55
11	Shale, brownish green, silty, soft; slightly coaly 6" band at 4.5'	9	52

Bed	Lithology	Thickness (feet)	Height above base (feet)
10	Siltstone, greenish tan, knobbly, irregular weathering; some plant fragments	3	43
9	Shale, coaly	2	40
8	Shale, greenish brown, soft, silty	2	38
7	Siltstone, greenish brown, argillaceous, soft	1	36
6	Sandstone, fine-grained, medium fine-grained, brownish grey, homogeneous, calcareous	3	35
5	Sandstone, brownish grey, medium- to fine-grained, laminated, large crossbedding, massive, calcareous	3	32
4	Shale, not accessible	2	29
3	Sandstone, not accessible	3	27
2	Sandstone, light grey, massive, fairly clean	5	24
1	Sandstone, medium-grained, light grey, massive, rather soft, laminated with rare carbonaceous parting; more massive at base and some small 6" cut and fill structure	19	19
	Underlying beds - Blackstone Formation; See Section 3		

Section 5. Bighorn Formation, Entrance Map-Area, Maskuta Creek, western limb of syncline, Tp. 49, R. 26, W. 5.

Bed	Lithology	Thickness (feet)	Height above base (feet)
	Overlying beds not exposed		
	Bighorn Formation		
17	Not well exposed. Sandstone, fine-grained, grey, laminated; 40% shale in beds 2 - 8"	13	247
16	Sandstone, fine-grained, laminated, grey, beds 4 - 10"; some shaly beds	11	234
15	Shale, blocky, dark grey, bedded; a few hard siltstone bands and concretionary bands	18	223
14	Sandstone, fine-grained, laminated, well indurated; beds 4 - 1", concretionary; 50% siltstone, shaly, dark grey	13	205
13	Sandstone, very coarse-grained, homogeneous to laminated, cherty, massive, grey, grey weathering; bedding not well defined, finer grained at top	26	192
12	Shale, silty, grey, concretions; 1' sandstone in middle with trace of carbonaceous remains	11	166
11	Sandstone, coarse-grained, brown, brownish grey weathering, homogeneous to laminated, massive; traces of worm burrows; cut and fill break at 25'	46	156
10	Sandstone, medium- to coarse-grained, brownish grey, brownish grey weathering, slightly carbonaceous, homogeneous to laminated; beds 4 - 6"; some shale beds	9	110

Bed	Lithology	Thickness (feet)	Height above base (feet)
9	Sandstone, fine-grained, silty; soft and siltier towards base; some shaly beds, 10%	6	101
8	Covered. Soft, platy shale at base	19	95
7	Sandstone, medium-grained, brownish grey, rusty tan weathering, laminated, beds 6 - 12"	15	76
6	Sandstone, thinly bedded; 50% shale	3	61
5	Sandstone, fine-grained, slightly laminated, grey, rusty tan weathering; massive to bedded; somewhat concretionary	23	58
4	Sandstone, fine-grained, grey, rusty tan weathering, homogeneous; a few shaly intervals	5	35
3	Sandstone, 40%, very fine-grained, laminated, grey, rusty tan weathering, concretionary; shale, 60%, dark grey, platy; a few concretionary bands	17.5	30
2	Sandstone, fine-grained, grey, somewhat concretionary; 1' beds; few shaly breaks at base	5.5	12.5
1	Sandstone, fine-grained, grey, laminated, rusty tan weathering; and 50% shale, platy, somewhat shaly in lower half; a few small concretions	7	7
	Blackstone Formation		
	Concretionary Shale Zone		
	Shale, blocky, dark grey, rusty weathering; concretionary bands and concretions	32	

Bed	Lithology	Thickness (feet)	Height above base (feet)
	Shale, dark grey, rubbly to blocky, rusty weathering, some concretions	16	
	Siltstone, argillaceous, bedded, rusty weathering, some concretions	4	
	Shale, blocky, rusty weathering, bedded; concretions	34	

Section 6. Bighorn Formation, Cripple Creek Map-Area, South Ram River, approximately 3 1/2 miles below falls, Tp. 36, R. 13, W. 5.

Bed	Lithology	Thickness (feet)	Height above base (feet)
	Wapiabi Formation		
	Immediately overlying beds not exposed		
	Shale, platy to rubbly, dark grey, pebbles at base	5	
	Concretionary grit and 50% shale, mainly at base; rounded chert pebbles up to 1" scattered throughout	3	
	Bighorn Formation		
29	Sandstone, fine-grained, argillaceous, grey, brownish grey weathering; concretionary	2.5	342
28	Sandstone, fine-grained, brownish grey, brownish grey weathering, laminated; beds platy to 6"; 40% shale in 4 - 6" beds, 6" at top and base, platy, dark grey; some channel fillings; downslope the lower 3' is replaced by massive sandstone similar to that below	7	339.5
27	Sandstone, fine-grained, grey to bluish grey, slightly laminated, massive, beds not well defined; some large scale crossbedding at top; concretionary zones 3" x 1 - 2', orange weathering, with majority in basal 10'; bedding surfaces near base covered with Cardium	16	332.5
26	Sandstone, fine-grained, very finely laminated, beds 3 - 6"; concretionary spots; 3" siltstone in centre; 5% shale	3.5	316.5

Bed	Lithology	Thickness (feet)	Height above base (feet)
25	Sandstone, fine-grained, very finely laminated, grey to bluish grey, grey weathering, beds 6 - 12"; concretionary; 25% siltstone; beds separated by thinly bedded sandstone and siltstone; worm burrows, tracks, and trails	11.5	313
24	Siltstone, sandy, somewhat argillaceous, laminated, wavy bedded; bands of very fine-grained sandstone, 25%; rusty concretionary spots; rare concretions	13	301.5
23	Siltstone, as above; 40% sandstone in 6 - 12" beds; wavy bedded, grey weathering; orange weathering concretions	6	288.5
22	Siltstone, sandy, argillaceous, bedded, dark grey; more massive at top becoming shaly towards base; few scattered concretions; numerous rusty concretionary spots in upper half, two rows of orange weathering concretions in basal 10'	27	282.5
21	Sandstone to siltstone; bluish grey, laminated, rusty orange weathering	0.5	255.5
20	Shale, silty, blocky to platy, almost siltstone at top, more rubbly at base; bands of concretionary siltstone, 4" concretions in row at 35', scattered concretions more numerous below, grades into	51	255
19	Siltstone, very argillaceous, shaly, dark grey, rusty weathering, bedded, blocky; thinly bedded siltstone, 20%, laminated, bluish grey; rare concretions; pebbles at base	19	204

Bed	Lithology	Thickness (feet)	Height above base (feet)
18	Grit, greenish grey, cherty, massive, concretionary, rusty orange weathering; top surface covered with rounded pebbles up to 1 1/2', scattered pebbles throughout	3	185
17	Shale, blocky, dark grey, rusty weathering, some 2" x 1' concretions, band of argillaceous laminated siltstone at 6'	14	182
16	Siltstone, argillaceous, massive, dark grey; rusty concretionary spots; few irregular maroon weathering concretions; 4" concretionary band at base, grades into	15.5	168
15	Siltstone, slightly more bedded than above, more platy and shaly at base, dark grey, rusty weathering; concretionary spots; large 6" x 1 - 2' concretions at base, grades into	13	152.5
14	Shale, very silty, platy, blocky, dark grey, rusty weathering; rare concretions	13	139.5
13	Shale, dark grey, rubbly; 6" - 1' irregular orange weathering concretions	7	126.5
12	Shale, dark grey, blocky to rubbly; few concretions	20	119.5
11	Sandstone, fine-grained, grey, homogeneous, dense, tan weathering; beds 6" - 2'; top surface very argillaceous and carbonaceous	18	99.5
10	Sandstone, fine-grained, grey, massive, tan weathering, well cemented, worm reworked (?); few laminated bands; 3" reddish weathering concretionary band at base	4	81.5

Bed	Lithology	Thickness (feet)	Height above base (feet)
9	Sandstone, fine-grained, laminated, massive 1 - 3' beds; slightly concretionary; tan weathering; sharp break with concretionary band at 18'	19	77.5
8	Siltstone, argillaceous, bluish grey, wavy bedded; thinly bedded sandstone in basal 6"; 3" concretionary band in middle and concretions at base	9.5	58.5
7	Sandstone, fine-grained, laminated, grey, massive; some thinly bedded sandstone, crossbedding	7	49
6	Sandstone, as above, beds 2 - 6"; concretionary bands and few thin shale partings; sharp break at top grades into	7	42
5	Sandstone and 10% shale; 2 - 4" beds, wavy bedding, grades into	5	35
4	Sandstone, fine-grained, laminated, grey; 40% shale, cut and fill base	9	30
3	Sandstone, fine-grained, slightly argillaceous, bluish grey, laminated, massive 1 - 2' beds	9	21
2	Sandstone, argillaceous, laminated, more bedded and platy than above; 2" concretionary band at base, grades into	6	12
1	Siltstone, argillaceous, dark grey; shaly at base; concretionary bands	6	6
	Blackstone Formation		
	Concretionary Shale Zone		
	Shale, platy; 1 - 2" bands of siltstone, 10%; 2" concretionary bands, bedded appearance	17	

Bed	Lithology	Thickness (feet)	Height above base (feet)
	Shale, rubbly, dark grey; 4 - 6" x 6" - 1' orange weathering concretions	37	
	Shale, very rubbly, rusty weathering, dark grey; 2" concretionary bands; a few thin siltstone bands	46	
	Shale, platy to rubbly, rusty weathering; 3 - 4" x 8 - 12" concretions	33	
	Shale, platy, dark grey; thin concretionary bands	12	
	Shale, rubbly, rusty weathering; 2 - 3" x 6" concretions	13	

Section 7. Bighorn Formation, Wapiabi Creek Map-Area; Tp. 41, R. 17, W. 5; 1 mile downstream from junction of Wapiabi and Sturrock Creeks on western flank of anticline.

Bed	Lithology	Thickness (feet)	Height above base (feet)
	Wapiabi Formation		
9	Shale, fissile to rubbly, dark grey, rusty weathering, with irregular concretions	12	140
8	Shale, rubbly, increasing in silt content towards base; some siltstone bands	41	128
7	Shale, fissile to rubbly, with increasing silt content towards base; few thin siltstone bands with 4 inches of light grey clay, (bentonite ?) at base	24	87
6	Shale, black, rubbly to blocky, with gritty band 3 feet from top; abundant Scaphites, Inoceramus, gastropods; some pyrite and coaly fragments	25	63
5	Shale, rubbly, more silty than overlying beds, with thin 1" bands of finely laminated siltstone	6	38
4	Shale, rubbly to fissile, rusty weathering, with concretions in basal 2 feet; one inch bentonite bed at 7'	14	32
3	Shale, silty, hard, blocky to platy, with 1" band of bentonite at top and two feet from top	11	18
2	Grit, calcareous, greenish grey, rusty weathering, with 6" shale break at 1' and 3'	4	7
1	Grit, calcareous, and shale; 50% concretionary bands; some pebbles, 1/2" diameter, particularly at base	3	3

Bed	Lithology	Thickness (feet)	Height above base (feet)
	Contact with Bighorn formation: sandstone surface is somewhat uneven with flat pebbles 1" in diameter on top		
	Bighorn Formation		
35	Sandstone, hard, light grey, massive; Cardium at 1' and as coquina at base	2	230
34	Sandstone, finely laminated and thinly bedded, interbedded with 50% silty shale, dark grey; some poorly preserved fossils	4	228
33	Sandstone, silty, very finely laminated, fine-grained; concretionary at base	2	224
32	Sandstone, finely laminated, light grey, hard; massive beds with irregular base; possibly a channel filling	2	222
31	Shale, rubbly, and sandstone; these beds appear to be cut out by bed 32	1	220
30	Sandstone, hard, finely laminated, light grey; poorly preserved Cardium	9	219
29	Six inches of silty shale above and below one foot of sandstone, finely laminated: these appear to fill a channel as with bed 32	2	210
28	Sandstone, fine-grained, medium grey; some suggestion of channel filling	2	208
27	Shale, silty, 40%, and sandstone, interbedded; sandstone is finely laminated, light grey, fine-grained, in 6" - 1' beds	8	206
26	Shale, silty, 60%, and interbedded sandstone in beds 1 - 6" thick	6	198

Bed	Lithology	Thickness (feet)	Height above base (feet)
25	Sandstone, fine-grained, finely laminated; 4" of silty shale in middle	2	192
24	Shale, silty, and 30% interbedded sandstone, light grey, calcareous, some laminations, in beds 4 - 8" thick	12	190
23	Shale, silty and 10% sandstone, similar to above with rare concretions	8	178
22	Shale, very silty, dark grey, blocky, with thin sandstone beds; rare concretions and concretionary zones	8	170
21	Shale, rubbly to fissile, with few concretions and silty zones	7	162
20	Shale, silty, blocky; becoming more silty towards base; some irregular concretions and concretionary bands, 4" - 6' wide	42	155
19	Siltstone, very argillaceous, calcareous, dark grey, greenish-brown weathering, more shaly towards base; some concretionary zones	21	113
18	Shale, rubbly, fairly silty, dark grey, with some concretions, 6 x 8"	8	92
17	Shale, silty, blocky, dark grey, with concretions at top; one-inch band of light grey clay at base	11	84
16	Shale, black, fissile to rubbly, with concretionary band at top	2	73
15	Eight inches of concretionary band with 4" of dark grey shale at base	1	71
14	Sandstone, fine-grained, some finely laminated, mostly hard, massive, dark grey and calcareous	4	70

Bed	Lithology	Thickness (feet)	Height above base (feet)
13	Shale, silty, and finely laminated sandstone	2	66
12	Sandstone, silty, dark grey, hard, very calcareous	1	64
11	Shale, silty, dark grey, with some pelecypods; slickensided	2	63
10	Sandstone, silty, with abundant pelecypods	2	61
9	Shale, very sandy at top grading into black, platy shale at base	3	59
8	Sandstone, very argillaceous, dark grey, crossbedded, calcareous, fine-grained; grades into silty shales in basal 6"	2	56
7	Sandstone, finely laminated, fine-grained, irregularly bedded, rubbly in some zones	4	54
6	Sandstone, fine-grained, light grey, hard, becomes medium fine-grained towards base; massive bedded at top, and thinner, in beds 4 - 6", at base	11	50
5	Shale, silty; rubbly at top, becoming coaly at base	2	39
4	Sandstone, medium fine-grained, light grey, hard, massive; somewhat laminated and thinner, 4 - 6", at base	8	37
3	Sandstone, medium to medium fine-grained, light grey with slight brownish tint, hard, in beds 6 - 8" thick; irregular base, wave-like with amplitude of 6" and wave length of 1', formed of thinly bedded sandstone	8	29

Bed	Lithology	Thickness (feet)	Height above base (feet)
2	Sandstone, medium fine-grained, very light brownish grey, in beds 4 - 18" thick, slightly laminated in some zones	14	21
1	Sandstone, fine-grained, light grey, slightly laminated	7	7
	Blackstone Formation		
	Six inches of silty shale overlying 6" of sandstone, fine-grained, cross-bedded	1	
	Shale, very silty with thin, laminated sandstone bands	2	
	Shale, silty, 30%, rubbly and inter-bedded sandstone, fine-grained, crossbedded, in beds 2 - 4" thick	6	
	Sandstone, very fine-grained, hard, light grey; some carbonaceous inclusions	1	
	Sandstone, hard, light grey, fine-grained; 20% silty shale	6	
	Shale, very silty, blocky, dark grey; 50% sandstone, finely laminated, crossbedded, light grey	8	
	Shale, blocky, very silty, with few concretionary zones and some hard siltstone bands	20	
	Shale, silty, blocky to rubbly at top, becoming less silty towards base; disseminated concretions, 4 x 12", few 1" siltstone bands	30	

Section 8. Wapiabi Formation, George Creek Map-Area, Alberta, Blackstone River, east flank of syncline, eight miles below Mons Cabin, Tp. 42, R. 18, W. 5.

Bed	Lithology	Thickness (feet)	Height above base (feet)
	Brazeau Formation		
	Sandstone, medium-grained, greenish grey, laminated, brownish to greenish grey weathering, beds 6 - 8"; 20% shaly siltstone	2	
	Siltstone and 50% shale: greenish grey, irregularly bedded	2	
	Sandstone, medium-grained, greenish grey, greenish grey weathering, slightly laminated, carbonaceous, massive; suggestion of cross-bedding	11	
	Wapiabi Formation		
	Transition Zone		
71	Shale, dark grey, rubbly; 50% very thinly bedded siltstone, greenish to brownish grey, slightly calcareous	4	1108
70	Sandstone, grey, fine-grained, calcareous, brownish grey weathering; in beds 4 - 8" thick; 40% shale, dark grey, rubbly	7	1104
69	Shale, platy to rubbly, silty, greenish grey; 50% thin siltstone, some 1" bands in upper 4'	8	1097
68	Sandstone, fine-grained, grey, laminated, very calcareous, brown weathering; 50% shale, rubbly in 1 - 6" beds	9	1089
67	Shale, platy to blocky, rusty to greenish grey weathering, bedded appearance	12	1080

Bed	Lithology	Thickness (feet)	Height above base (feet)
66	Sandstone, very fine-grained, argillaceous, dark grey, dirty, rusty brown weathering, laminated, beds 1 - 4", grades into	4	1068
65	Shale, very silty; 40% very fine-grained sandstone or siltstone; greenish grey to rusty weathering, calcareous	8	1064
64	Shale, dark grey, rusty weathering, slightly calcareous, platy to rubbly; a few 1" concretionary bands	19	1056
63	Shale, blocky to rubbly, dark grey, rusty weathering, slightly calcareous	23	1037
62	Shale, rubbly to blocky, dark grey; 4 x 12" concretions at top and rare concretionary bands	12	1014
61	Limestone, dense, argillaceous, bluish grey, laminated; buff weathering and concretionary at base	2.5	1002
60	Shale, blocky, dark grey; few concretions	7	999.5
59	Grit, concretionary; very pebbly in upper 6", grades into	3	992.5
58	Shale, very silty to sandy, dark grey, rusty to greenish grey weathering; poorly developed concretionary areas	12	989.5
	Solomon Sandstone		
57	Sandstone, fine-grained, grey, rusty grey weathering, slightly calcareous; 20% shale	7.5	977.5
56	Siltstone, argillaceous, blocky; 50% shale, very silty, dark grey, bedded appearance	12	970

Bed	Lithology	Thickness (feet)	Height above base (feet)
55	Sandstone, fine-grained, grey, rusty grey weathering, laminated, massive	2	958
54	Siltstone to sandstone; laminated, grey, bedded, some concretions	9	956
53	Sandstone, fine-grained, silty, laminated, very slightly calcareous, grey, grey weathering; bedding not well defined, some concretions	9	947
52	Sandstone to siltstone; grey, massive, bedding very poorly defined, grey weathering; more shaly toward base	11	938
51	Siltstone, argillaceous, laminated bedded, dark grey	10	927
50	Siltstone to sandstone; very slightly calcareous, fine-grained, grey, argillaceous, massive with 6" x 2' concretions at top; more bedded at base, grades into	6	917
49	Siltstone, sandy to argillaceous; shaly, bedded, calcareous, rare concretions near top	15	911
48	Shale and 50% argillaceous siltstone, dark grey, bedded	4	896
47	Siltstone, argillaceous, massive, dark grey	7	892
46	Shale to siltstone: blocky, dark grey, 3" x 6 - 8" concretions at top and base	4	885
45	As above, no concretions	8	881
44	Shale, very silty, blocky, dark grey, calcareous; 6 x 24" concretions in bands	16	873

Bed	Lithology	Thickness (feet)	Height above base (feet)
43	Shale, blocky to rubbly, dark grey, a few thin siltstone bands, rare concretions; basal 2' slightly siltier	13	857
42	Siltstone, argillaceous, shaly, dark grey; more shaly towards base	8	844
41	Concretionary zone with 6" siltstone in centre, glauconite	2	836
40	Shale, blocky, dark grey; more rubbly toward base; rare concretions	9	834
39	Siltstone to shale, bedded, dark grey, glauconitic, concretionary spots, concretions 3 - 6" x 6 - 24"	19	825
38	Shale, rubbly; concretionary zone in centre	3	806
37	Siltstone to shale	6	803
36	Siltstone, argillaceous, massive, dark grey	8	797
	Upper Concretionary Shale Zone		
35	Shale, very silty, blocky, concretions 6 x 24"	12	789
34	Poorly exposed. Shale with concretions	49	777
33	Partly talus covered. Shale; rubbly, dark grey, irregular concretions, 6" x 8 - 24"	74	728
	Platy Zone		
32	Shale, platy to rubbly; 25% thin siltstone, dark grey; concretions 2 - 3" x 6 - 8"; basal 4' without concretions	39	654
31	Shale, rubbly	4	615

Bed	Lithology	Thickness (feet)	Height above base (feet)
30	Shale, platy to rubbly; 25% thin siltstones, rusty weathering; no concretions except for zone at top	19	611
29	Shale, platy, more rusty weathering than above; thin limestone zone at 22'	33	592
28	Limestone zone, platy, argillaceous, dense, bluish grey, yellow weathering	1	559
27	Shale, platy, dark grey; 30% thin siltstone, slightly calcareous; rare sandstone band at base	20	558
26	Limestone, dense, argillaceous, bluish grey, yellow weathering	1	538
25	Shale, platy, dark grey; 35% siltstone, very thinly bedded; rusty weathering, slightly calcareous; limestone lens 4' from top	47	537
24	Sandstone, fine-grained, laminated, calcareous, in 1 - 2" beds; 50% platy shale	36	490
23	Limestone, dense, argillaceous	1	454
22	Shale, platy, dark grey; 30% thinly bedded platy siltstone	24	453
21	Partially covered. Six inches lensy limestone at top, platy shale	18	429
20	Shale and 40% siltstone	12	411
19	Limestone, lensy; papery shale	1	399
18	Shale, platy; 40% thinly bedded siltstone	23	398

Bed	Lithology	Thickness (feet)	Height above base (feet)
17	Shale and 50% siltstone; somewhat rusty weathering	18	375
16	Covered	31	357
	Lower Concretionary Shale Zone		
15	Shale, dark grey, rubbly, rusty weathering; concretions 3 x 6" and 1' concretionary bands	13	326
14	Shale, platy, rusty weathering; concretions, 3" x 1'	5	313
13	Covered	22	308
12	Shale, blocky to rubbly, dark grey, rusty weathering; a few concretions 4 x 12"	61	286
	Lower Concretionary Siltstone Zone		
11	Concretionary zone with 50% shale	1	225
10	Siltstone, argillaceous, massive to bedded, dark grey, grey weathering, concretionary spots; large 1 - 3' concretions in centre, orange weathering	26	224
9	Siltstone to silty shale: dark grey, 6" x 2' concretions near base	8	198
8	Siltstone, dark grey, massive, rusty weathering; more bedded at base, some 4 x 8" concretions near base	45	190
	Striped Zone		
7	Shale, platy; 50% thin siltstone; concretions 3" x 6 - 8"	24	145
6	Shale, rubbly, rusty weathering; concretions, 2 x 6"	16	121

Bed	Lithology	Thickness (feet)	Height above base (feet)
5	Shale and 30% siltstone; basal part more rubbly with concretions	21	105
4	Shale and 40% siltstone: rusty weathering; concretions 4 x 8"	22	84
3	Shale, blocky to platy, rubbly; 30% thinly bedded siltstone; 1" bentonite at base, some concretionary bands	48	62
2	Shale, rubbly, dark grey, rusty weathering; a few small concretions	13	14
1	Siltstone to sandstone; concretionary, argillaceous; 50% shale	1	1
	Underlying beds - Bighorn Formation		

Section 9. Wapiabi Formation, Grave Flats Map-Area, Alberta, west flank of syncline on Thistle Creek. Sec. 13, Tp. 44, R. 20, W. 5. Described by R. J. W. Douglas, D. F. Stott, and D. C. Pugh.

Bed	Lithology	Thickness (feet)	Height above base (feet)
	Brazeau Formation		
	Conglomerate and sandstone: top 27 ft., grey weathering; underlain by greenish grey shale and thinly bedded sandstone, rubbly and concretionary	77	
	Sandstone capping, dark brown weathering, calcareous indurated	2	
	Sandstone, medium-grained, grey, massive-bedded; some laminations and large crossbedding; soft weathering places	22	
	Wapiabi Formation		
	Transition Zone		
90	Siltstone and shale; evenly bedded in alternating 2 - 3" beds	3	2100
89	Sandstone, fine-grained, evenly bedded, finely laminated; pinches out on south side	3	2097
88	Siltstone and shale: greenish grey, in alternating 1/2 - 1" beds; siltstone fine-grained, shaly silty; unit has banded appearance	20	2094
87	Sandstone, fine-grained, finely laminated, in 6 - 1" beds, alternating with 25% shale; silty	5	2074
86	Siltstone, fine-grained; shale, silty; greenish grey, in alternating 1/2 - 1" beds, banded appearance	30	2069

Bed	Lithology	Thickness (feet)	Height above base (feet)
85	Sandstone, fine-grained, finely laminated; and silty shale; 1.5' massive sandstone at base	7	2039
84	Shale, greenish grey, rubbly; banded appearance of alternating shale and silt, poorly defined bands, 2 - 3" thick; 2' limestone concretionary band at 22'; more massive, homogeneous, and silty towards base	42	2032
83	Limestone, silty to argillaceous, massive-bedded, finely laminated and crossbedded, 1/2 - 2" on weathered surface, dense, dark grey on fresh surface; base sharp	6	1990
82	Shale, silty, 1/2" pebbles throughout	1	1984
81	Sandstone, medium-grained, grey; 1/2" pebble conglomerate in top 2", lustre mottling	3	1983
80	Shale, silty, sandy, coaly	2	1980
79	Sandstone, medium-grained, grey	2.5	1978
78	Shale, coaly, sandy	0.5	1975.5
	Solomon Sandstone		
77	Sandstone, fine-grained, brown, calcareous cement, rusty to reddish brown, weathering maroon or purplish; 2" pebble conglomerate 9' below top, massive bedded, some crossbedding, some poor laminations; more greenish grey below 12'; 2" conglomerate, 1/4" pebbles at 35'; more greenish and brown to light brown weathering below with some suggestion of crossbedding and laminations	52	1975

Bed	Lithology	Thickness (feet)	Height above base (feet)
76	Shale, soft, clayey, and thinly bedded; finely laminated sandstone, ripple marked	3	1923
75	Sandstone, fine- to medium-grained, very massive bedded, greenish grey, large crossbedding and in places well developed laminations; shale pebble conglomerate 2" at 18' and 23' with flat silty shale pebbles 1 - 2"; 0.5' thinly bedded shaly partings at 44' and at base	52	1920
74	Sandstone, fine-grained, grey, finely and evenly laminated in 1 - 3' beds with thin shale partings	14	1868
73	Siltstone, argillaceous, rubbly; iron stained spots and interbedded more shaly bands	12	1854
72	Shale, silty	1	1842
71	Siltstone, fine-grained, grey, finely laminated, in 4" beds; shaly partings	2	1841
70	Shale, silty, homogeneous and massive; iron stain spots alternating with 50% 2 - 6" siltstone beds; fine pebbles, 1/8", in basal 2"	16	1839
69	Grit to fine conglomerate, orange weathering concretions	1	1823
68	Sandstone, massive-bedded, fine- to medium-grained, greenish grey, laminated; large crossbedding, traces of maroon weathering	15	1822
67	Sandstone, as above, and shale; silty, thinly bedded; iron stain spots	3	1807

Bed	Lithology	Thickness (feet)	Height above base (feet)
66	Siltstone, argillaceous, massive, blocky to rubbly, with concretionary spots; 3" concretionary band 7' below top, glauconitic	14	1804
65	Shale, silty, massive, rubbly; rather rare concretions, gradational above and below	20	1790
64	Siltstone, argillaceous, massive rubbly with large concretions and iron spots; 1' more shaly at 24' and in beds that follow at intervals dividing it into four to five sub-equal units, basal one 4' thick	56	1770
	Upper Concretionary Zone		
63	Shale, very silty; three large concretionary bands	12	1714
62	Shale, fairly fissile; numerous medium and large concretions	68	1702
61	Shale, very silty, dark grey; numerous large concretions	27	1634
60	Shale, very silty; rare concretions	22	1607
59	Shale, silty, dark grey; some concretions	6	1585
58	Shale, silty; rare concretions	12	1579
57	Shale, silty, dark grey; numerous concretions	18	1567
56	Shale, silty; some concretions	12	1549
55	Shale, fairly silty; rare concretions	11	1537
54	Shale, silty, dark grey; numerous concretions	18	1526
53	Shale, fissile; rare concretions	8	1508

Bed	Lithology	Thickness (feet)	Height above base (feet)
	Platy Zone		
52	Siltstone and shale: 20% siltstone in 1/2 - 1" beds, alternating with thin to massive silty shale; rare concretions 5' below top	20	1500
51	Shale, silty; rare thin siltstones	11	1480
50	Shale, silty and 15% siltstone; 1' yellow buff calcareous bed at top	27	1469
49	Siltstone and 30% shale; some 2" - 6' thick beds, with thicker ones weathering yellow buff	48	1442
48	Shale and 30% siltstones; in 1/2 - 2" bands; shale is thinly bedded, silty, dark grey	43	1394
47	Siltstone and 40% shale, as above	41	1351
46	Shale and 25% siltstone: heavy bedded siltstone, 4 - 6" at top, large ripples; pelecypods	28	1310
45	Sandstone, fine-grained, grey, in 2 - 6" beds, 40%, with silty shale and siltstones between	5	1282
44	Sandstone and 50% shale, as above; less resistant towards base	16	1277
43	Inaccessible but appears to be similar to overlying beds, 60% sandstone	70	1261
42	Siltstone and silty shale similar to overlying beds; occasional 2 - 3" fine-grained sandstone bed, 6" yellow weathering bed at base	45	1191
41	Shale, thinly bedded, platy with 30% siltstone, weathers rubbly below 35"	77	1146

Bed	Lithology	Thickness (feet)	Height above base (feet)
40	Sandstone, fine-grained, medium grey, laminated, dense, in 1 - 2" bands with 40% silty shale	21	1069
39	Limestone, silty, laminated, light yellow buff weathering, 6" shale 6" from top	3	1048
38	Siltstone and shale, finely interbedded forming hard banded unit; siltstone light grey	29	1045
37	Shale, silty, platy; some bands of dense hard siltstone; unit has banded appearance	44	1016
36	Siltstone and 50% shale: 1/4 - 1/2" bands with occasional 4 - 6" sandstone, fine-grained	27	972
35	Shale, silty, and 25% siltstones: rather rusty weathering; 2' limestone concretion at 20' and at 39'	43	945
34	Siltstone and 50% shale, thinly bedded	39	902
33	Shale, silty, platy; grading into laminated siltstone in upper 10': some hard, dense siltstone bands in basal 30'	81	863
32	Shale, silty, rubbly, rusty weathering, dark grey	16	782
	Lower Concretionary Shale Zone		
31	Shale, silty, rusty weathering; 25% thin rusty weathering siltstones and rare concretions in bands; concretionary at top	55	766
30	Partially covered. Appears to contain less siltstone	20	711

Bed	Lithology	Thickness (feet)	Height above base (feet)
29	Shale, silty, rusty weathering; 25% thin rusty weathering siltstones	25	691
28	Shale; a few 1/2" siltstone beds with larger irregular concretions	50	666
27	Shale, silty; concretions rare	15	616
26	Shale and thin siltstones; concretions common	27	601
25	Shale; concretions rare	20	574
24	Shale, silty, blocky to rubbly, less silty in basal 15'; some concretions 4" and 4" - 2'; large concretions contain pelecypod fragments	49	554
23	Covered. Shale rubbly with concretions. Estimated	90	505
	Lower Concretionary Siltstone Zone		
22	Siltstone, argillaceous, dark grey, blocky; concretions 4" and 12 - 18". Estimated	90	415
21	Shale, silty, massive, blocky; large 6" - 1' concretions, rather rare; seems more resistant than underlying beds	23	325
20	Shale, concretions common and rare, 5%; 1/4" siltstone beds	23	302
	Striped Zone		
19	Siltstone and 20% shale; rare concretions, top 6" and 1' concretionary bands	25	279
18	Shale with 5% siltstone; 1/4" bands; scattered concretions, some in bands	45	254

Bed	Lithology	Thickness (feet)	Height above base (feet)
17	Siltstone, thinly bedded; and 25% shale, in alternating 1/2 - 1" bands; top 10' is rusty weathering, 6" concretionary bed at top but no concretions in unit	18	209
16	Shale, grey, 1/8 - 1/2" siltstone stringers; scattered concretions and concretionary bands, 5%; 1/4" bentonite at 19'	37	191
15	Shale, grey; scattered concretions	6	154
14	Shale, more resistant and siltier	10	148
13	Shale, grey, sub-fissile; bands of concretions; 4 x 6", ovoid, common; some 2" bands of siltstone at top	27	138
12	Shale and 15% siltstone: in bands 1/2 - 2" thick with concretionary bands, 2 - 4"; rows of concretions	15	111
11	Shale, grey; concretions in bands	5	96
10	Shale, grey, sub-fissile, very rusty weathering	5	91
9	Shale, grey; common large 2" x 1' orange weathering concretions and 5% siltstone bands	11	86
8	Shale, grey; round to oval concretions; rare siltstone bands	9	75
7	Sandstone and shale	4	66
6	Siltstone and 25% shale; many concretionary bands at top and concretions throughout	12	62
5	Shale, grey, sub-fissile; rare 2 x 4" concretions	7	50

Bed	Lithology	Thickness (feet)	Height above base (feet)
4	Shale, 30% siltstone, in underlying beds; 4" x 2' concretions	8	43
3	Shale, grey; 10% 1/2 - 2" grey siltstone in bands and lenses	15	35
2	Shale, grey, massive to sub-fissile, grey weathering in basal part, rusty weathering at top	14	20
1	Siltstone, argillaceous; 1/4" pebbles near top	6	6
	Underlying beds - Bighorn Formation; See Section 4		

Section 10. Solomon Sandstone, Wapiabi Formation, Cripple Creek Map-Area, Alberta, South Ram River, approximately 1 1/2 miles west of forestry road, Tp. 36, R. 14, W. 5.

Bed	Lithology	Thickness (feet)	Height above base (feet)
	Wapiabi Formation		
	Solomon Sandstone		
	Overlying beds not exposed		
24	Grit; scattered 1/2" rounded chert pebbles, rusty weathering, grades into	8	215
23	Siltstone, argillaceous to gritty at top; shaly at base; dark grey	6	207
22	Siltstone, argillaceous, gritty at top with 4" concretionary band; more shaly at base; dark grey, rusty spots	5	201
21	Siltstone, argillaceous, dark grey, shaly	4	196
20	Siltstone, massive at top, shaly at base, dark grey; rusty concretionary spots	13	192
19	Siltstone, bedded, dark grey, argillaceous; 3 x 6" concretions; more silty in basal 9'	23	179
18	Sandstone, fine-grained, laminated, grey, brownish grey weathering; beds 6" - 1', lensy; 20% shale, rare concretions	7	156
17	Siltstone to sandstone, laminated, wavy bedded massive; 10% shale	7	149
16	Sandstone, fine-grained, laminated, grey, brownish grey weathering, massive; 10% shale	2	142

Bed	Lithology	Thickness (feet)	Height above base (feet)
15	Shale, very silty; 20% sandstone as above	4	140
14	Sandstone as above; 15% shale; lensy, rare concretions, more platy at base	11	136
13	Siltstone to sandstone: laminated, dark grey; 50% shale in 1 - 2' beds, irregular, lensy	8	125
12	Siltstone, argillaceous, shaly; shale; bedded appearance	18	117
11	Sandstone to siltstone: laminated, massive to irregularly bedded, dark grey, grey weathering	5	99
10	Shale, very silty, to argillaceous siltstone, platy	7	94
9	Sandstone to siltstone: laminated, grey, 6" band with concretions at base	4	87
8	Siltstone to shale; mostly covered	11	83
7	Siltstone, sandy, dark grey	2	72
6	Siltstone and shale: dark grey, platy	13	70
5	Siltstone, sandy, argillaceous, irregularly bedded; concretionary band at top with lenses of grit	7	57
4	Siltstone, argillaceous, wavy bedded; 20% shale; concretionary band at top and base with sandy glauconite; a few laminated bands of siltstone	21	50
3	Sandstone, fine-grained, silty, grey, laminated, crossbedded, massive to platy; a few shaly intervals; rare concretions	8	29

Bed	Lithology	Thickness (feet)	Height above base (feet)
2	Siltstone, argillaceous, dark grey, irregularly bedded, grey weathering; slightly more shaly at base	10	21
1	Siltstone, very shaly; 1' concretionary zone at top	11	11
	Upper Concretionary Shale Zone		
	Shale, blocky, dark grey, rusty weathering; 2" concretionary zone at top	20	
	Shale, blocky to rubbly, dark grey, rusty weathering; 3 x 6" orange weathering concretions	9	
	Shale, blocky, dark grey, rusty weathering; row of concretions at top	7	
	Shale, blocky to rubbly	11	
	Shale, blocky; band of concretions at top; irregular concretions throughout; grades into	22	
	Shale, more rubbly than above, dark grey; 6" x 1' irregular concretions	13	

Section 11. Solomon Sandstone, and Transition Zone, Wapiabi Formation, Cardinal River, west flank of syncline, 4 miles below Grave Flats, Grave Flats Map-Area, Alberta; Tp. 45, R. 20, W. 5.

Bed	Lithology	Thickness (feet)	Height above base (feet)
	Brazeau Formation		
	Sandstone, coarse-grained, greenish grey; conglomerate at base; pebbles 1/8 - 1 1/2"; base sharp, cutting into underlying beds to depth of 1 1/2"		
	Wapiabi Formation		
	Transition Zone		
31	Shale, grey, silty, thinly bedded	3	293
30	Siltstone, dark grey, well indurated, dense, brown weathering; 6" of grey thinly bedded to fissile shale at base	2	290
29	Sandstone, fine-grained at top becoming coarse-grained to gritty at base, greenish grey, massive bedded, laminated; some large crossbedding, thinly bedded towards base; contact sharp	4	288
28	Shale, rubbly to sub-fissile, alternating with 50% siltstone in 1 - 2" beds, dark grey, banded appearance	8	284
27	Shale, silty, greenish to brownish grey; 50% alternating siltstones, 1 - 4", finely and evenly laminated, bedded appearance, a few carbonaceous inclusions; 40% shale, at top increasing to 50% at base	33	276
26	Shale, silty, rubbly to thinly bedded, grey to greenish grey	10	243

Bed	Lithology	Thickness (feet)	Height above base (feet)
25	Shale, as above, 30% 1/2 - 1" siltstone bands, rusty weathering; 1' lenticular limestone concretion at 9'	10	233
24	Shale, silty, blocky to bedded, dark grey, rusty weathering, a few thin, poorly developed concretionary bands; rare concretions, 3 x 10", at top, increasing in number towards the base	25	223
23	Concretionary band; some gritty, greenish grey sandstone	1	198
22	Shale, massive, silty; small lenses of grit	5	197
21	Conglomeratic silty shale; pebbles up to 1 1/2" well rounded; concretions, 2 x 6", common	3	192
20	Siltstone, thinly bedded, laminated; thin shale partings, grey	3	189
	Solomon Sandstone		
19	Sandstone, fine-grained, slightly greenish grey, laminated, cross-bedded, massive	3	186
18	Sandstone and 50% silty shale in alternating beds; ripple marked; concretions	2.5	183
17	Shale, silty, carbonaceous; thin sandstone beds, ripple marked	0.5	180.5
16	Sandstone, laminated, fine-grained, massive, light grey; 2" carbonaceous shale at 2' thins to a knife edge up slope	5	180

Bed	Lithology	Thickness (feet)	Height above base (feet)
15	Sandstone, as above, alternating with silty shale. Sandstone in lenses passing into underlying bed	3	175
14	Sandstone, fine-grained, grey, greenish cast, finely laminated, crossbedded, greenish to rusty weathering; shaly, concretionary parting at base	3	172
13	Sandstone, as above, 6" concretionary shale parting at base; beds are very lenticular	2	169
12	Sandstone, massive, fine-grained, grey, greenish grey; not as finely laminated as in overlying beds	3	167
11	Shale, silty, grey, and alternating sandstone; beds 3 - 6", fine-grained, brown, lenticular, calcareous, well indurated	3	164
10	Sandstone, thinly bedded, finely laminated, crossbedded, fine-grained	3	161
9	Covered. Bedded argillaceous siltstone	6	158
8	Sandstone, as above; in three beds, 1' - 10" thick with silty partings	5	152
7	Siltstone, bedded, light grey to medium grey	16	147
6	Siltstone, laminated, dirty grey, thinly bedded, hard, platy	5	131
5	Siltstone, argillaceous, massive to bedded; iron stained spots	4	126
4	Sandstone, fine-grained, hard, concretionary, dirty grey, massive, laminated	2	122

Bed	Lithology	Thickness (feet)	Height above base (feet)
3	Siltstone, argillaceous, medium grey, concretionary, massive, irregularly weathering; concretions better developed at base; unit becomes less silty towards base	52	120
2	Siltstone, shaly; 6" well indurated siltstone at top, rusty weathering, glauconitic at 11'; upper 11' contains no concretions; basal 9' contains concretions and glauconite	20	68
1	Siltstone, argillaceous, dark grey, massive; iron stained spots, large concretions; becomes more shaly towards base	48	48
	Upper Concretionary Shale Zone		
	Covered	14	
	Shale, dark grey, silty, thinly bedded to blocky, slightly rusty weathering; 2 - 3" x 6 - 12" concretions, some irregular	70	
	Shale, sub-fissile, less silty than in overlying beds; concretions	32	
	Shale as above, with thinly bedded, finely laminated siltstone in 1/2 - 1" bands; few concretions	20	

Section 12. Solomon Sandstone, Wapiabi Formation, Moon Creek Map-Area, Alberta, Little Berland River.

Bed	Lithology	Thickness (feet)	Height above base (feet)
	Overlying beds - Brazeau Formation, not exposed		
	Wapiabi Formation		
	Solomon Sandstone		
	Upper contact not visible		
24	Not well exposed. Sandstone, fine-grained, grey weathers rusty brown, laminated, deeply weathered; beds 1 - 3" thick	5	205
23	Sandstone, fine-grained, grey, rusty-brown weathering, laminated, beds 2 - 6", deeply weathered	4	200
22	Covered	7	196
21	Sandstone, similar to above, beds 1 - 4", not well exposed in basal 8'	14	189
20	Sandstone, fine-grained, laminated, massive, beds 1 - 2', rusty brown weathering	21	175
19	Covered. Appears to be sandstone, fine-grained, grey to brownish grey, dirty, more thinly bedded than above, 2 - 4"	8	154
18	Sandstone, fine-grained, grey, dirty, brownish grey weathering, beds 4 - 10"; 1' zone of thinly bedded sandstone at 5'; some concretion zones in basal 6'	17	146
17	Covered	4	129

Bed	Lithology	Thickness (feet)	Height above base (feet)
16	Sandstone, fine-grained, as above, 4" concretionary zone in centre, with shale	2.5	125
15	Sandstone, silty, irregularly bedded, blocky, dark grey	2	122.5
14	Sandstone, finely laminated, grey, rusty tan weathering, suggestion of crossbedding, beds 4 - 8"	3.5	120.5
13	Sandstone, silty, irregularly bedded, grey; 8" sandstone at 2'; trace of worm burrows	4	117
12	Sandstone, grey, fine-grained, laminated, beds 6 - 10"	2.5	113
11	Siltstone, sandy, irregular to wavy bedding, grey, dirty, grades into	6.5	110.5
10	Shale, dark grey, very silty at top becoming less so towards base, blocky; a few small silty concretions, 1 - 2"	12	104
9	Siltstone to sandstone; poorly bedded, argillaceous, grey, rusty tan weathering	4	92
8	Shale, very silty, to argillaceous siltstone, blocky, dark grey, rusty weathering	13	88
7	Covered	14	75
6	Shale, brownish grey, blocky; 10% thin sandstone; concretionary zones	5	61
5	Sandstone, fine-grained, laminated, grey, massive, rusty orange weathering	2	56

Bed	Lithology	Thickness (feet)	Height above base (feet)
4	Sandstone, fine-grained, grey, laminated, rusty orange weathering; 40% shale, blocky, silty; sandstone more abundant in basal 4'; beds 1 - 2" at top, 4 - 6" near base	16	54
3	Shale to siltstone, grey, bedded, blocky, rusty weathering	12	38
2	Siltstone, sandy, grey, rusty weathering, somewhat bedded; grades downward into	15	26
1	Shale, very silty, to siltstone, argillaceous, bedded, blocky, grey; some 1 - 2" concretions, glauconite	11	11
	Covered Interval		