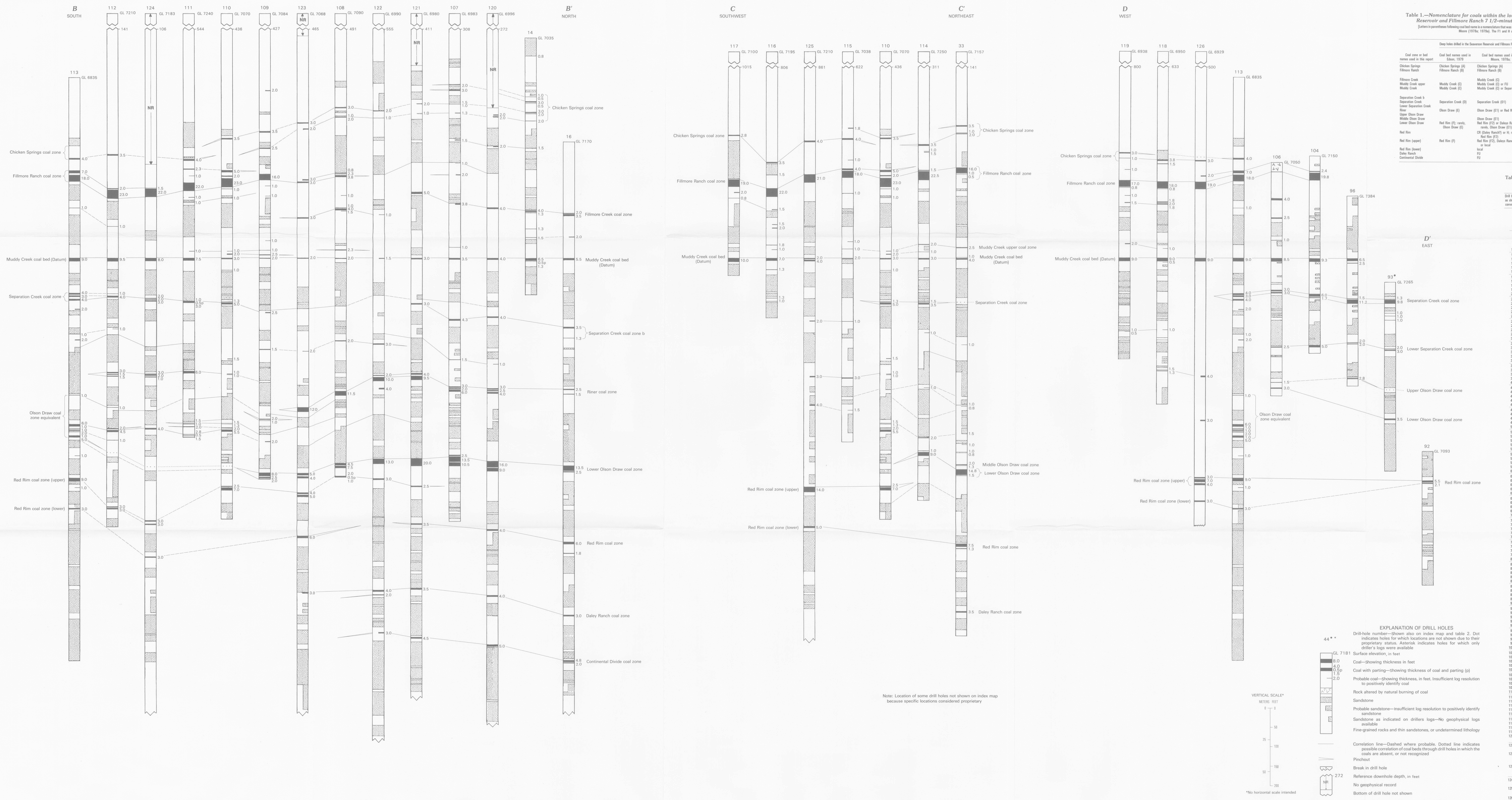


EXPLANATION OF DRILL HOLES

44• * Drill-hole number—Shown also on index map and table 2. Dot indicates holes for which locations are not shown due to their proprietary status. Asterisk indicates holes for which only driller's logs were available

GL 7181 Surface elevation, in feet

8.0 Coal—Showing thickness in feet

4.0 0.5p Coal with parting—Showing thickness of coal and parting (p)

2.0 Probable coal—Showing thickness, in feet. Insufficient log resolution to positively identify coal

Rock altered by natural burning of coal

Sandstone

Probable sandstone—Insufficient log resolution to positively identify sandstone

Sandstone as indicated on drillers logs—No geophysical logs available

Fine-grained rocks and thin sandstones, or undetermined lithology

Correlation line—Dashed where probable. Dotted line indicates possible correlation of coal beds through drill holes in which the coals are absent, or not recognized

Pinchout

Break in drill hole

272 Reference downhole depth, in feet

NR No geophysical record

Bottom of drill hole not shown

Note: to convert measurements from feet to meters, multiply values in feet by 0.305.

Table 1.—*Nomenclature for coals within the lower coal zone of the Paleocene Fort Union Formation, Seaverson Reservoir and Fillmore Ranch 7 1/2–minute quadrangles, Little Snake River coal field, Wyoming*

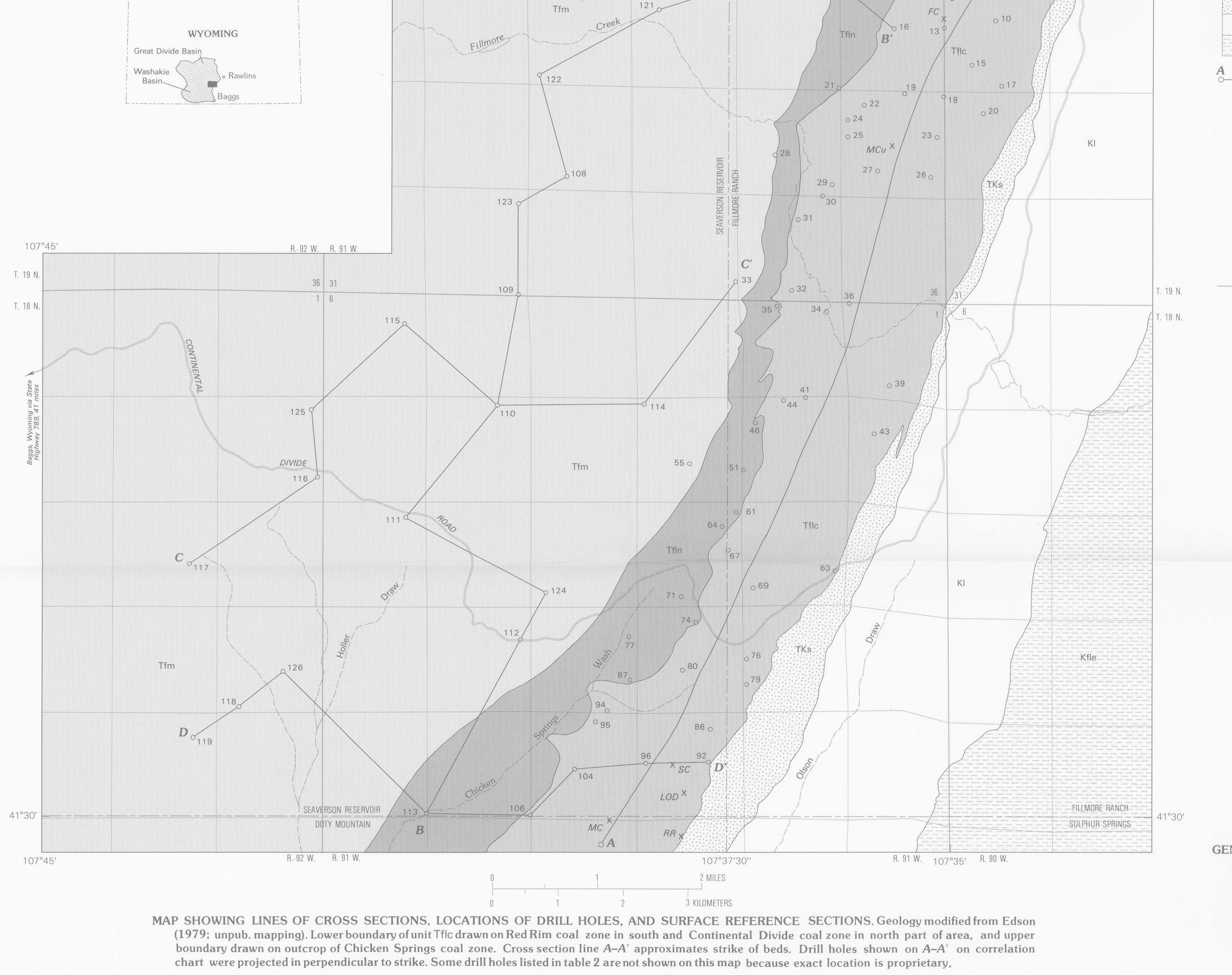
[Letters in parentheses following coal bed name is a nomenclature that was used by Rocky Mountain Energy Company in the late 1970's, and followed by Edson (1979) and Dames and Moore (1978a; 1979a). The F1 and H coals were never named. FU indicates undifferentiated Fort Union coal]

	Deep holes drilled in the Seaverson Reservoir and Fillmore Ranch quadrangles		Shallow holes drilled in the Seaverson Reservoir and Fillmore Ranch quadrangles		
Coal zone or bed names used in this report	Coal bed names used in Edson, 1979	Coal bed names used in Dames and Moore, 1978a; 1979a	Coal bed names used in Edson, 1979	Coal bed names used in Dames and Moore, 1978a, 1979a, south of Fillmore Creek	Coal bed names used in Dames and Moore, 1978a, north of Fillmore Creek
Chicken Springs	Chicken Springs (A)	Chicken Springs (A)	Chicken Springs (A)	Chicken Springs (A) or FU	FU
Fillmore Ranch	Fillmore Ranch (B)	Fillmore Ranch (B)	Fillmore Ranch (B)	Fillmore Ranch (B)	Fillmore Ranch (B); sometimes Chicken Springs (A) or FU
Fillmore Creek		Muddy Creek (C)			Muddy Creek (C) or FU
Muddy Creek upper	Muddy Creek (C)	Muddy Creek (C) or FU		Muddy Creek (C) or FU	FU
Muddy Creek	Muddy Creek (C)	Muddy Creek (C) or Separation Creek (D1)	Muddy Creek (C)	Muddy Creek (C)	Separation Creek (D1) or FU; sometimes Muddy Creek (C)
Separation Creek b					FU or Separation Creek (D1)
Separation Creek	Separation Creek (D)	Separation Creek (D1)	Separation Creek (D)	Separation Creek (D1) or FU	Separation Creek (D1)
Lower Separation Creek				FU	
Riner	Olson Draw (E)	Olson Draw (E1) or Red Rim (F2)			Olson Draw (E1)
Upper Olson Draw				FU	
Middle Olson Draw		Olson Draw (E1)		Olson Draw (E1)	F1 or Red Rim (F2)
Lower Olson Draw	Red Rim (F); rarely, Olson Draw (E)	Red Rim (F2) or Daleys Ranch (G); rarely, Olson Draw (E1)	Olson Draw (E)	Olson Draw (E1)	Red Rim (F2)
Red Rim		CR (Daley Ranch?) or H; rarely, Red Rim (F2)	Red Rim (F)	Red Rim (F2)	Daleys Ranch (G) or FU
Red Rim (upper)	Red Rim (F)	Red Rim (F2), Daleys Ranch (G) or local			
Red Rim (lower)		local			
Daley Ranch		FU			FU
Continental Divide		FU		FU	FU

Table 2.—*List of drill holes used in correlating coal beds in the Fillmore Ranch and Seaverson Reservoir 7 1/2–minute quadrangles, Carbon County, Wyoming*

Drill Hole no. as shown on correlations[1]	Source of data	Name of Drill Hole	Location Sec.	Location T. N.	Location R. W.	References for Published Logs
1	Rocky Mountain Energy	RR 514	18	19	90	
2	-----do.---------	RR 518	18	19	90	
3	Union Carbide	SS 64–2	18	19	90	
4	U.S. Geological Survey	FR–D1	18	19	90	Hettinger and Brown, 1979.
5	Rocky Mountain Energy	RR 85	19	19	90	
6	Rocky Mountain Energy	RR 527	18	19	90	
7	-----do.---------	RR 531	13	19	91	
8	-----do.---------	RR 117	13	19	91	
9	-----do.---------	RR 197	19	19	90	
10	-----do.---------	RR 87	19	19	90	
11	Rocky Mountain Energy	RR 196	13	19	91	
12	-----do.---------	RR 97	13	19	91	
13	-----do.---------	RR 86	19	19	90	
14	U.S. Geological Survey	FR–D2	14	19	91	Hettinger and Brown, 1979.
15	Rocky Mountain Energy	RR 116	19	19	90	
16	Union Carbide	BS 211–1	24	19	91	
17	Rocky Mountain Energy	RR 198	19	19	90	
18	-----do.---------	RR 98	25	19	91	
19	-----do.---------	RR 96	25	19	91	
20	Union Carbide	SS 108–1	30	19	90	
21	Rocky Mountain Energy	RR 199	23	19	91	
22	-----do.---------	RR 113	25	19	91	
23	-----do.---------	RR 110	25	19	91	
24	-----do.---------	RR 565	25	19	91	
25	-----do.---------	RR 201	25	19	91	
26	Rocky Mountain Energy	RR 112	25	19	91	
27	-----do.---------	RR 101	25	19	91	
28	U.S. Geological Survey	FR–D5	26	19	91	Hettinger and Brown, 1979.
29	Union Carbide	BS 16–1	26	19	91	
30	Rocky Mountain Energy	RR 579	26	19	91	
31	Rocky Mountain Energy	RR 108	35	19	91	
32	-----do.---------	RR 105	35	19	91	
33	Union Carbide	BS 52–1	34	19	91	
34	---do.--	BS 145–1	2	18	91	
35	U.S. Geological Survey	FR–D3	2	18	91	Edson and Curtiss, 1976.
36	Rocky Mountain Energy	CB 1	1	18	91	
37*	-----do.---------	CB 9	1	18	91	
38*	-----do.---------	CB 5	1	18	91	
39	-----do.---------	CB 7	1	18	91	
40*	-----do.---------	CB 8	1	18	91	
41	Rocky Mountain Energy	CB 13	11	18	91	
42*	-----do.---------	CB 14	11	18	91	
43	U.S. Geological Survey	FR–D8	12	18	91	Hettinger and Brown, 1979.
44	Rocky Mountain Energy	CB 15	11	18	91	
45*	-----do.---------	CB 20	11	18	91	
46	Rocky Mountain Energy	CB 17	11	18	91	
47*	-----do.---------	CB 21	11	18	91	
48*	-----do.---------	CB 18	11	18	91	
49*	-----do.---------	CB 31	11	18	91	
50*	-----do.---------	CB 27	11	18	91	
51	Rocky Mountain Energy	CB 22	11	18	91	
52*	-----do.---------	CB 26	11	18	91	
53*	-----do.---------	CB 187	14	18	91	
54*	-----do.---------	CB 186	14	18	91	
55	U.S. Geological Survey	SR–D8	10	18	91	Hettinger and Brown, 1979.
56*	Rocky Mountain Energy	CB 25	11	18	91	
57*	-----do.---------	CB 24	11	18	91	
58*	-----do.---------	CB 184	14	18	91	
59*	-----do.---------	CB 23	11	18	91	
60*	-----do.---------	CB 185	14	18	91	
61	Rocky Mountain Energy	CB 36	15	18	91	
62*	-----do.---------	CB 182	14	18	91	
63	U.S. Geological Survey	FR–D7	14	18	91	Edson and Curtiss, 1976.
64	Rocky Mountain Energy	CB 37	15	18	91	
65*	-----do.---------	CB 38	15	18	91	
66*	Rocky Mountain Energy	CB 144	14	18	91	
67	-----do.---------	CB 39	15	18	91	
68*	-----do.---------	CB 180	15	18	91	
69	U.S. Geological Survey	FR D6	14	18	91	Edson and Curtiss, 1976
70*	Rocky Mountain Energy	CB 49	23	18	91	
71	Rocky Mountain Energy	CB 41	15	18	91	
72*	-----do.---------	CB 45	23	18	91	
73*	-----do.---------	CB 189	22	18	91	
74	U.S. Geological Survey	SR–D4	22	18	91	Edson and Curtiss, 1976.
75*	Rocky Mountain Energy	CB 170	22	18	91	
76	Rocky Mountain Energy	CB 52	23	18	91	
77	-----do.---------	CB 54	21	18	91	
78*	-----do.---------	CB 169	22	18	91	
79	-----do.---------	CB 53	23	18	91	
80	U.S. Geological Survey	SR–D5	22	18	91	Edson and Curtiss, 1976.
81*	Rocky Mountain Energy	CB 156	22	18	91	
82*	-----do.---------	CB 175	22	18	91	
83*	-----do.---------	CB 155	27	18	91	
84*	-----do.---------	CB 176	22	18	91	
85*	-----do.---------	CB 168	22	18	91	
86	Rocky Mountain Energy	CB 64	27	18	91	
87	-----do.---------	CB 57	21	18	91	
88*	-----do.---------	CB 63	27	18	91	
89*	-----do.---------	CB 178	22	18	91	
90*	-----do.---------	CB 56	21	18	91	
91*	Rocky Mountain Energy	CB 60	21	18	91	
92	-----do.---------	CB 65	27	18	91	
93*	-----do.---------	CB 157	27	18	91	
94	-----do.---------	CB 59	21	18	91	
95	U.S. Geological Survey	SR–D6	28	18	91	Edson and Curtiss, 1976.
96	Rocky Mountain Energy	CB 68	27	18	91	
97*	-----do.---------	CB 152	27	18	91	
98*	-----do.---------	CB 166	28	18	91	
99*	-----do.---------	CB 160	27	18	91	
100*	-----do.---------	CB 66	27	18	91	
101*	Rocky Mountain Energy	CB 161	28	18	91	
102*	-----do.---------	CB 149	27	18	91	
103*	-----do.---------	CB 135	28	18	91	
104	U.S. Geological Survey	SR–D7	28	18	91	Edson and Curtiss, 1976
105*	Rocky Mountain Energy	CB 163	28	18	91	
106	Rocky Mountain Energy	CB 74	29	18	91	
107	Union Carbide	BS 109–1	22	19	91	
108	---do.--	BS 610–1	28	19	91	
109	---do.--	BS 629–1	32	19	91	
110	---do.--	BS 218–1	8	18	91	
111	Union Carbide	BS 256–1	18	18	91	
112	---do.--	BS 293–1	20	18	91	
113	---do.--	BS 341–1	30	18	91	
114	---do.--	BS 200–1	10	18	91	
115	---do.--	BS 653–1	6	18	91	
116	Union Carbide	BS 677–1	12	18	92	
117	---do.--	BS 731–1	14	18	92	
118	---do.--	BS 395–1	24	18	92	
119	---do.--	BS 400–1	26	18	92	
120	Davis Oil, No. 1 Elaine Federal		14	19	91	
121	Texas Oil and Gas, Federal J1		22	19	91	
122	Davis Oil and Southland Royalty, No. 1 North Creston		21	19	91	
123	-----do.---------, No. 1 Petroleum Federal		32	19	91	
124	Samedan Oil, No. 1 State		16	18	91	
125	Amoco Production, Creston Unit No. 1		12	18	92	
126	Marathon Oil, 5–24 Creston Unit No. 3		24	18	92	

[1] Asterisk indicates not shown on index map because specific location considered proprietary



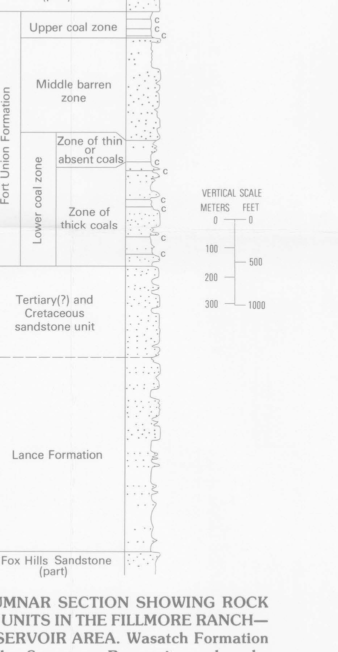
MAP SHOWING LINES OF CROSS SECTIONS, LOCATIONS OF DRILL HOLES, AND SURFACE REFERENCE SECTIONS. Geology modified from Edson (1979; unpub. mapping). Lower boundary of unit Tflc drawn on Red Rim coal zone in south and Continental Divide coal zone in north part of area, and upper boundary drawn on outcrop of Chicken Springs coal zone. Cross section line *A–A′* approximates strike of beds. Drill holes shown on *A–A′* on correlation chart were projected in perpendicular to strike. Some drill holes listed in table 2 are not shown on this map because exact location is proprietary.

LIST OF MAP UNITS

Fort Union Formation (Paleocene)
- Tfm — Middle barren zone
- Lower coal zone
  - Tfln — Zone of thin or absent coal beds
  - Tflc — Zone of thick coal beds
- TKs — Tertiary(?) and Cretaceous sandstone unit
- Kl — Lance Formation (Upper Cretaceous)
- Kfle — Fox Hills Sandstone and Lewis Shale (Upper Cretaceous)

A———A′ Cross section
○15 Drill hole—Showing number used on cross sections
Surface reference section
- xFC Fillmore Creek coal zone
- xMCu Muddy Creek upper coal zone
- xMC Muddy Creek coal bed
- xSC Separation Creek coal zone
- xLOD Lower Olson Draw coal zone
- xRR Red Rim coal zone
- xCD Continental Divide coal zone

—— – —— Boundary of 7 1/2–minute quadrangles



GENERALIZED COLUMNAR SECTION SHOWING ROCK STRATIGRAPHIC UNITS IN THE FILLMORE RANCH—SEAVERSON RESERVOIR AREA. Wasatch Formation exposed west of the Seaverson Reservoir quadrangle. Thicknesses of most units and positions of major sandstones (dotted) and coals (c) inferred from El Paso Natural Gas Company, No. 1 Government-Davidson, in sec. 4, T. 19 N., R. 92 W.

INTRODUCTION

The Fort Union Formation of Paleocene age crops out in a north-south band along the southeastern margin of the Great Divide basin and the eastern margin of the Washakie basin, from west of Rawlins to east of Baggs, Wyo. (index map). This area is situated in the west half of the Little Snake River coal field. As mapped by Edson (1979; unpub. data) the Fort Union crops out in the Seaverson Reservoir and in the western half of the Fillmore Ranch 7 1/2–minute quadrangles about 25 mi southwest of Rawlins. In these quadrangles the Fort Union dips to the west, from 9° to 20° in the lower part of the formation decreasing to 4° or less in the upper part of the formation. The Fort Union overlies an unnamed Upper Cretaceous and Tertiary(?) sandstone unit, and is overlain by the Eocene Wasatch Formation west of the Seaverson Reservoir quadrangle. In the Fillmore Ranch and Seaverson Reservoir quadrangles the highest part of the Fort Union Formation is not preserved, but a few miles west of the Seaverson Reservoir quadrangle a complete section of the Fort Union is between 2,800 and 2,900 ft thick (based on thicknesses in El Paso Natural Gas Company, No. 1 Govt.-Davidson, in sec. 4, T. 19 N., R. 92 W., and in El Paso Natural Gas Company, No. 1 Cortez-Govt., in sec. 32, T. 19 N., R. 92W.). The Fort Union as mapped by Edson (1979) is divisible into upper and lower coal-bearing zones which are separated by a middle barren zone. Edson (1979; unpub. mapping) included a thick sandstone sequence as the basal part of the Fort Union; this sandstone is separated from the Fort Union Formation in this report. This sandstone unit is at least 800 ft thick in surface outcrops just north of the Fillmore Ranch quadrangle and is about 1,000 ft thick in El Paso Natural Gas Company, No. 1 Govt.-Davidson. About 4.5 mi south of the Seaverson Reservoir quadrangle, this thick sandstone sequence is Late Cretaceous in age in the bottom two-thirds and early Tertiary in age in the top third (J. G. Honey and R. D. Hettinger, unpub. data). It is not known if this unit crosses the Cretaceous-Tertiary boundary in the Seaverson Reservoir and Fillmore Ranch quadrangles; however, in the Riner 7 1/2–minute quadrangle just north of the Fillmore Ranch quadrangle, the lower part of this unit has been dated as Late Cretaceous (J. G. Honey and R. D. Hettinger, unpub. data). Thicknesses for the rock units overlying the Cretaceous and Tertiary(?) sandstone sequence were determined using geophysical logs from the El Paso drill holes west of the Seaverson Reservoir quadrangle. The lower coal zone of the Fort Union Formation consists of sandstone, siltstone, shale, and coal and is from 1,400 to 1,500 ft thick. The upper 130 to 260 ft of this zone lacks coal or has only one or two very thin coals, and is shown separately on the geologic map. The middle barren zone consists mainly of light-gray sandstone and siltstone, is barren of coal, and has a coarse-grained sandstone at the base. It is about 1,200 ft thick. The upper coal zone of the Fort Union is from 120 to about 300 ft thick and consists of interbedded sandstone, siltstone, shale, and thick coal (Cherokee coal beds), but is not a part of this study.

The lower coal zone of the Fort Union is widespread in the Little Snake River coal field, with coal cropping out from west of Rawlins to east of Baggs. Interest in these coals has increased in recent years as indicated by exploratory drilling by private industry and the government, mapping studies by the U.S. Geological Survey (USGS), and delineation of lease tracts by the U.S. Bureau of Land Management. Concurrent with these activities has been the establishment of correlations and nomenclature for these coals throughout most of the Little Snake River coal field. Examination of these previous correlations has revealed some errors, most notably north and south of Fillmore Creek, which has led to major miscorrelations of coals between the northern and central parts of the Little Snake River coal field. Subsurface studies in the Seaverson Reservoir-Fillmore Ranch area are critical for the correction of these errors. The purposes of these cross sections are to present the coal-bed stratigraphy of the lower coal zone of the Fort Union Formation in the area of the Seaverson Reservoir and Fillmore Ranch quadrangles, resolve existing miscorrelations, and provide a standardized nomenclature for these coal beds.

PREVIOUS WORK

Previous USGS mapping studies which included the Seaverson Reservoir-Fillmore Ranch area were done by Ball (1909) and Ball and Stebinger (1910). They included the lower coal zone of the Fort Union formation in their upper coal group (1909) and "Upper Laramie" formation (1910). Sanders (1974) published a geologic map of the Riner 7 1/2–minute quadrangle immediately north of the Fillmore Ranch quadrangle, showing outcrop patterns and thicknesses of coal beds in the Fort Union Formation. Edson (1979) published a geologic map and coal correlation diagram for the Seaverson Reservoir quadrangle, and proposed names for the coals in the Fort Union. Lithologic and geophysical logs from exploratory drilling conducted by the USGS in the Fort Union were published by Edson and Curtiss (1976) and Hettinger and Brown (1979). Lithologic logs from drilling, and chemical analyses of some coals in the Fort Union were reported for the Red Rim Energy Mineral Rehabilitation inventory and Analysis (EMRIA) study area in the Riner quadrangle (U.S. Department of the Interior, 1976), and for several holes in the Seaverson Reservoir and Fillmore Ranch quadrangles (Hatch and Affolter, 1980). Coal correlations by Edson were provided to, revised, and published in correlation charts by Dames and Moore (1978a; 1979a); these charts were part of a series of Coal Resource Occurrence and Coal Development Potential maps for the Seaverson Reservoir and Fillmore Ranch quadrangles.

COAL NOMENCLATURE

Except for the introduction of new names for some previously unnamed coals, the nomenclature used herein is that of Edson (1979), which was also used by Dames and Moore (1978a; 1979a). Edson (1979) proposed several of these names for coal beds exposed in the southeast corner of the Seaverson Reservoir quadrangle, and he extended this nomenclature into the subsurface. Based in part of Edson's unpublished mapping, Dames and Moore (1978a) applied these names to some surface and subsurface occurrences of coal in the Fillmore Ranch quadrangle. However, because some of the coal beds change in thickness significantly across Fillmore Creek in the northern half of the Fillmore Ranch quadrangle, and because of a relative paucity of data in this critical area, some miscorrelations were made by Dames and Moore. Consequently, incorrect names were applied to some beds in areas north of Fillmore Creek. We have reexamined the geophysical logs available to these earlier investigators, and have studied additional logs not previously available. These additional geophysical logs have helped us to resolve the difficult correlations across Fillmore Creek, so that Edson's nomenclature may now be applied consistantly to coals in areas north of Fillmore Creek. To serve as a basis for all coal correlations, we are proposing both surface (where applicable) and subsurface reference sections for the previously named and herein newly named coal zones and beds. By surface reference section we are referring to a specific location where the coal is exposed at the surface. Where Edson (1979) applied a name (for example, Red Rim) to an outcrop of coal, we have retained that name for that particular coal and have designated a surface reference section somewhere on that coal, either where Edson mapped it in the Seaverson Reservoir quadrangle or on the outcrop of the coal in the Doty Mountain 7 1/2–minute quadrangle immediately to the south of the Seaverson Reservoir quadrangle. The coals are discussed below in descending stratigraphic order. Table 1 shows a comparison of the nomenclatures used in this report and in the cited previous publications, so that continued use may be made of these earlier contributions.

Chicken Springs coal zone: Named and mapped by Edson (1979), this zone is represented by a single coal bed in the SE1/4 sec. 21, T. 18 N., R. 91 W. in the Seaverson Reservoir quadrangle. It is identified in drill hole no. 87 at a depth of 10 ft. The Chicken Springs coal zone is not present in the Doty Mountain 7 1/2–minute quadrangle to the south, but it splits into two or more beds north of Fillmore Creek and in the subsurface to the west.

Fillmore Ranch coal zone: Named and mapped by Edson (1979), the Fillmore Ranch coal zone is well exposed in sec. 28, T. 18 N., R. 91 W. in the Seaverson Reservoir quadrangle, and is identified in drill hole no. 104 at a depth of 40 ft. South of Fillmore Creek, the Fillmore Ranch coal zone generally occurs as a thick bed with very thin coal beds immediately above and below. North of Fillmore Creek it splits and thins markedly, and pinches out in the northern part of the Fillmore Ranch quadrangle.

Fillmore Creek coal zone (FC): This new name is proposed for a 6.1 ft thick coal bed that crops out 50 ft from the west line (FWL) and 1,600 ft from the north line (FNL) in sec. 19, T. 19 N., R. 90 W. in the Fillmore Ranch quadrangle. It is identified in drill hole no. 13 at a depth of 8 ft. The outcrop of the Fillmore Creek coal bed is shown on plate 1 of Dames and Moore, 1978a, and is labelled as the Muddy Creek (C) bed. The Fillmore Creek coal zone is usually a single bed, and occurs only north of Fillmore Creek in the Fillmore Ranch quadrangle and in the most northern part of the Seaverson Reservoir quadrangle.

Muddy Creek upper coal zone (MCu): This is a new name proposed for a coal bed that crops out 2,750 ft FNL and 2,500 ft from the east line (FEL) in sec. 25, T. 19 N., R. 91 W. in the Fillmore Ranch quadrangle; the coal is labeled FU on plate 1 of Dames and Moore, 1978a. It is identified in drill hole no. 19 at a depth of 127 ft. This coal is 1.5–2 ft thick at the outcrop. The Muddy Creek upper coal zone splits from the Muddy Creek coal bed and consists of two beds, the lower of which pinches out north of Fillmore Creek.

Muddy Creek coal bed (MC): This bed was named by Edson (1979). The best exposure occurs immediately south of the Seaverson Reservoir quadrangle at 100 ft FNL and 1,550 ft FEL in sec. 33, T. 18 N., R. 91 W. in the Doty Mountain quadrangle (Dames and Moore, 1979c). The Muddy Creek coal bed is identified in drill hole no. 104 at a depth of 270 ft. The Muddy Creek coal bed occurs throughout the area and thickens somewhat to the south and west. This bed was chosen as the datum because it usually occurs as a single bed which is recognizable in all drill holes.

Separation Creek coal zone (SC): This zone was named by Edson (1979) for a single 11 ft thick coal bed located 2,700 ft FNL and 1,700 ft FWL, in sec. 27, T. 18 N., R. 91 W. in the Seaverson Reservoir quadrangle. It is identified in drill hole no. 96 at a depth of 270 ft. The Separation Creek coal zone is thickest in the Seaverson Reservoir and Doty Mountain quadrangles, and thins just south of Fillmore Creek.

Separation Creek b coal zone: This designation refers to several coal beds present in the northern part of the Fillmore Ranch quadrangle and in the Riner quadrangle immediately to the north; these coals occur at about the same stratigraphic position as the coals of the Separation Creek coal zone to the south, but are not continuous with them. This relation can be seen on cross sections ***A–A′*** and ***B–B′***. This designation was designed for coal resource calculation purposes, and no refrence sections are proposed.

Lower Separation Creek coal zone: This new name is proposed for a coal bed identified in drill hole no. 96 at a depth of 385 ft. This is probably the same bed as a 2 ft thick local bed mapped by Edson (1979) between the Separation Creek and Olson Draw coal beds in SW1/4SE1/4, sec. 22, T. 18 N., R. 91 W. in the Seaverson Reservoir quadrangle. This name was chosen because to the south in sec. 23, T. 17 N., R. 92 W. in the Doty Mountain quadrangle, coals in this zone join with coals of the Separation Creek coal zone. The Lower Separation Creek coal zone is best developed south of Fillmore Creek.

Riner coal zone: This new name is proposed for a series of coal beds well developed in the Riner 7 1/2–minute quadrangle immediately north of the Fillmore Ranch quadrangle. In the Riner quadrangle the coal crops out as a 1.8 ft bed mapped by Sanders (1974) at 850 ft FEL and 500 ft from the south line (FSL) in sec. 7, T. 19 N., R. 90 W. It is identified in USGS drill hole R-D6 in the Riner quadrangle as a series of beds starting at a depth of 38 ft (Hettinger and Brown, 1979). The Riner coal zone is thin in holes drilled near the outcrop in the northern part of the Fillmore Ranch quadrangle, and it is not unequivocally identifiable at the surface. However, the bed is much thicker in the subsurface in the northern part of the Seaverson Reservoir quadrangle. Coals of the Riner coal zone were previously identified as being part of the Olson Draw coal zone (see table 1).

Upper Olson Draw coal zone: This is a new name proposed for a coal bed identified in drill hole no. 86 at a depth of 23 ft. This coal zone is present south of Fillmore Creek in the Fillmore Ranch quadrangle.

Middle Olson Draw coal zone: This is a new name proposed for one or more coal beds present in the subsurface, and identified in drill hole no. 23 at a depth of 162 ft. This zone is best developed north of Fillmore Creek; south of the creek it pinches out, and is not present in the Seaverson Reservoir quadrangle.

Lower Olson Draw coal zone (LOD): This new name is proposed for a coal mapped by Edson (1979) in the Seaverson Reservoir quadrangle and referred to by him as the Olson Draw bed. This coal crops out as a 4 ft bed at 2,400 ft FWL and 1,200 ft FSL, in sec. 27, T. 18 N., R. 91 W. in the Seaverson Reservoir quadrangle. It is identified in drill hole no. 86 at a depth of 80 ft. This bed thickens markedly and splits north of Fillmore Creek, and occurs as one or more major beds in the subsurface. Coal beds in this zone have previously been confused with coal beds of the Red Rim coal zone in areas north of Fillmore Creek and in deep holes in the Seaverson Reservoir quadrangle (table 1).

Red Rim coal zone (RR): This zone was named by Edson (1979) and is best exposed in the northern part of the Doty Mountain quadrangle, at 2,150 ft FWL and 950 ft FNL, sec. 34, T. 18 N., R. 91 W. (Dames and Moore, 1979c, pl. 1). It is identified in drill hole no. 92 at a depth of 78 ft. The coal zone, which is thickest south of Fillmore Creek, thins and splits north of the creek. In the Seaverson Reservoir quadrangle the Red Rim coal zone evidently splits into a lower and one or more upper beds. Informal upper and lower designations are applied to these splits in cross sections ***B–B′***, ***C–C′***, and ***D–D′***. Coals of the Red Rim coal zone were previously confused with coals of the Daley Ranch coal zone in areas north of Fillmore Creek (table 1).

Daley Ranch coal zone: The name Daley Ranch was first used by Dames and Moore, who refer to it as Daleys Ranch, for several exposures of coal in the Riner and Separation Peak 7 1/2–minute quadrangles (the Separation Peak quadrangle is just east of the Riner quadrangle) and to some subsurface coals in the Seaverson Reservoir, Fillmore Ranch, Riner, and Separation Peak 7 1/2 quadrangles (1978a; 1978b; 1979a; 1979b). Although the name was credited to Edson, he did not propose or use the name in his geologic map of the Seaverson Reservoir quadrangle (1979) because the Daley Ranch coal zone does not crop out. The zone does not appear to crop out in the Fillmore Ranch quadrangle. We believe, however, that the name Daley Ranch was incorrectly applied to coals belonging to the Red Rim and Olson Draw coal groups. We therefore propose that the name Daley Ranch be restricted to the coal bed present in drill hole no. 3 at a depth of 1,230 ft. The Daley Ranch coal zone continues north of Fillmore Creek, but pinches out south of the creek.

Continental Divide coal zone (CD): This new name is proposed for a coal bed at a depth of 1,349 ft in drill hole no. 3 in the Fillmore Ranch quadrangle. The Continental Divide coal zone crops out as a 4.5 ft coal bed 1,500 ft FWL and 2,400 ft FSL in sec. 17, T. 19 N., R. 90 W. in the Fillmore Ranch quadrangle, and is labelled FU on plate 1 of Dames and Moore (1978a). The Continental Divide coal zone is prominent and widespread in the subsurface north of Fillmore Creek.

DISCUSSION

The thickness of the lower coal zone of the Fort Union Formation is greater in the northern part of the study area than in the southern part. The increase in thickness is due to a stratigraphic rise in the position of the coals of the Chicken Springs coal zone at the top of the section, and the addition of the Dailey Ranch and Continental Divide coal zones at the base. In the southern part of cross section ***B–B′***, the Chicken Springs coal zone approaches the Fillmore Ranch coal zone, and is absent in the Doty Mountain 7 1/2–minute quadrangle to the south. Whether it pinches out or merges with the Fillmore Ranch coal zone in the subsurface is not known. The Daley Ranch and Continental Divide coal zones pinch out rapidly south of Fillmore Creek, and are not present in the most southern holes. In the Doty Mountain quadrangle however, a thin coal is sometimes present below the Red Rim coal zone in the approximate stratigraphic position of the Daley Ranch coal zone.

The Red Rim coal zone apparently splits into upper and lower zones towards the west in the southern part of the study area, as shown on cross section ***D–D′***. This splitting is suggested when a direct east to west correlation in the southern part of the area (cross section ***D–D′***) is compared with a correlation from south to north (***A–A′***) and then back to the south (***B′–B***). The Red Rim coal zone can be easily traced north from its surface exposure in the Doty Mountain quadrangle and projected into holes drilled near its outcrop in the Seaverson Reservoir quadrangle (nos. 102, 100, and 97). Correlation from these holes to deeper holes (cross section ***D–D′***) indicates that the Red Rim coal zone correlates best with the 9.0 ft coal at a depth of 1,046 ft in drill hole no. 113. A south to north to south correlation however (***A–A′*** and ***B′–B***) results in the Red Rim coal zone in drill hole nos. 92 and 102 correlating with a 3.0 ft coal at a depth of 1,125 ft in drill hole no. 113. The latter correlation involves longer distances (2.5–3.5 mi) between drill holes when compared to the shorter distances (1.25–1.75 mi) between holes in the east to west direction. Nevertheless, these differing correlations are explainable if the Red Rim coal zone south of Fillmore Creek splits in a westward direction in the subsurface. No holes have been drilled deep enough between drill hole nos. 92 and 113 to test this hypothesis.

In deep holes in the southern part of the study area exists a series of coals, best seen in drill hole no. 113 between 832 and 942 ft and labelled "Olson Draw coal zone equivalent." These coals occupy approximately the same stratigraphic interval as the combined Lower, Middle, and Upper Olson Draw coal zones, but their exact relation to the Olson Draw coal zones cannot be determined with existing information. As shown on a line from ***A*** to ***A′*** and ***B′*** to ***B***, a south to north to south correlation indicates that the Lower Olson Draw coal zone in the east projects across a barren interval to about the level of the lower coal in the Olson Draw coal zone equivalent in drill hole no. 113. However, in an east to west direction (***D′–D***), the Lower Olson Draw coal zone near the outcrop in drill hole no. 93 appears to correlate to a 1.0 ft bed at a depth of 831 ft in drill hole no. 113 (the highest bed of the Olson Draw coal zone equivalent). This correlation is suggested by a few intermediate holes (not shown) which were drilled deep enough to penetrate the same thin coal present at 831 ft in drill hole no. 113 but, except for holes nearly on strike with drill hole no. 93, were not drilled deep enough to penetrate the coals between 906 and 942 ft in drill hole no. 113. Thus on the basis of the available drill-hole data, it cannot be determined if some or all of the coals between 906 and 942 ft in drill hole no. 113 pinch out to the east, or if they merge with the Lower Olson Draw coal zone in drill hole no. 93.

SOURCES OF DATA

The main sources of data for the correlations of the interpretative lithologic logs were lithologic and geophysical logs from mineral and oil and gas test holes which were drilled and logged by the USGS and private industry. The geophysical logs available usually included natural gamma and resistivity logs, and often density and spontaneous potential logs. For some drill holes only driller's logs were available. However, the data from the driller's logs seemed to be reliable when correlated with nearby geophysical logs. Only representatives of the numerous logs studied by us are shown on the correlation charts. The names and corresponding numbers of the logs used are shown in table 2. Other data sources included published and unpublished mapping by the USGS, and aerial photographs.

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STRATIGRAPHIC SECTIONS SHOWING COAL CORRELATIONS WITHIN THE LOWER COAL ZONE OF THE PALEOCENE FORT UNION FORMATION, FILLMORE RANCH AND SEAVERSON RESERVOIR QUADRANGLES, CARBON COUNTY, WYOMING

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