

UNITED STATES DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY

RECONNAISSANCE DRILLING DURING 1977 IN THE YAMPA COAL FIELD,  
MOFFAT AND ROUTT COUNTIES, COLORADO

By

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Open-File Report 78-365

1978

This report has not been edited for conformity  
with Geological Survey editorial standards or  
stratigraphic nomenclature.

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RECONNAISSANCE DRILLING DURING 1977 IN THE YAMPA COAL FIELD,  
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INTRODUCTION

Under contract no. 14-08-0001-15788, awarded by the U.S. Geological Survey on June 13, 1977, McCabe Brothers Drilling, Inc. and Hugh M. Harris Drilling Co. drilled 45 test holes in the Yampa coal field of northwest Colorado. The purpose of the drilling was to obtain information on the quality, thickness, and extent of the coal in the area. Holes were logged using natural-gamma, gamma-gamma (density), resistance, or spontaneous-potential logs. The logging was done by Digilog, Inc., Rocky Mountain Logging Service, and Savage Scientific, Inc. All holes were drilled on Federal coal lands and locations are shown on figures 1, 2, and 3.

U.S. Geological Survey personnel collected drill cuttings for lithologic control. These cuttings were used in conjunction with the geophysical logs to determine the lithologic logs presented in this report. Where cuttings were poor, or absent, the lithology was interpreted from the geophysical logs, if possible. The logs were originally run at a vertical scale of 1 inch to 10 feet, but for convenience of reproducing this report, the logs were reduced in scale to 1 inch to 50 feet and the horizontal logging scales were reduced accordingly. (To convert feet to meters, multiply by 0.3048.)

Drill-hole locations, selected by Geological Survey personnel, met the following criteria: (1) geologically favorable for coal occurrence with both underground and strippable potential, (2) federally owned coal, (3) accessibility by existing roads or trails, (4) absence of archeological or historic sites, (5) nearly level drill sites with minimal reclamation problems, and (6) permission of the surface land owner.

Several of the test holes were turned over to the Water Resources Division, U.S. Geological Survey, for use as water observation wells. All holes were reclaimed in accordance with Bureau of Land Management's specifications for northwestern Colorado. A summary of drill-hole information is given in table 1.

R. 94 W.

R. 93 W.

T. 8 N.

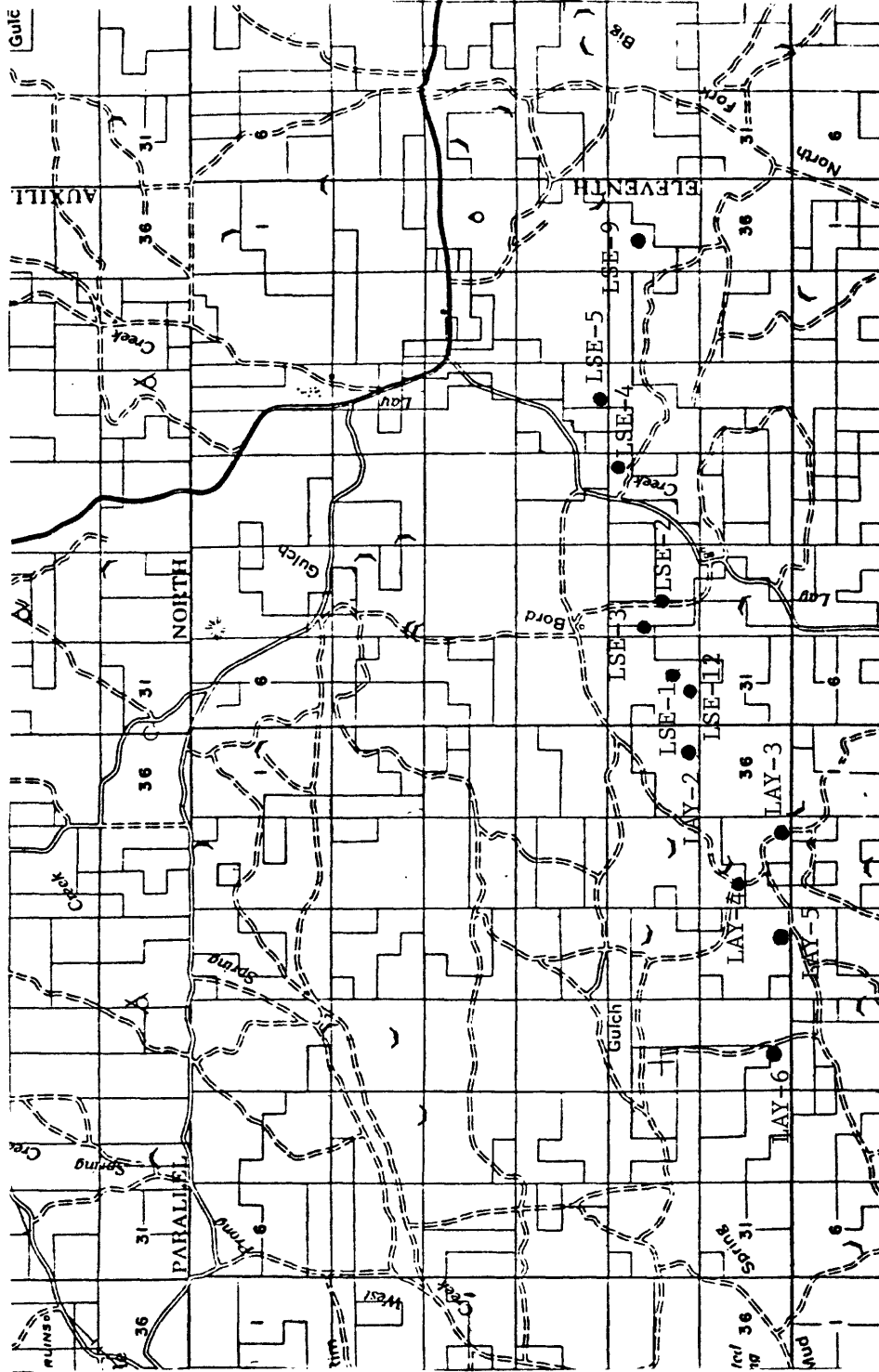


Figure 1.--Locations of drill holes in the Lay area, Moffat County, Colorado. LAY, Lay quadrangle; LSE, Lay SE quadrangle.

R. 88 W.

R. 89 W.

R. 90 W.

T. 6 N.

T. 5 N.

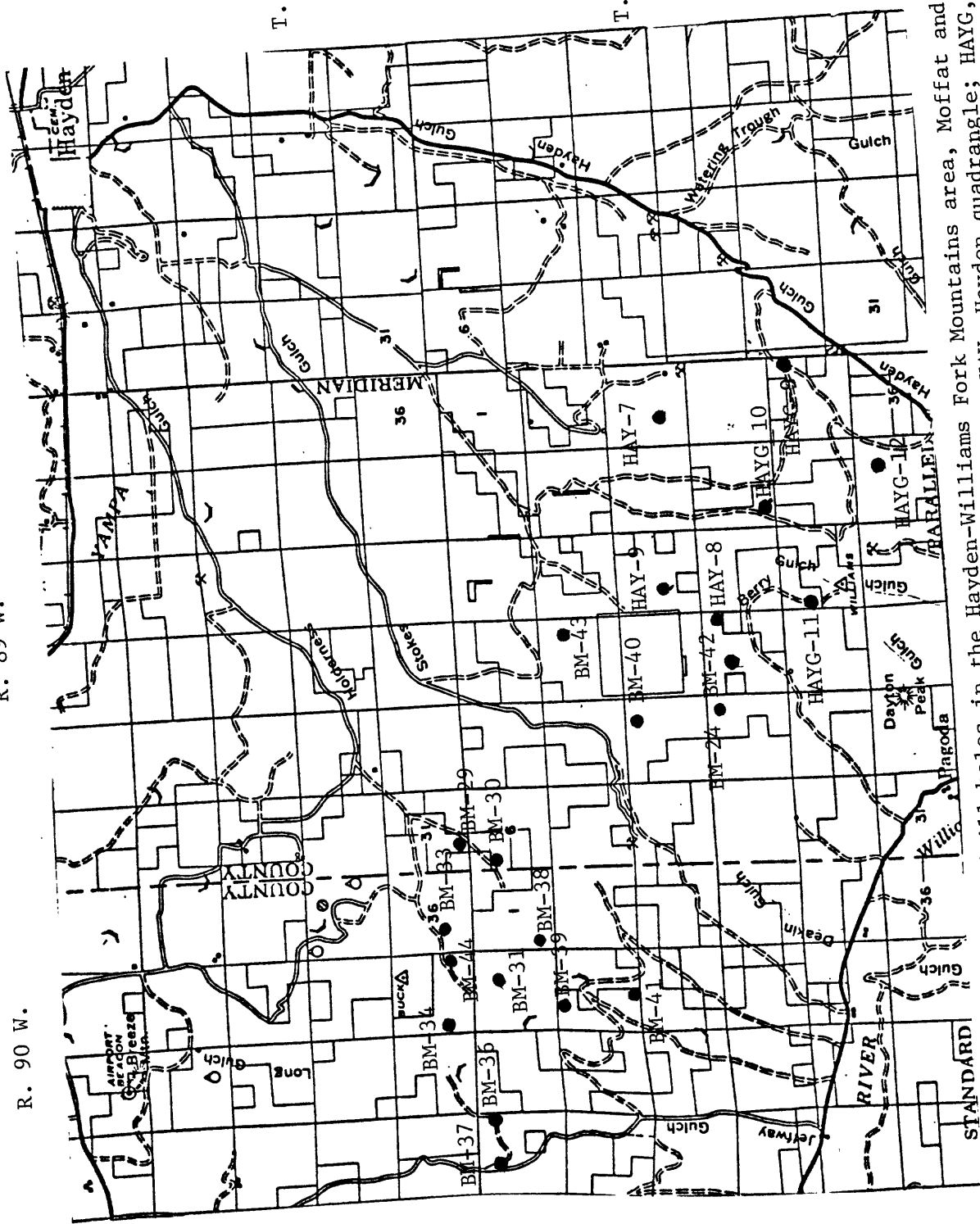


Figure 2.--Locations of drill holes in the Hayden-Williams Fork Mountains area, Moffat and Routt Counties, Colorado. BM, Breeze Mountain quadrangle; HAY, Hayden quadrangle; HAYG, Hayden Gulch quadrangle.

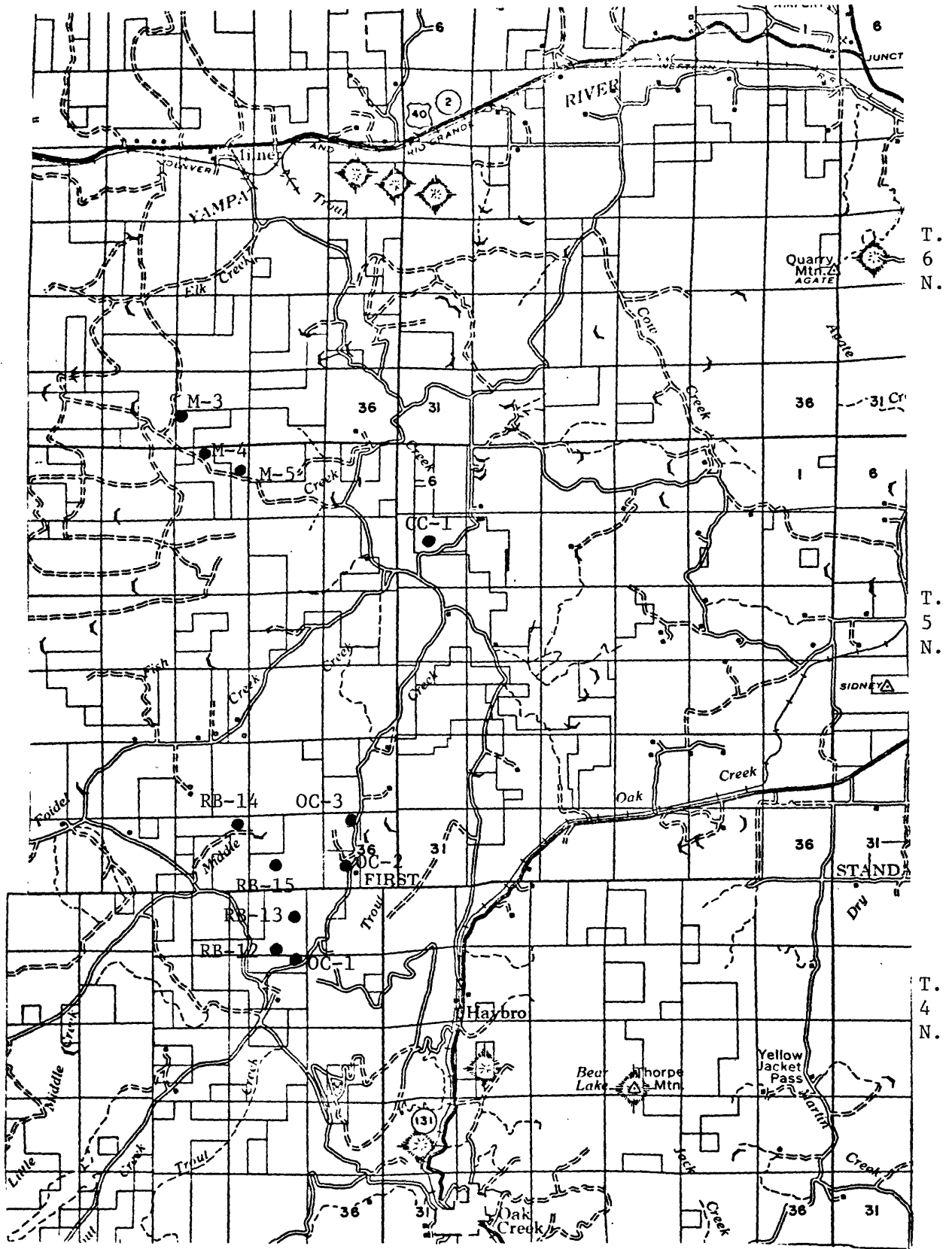


Figure 3.--Locations of drill holes in the Milner-Oak Creek area, Routt County, Colorado. CC, Cow Creek quadrangle; M, Milner quadrangle; OC, Oak Creek quadrangle; RB, Rattlesnake Butte quadrangle.

Table 1.--Summary of information for 45 test holes drilled in Moffat and Routt Counties, Colorado, during 1977

[W.R.D. = Water Resources Division observation well; C = Hole cemented]

Drill-hole No.	Location	Depth drilled (feet)	Depth logged (feet)	Remarks
For hole locations, see figure 1				
LAY-2	T. 8 N., R. 94 W., sec. 25, SW $\frac{1}{4}$ SE $\frac{1}{4}$	850	829	W.R.D.
LAY-3	T. 8 N., R. 94 W., sec. 35, SE $\frac{1}{4}$ SE $\frac{1}{4}$	830	828	C
LAY-4	T. 8 N., R. 94 W., sec. 35, SW $\frac{1}{4}$ NW $\frac{1}{4}$	1,020	998	C
LAY-5	T. 8 N., R. 94 W., sec. 34, SW $\frac{1}{4}$ SE $\frac{1}{4}$	800	739	C
LAY-6	T. 8 N., R. 94 W., sec. 33, SE $\frac{1}{4}$ SW $\frac{1}{4}$	800	633	C
LSE-1	T. 8 N., R. 93 W., sec. 30, NW $\frac{1}{4}$ SE $\frac{1}{4}$	880	425	W.R.D.
LSE-2	T. 8 N., R. 93 W., sec. 29, NE $\frac{1}{4}$ SW $\frac{1}{4}$	700	655	W.R.D.
LSE-3	T. 8 N., R. 93 W., sec. 29, SW $\frac{1}{4}$ NW $\frac{1}{4}$	913	913	C
LSE-4	T. 8 N., R. 93 W., sec. 28, NE $\frac{1}{4}$ NE $\frac{1}{4}$	770	770	W.R.D.
LSE-5	T. 8 N., R. 93 W., sec. 22, SW $\frac{1}{4}$ SE $\frac{1}{4}$	505	505	W.R.D.
LSE-9	T. 8 N., R. 93 W., sec. 25, SE $\frac{1}{4}$ NW $\frac{1}{4}$	820	817	W.R.D.
LSE-12	T. 8 N., R. 93 W., sec. 30, SE $\frac{1}{4}$ SW $\frac{1}{4}$	690	686	W.R.D.
For hole locations, see figure 2				
BM-24	T. 5 N., R. 89 W., sec. 20, NE $\frac{1}{4}$ NE $\frac{1}{4}$	720	712	W.R.D.
BM-29	T. 6 N., R. 89 W., sec. 31, SE $\frac{1}{4}$ SW $\frac{1}{4}$	600	543	C
BM-30	T. 5 N., R. 89 W., sec. 6, SW $\frac{1}{4}$ NW $\frac{1}{4}$	885	883	C
BM-31	T. 5 N., R. 90 W., sec. 2, Center NE $\frac{1}{4}$	820	820	C
BM-33	T. 6 N., R. 90 W., sec. 36, NW $\frac{1}{4}$ SW $\frac{1}{4}$	640	614	W.R.D.
BM-34	T. 6 N., R. 90 W., sec. 35, NW $\frac{1}{4}$ SW $\frac{1}{4}$	840	827	C

Table 1.--Summary of information for 45 test holes drilled in Moffat and Routt Counties, Colorado, during 1977--continued

Drill-hole No.	Location	Depth drilled (feet)	Depth logged (feet)	Remarks
For hole locations, see figure 2				
BM-36	T. 5 N., R. 90 W., sec. 4, NE $\frac{1}{4}$ NE $\frac{1}{4}$	1,000	986	W.R.D.
BM-37	T. 5 N., R. 90 W., sec. 4, NE $\frac{1}{4}$ NW $\frac{1}{4}$	980	979	C
BM-38	T. 5 N., R. 90 W., sec. 1, SW $\frac{1}{4}$ SW $\frac{1}{4}$	820	816	C
BM-39	T. 5 N., R. 90 W., sec. 11, NE $\frac{1}{4}$ NW $\frac{1}{4}$	760	758	W.R.D.
BM-40	T. 5 N., R. 89 W., sec. 17, NE $\frac{1}{4}$ NE $\frac{1}{4}$	1,040	1,036	W.R.D.
BM-41	T. 5 N., R. 90 W., sec. 11, SW $\frac{1}{4}$ SE $\frac{1}{4}$	800	762	W.R.D.
BM-42	T. 5 N., R. 89 W., sec. 21, SE $\frac{1}{4}$ NW $\frac{1}{4}$	800	790	C
BM-43	T. 5 N., R. 89 W., sec. 9, SE $\frac{1}{4}$ NE $\frac{1}{4}$	560	480	W.R.D.
BM-44	T. 6 N., R. 90 W., sec. 35, NE $\frac{1}{4}$ SE $\frac{1}{4}$	880	876	W.R.D.
HAYG-9	T. 5 N., R. 89 W., sec. 25, NE $\frac{1}{4}$ NE $\frac{1}{4}$	770	766	C
HAYG-10	T. 5 N., R. 89 W., sec. 23, SW $\frac{1}{4}$ SW $\frac{1}{4}$	800	791	W.R.D.
HAYG-11	T. 5 N., R. 89 W., sec. 27, SW $\frac{1}{4}$ NW $\frac{1}{4}$	800	798	C
HAYG-12	T. 5 N., R. 89 W., sec. 35, NW $\frac{1}{4}$ NE $\frac{1}{4}$	710	706	W.R.D.
HAY-7	T. 5 N., R. 89 W., sec. 13, NE $\frac{1}{4}$ SW $\frac{1}{4}$	753	751	W.R.D.
HAY-8	T. 5 N., R. 89 W., sec. 21, NE $\frac{1}{4}$ NE $\frac{1}{4}$	780	774	C
HAY-9	T. 5 N., R. 89 W., sec. 15, NE $\frac{1}{4}$ SW $\frac{1}{4}$	800	780	C
For hole locations, see figure 3				
RB-12	T. 4 N., R. 86 W., sec. 11, SW $\frac{1}{4}$ SE $\frac{1}{4}$	1,185	1,184	W.R.D.
RB-13	T. 4 N., R. 86 W., sec. 11, SE $\frac{1}{4}$ NE $\frac{1}{4}$	1,130	1,102	C



U.S. GEOLOGICAL SURVEY  
DRILL-HOLE LOG, YAMPA COAL FIELD

Hole No. OC-3 State Colorado County Routt Date logged 10-6-77 Elev. (ft) 7,070  
 Location: T. 5 N., R. 86 W., sec. 36, NE $\frac{1}{4}$ NW $\frac{1}{4}$  Cored:  Yes  No  
 Drilled depth 717' Logged depth 716' Drilling medium air Fluid level surface

Geophysical logs:

Spontaneous potential (SP): Scale 50 mv/in Logging speed 20 fpm  
 Resistance (RES): Scale 50  $\Omega$ /in Logging speed 20 fpm  
 Gamma (G): T.C. 2 Scale 20 cps/in Logging speed 20 fpm  
 Density (DEN): T.C. .5 Scale 60 cps/in Logging speed 20 fpm

Remarks: \_\_\_\_\_

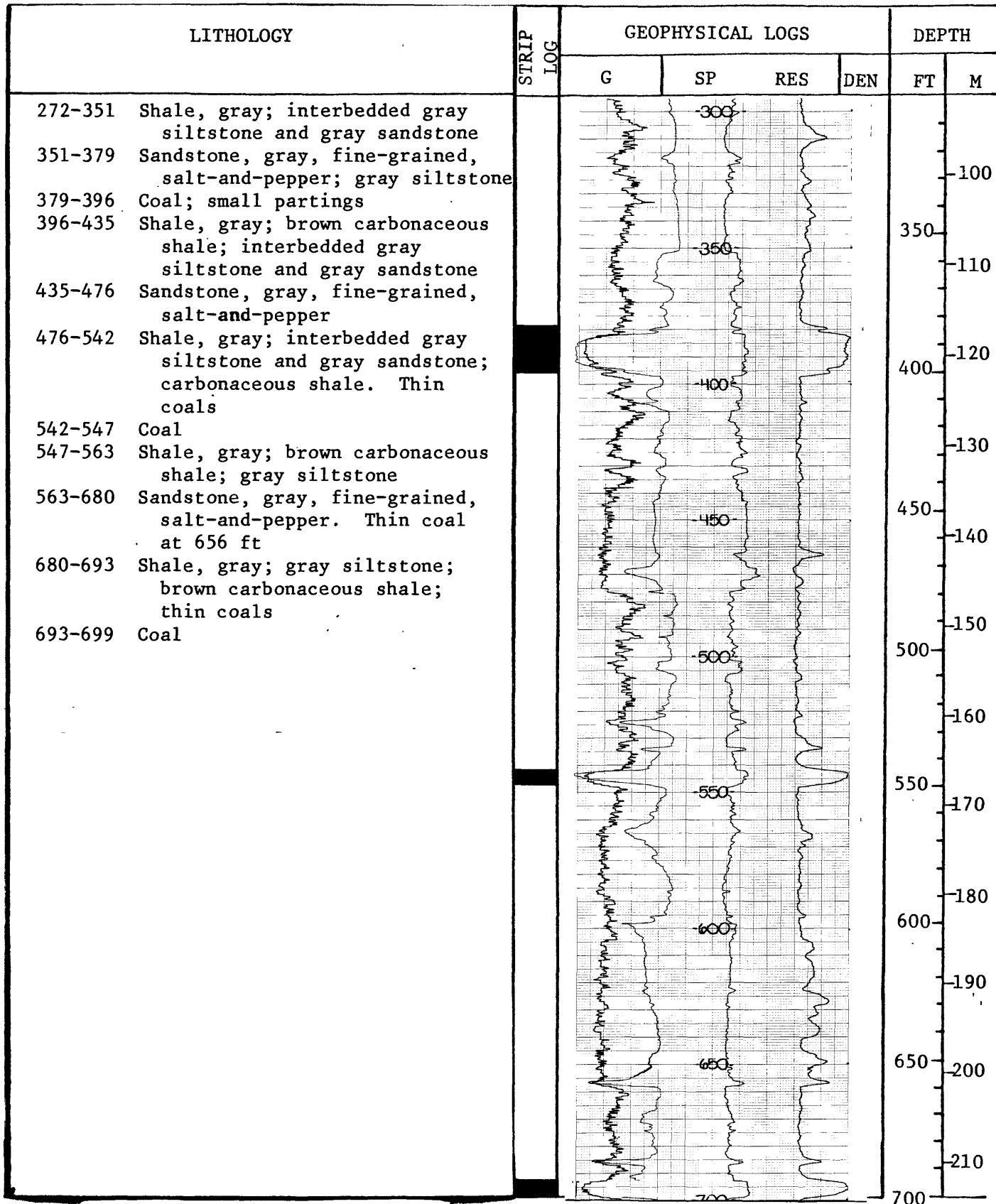
LITHOLOGY	STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
		G	SP	RES	DEN	FT	M
0-30 Colluvium; weathered, yellow-brown shale and siltstone						0	0
30-284 Shale, dark-gray; dark-gray siltstone						10	
284-301 Sandstone, gray, fine-grained, salt-and-pepper						50	
						100	30
						150	
						200	60
						250	
						300	90

Table 1.--Summary of information for 45 test holes drilled in Moffat and Routt Counties, Colorado, during 1977-continued

Drill-hole No.	Location	Depth drilled (feet)	Depth logged (feet)	Remarks
For hole locations, see figure 3				
RB-14	T. 5 N., R. 86 W., sec. 34, NE $\frac{1}{4}$ NE $\frac{1}{4}$	1,230	1,230	C
RB-15	T. 5 N., R. 86 W., sec. 35, NE $\frac{1}{4}$ SW $\frac{1}{4}$	1,250	1,248	C
M-3	T. 6 N., R. 86 W., sec. 34, NW $\frac{1}{4}$ NW $\frac{1}{4}$	1,000	1,000	W.R.D.
M-4	T. 5 N., R. 86 W., sec. 3, NE $\frac{1}{4}$ NW $\frac{1}{4}$	1,005	1,002	C
M-5	T. 5 N., R. 86 W., sec. 3, SE $\frac{1}{4}$ NE $\frac{1}{4}$	807	806	W.R.D.
CC-1	T. 5 N., R. 85 W., sec. 7, SE $\frac{1}{4}$ NW $\frac{1}{4}$	700	698	W.R.D.
OC-1	T. 4 N., R. 86 W., sec. 14, NE $\frac{1}{4}$ NE $\frac{1}{4}$	775	774	W.R.D.
OC-2	T. 5 N., R. 86 W., sec. 36, NE $\frac{1}{4}$ SW $\frac{1}{4}$	770	763	W.R.D.
OC-3	T. 5 N., R. 86 W., sec. 36, NE $\frac{1}{4}$ NW $\frac{1}{4}$	717	716	W.R.D.

U.S. GEOLOGICAL SURVEY

Hole No. LAY-2 continued



U.S. GEOLOGICAL SURVEY

Hole No. LAY-2 continued

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
		G	SP	RES	DEN	FT	M
699-758 Shale, gray; interbedded gray sandstone and siltstone; carbonaceous shale						220	
758-829 Sandstone, gray, fine-grained, salt-and-pepper						750	
					230		
					240		
					250		
					260		
					270		
					280		
					290		
					300		
					350		
					360		
					370		
					1100		

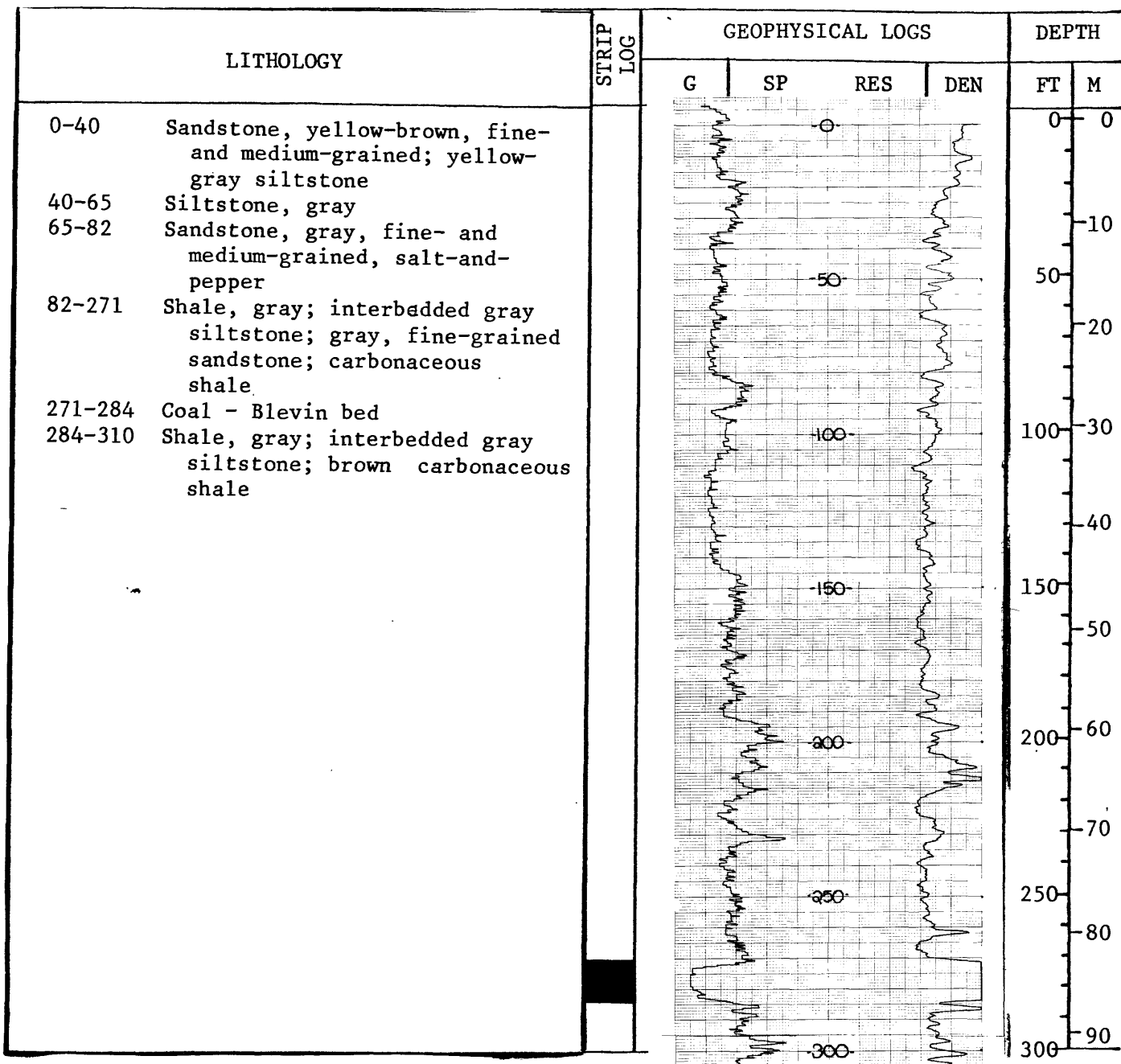
U.S. GEOLOGICAL SURVEY  
DRILL-HOLE LOG, YAMPA COAL FIELD

Hole No. LAY-3 State Colorado County Moffat Date logged 8-13-77 Elev. (ft) 7,070  
 Location: T. 8 N., R. 94 W., sec. 35, SE $\frac{1}{4}$ SE $\frac{1}{4}$  Cored:  Yes  No  
 Drilled depth 830' Logged depth 828' Drilling medium air Fluid level 540'

Geophysical logs:

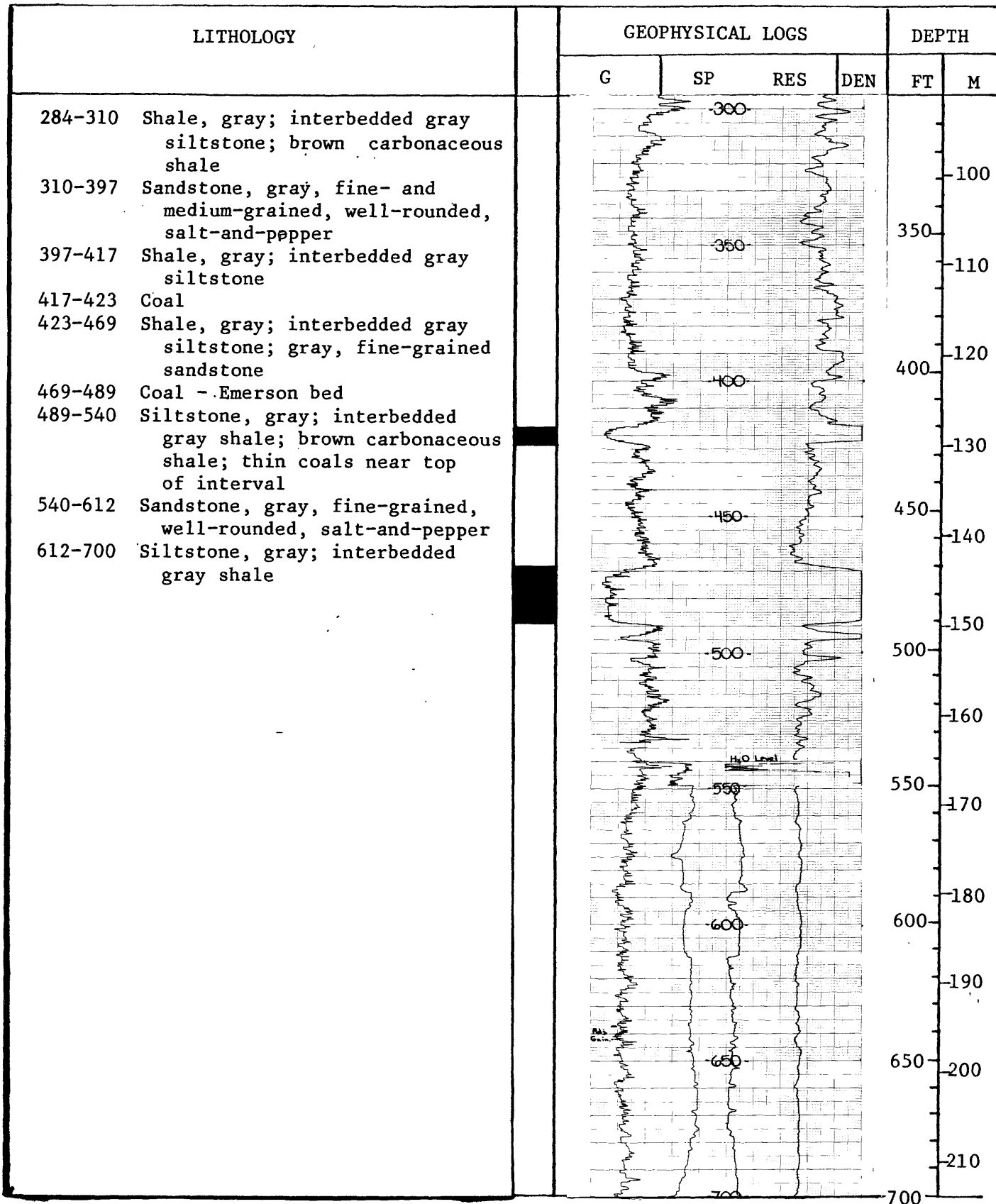
Spontaneous potential (SP): Scale 50 mv/in Logging speed 20 fpm  
 Resistance (RES): Scale 25  $\Omega$ /in Logging speed 20 fpm  
 Gamma (G): T.C. 1 Scale 25 cps/in Logging speed 20 fpm  
 Density (DEN): T.C. 1 Scale 5,000 cps/in Logging speed      fpm

Remarks: \_\_\_\_\_



U.S. GEOLOGICAL SURVEY

Hole No. LAY-3 continued



U.S. GEOLOGICAL SURVEY

Hole No. LAY-3 continued

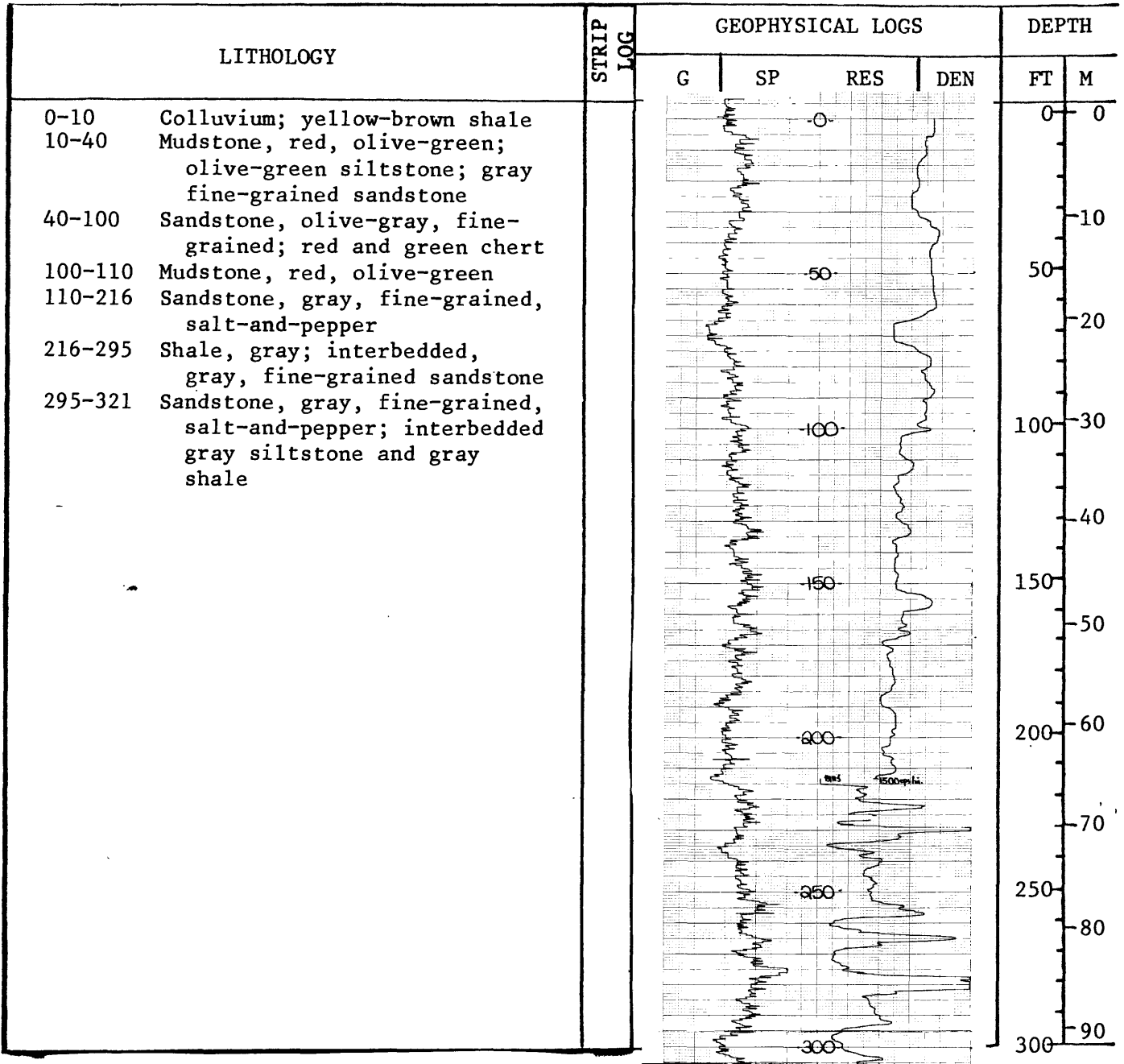
LITHOLOGY	STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
		G	SP	RES	DEN	FT	M
700-828 Sandstone, gray, fine-grained, well-rounded, salt-and-pepper; interbedded gray siltstone						220	
						750	
						230	
						800	240
						250	
						850	260
						900	270
						280	
						950	290
						300	
						1000	350
						360	
						1050	370
						1100	

U.S. GEOLOGICAL SURVEY  
DRILL-HOLE LOG, YAMPA COAL FIELD

Hole No. LAY-4 State Colorado County Moffat Date logged 8-13-77 Elev. (ft) 6,845  
 Location: T. 8 N., R. 94 W., sec. 35, SW $\frac{1}{4}$ NW $\frac{1}{4}$  Cored:  Yes  No  
 Drilled depth 1,020' Logged depth 998' Drilling medium air Fluid level 356'

Geophysical logs:

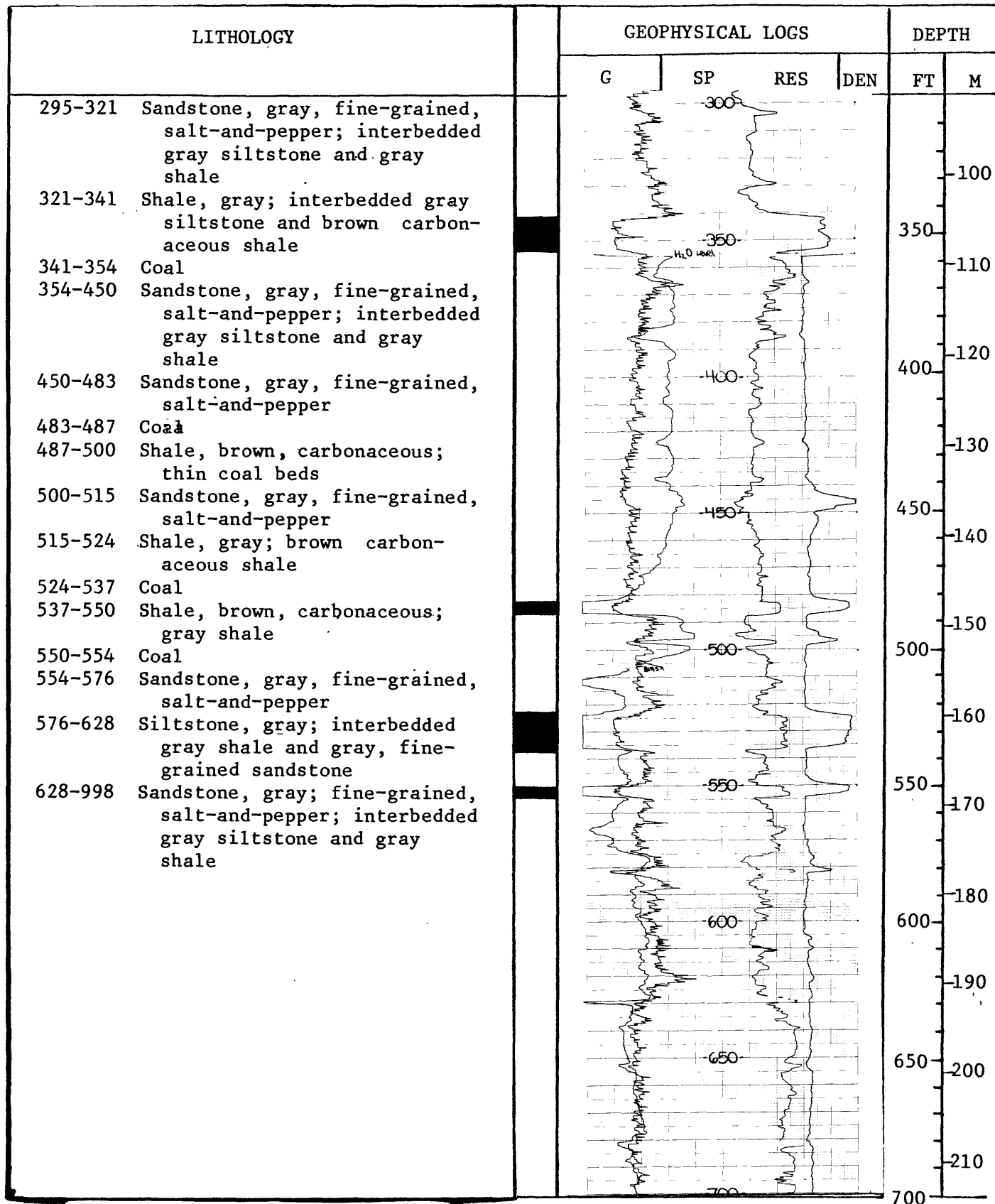
Spontaneous potential (SP): Scale 50 mv/in Logging speed 20 fpm  
 Resistance (RES): Scale 10  $\Omega$ /in Logging speed 20 fpm  
 Gamma (G): T.C. 1 Scale 25 cps/in Logging speed 20 fpm  
 Density (DEN): T.C. 1 Scale 5,000 cps/in Logging speed 20 fpm  
 Remarks: Changed density scale at 225' to 1,500 cps/in





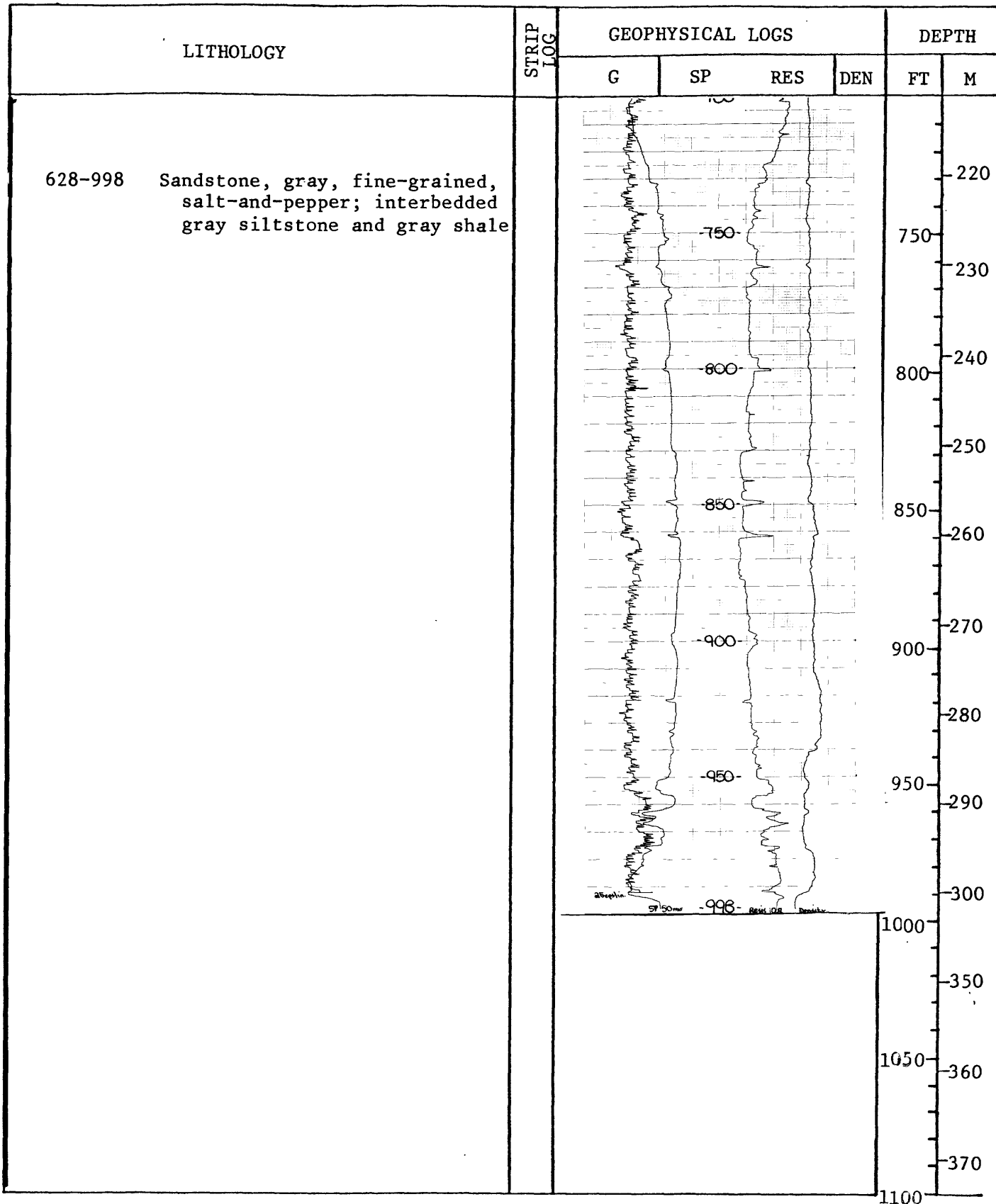
U.S. GEOLOGICAL SURVEY

Hole No. LAY-4 continued



U.S. GEOLOGICAL SURVEY

Hole No. LAY-4 continued

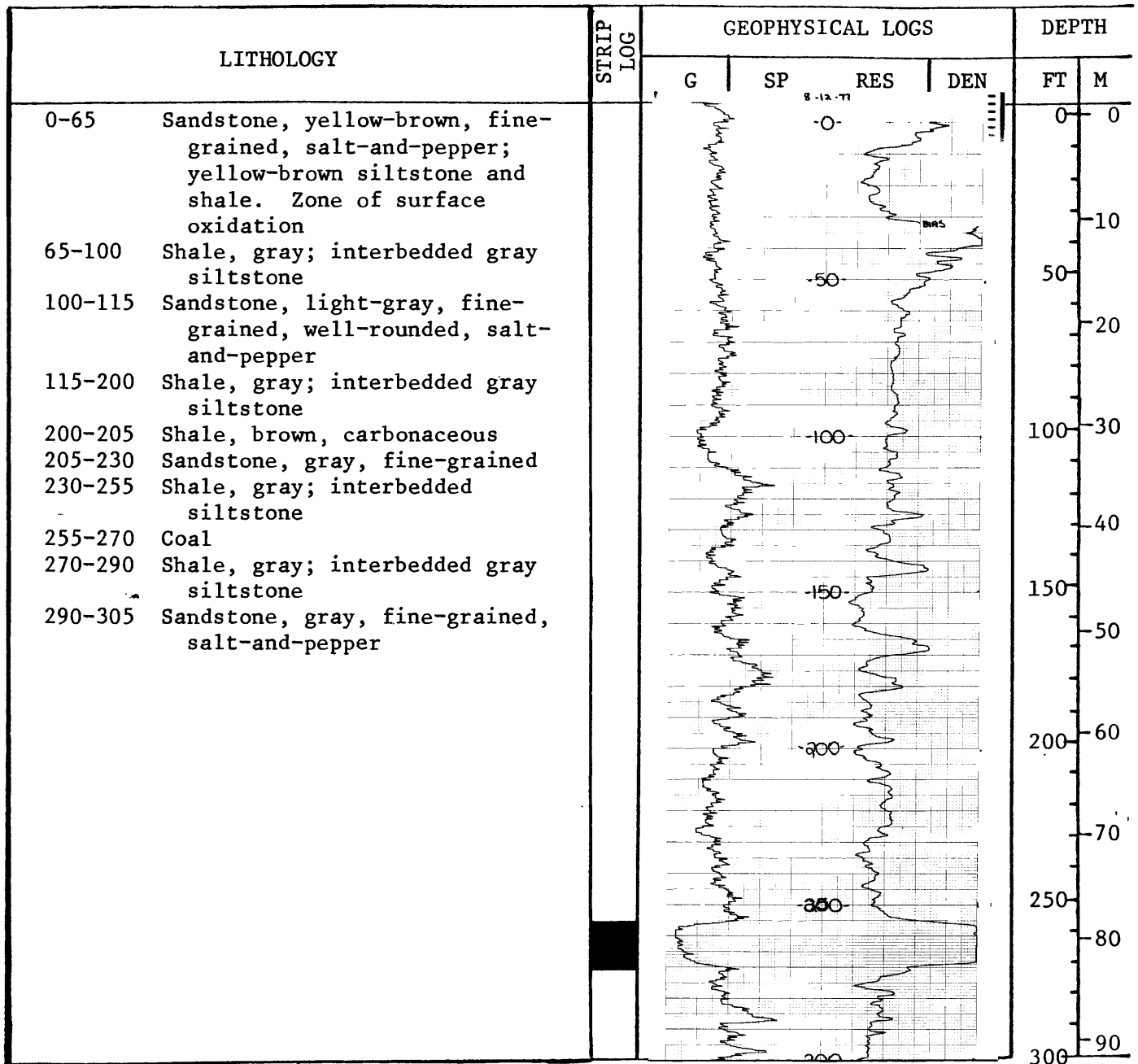


U.S. GEOLOGICAL SURVEY  
DRILL-HOLE LOG, YAMPA COAL FIELD

Hole No. LAY-5 State Colorado County Moffat Date logged 8/12/77 Elev. (ft) 6,940  
 Location: T. 8 N., R. 94 W., sec. 34, SW $\frac{1}{4}$ SE $\frac{1}{4}$  Cored:  Yes  No  
 Drilled depth 800' Logged depth 739' Drilling medium air Fluid level 397'

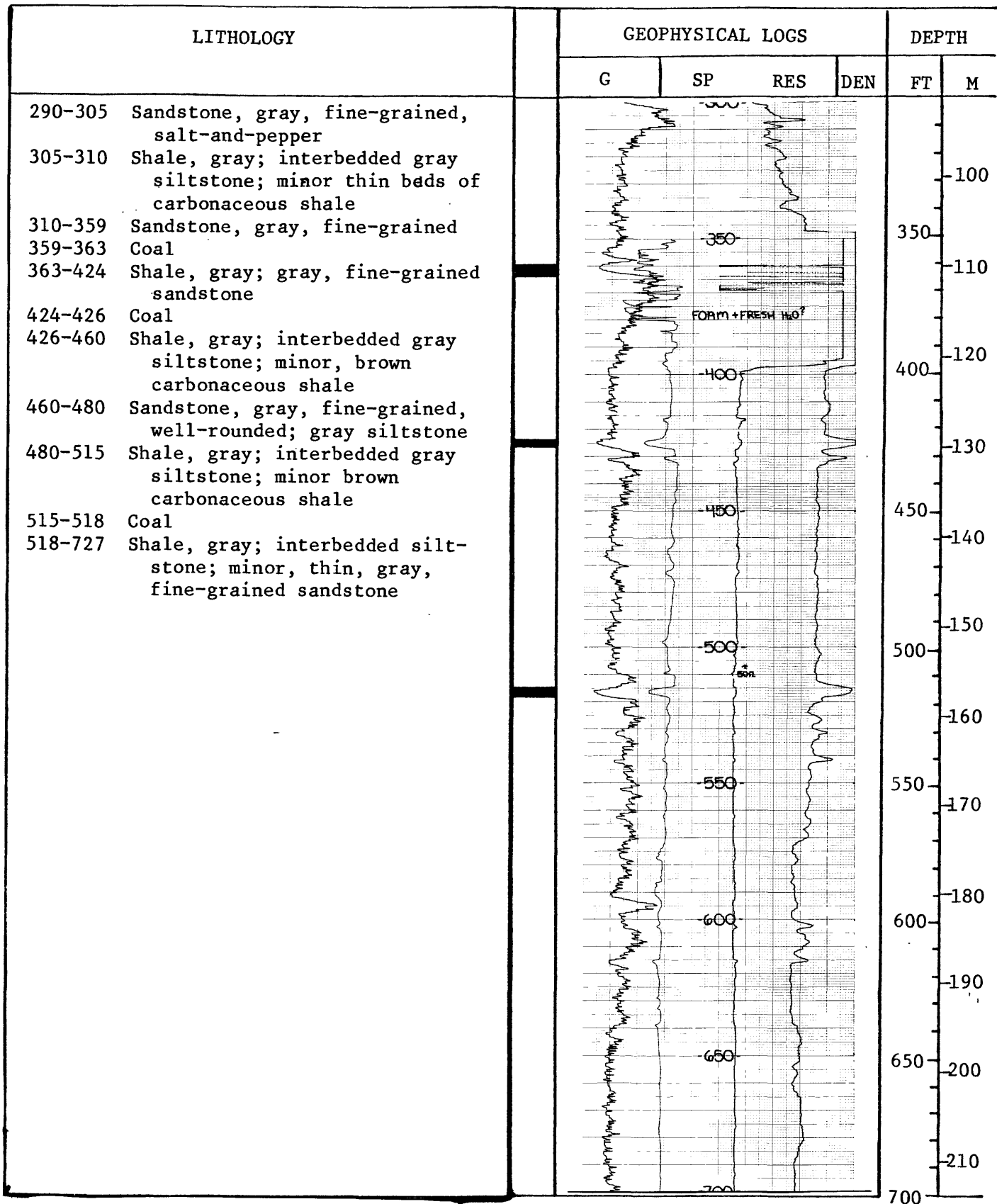
Geophysical logs:

Spontaneous potential (SP): Scale 100 mv Logging speed 20 fpm  
 Resistance (RES): Scale 100  $\Omega$ /in Logging speed 20 fpm  
 Gamma (G): T.C. 1 Scale 25 cps/in Logging speed 20 fpm  
 Density (DEN): T.C. 1 Scale 5,000 cps/in Logging speed 20 fpm  
 Remarks: Changed resistance scale at 510' to 50  $\Omega$ /in



U.S. GEOLOGICAL SURVEY

Hole No. LAY-5 continued



U.S. GEOLOGICAL SURVEY

Hole No. LAY-5 continued

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
		G	SP	RES	DEN	FT	M
518-727 Shale, gray; interbedded siltstone; minor, thin, gray, fine-grained sandstone	[Blank strip log area]					220	
727-731 Coal						750	
731-739 Shale, gray; interbedded gray siltstone						230	
					240		
					250		
					260		
					270		
					280		
					290		
					300		
					350		
					360		
					370		
					1100		

U.S. GEOLOGICAL SURVEY  
DRILL-HOLE LOG, YAMPA COAL FIELD

Hole No. LAY-6 State Colorado County Moffat Date logged 8-10-77 Elev. (ft) 6,770  
 Location: T. 8 N., R. 94 W., sec. 33, SE $\frac{1}{4}$ SW $\frac{1}{4}$  Cored:  Yes  No  
 Drilled depth 800' Logged depth 633' Drilling medium air Fluid level 420'

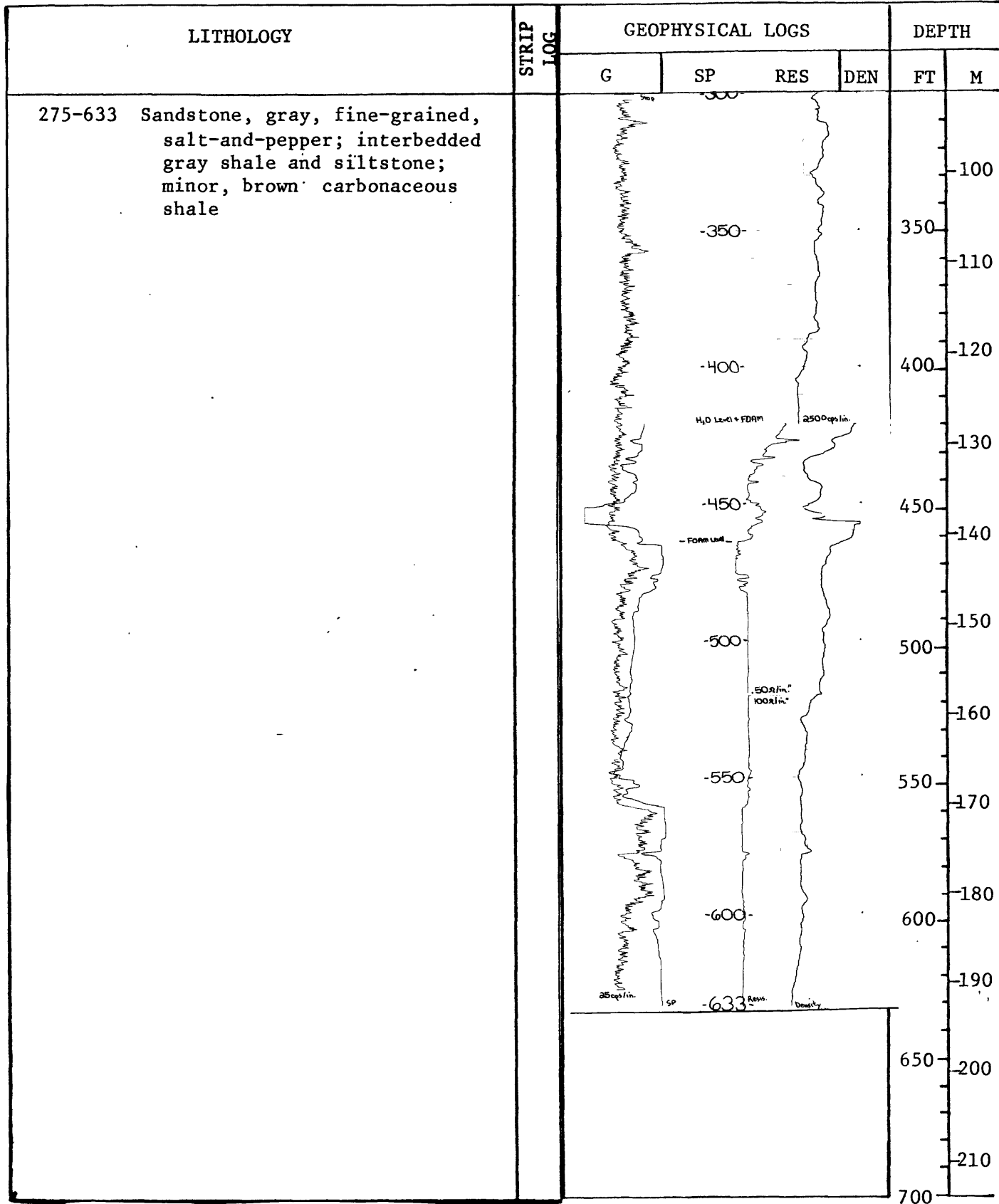
Geophysical logs:

Spontaneous potential (SP): Scale 100 mv Logging speed 20 fpm  
 Resistance (RES): Scale 100  $\Omega$ /in Logging speed 20 fpm  
 Gamma (G): T.C. 1 Scale 25 cps/in Logging speed 20 fpm  
 Density (DEN): T.C. 1 Scale 5,000 cps/in Logging speed 20 fpm  
 Remarks: Density scale 2,500 cps/in above fluid level

LITHOLOGY		STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
			G	SP	RES	DEN	FT	M
0-25	Sandstone, yellow-brown, fine-grained; yellow-brown shale. Zone of surface oxidation			Lay 6 -0-			0	0
25-60	Shale, gray; interbedded gray siltstone						10	
60-80	Shale, brown, carbonaceous						50	
80-100	Sandstone, gray, fine-grained, well-rounded, salt-and-pepper			-50-			20	
100-125	Shale, gray; interbedded gray siltstone						100	30
125-160	Sandstone, gray, fine-grained, well-rounded, salt-and-pepper						150	
160-164	Shale, brown, carbonaceous			-100-			50	
164-172	Coal						200	60
172-246	Shale, gray; interbedded gray siltstone; brown carbonaceous shale						250	80
246-252	Coal						250	80
252-275	Shale, dark-brown, carbonaceous			-150-			200	60
275-633	Sandstone, gray, fine-grained, salt-and-pepper; interbedded gray shale and siltstone; minor, brown carbonaceous shale			-200-			250	80
				-250-			300	90

U.S. GEOLOGICAL SURVEY

Hole No. LAY-6 continued

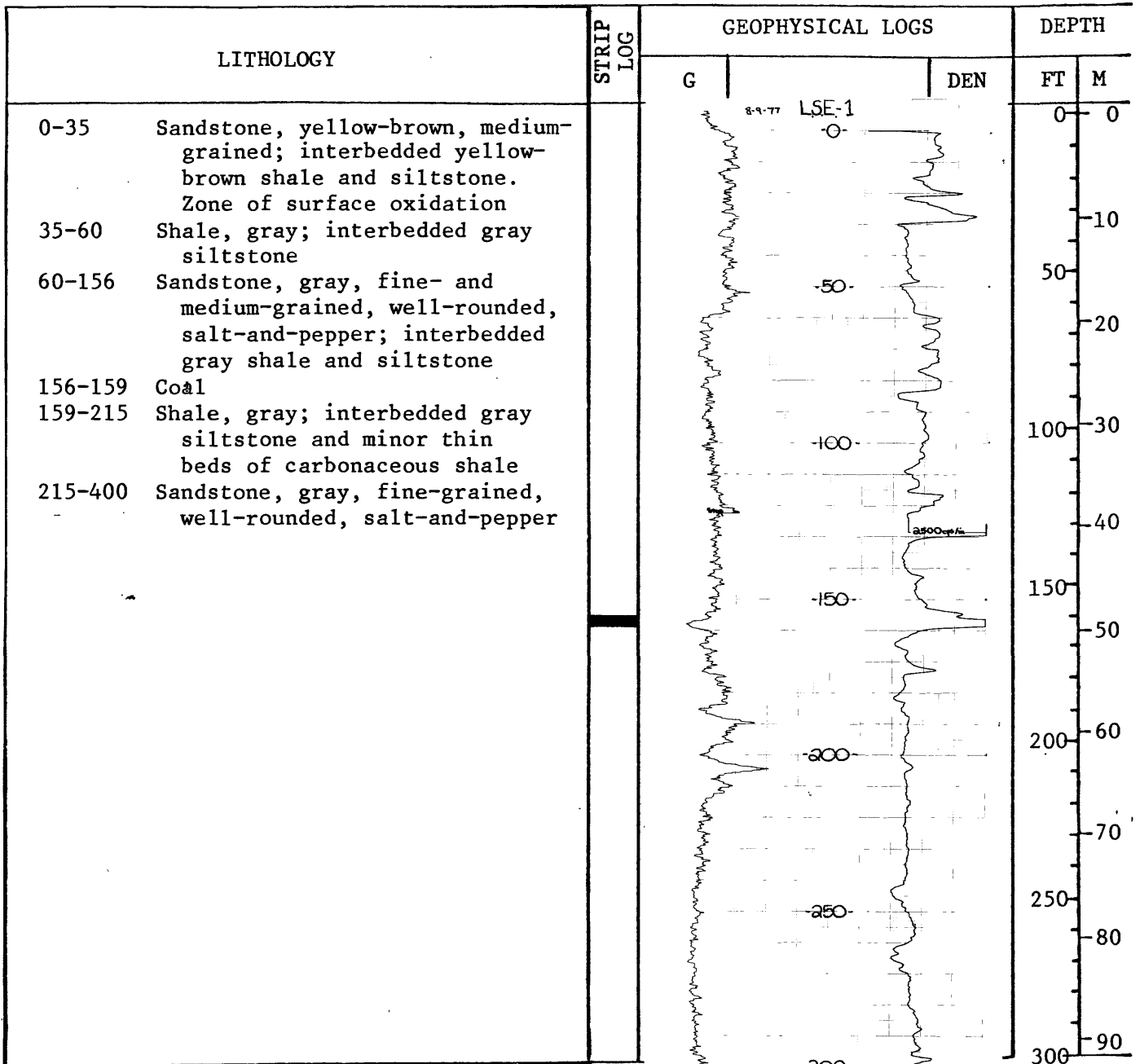


U.S. GEOLOGICAL SURVEY  
DRILL-HOLE LOG, YAMPA COAL FIELD

Hole No. LSE-1 State Colorado County Moffat Date logged 8-9-77 Elev. (ft) 6,605  
 Location: T. 8 N., R. 93 W., sec. 30, NW 1/4 SE 1/4 Cored:  Yes  No  
 Drilled depth 880' Logged depth 425' Drilling medium air Fluid level \_\_\_\_\_

Geophysical logs:

Spontaneous potential (SP): Scale \_\_\_\_\_ Logging speed \_\_\_\_\_ fpm  
 Resistance (RES): Scale \_\_\_\_\_ Logging speed \_\_\_\_\_ fpm  
 Gamma (G): T.C. 1 Scale 25 cps/in Logging speed 20 fpm  
 Density (DEN): T.C. 1 Scale 5,000 cps/in Logging speed 20 fpm  
 Remarks: Casing in hole No. E-Log; density scale changed: 2,500 cps/in at 129'





U.S. GEOLOGICAL SURVEY

Hole No. LSE-continued

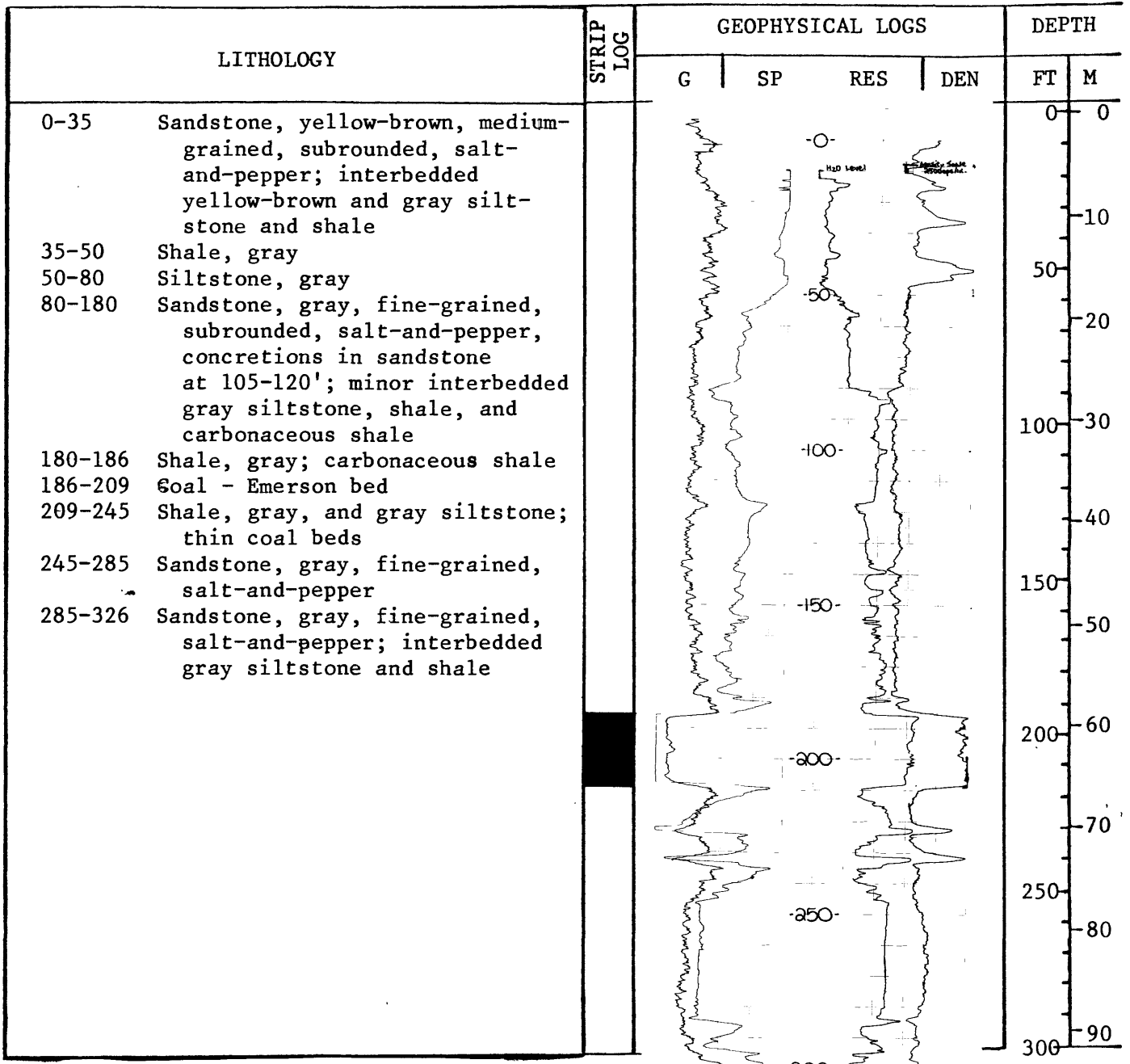
LITHOLOGY	STRIP LOG	GEOPHYSICAL LOGS		DEPTH			
		G	DEN	FT	M		
215-400 Sandstone, gray, fine-grained, well-rounded, salt-and-pepper				100			
400-408 Shale, brown, carbonaceous; some coal fragments				350	350	110	
408-425 Coal, Emerson bed				400	400	120	
				425	425	130	
						140	
						150	
						160	
						170	
						180	
						190	
						200	
						210	
						700	

U.S. GEOLOGICAL SURVEY  
DRILL-HOLE LOG, YAMPA COAL FIELD

Hole No. LSE-2 State Colorado County Moffat Date logged 8-5-77 Elev.(ft) 6,420  
 Location: T. 8 N., R. 93 W., sec. 29, NE $\frac{1}{4}$ SW $\frac{1}{4}$  Cored:  Yes  No  
 Drilled depth 700' Logged depth 655' Drilling medium Air Fluid level 10'

Geophysical logs:

Spontaneous potential (SP): Scale 25 mv/in Logging speed 20 fpm  
 Resistance (RES): Scale 25  $\Omega$ /in Logging speed 20 fpm  
 Gamma (G): T.C. 1 Scale 25 cps/in Logging speed 20 fpm  
 Density (DEN): T.C. 1 Scale 5,000 cps/in Logging speed 20 fpm  
 Remarks: Changed density scale to 2,500 cps/in at 9'



U.S. GEOLOGICAL SURVEY

Hole No. LSE-2 continued

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
		G	SP	RES	DEN	FT	M
285-326 Sandstone, gray, fine-grained, salt-and-pepper; interbedded gray siltstone and shale							
326-341 Shale, gray; brown carbonaceous shale; gray siltstone							
341-349 Coal						350	
349-403 Sandstone, gray, fine-grained, salt-and-pepper; interbedded gray shale and siltstone; brown carbonaceous shale and thin coal beds							
403-512 Sandstone, gray, fine-grained, salt-and-pepper						400	
512-516 Coal							
516-648 Sandstone, gray, fine-grained, well-rounded, salt-and-pepper							
648-655 Sandstone, gray, medium-grained, subrounded, salt-and-pepper; large pebbles of chert and quartz. Basal Fort Union conglomerate						450	
						500	
						550	
						600	
						650	
						700	

U.S. GEOLOGICAL SURVEY  
DRILL-HOLE LOG, YAMPA COAL FIELD

Hole No. LSE-3 State Colorado County Moffat Date logged 8-6-77 Elev. (ft) 6,440  
 Location: T. 8 N., R. 93 W., sec. 29, SW $\frac{1}{4}$ NW $\frac{1}{4}$  Cored:  Yes  No  
 Drilled depth 913' Logged depth 913' Drilling medium Air Fluid level surface

Geophysical logs:

Spontaneous potential (SP): Scale 20 mv/in Logging speed 40 fpm  
 Resistance (RES): Scale 50  $\Omega$ /in Logging speed 40 fpm  
 Gamma (G): T.C. 3 Scale 8 cps/in Logging speed 40 fpm  
 Density (DEN): T.C. 3 and 1 Scale 1,250 cps/in Logging speed 40 fpm  
 Remarks: Change density T.C. at 790' to 1; casing to 20'

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
		G	DEN	SP	RES	FT	M
0-40 Colluvium, yellow-brown, medium-grained sandstone; minor siltstone						0	0
40-45 Sandstone, gray, fine- and medium-grained; red chert present						10	
45-95 Shale, gray; interbedded gray siltstone and gray sandstone						50	
95-155 Shale, gray; interbedded gray sandstone and gray siltstone						20	
155-165 Sandstone, dark-brown, fine-grained, iron cemented						100	30
165-241 Sandstone, gray, medium-grained, salt-and-pepper						40	
241-246 Shale, gray; brown carbonaceous shale						150	
246-257 Coal - Blevin bed; small parting near top						50	
257-285 Sandstone, gray, fine-grained, well-rounded, salt-and-pepper						200	60
285-372 Shale, gray; minor thin. gray siltstone; and sandstone						70	
						250	
						80	
						300	90

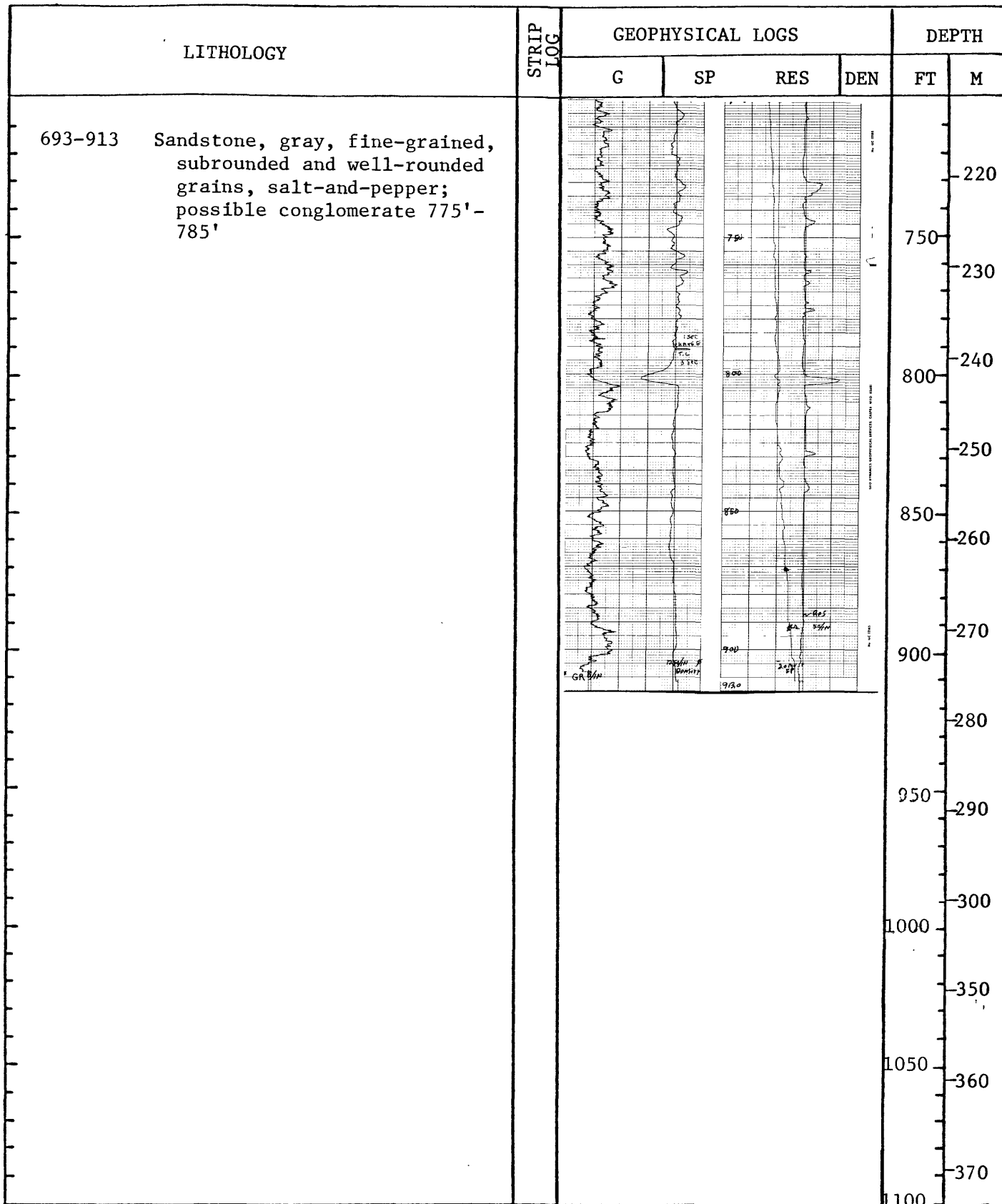
U.S. GEOLOGICAL SURVEY

Hole No. LSE-3 continued

LITHOLOGY		STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
			G	SP	RES	DEN	FT	M
285-372	Shale, gray; minor thin gray siltstone and sandstone							
372-427	Sandstone, gray, fine-grained, well-rounded; salt-and-pepper						100	
427-450	Shale, gray; minor gray siltstone							
450-476	Sandstone, gray, fine-grained, well-rounded, salt-and-pepper						350	
476-500	Coal - Emerson bed							
500-506	Shale, gray; brown carbonaceous shale							
506-637	Sandstone, gray, fine-grained, well-rounded, salt-and-pepper; interbedded gray shale and siltstone; brown carbonaceous shale						400	
637-653	Shale, gray; gray siltstone; brown carbonaceous shale							
653-662	Coal							
662-693	Shale, gray; interbedded gray sandstone and siltstone; brown carbonaceous shale and thin coal beds						450	
693-913	Sandstone, gray, fine-grained, subrounded, and well-rounded, salt-and-pepper; possible conglomerate 775-785'						500	
							550	
							600	
							650	
							700	

U.S. GEOLOGICAL SURVEY

Hole No. LSE-3 continued



U.S. GEOLOGICAL SURVEY  
DRILL-HOLE LOG, YAMPA COAL FIELD

Hole No. LSE-4 State Colorado County Moffat Date logged 7-27-77 Elev. (ft) 6,505

Location: T. 8 N., R. 93 W., sec. 28, NE $\frac{1}{4}$ NE $\frac{1}{4}$  Cored:  Yes  No

Drilled depth 770' Logged depth 770' Drilling medium water & mud Fluid level surface

Geophysical logs:

Spontaneous potential (SP): Scale 50 mv/in Logging speed 20 fpm

Resistance (RES): Scale 100 $\Omega$  /in Logging speed 20 fpm

Gamma (G): T.C. 1 Scale 25 cps/in Logging speed 20 fpm

Density (DEN): T.C. 1 Scale 5,000 cps/in Logging speed 20 fpm

Remarks: \_\_\_\_\_

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
		G	SP	RES	DEN	FT	M
0-20 Sandstone, yellow-brown, medium-grained, salt-and-pepper; carbonaceous shale; olive-gray claystone. Zone of surface oxidation						0	0
20-65 Sandstone, gray, fine-grained, well-rounded, salt-and-pepper						10	
65-82 Shale, gray; brown carbonaceous shale; gray siltstone						20	
82-92 Coal - Blevin bed							
92-110 Siltstone, gray; brown carbonaceous shale; gray shale						30	
110-137 Sandstone, gray, fine-grained, hard zone at 122'-126'						40	
137-257 Shale, gray; interbedded brown, carbonaceous shale; gray siltstone and gray, fine-grained, salt-and-pepper sandstone						50	
257-300 Sandstone, gray, fine- and medium-grained, well-rounded; very minor amounts of gray shale						60	
					70		
					80		
					90		
					300	90	

U.S. GEOLOGICAL SURVEY

Hole No. LSE-4 continued

LITHOLOGY		STRIP LOG	GEOPHYSICAL LOGS				DEPTH		
			G	SP	RES	DEN	FT	M	
300-326	Shale, gray; interbedded, gray siltstone; brown carbonaceous shale; thin sandstone beds								
326-346	Coal - Emerson bed								
346-390	Shale, gray; interbedded, gray siltstone; brown carbonaceous shale; gray sandstone; thin coal beds								
390-482	Sandstone, gray, fine- and medium-grained, well-rounded, salt-and-pepper								
482-528	Sandstone, gray, fine-grained, black chert grains; interbedded gray shale and gray siltstone; brown carbonaceous shale								
528-533	Coal								
533-574	Shale, brown, carbonaceous; gray shale; gray, fine-grained sandstone								
574-586	Sandstone, gray, medium-grained, well-rounded, salt-and-pepper								
586-651	Shale, gray; interbedded gray siltstone and brown carbonaceous shale								
651-654	Coal								
654-667	Shale, gray; interbedded, brown carbonaceous shale								
667-770	Sandstone, gray, medium-grained, well-rounded, salt-and-pepper. Possibly chert pebbles near 750'								



U.S. GEOLOGICAL SURVEY

Hole No. LSE-4 continued

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
		G	SP	RES	DEN	FT	M
667-770 Sandstone, gray, medium-grained, well-rounded, salt-and-pepper. Possibly chert pebbles near 750'						750	
						800	
						850	
						900	
						950	
						1000	
						1050	
						1100	

U.S. GEOLOGICAL SURVEY  
DRILL-HOLE LOG, YAMPA COAL FIELD

Hole No. LSE-5 State Colorado County Moffat Date logged 7-29-77 Elev. (ft) 6,580  
 Location: T. 8 N., R. 93 W., sec. 22, SW SE Cored:  Yes  No  
 Drilled depth 505' Logged depth 505' Drilling medium air Fluid level 31'

Geophysical logs:

Spontaneous potential (SP): Scale 100 mv/in Logging speed 20 fpm  
 Resistance (RES): Scale 25  $\Omega$ /in Logging speed 20 fpm  
 Gamma (G): T.C. 1 Scale 25 cps/in Logging speed 20 fpm  
 Density (DEN): T.C. 1 Scale 2,500 cps/in Logging speed 20 fpm  
 Remarks: Changed density scale at 31' to 5,000 cps/in

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
		G	SP	RES	DEN	FT	M
0-68 Sandstone, gray, medium-grained, well-rounded; some red chert with the black chert; possible conglomerate present			○			0	0
68-115 Shale, gray; interbedded gray siltstone; purple mudstone; olive-green mudstone						10	
115-165 Sandstone, gray, fine-grained, well-rounded, grain-size, fine- to medium-grained downward, salt-and-pepper		50				50	
165-180 Shale, dark-gray, carbonaceous							
180-191 Coal - Blevin bed		100				100	30
191-195 Shale, brown, carbonaceous; gray siltstone							
195-243 Sandstone, gray, fine-grained, well-rounded, salt-and-pepper						40	
243-420 Shale, gray; interbedded gray siltstone and gray, fine-grained sandstone; some carbonaceous shale		150				150	50
		200				200	60
		250				250	80
	300				300	90	

U.S. GEOLOGICAL SURVEY

Hole No. LSE-5 continued

LITHOLOGY		STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
			G	SP	RES	DEN	FT	M
243-420	Shale, gray; interbedded gray siltstone and gray sandstone; some carbonaceous shale							
420-441	Coal - Emerson bed						100	
441-462	Shale, brown, carbonaceous; interbedded gray shale and gray siltstone. Thin coal beds						350	
462-474	Sandstone						110	
474-479	Shale, gray; brown carbonaceous shale						120	
479-505	Sandstone, gray, fine-grained, salt-and-pepper						400	
							130	
						450		
						140		
						150		
						500		
						160		
						550		
						170		
						180		
						600		
						190		
						650		
						200		
						210		
						700		

U.S. GEOLOGICAL SURVEY  
DRILL-HOLE LOG, YAMPA COAL FIELD

Hole No. LSE-9 State Colorado County Moffat Date logged 7-24-77 Elev. (ft) 7,070  
 Location: T. 8 N., R. 93 W., sec. 25, SE $\frac{1}{4}$ NW $\frac{1}{4}$  Cored:  Yes  No  
 Drilled depth 820' Logged depth 817' Drilling medium air Fluid level 325'

Geophysical logs:

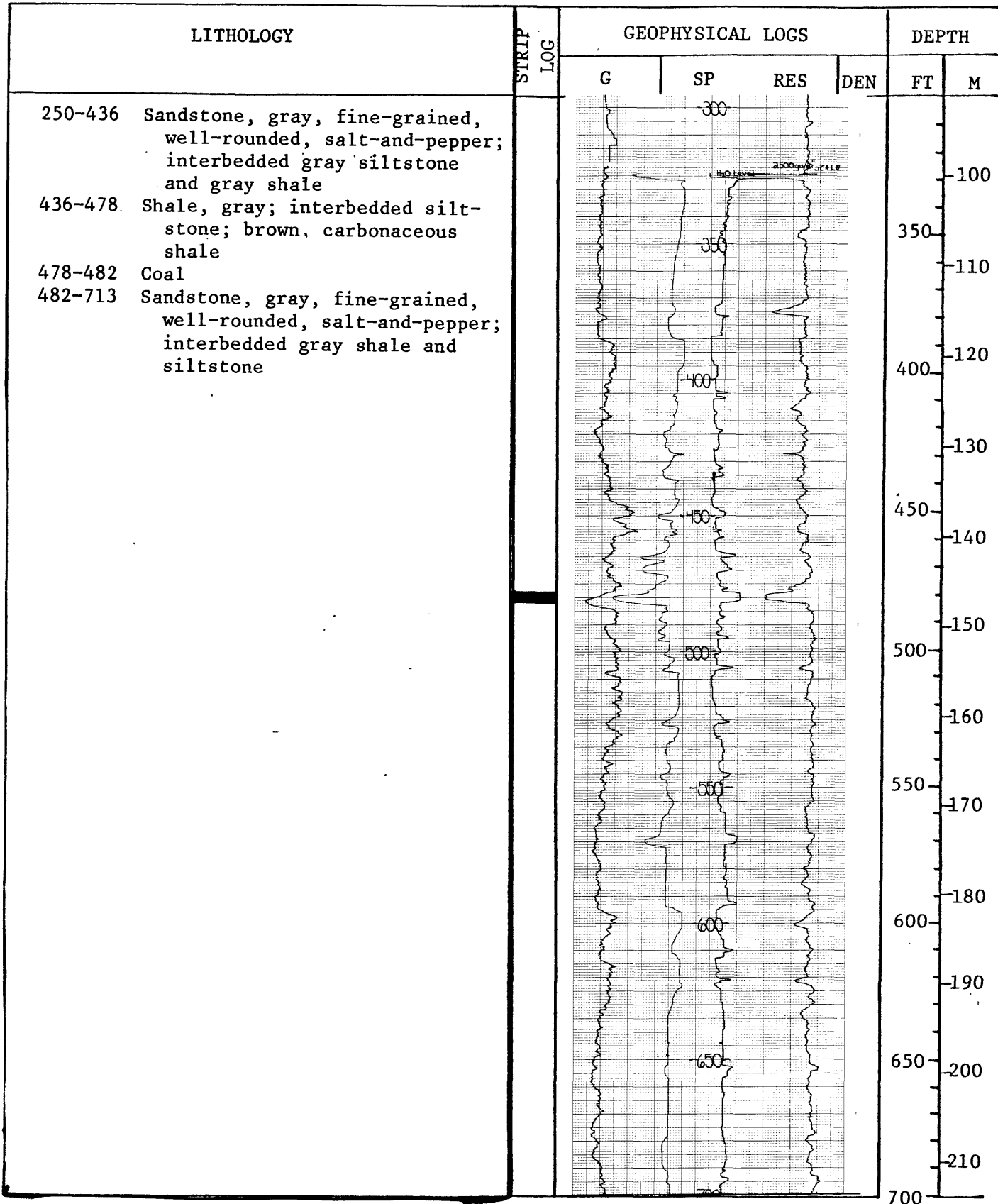
Spontaneous potential (SP): Scale 25 mv/in Logging speed 20 fpm  
 Resistance (RES): Scale 10  $\Omega$ /in Logging speed 20 fpm  
 Gamma (G): T.C. 2 Scale 50 cps/in Logging speed 20 fpm  
 Density (DEN): T.C. 1 Scale 1,000 cps/in Logging speed 20 fpm

Remarks: Changed density scale to 2,500 cps/in at 324'; note density reads  
in reverse because of error in equipment.

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
		G	SP	RES	DEN	FT	M
0-30 Sandstone, yellow-brown, fine-grained; red and black chert present. Zone of surface oxidation			0			0	0
30-88 Sandstone, gray, fine-grained, well-rounded; red and black chert present. Larger pebble-size grains of chert and other broken fragments of red chert (Browns Park Formation basal conglomerate)			50			10	10
88-202 Sandstone, gray, fine-grained; black chert present; interbedded gray shale and siltstone			100			20	20
202-206 Coal						30	30
206-250 Shale, gray; minor gray siltstone			150			40	40
250-436 Sandstone, gray, fine-grained, well-rounded, salt-and-pepper; interbedded gray siltstone and gray shale			200			50	50
			250			60	60
			300			70	70
						80	80
			300			90	90

U.S. GEOLOGICAL SURVEY

Hole No. LSE-9 continued



U.S. GEOLOGICAL SURVEY

Hole No. LSE-9 continued

LITHOLOGY		STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
			G	SP	RES	DEN	FT	M
482-713	Sandstone, gray, fine-grained, well-rounded, salt-and-pepper; interbedded gray shale and siltstone						220	
713-721	Shale, gray, brown, carbonaceous; interbedded gray siltstone		750				750	
721-724	Coal						230	
724-743	Siltstone, gray; interbedded gray shale; some brown and gray carbonaceous shale							230
743-775	Sandstone, gray, fine-grained, well-rounded, salt-and-pepper; interbedded gray siltstone and shale		800				800	
775-804	Shale, gray; interbedded gray siltstone; brown carbonaceous shale						250	
804-815	Coal						850	
815-817	Sandstone, gray, fine-grained, salt-and-pepper						260	
							270	
						900		
						280		
						950		
						290		
						300		
						1000		
						350		
						1050		
						360		
						370		
						1100		

U.S. GEOLOGICAL SURVEY  
DRILL-HOLE LOG, YAMPA COAL FIELD

Hole No. LSE-12 State Colorado County Moffat Date logged 8-10-77 Elev. (ft) 6,620  
 Location: T. 8 N., R. 93 W., sec. 30, SE $\frac{1}{4}$ SW $\frac{1}{4}$  Cored:  Yes  No  
 Drilled depth 690' Logged depth 686' Drilling medium air Fluid level 176'

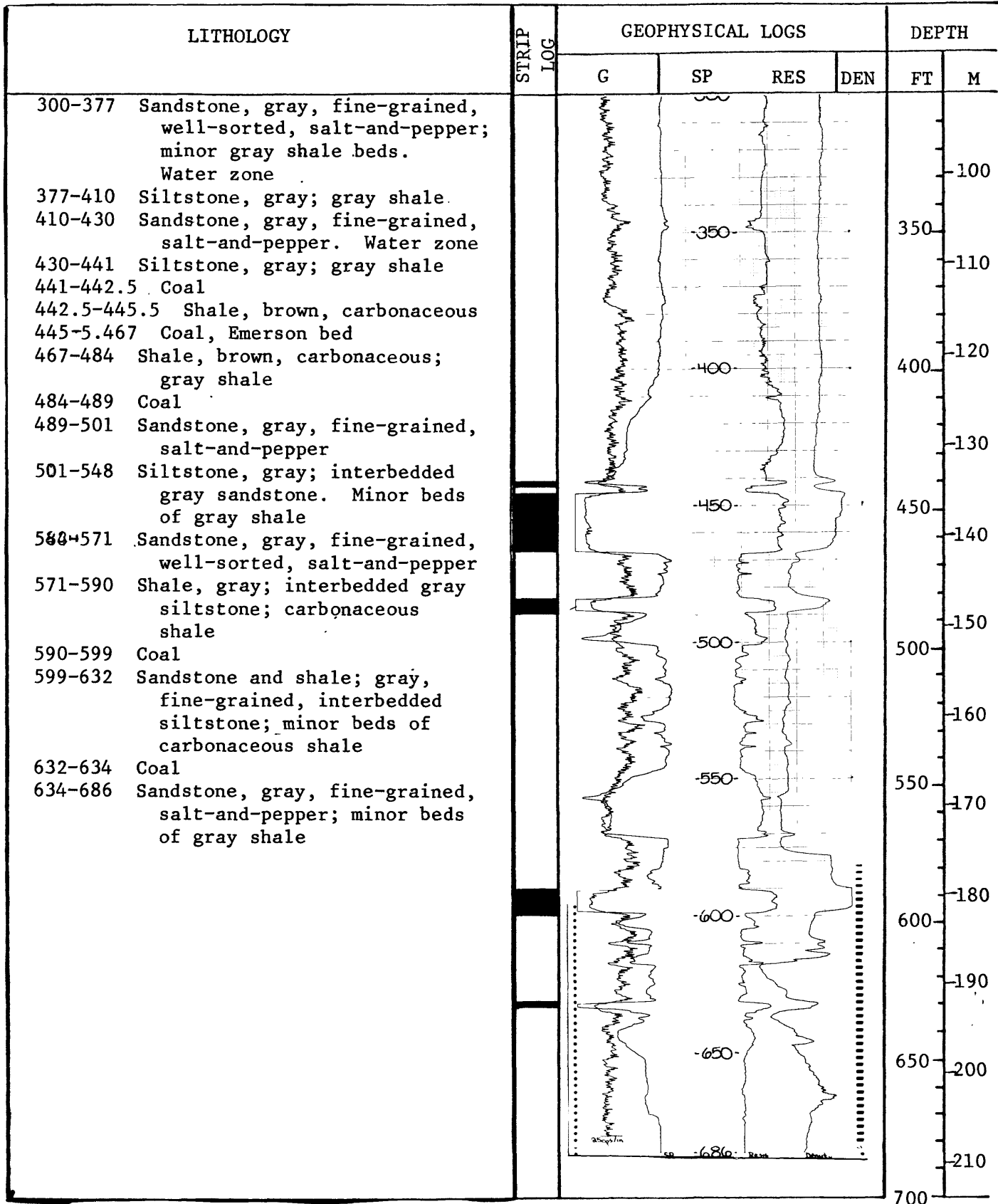
Geophysical logs:

Spontaneous potential (SP): Scale 50 mv/in Logging speed 20 fpm  
 Resistance (RES): Scale 25  $\Omega$ /in Logging speed 20 fpm  
 Gamma (G): T.C. 1 Scale 25 cps/in Logging speed 20 fpm  
 Density (DEN): T.C. 1 Scale 5,000 cps/in Logging speed 20 fpm  
 Remarks: Changed density scale at 176' to 2,500 cps/in

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
		G	SP	RES	DEN	FT	M
0-25 Siltstone, yellow-brown; yellow-brown, fine-grained sandstone. Zone of surface oxidation						0	0
25-80 Shale, gray; interbedded gray siltstone and gray, salt-and-pepper, fine-grained sandstone						10	
80-135 Sandstone, gray, fine-grained, salt-and-pepper. Water zone						50	
135-205 Shale, gray, minor, interbedded gray siltstone and brown carbonaceous shale						100	30
205-218 Coal - Blevin bed Small, brown carbonaceous shale parting at 206'-207'						40	
218-300 Siltstone, gray; interbedded gray shale and gray, salt-and-pepper, fine-grained sandstone						150	50
						200	60
					250	80	
					300	90	

U.S. GEOLOGICAL SURVEY

Hole No. LSE-12 continued





U.S. GEOLOGICAL SURVEY  
DRILL-HOLE LOG, YAMPA COAL FIELD

Hole No. BM-24 State Colorado County Routt Date logged 9-5-77 Elev.(ft) 7,860  
 Location: T. 5 N., R. 89 W., sec. 20, NE<sup>1</sup>/<sub>4</sub>NE<sup>1</sup>/<sub>4</sub> Cored:  Yes  No  
 Drilled depth 720' Logged depth 712' Drilling medium air Fluid level 8'

Geophysical logs:

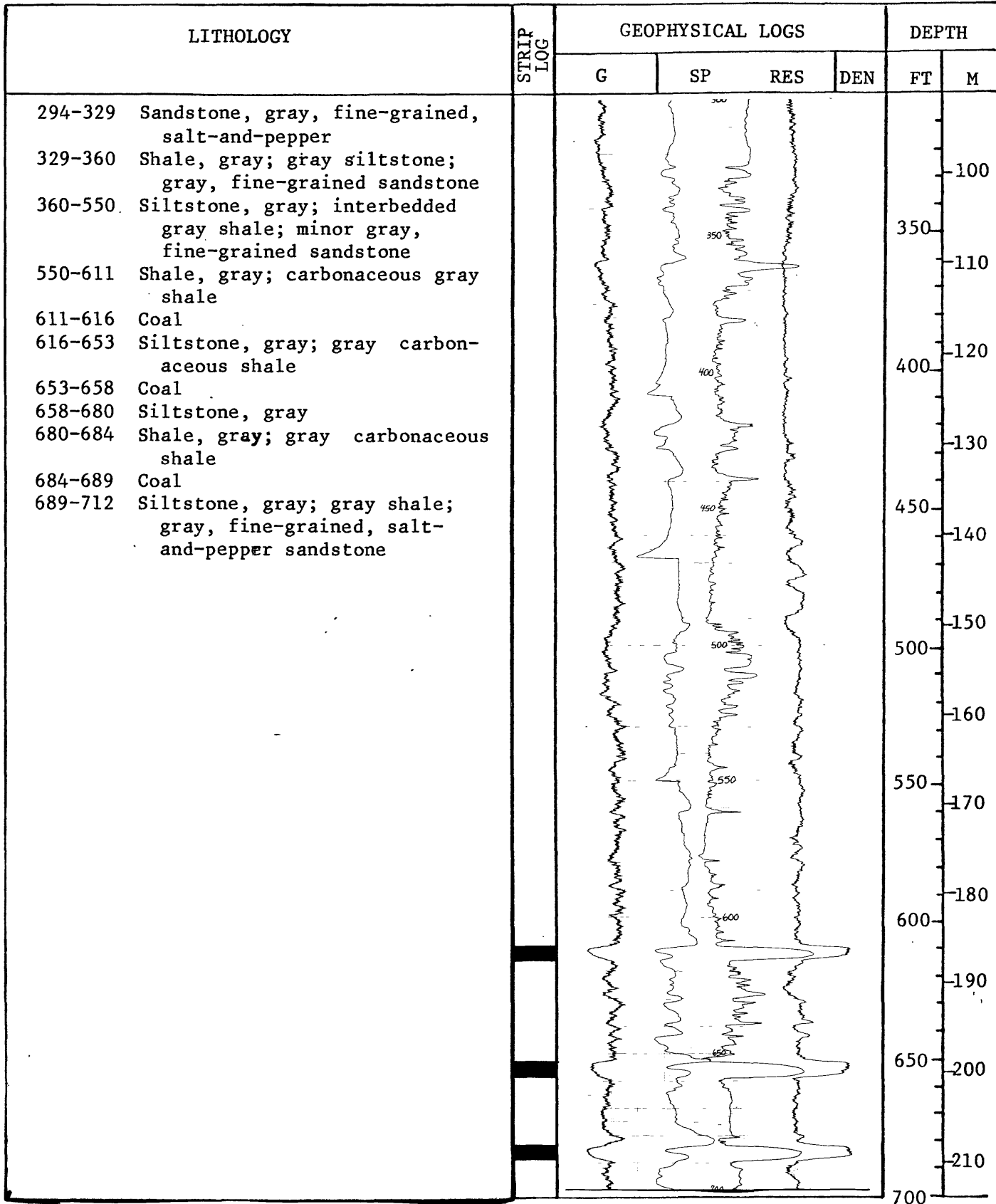
Spontaneous potential (SP): Scale 40 mv/in Logging speed 20 fpm  
 Resistance (RES): Scale 40 Ω/in Logging speed 20 fpm  
 Gamma (G): T.C. 1 Scale 100 cps/in Logging speed 20 fpm  
 Density (DEN): T.C. 1 Scale 1000 cps/in Logging speed 20 fpm

Remarks: \_\_\_\_\_

LITHOLOGY		STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
			G	SP	RES	DEN	FT	M
0-10	Colluvium; soil zone; weathered sandstone						0	0
10-73	Sandstone, yellow-brown and gray, fine-grained, salt-and-pepper						10	
73-79	Siltstone, gray						50	
79-157	Sandstone, gray, fine-grained, salt-and-pepper. Twentymile Sandstone Member of Williams Fork Formation						20	
157-273	Siltstone, gray; gray shale. Marine						100	30
273-285	Siltstone, gray; gray shale; brown carbonaceous shale						150	50
285-294	Coal						200	60
294-329	Sandstone, gray, fine-grained, salt-and-pepper						250	80
						300	90	

U.S. GEOLOGICAL SURVEY

Hole No. BM-24 continued



U.S. GEOLOGICAL SURVEY

Hole No. BM-24 continued

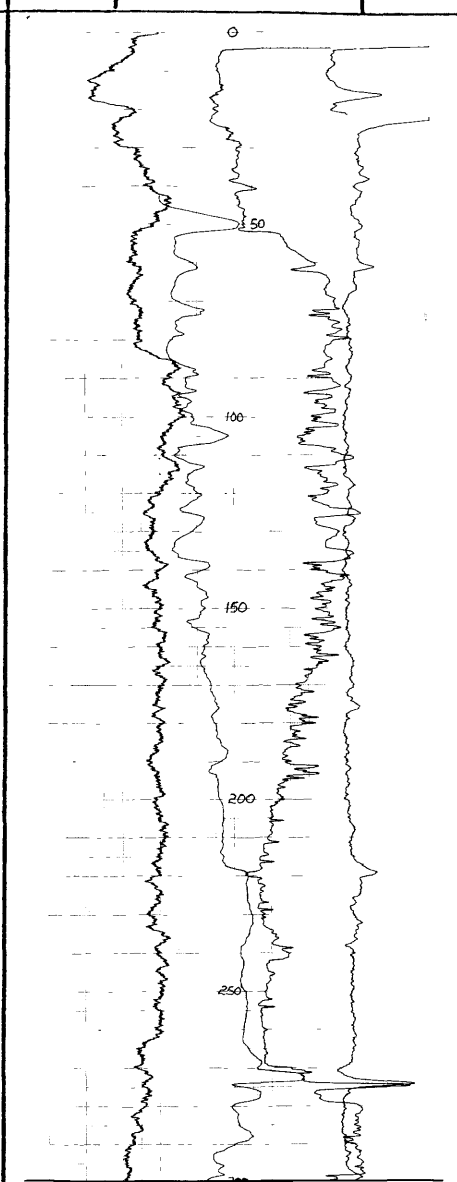
LITHOLOGY	STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
		G	SP	RES	DEN	FT	M
689-712 Siltstone, gray; gray shale; gray, fine-grained, salt-and-pepper sandstone						220	
		750					
		230					
		240					
		800					
		250					
		850					
		260					
		270					
		900					
		280					
		950					
		290					
		300					
		1000					
350							
1050							
360							
370							
1100							

U.S. GEOLOGICAL SURVEY  
DRILL-HOLE LOG, YAMPA COAL FIELD

Hole No. BM-29 State Colorado County Routt Date logged 8-21-77 Elev. (ft) 7,040  
 Location: T. 6 N., R. 89 W., sec. 31, SE  $\frac{1}{4}$  SW  $\frac{1}{4}$  Cored:  Yes  No  
 Drilled depth 600' Logged depth 543' Drilling medium mud Fluid level 5'

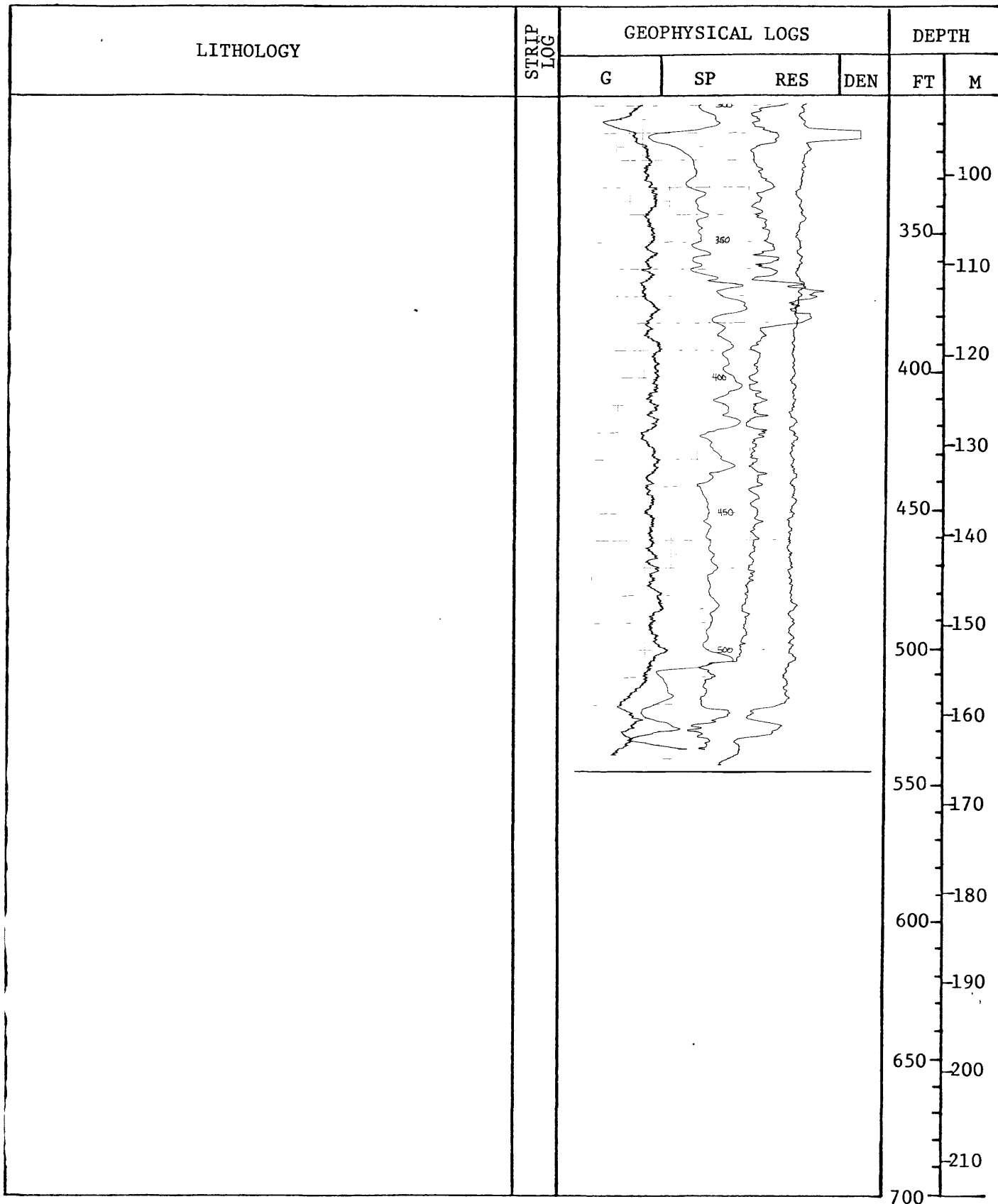
Geophysical logs:

Spontaneous potential (SP): Scale 30 mv/in Logging speed 20 fpm  
 Resistance (RES): Scale 10  $\Omega$ /in Logging speed 20 fpm  
 Gamma (G): T.C. 2 Scale 100 cps/in Logging speed 20 fpm  
 Density (DEN): T.C. 1 Scale 500 cps/in Logging speed 20 fpm  
 Remarks: Very poor circulation, cuttings very poor.

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
		G	SP	RES	DEN	FT	M
Cuttings are not reliable for correlation with the drill-hole log						0	0
						10	
						50	
						20	
						100	30
						40	
						150	50
						200	60
						70	
						250	80
						300	90

U.S. GEOLOGICAL SURVEY

Hole No. BM-29 continued



U.S. GEOLOGICAL SURVEY  
DRILL-HOLE LOG, YAMPA COAL FIELD

Hole No. BM-30 State Colorado County Routt Date logged 8-21-77 Elev. (ft) 7,150  
 Location: T. 5 N., R. 89 W., sec. 6, SW $\frac{1}{4}$ NW $\frac{1}{4}$  Cored:  Yes  No  
 Drilled depth 885' Logged depth 883' Drilling medium mud Fluid level 34'

Geophysical logs:

Spontaneous potential (SP): Scale 30 mv/in Logging speed 20 fpm  
 Resistance (RES): Scale 10  $\Omega$ /in Logging speed 20 fpm  
 Gamma (G): T.C. 2 Scale 100 cps/in Logging speed 20 fpm  
 Density (DEN): T.C. 1 Scale 500 cps/in Logging speed 20 fpm  
 Remarks: \_\_\_\_\_

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
		G	SP	RES	DEN	FT	M
0-20 Colluvium; brown, weathered shale; minor sandstone						0	0
20-30 Sandstone, yellow-orange, medium-grained, salt-and-pepper						10	
30-35 Shale, brown, carbonaceous; thin coal bed						50	
35-40 Sandstone, gray, fine-grained, salt-and-pepper						20	
40-45 Siltstone, gray							
45-125 Sandstone, gray, medium- and fine-grained, well-rounded, salt-and-pepper						100	30
125-129 Shale, gray; gray siltstone							
129-182 Sandstone, gray, fine-grained, well-rounded, salt-and-pepper						40	
182-199 Siltstone, gray; gray shale							
199-333 Sandstone, gray, fine-grained, well-rounded, salt-and-pepper; interbedded gray siltstone and gray shale						150	50
						200	60
					250	80	
					300	90	

U.S. GEOLOGICAL SURVEY

Hole No. BM-30 continued

LITHOLOGY		STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
			G	SP	RES	DEN	FT	M
199-333	Sandstone, gray, fine-grained, well-rounded, salt-and-pepper; interbedded gray siltstone and gray shale							100
333-345	Shale, gray; brown carbonaceous shale							350
345-359	Coal							110
359-525	Siltstone, gray; interbedded gray shale and minor thin, gray, fine-grained sandstone beds							120
525-538	Sandstone, gray, medium-grained, rounded, salt-and-pepper							400
538-592	Siltstone, gray; gray shale							130
592-620	Sandstone, gray; fine-grained, pyrite, salt-and-pepper							140
620-666	Shale, gray; interbedded gray shale; brown carbonaceous shale							450
666-671	Coal							140
671-676	Shale, carbonaceous							150
676-683	Sandstone, gray, fine-grained, salt-and-pepper							500
683-689	Shale, carbonaceous							160
689-692	Coal							170
692-702	Shale, gray; carbonaceous shale; gray siltstone							550
								180
								600
								190
								650
								200
								210
								700

U.S. GEOLOGICAL SURVEY

Hole No. BM-30 continued

LITHOLOGY		STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
			G	SP	RES	DEN	FT	M
692-702	Shale, gray; carbonaceous shale; gray siltstone							
702-716	Coal							
716-742	Shale, gray; gray siltstone; carbonaceous shale		220					
742-750	Coal						750	
750-800	Siltstone, gray; gray shale; carbonaceous shale							230
800-808	Coal							
808-883	Siltstone, gray; gray shale; carbonaceous shale; thin coal beds		800					240
								250
			850					260
								270
			900					280
							290	
		950					300	
							350	
		1000					360	
							370	
		1050						
							1100	



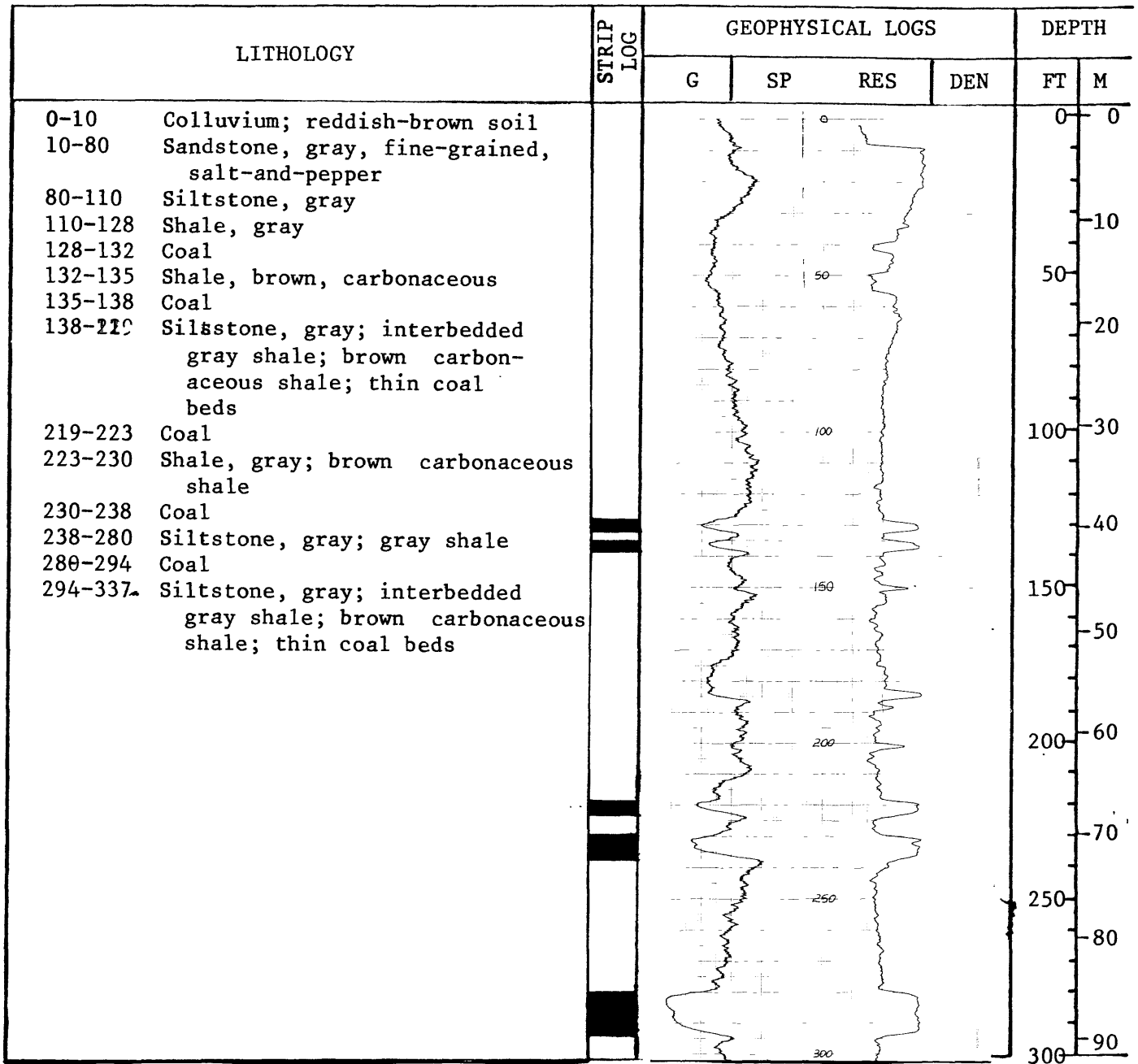
U.S. GEOLOGICAL SURVEY  
DRILL-HOLE LOG, YAMPA COAL FIELD

Hole No. BM-31 State Colorado County Moffat Date logged 8-27-77 Elev. (ft) 7,680  
 Location: T. 5 N., R. 90 W., sec. 2, Center NE¼ Cored:  Yes  No  
 Drilled depth 820' Logged depth 820' Drilling medium air Fluid level 521'

Geophysical logs:

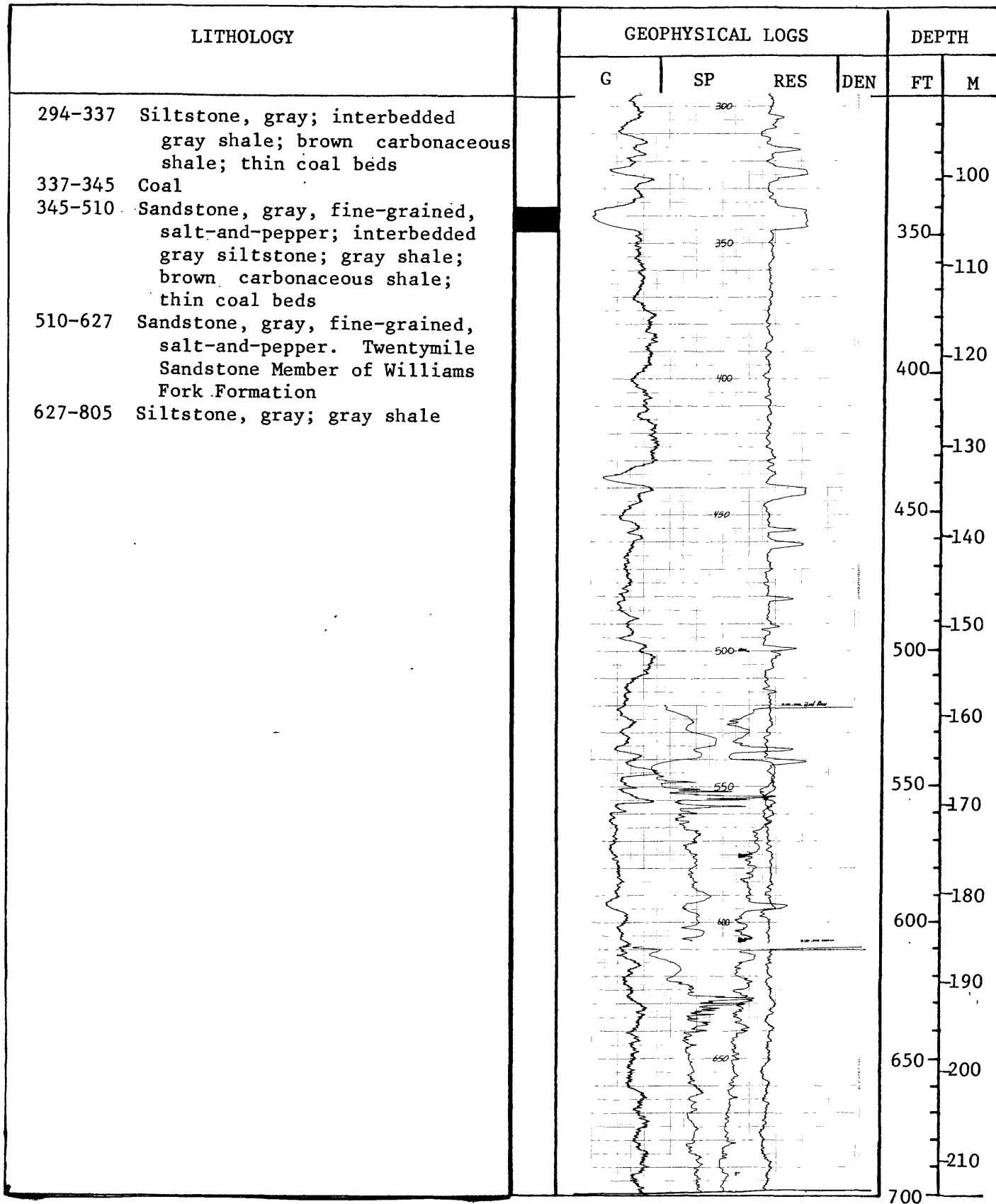
Spontaneous potential (SP): Scale 40 mv/in Logging speed 20 fpm  
 Resistance (RES): Scale 40 Ω/in Logging speed 20 fpm  
 Gamma (G): T.C. 2 Scale 50 cps/in Logging speed 20 fpm  
 Density (DEN): T.C. 1 Scale 400 cps/in Logging speed 20 fpm

Remarks: \_\_\_\_\_



U.S. GEOLOGICAL SURVEY

Hole No. BM-31 continued



U.S. GEOLOGICAL SURVEY

Hole No. BM-31 continued

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
		G	SP	RES	DEN	FT	M
627-805 Siltstone, gray; gray shale						220	
805-808 Coal						750	
808-820 Siltstone, gray; gray shale						230	
						240	
						800	
						250	
						850	
						260	
						900	
						270	
		280					
		950					
		290					
		300					
		1000					
		350					
		1050					
		360					
		370					
		1100					

U.S. GEOLOGICAL SURVEY  
DRILL-HOLE LOG, YAMPA COAL FIELD

Hole No. BM-33 State Colorado County Moffat Date logged 8-22-77 Elev. (ft) 7,320  
 Location: T. 6 N., R. 90 W., sec. 36, NW $\frac{1}{4}$ SW $\frac{1}{4}$  Cored:  Yes  No  
 Drilled depth 640' Logged depth 614' Drilling medium air Fluid level 28'

Geophysical logs:

Spontaneous potential (SP): Scale \_\_\_\_\_ Logging speed \_\_\_\_\_ fpm  
 Resistance (RES): Scale \_\_\_\_\_ Logging speed \_\_\_\_\_ fpm  
 Gamma (G): T.C. 2 Scale 100 cps/in Logging speed 20 fpm  
 Density (DEN): T.C. 1 Scale 200 cps/in Logging speed 20 fpm  
 Remarks: No E-Log-Casing in hole

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOGS		DEPTH	
		G	DEN	FT	M
0-30 Colluvium; yellow-brown, weathered sandstone and shale				0	0
30-40 Sandstone, gray, fine-grained, salt-and-pepper				10	
40-60 No sample - lost air				50	
60-80 Shale, gray; gray siltstone				20	
80-100 Coal; gray shale; carbonaceous shale				100	30
100-614 No samples. Drilling blind - no air return				40	
				150	
				50	
				200	60
				70	
				250	80
				80	
				300	90

U.S. GEOLOGICAL SURVEY

Hole No. BM-33 continued

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOGS		DEPTH		
		G		DEN	FT	M
100-614 No samples. Drilling blind - no air return		<p>The geophysical logs consist of two curves plotted against depth. The 'G' curve (left) shows a relatively stable signal with minor fluctuations. The 'DEN' curve (right) shows significant variability, with several sharp peaks and troughs, particularly between 100 and 400 feet depth. The curves end at approximately 600 feet depth.</p>			100	
			350		110	
			400		120	
			450		130	
			500		140	
			550		150	
			600		160	
					170	
					180	
					190	
					200	
					210	
					700	

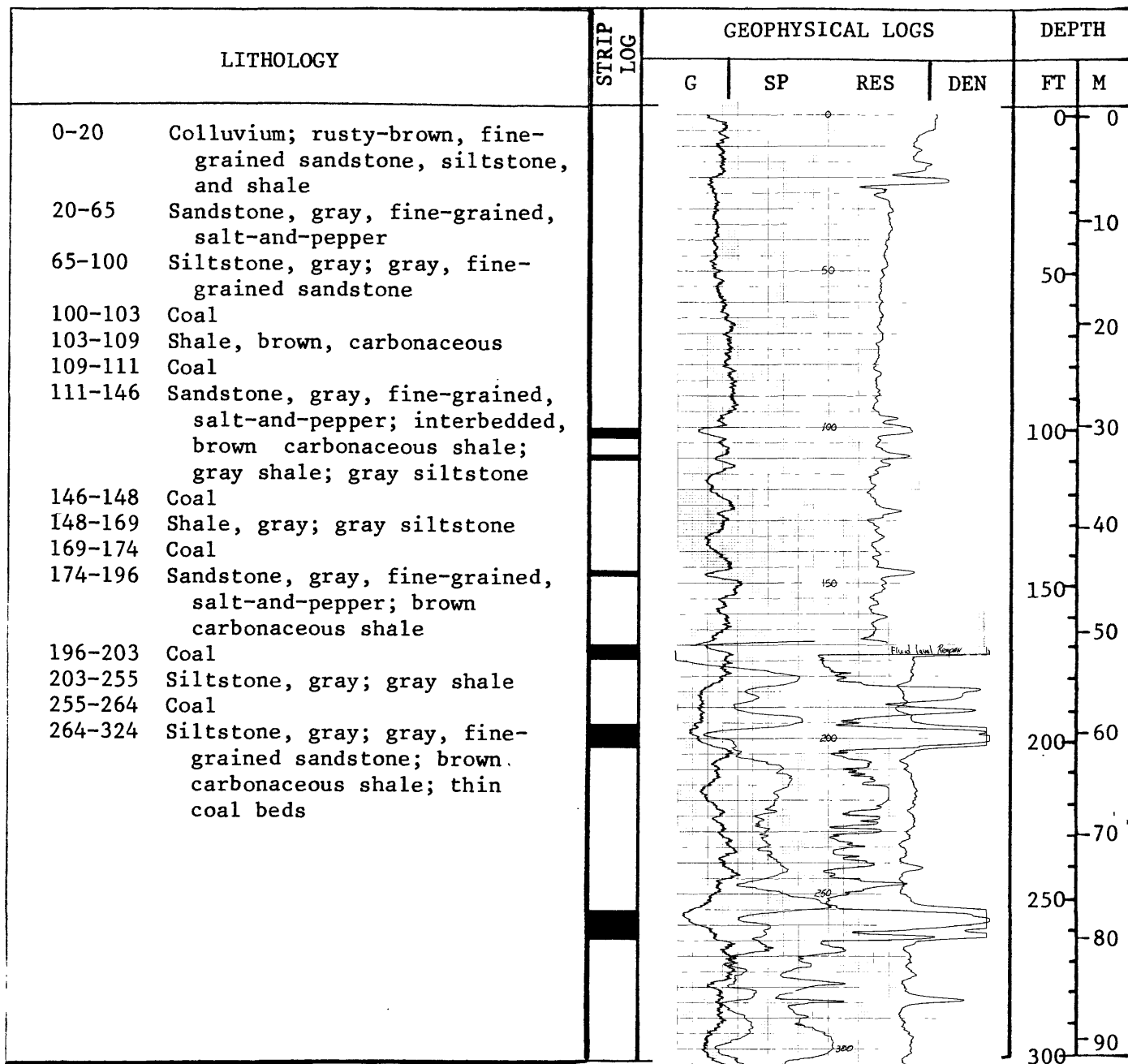
U.S. GEOLOGICAL SURVEY  
DRILL-HOLE LOG, YAMPA COAL FIELD

Hole No. BM-34 State Colorado County Moffat Date logged 8-23-77 Elev. (ft) 7,480  
 Location: T. 6 N., R. 90 W., sec. 35, NW $\frac{1}{4}$ SW $\frac{1}{4}$  Cored:  Yes  No  
 Drilled depth 840' Logged depth 827' Drilling medium air Fluid level 173'

Geophysical logs:

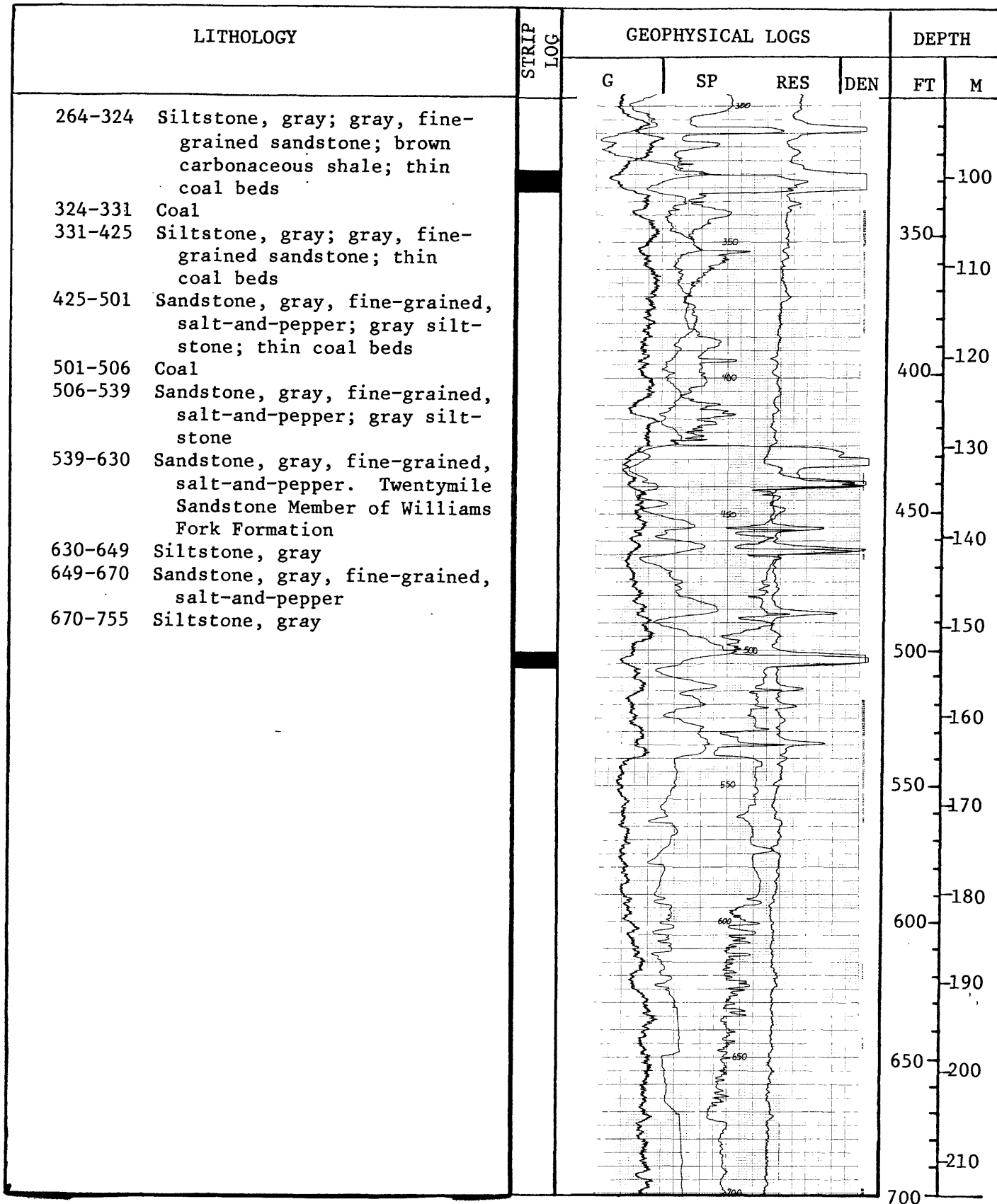
Spontaneous potential (SP): Scale 30 mv/in Logging speed 20 fpm  
 Resistance (RES): Scale 30  $\Omega$ /in Logging speed 20 fpm  
 Gamma (G): T.C. 2 Scale 100 cps/in Logging speed 20 fpm  
 Density (DEN): T.C. 1 Scale 500 cps/in Logging speed 20 fpm

Remarks: \_\_\_\_\_



U.S. GEOLOGICAL SURVEY

Hole No. BM-34 continued



U.S. GEOLOGICAL SURVEY

Hole No. BM-04 continued

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
		G	SP	RES	DEN	FT	M
670-755 Siltstone, gray						220	
755-827 Sandstone, gray, fine-grained, salt-and-pepper; gray siltstone						750	230
						800	240
						850	250
						900	260
						950	270
						1000	280
						1050	290
						1100	300
							350
							360
							370
							370
							1100



U.S. GEOLOGICAL SURVEY  
DRILL-HOLE LOG, YAMPA COAL FIELD

Hole No. BM-36 State Colorado County Moffat Date logged 9-3-77 Elev.(ft) 7,740  
 Location: T. 5 N., R. 90 W., sec. 4, NE $\frac{1}{4}$ NE $\frac{1}{4}$  Cored:  Yes  No  
 Drilled depth 1,000' Logged depth 986' Drilling medium air Fluid level 5'

Geophysical logs:

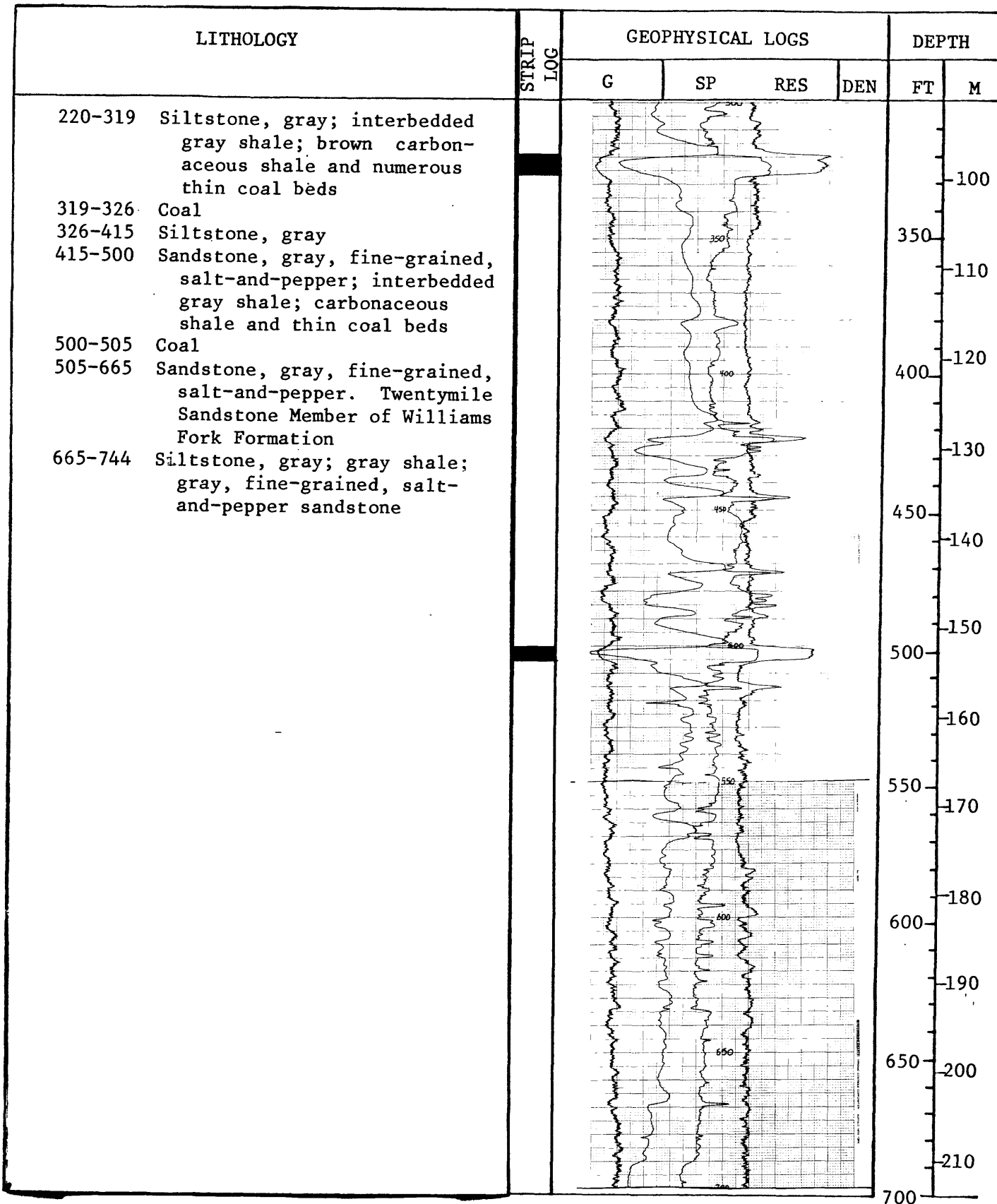
Spontaneous potential (SP): Scale 40 mv/in Logging speed 20 fpm  
 Resistance (RES): Scale 40  $\Omega$ /in Logging speed 20 fpm  
 Gamma (G): T.C. 2 Scale 50 cps/in Logging speed 20 fpm  
 Density (DEN): T.C. 1 Scale 400 cps/in Logging speed 20 fpm

Remarks: \_\_\_\_\_

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
		G	SP	RES	DEN	FT	M
0-30 Colluvium, sandy, clayey						0	0
30-65 Siltstone, gray; gray shale							
65-111 Sandstone, gray, fine-grained, salt-and-pepper							
111-158 Siltstone, gray; interbedded gray shale; brown carbonaceous shale; thin coal beds						10	
158-175 Shale, brown, carbonaceous; gray shale						20	
175-179 Coal							
179-220 Sandstone, gray, fine-grained, salt-and-pepper						30	100
220-319 Siltstone, gray; interbedded gray shale; brown carbonaceous shale and numerous thin coal beds						40	
						50	150
						60	200
						70	
						80	250
						90	
						90	300

U.S. GEOLOGICAL SURVEY

Hole No. BM-36 continued



U.S. GEOLOGICAL SURVEY

Hole No. BM-36 continued

LITHOLOGY		STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
			G	SP	RES	DEN	FT	M
665-744	Siltstone, gray; gray shale; gray, fine-grained, salt-and-pepper sandstone							
744-752	Coal						220	
752-927	Sandstone, gray, fine-grained, salt-and-pepper; gray siltstone						750	
927-950	Siltstone, gray						230	
950-965	Sandstone, gray, fine-grained, salt-and-pepper						800	
965-975	Siltstone, gray						240	
975-986	Sandstone, gray, fine-grained, salt-and-pepper						850	
							250	
							850	
							260	
						270		
						900		
						280		
						950		
						290		
						300		
						1000		
						350		
						1050		
						360		
						370		
						1100		

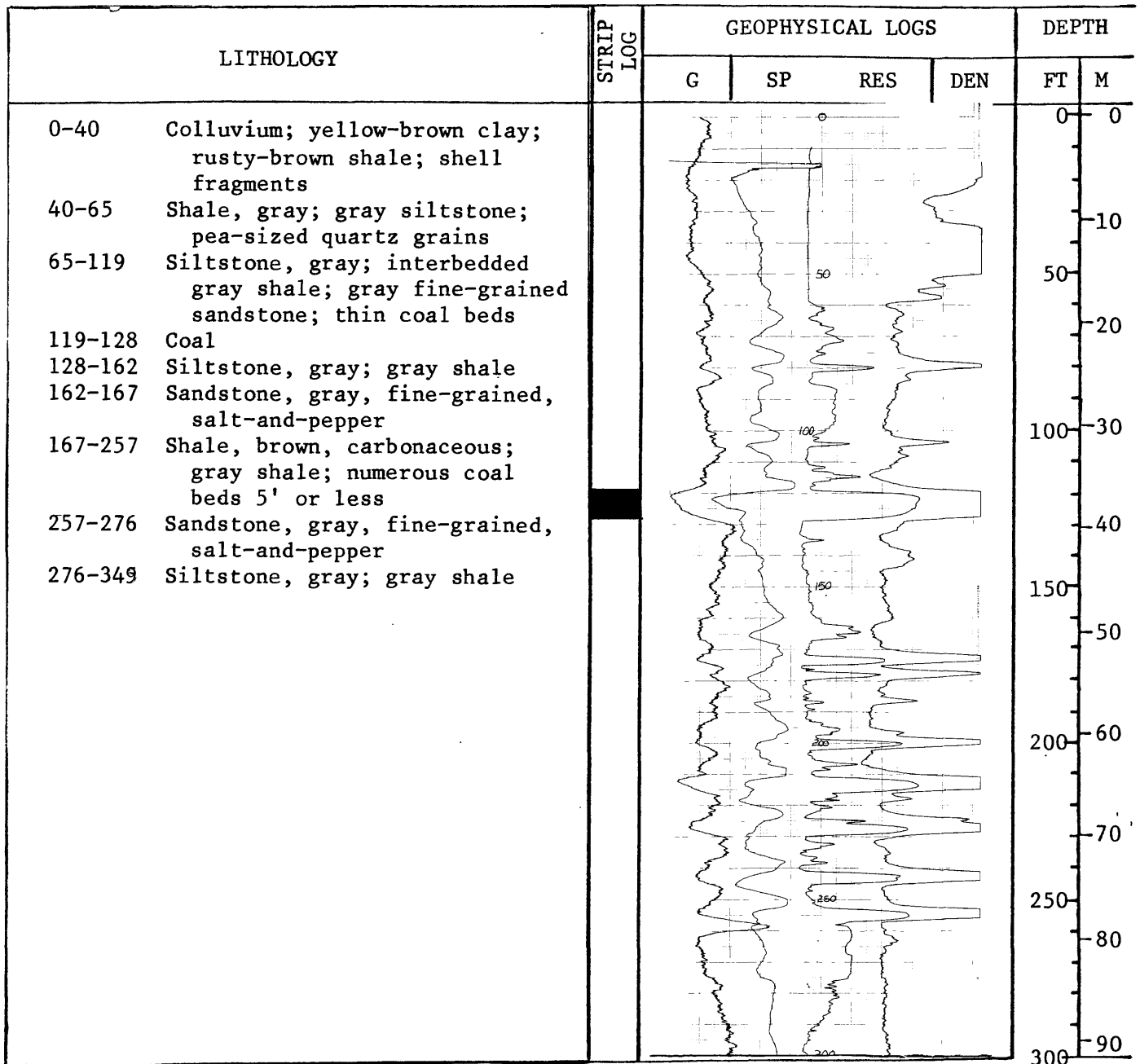
U.S. GEOLOGICAL SURVEY  
DRILL-HOLE LOG, YAMPA COAL FIELD

Hole No. BM-37 State Colorado County Moffat Date logged 8-27-77 Elev. (ft) 7,300  
 Location: T. 5 N., R. 90 W., sec. 4, NE $\frac{1}{4}$ NW $\frac{1}{4}$  Cored:  Yes  No  
 Drilled depth 980' Logged depth 979' Drilling medium air Fluid level 16'

Geophysical logs:

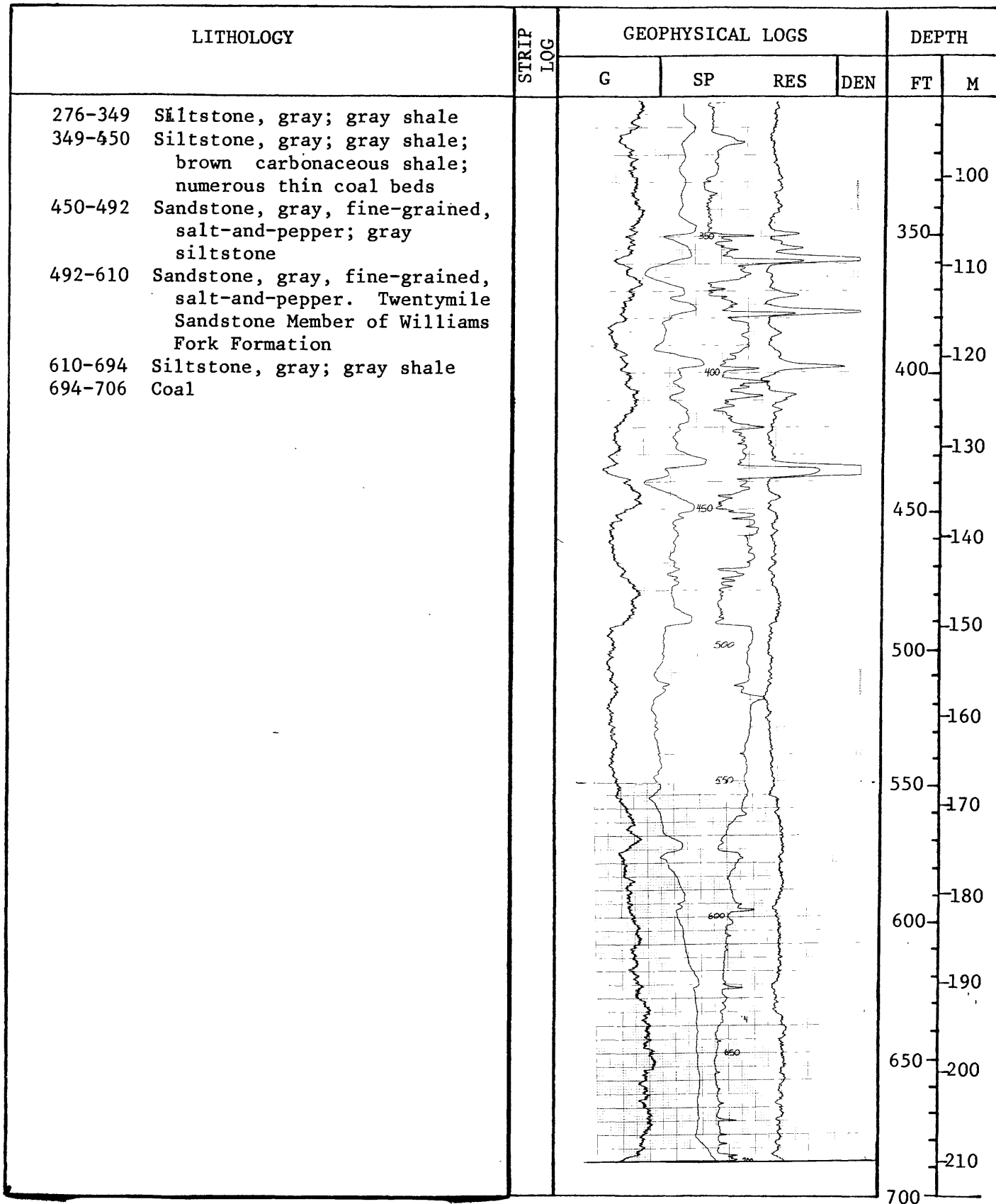
Spontaneous potential (SP): Scale 40 mv/in Logging speed 20 fpm  
 Resistance (RES): Scale 40  $\Omega$ /in Logging speed 20 fpm  
 Gamma (G): T.C. 2 Scale 50 cps/in Logging speed 20 fpm  
 Density (DEN): T.C. 1 Scale 400 cps/in Logging speed 20 fpm

Remarks: \_\_\_\_\_



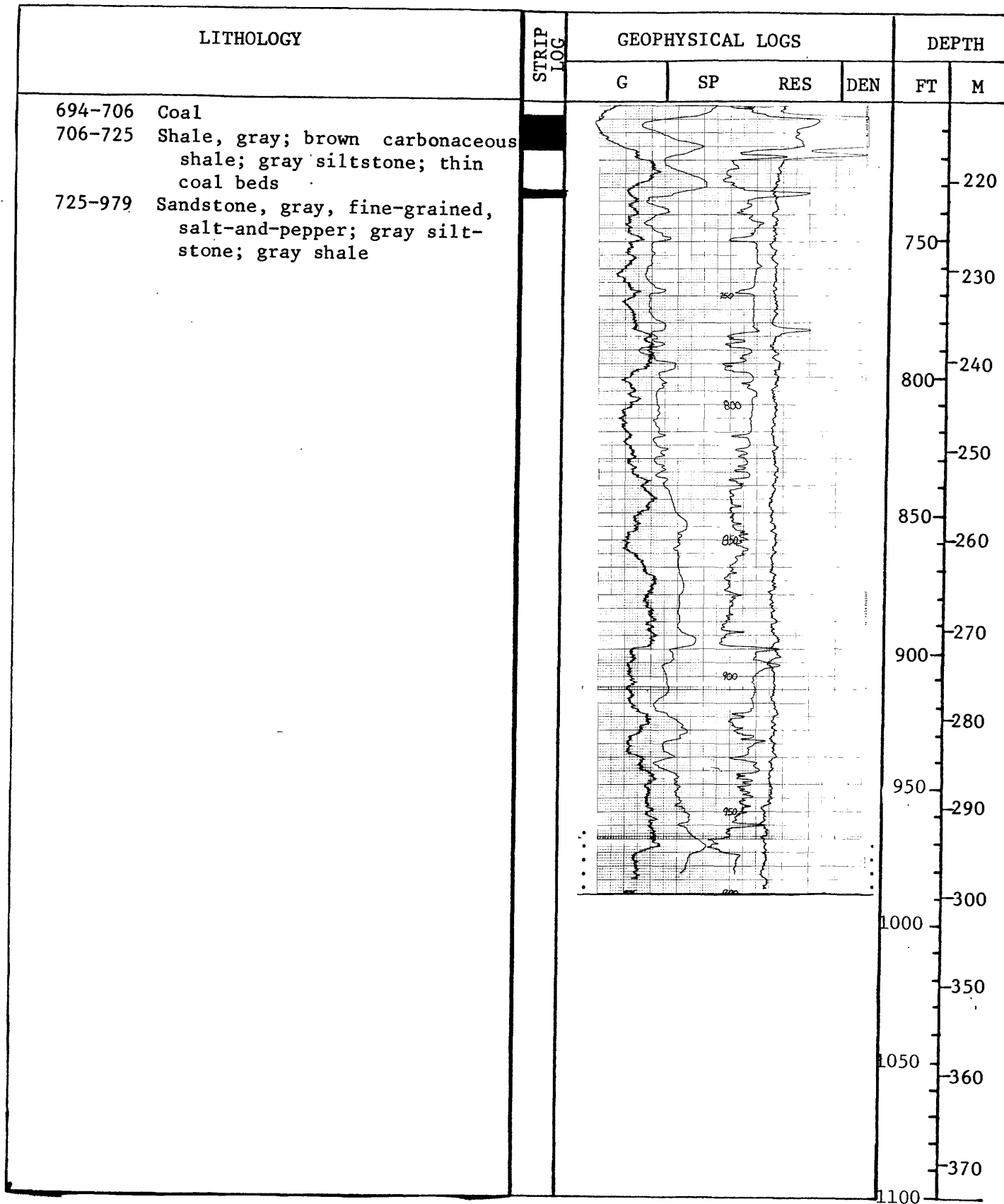
U.S. GEOLOGICAL SURVEY

Hole No. BM-37 continued



U.S. GEOLOGICAL SURVEY

Hole No. BM-37 continued



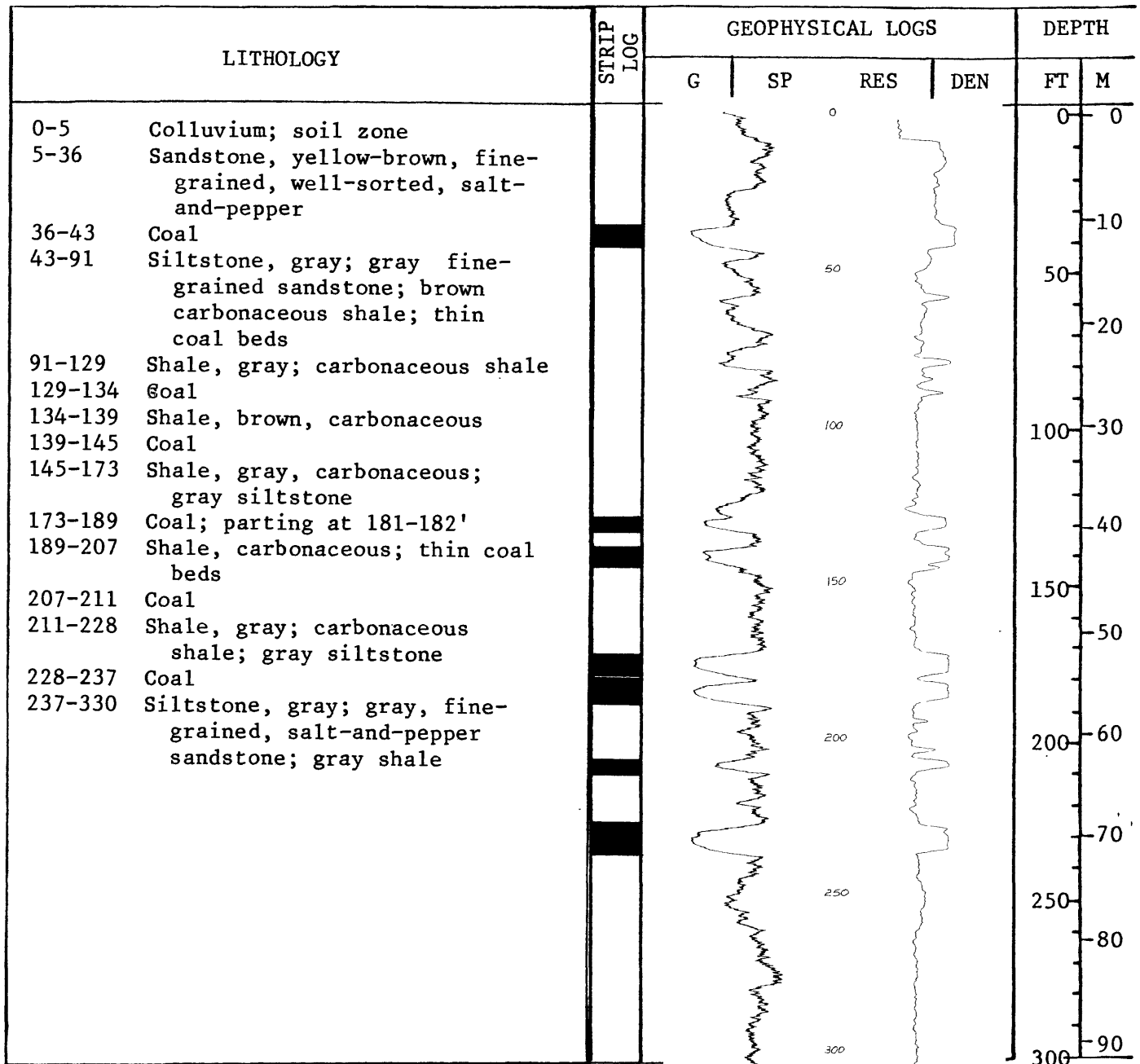
U.S. GEOLOGICAL SURVEY  
DRILL-HOLE LOG, YAMPA COAL FIELD

Hole No. BM-38 State Colorado County Moffat Date logged 8-25-77 Elev. (ft) 7,700  
 Location: T. 5 N., R. 90 W., sec. 1, SW $\frac{1}{4}$ SW $\frac{1}{4}$  Cored:  Yes  No  
 Drilled depth 820' Logged depth 816' Drilling medium air Fluid level 430'

Geophysical logs:

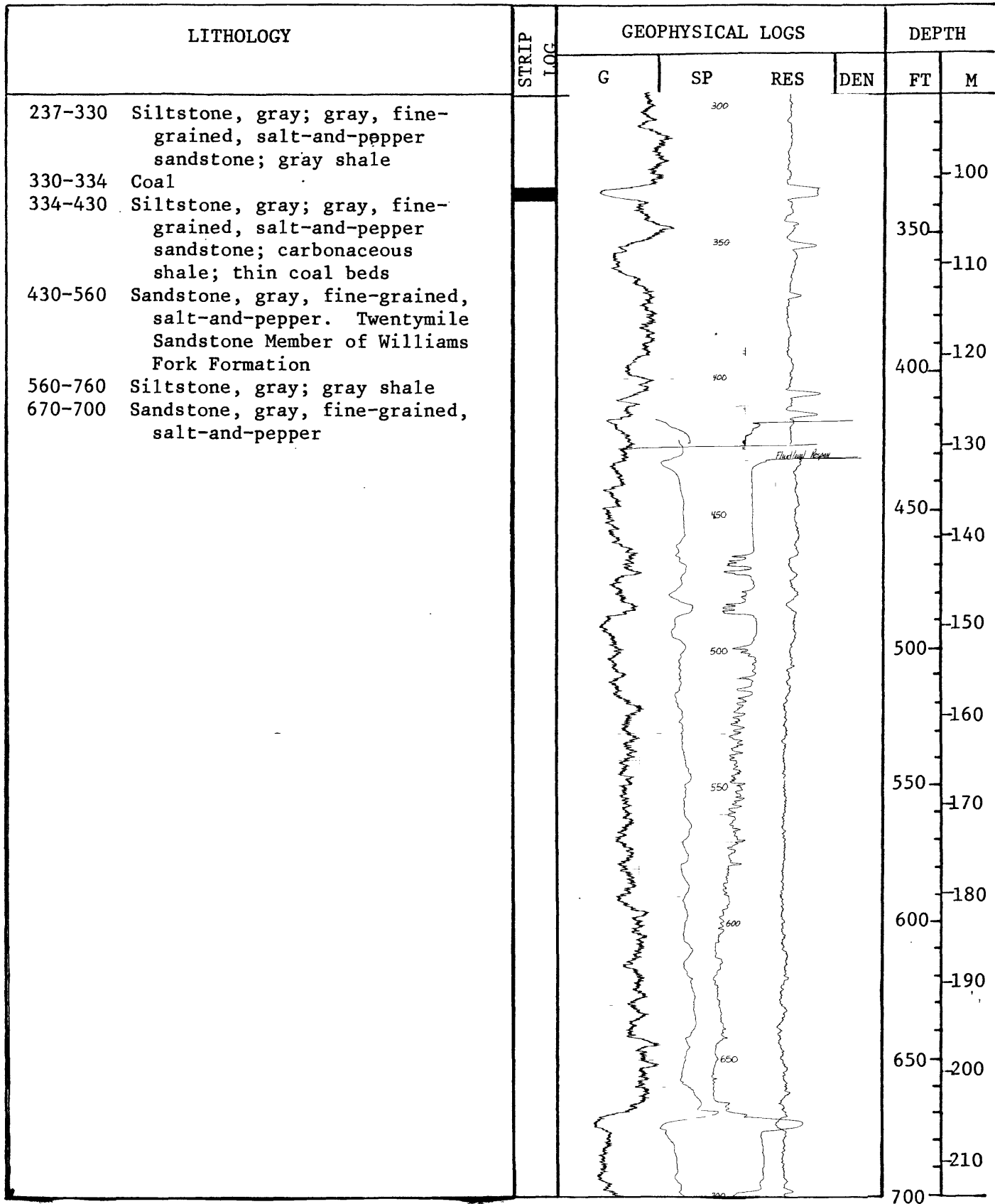
Spontaneous potential (SP): Scale 40 mv/in Logging speed 20 fpm  
 Resistance (RES): Scale 40  $\Omega$ /in Logging speed 20 fpm  
 Gamma (G): T.C. 2 Scale 20 cps/in Logging speed 20 fpm  
 Density (DEN): T.C. 1 Scale 500 cps/in Logging speed 20 fpm

Remarks: \_\_\_\_\_



U.S. GEOLOGICAL SURVEY

Hole No. BM-38 continued





U.S. GEOLOGICAL SURVEY

Hole No. BM-38 continued

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
		G	SP	RES	DEN	FT	M
700-722 Siltstone, gray; gray shale							
722-727 Coal							
727-816 Siltstone, gray; gray shale; gray, fine-grained, salt- and-pepper sandstone							
					220		
					750		
					230		
					240		
					800		
					250		
					850		
					260		
					270		
					900		
					280		
					290		
					950		
					300		
					1000		
					350		
					1050		
					360		
					370		
					1100		

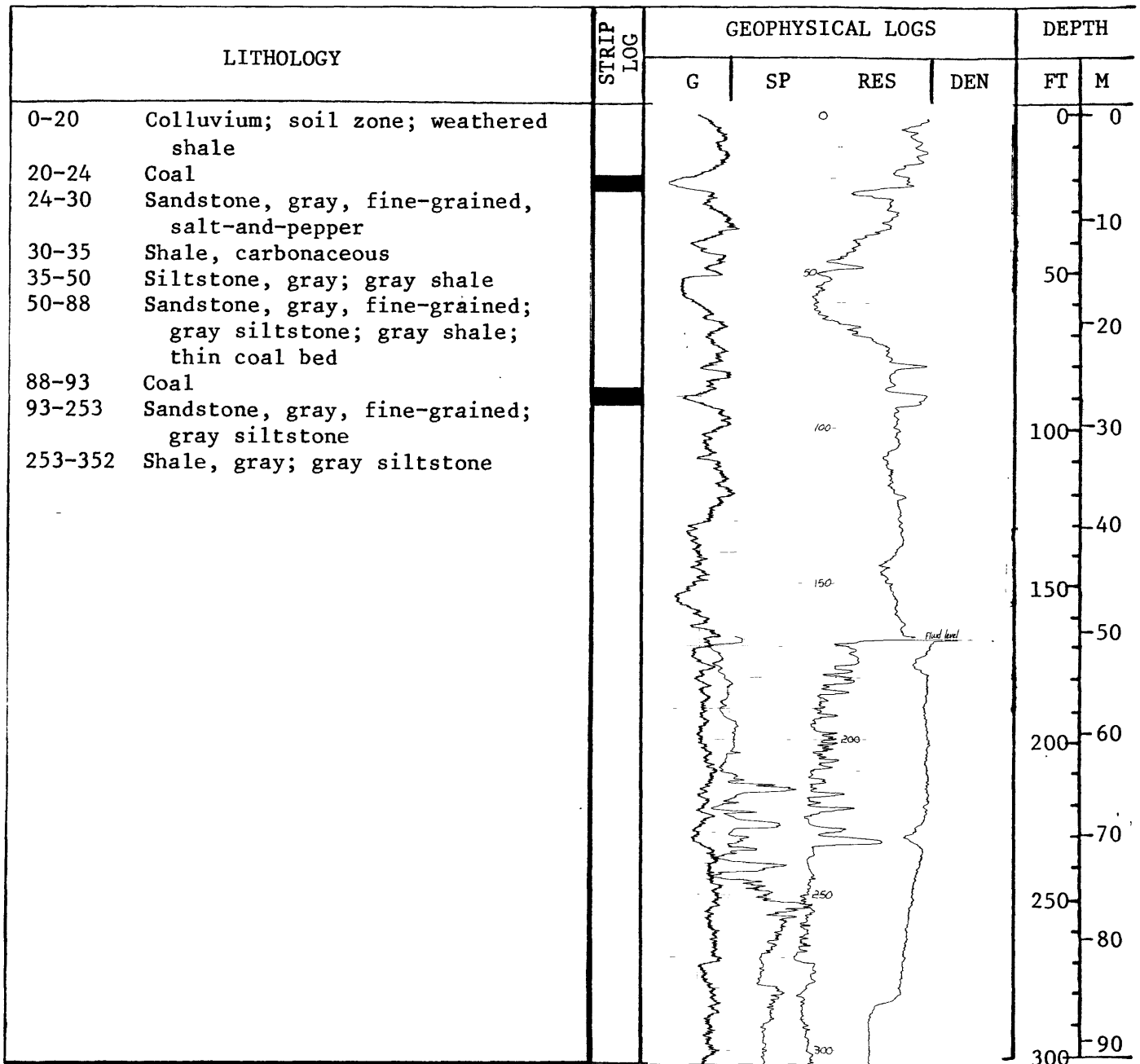
U.S. GEOLOGICAL SURVEY  
DRILL-HOLE LOG, YAMPA COAL FIELD

Hole No. BM-39 State Colorado County Moffat Date logged 9-7-77 Elev.(ft) 7,680  
 Location: T. 5 N., R. 90 W., sec. 11, NE 1/4 NW 1/4 Cored:  Yes  No  
 Drilled depth 760' Logged depth 758' Drilling medium air Fluid level 168'

Geophysical logs:

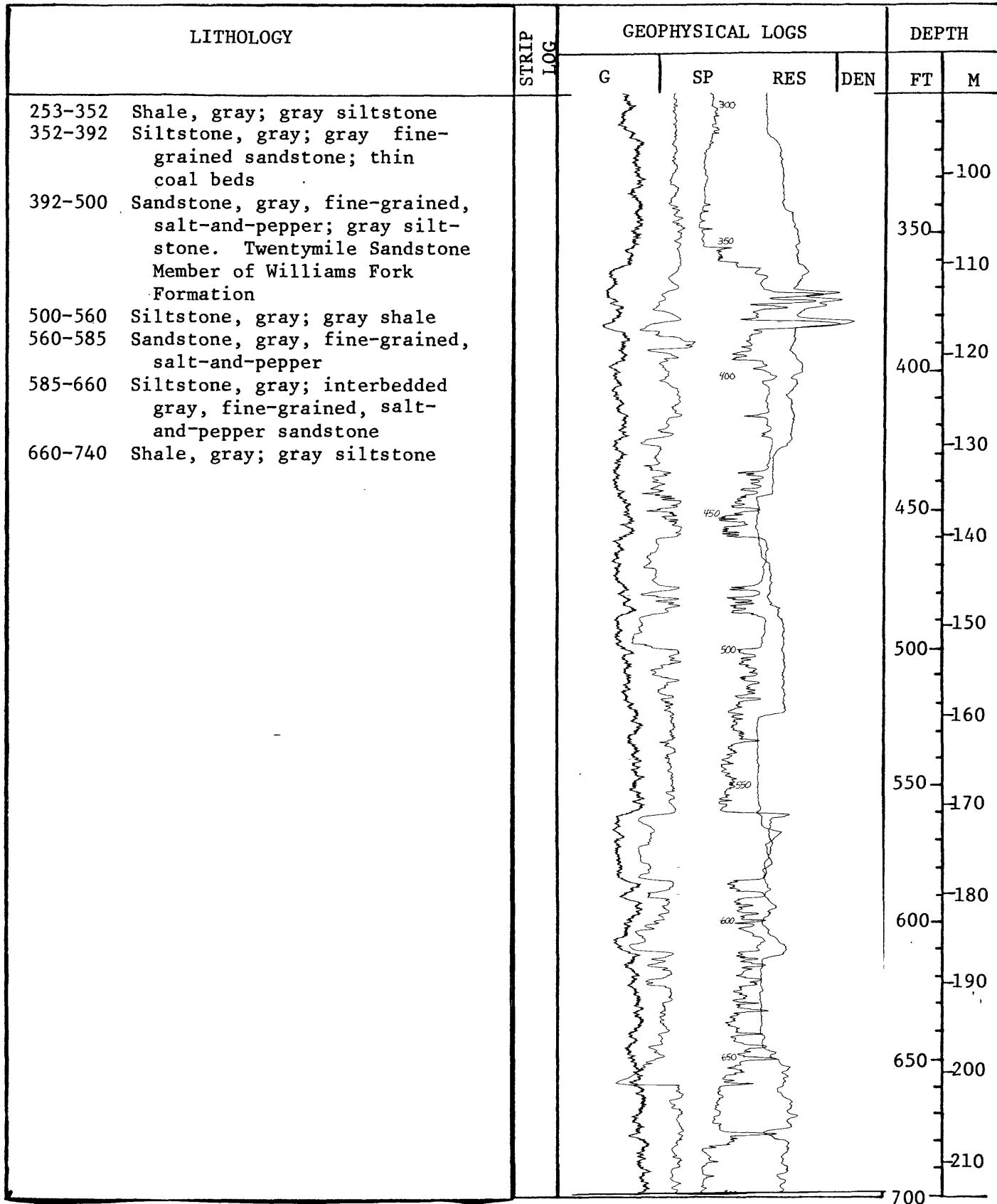
Spontaneous potential (SP): Scale 40 mv/in Logging speed 20 fpm  
 Resistance (RES): Scale 40 Ω/in Logging speed 20 fpm  
 Gamma (G): T.C. 2 Scale 100 cps/in Logging speed 20 fpm  
 Density (DEN): T.C. 1 Scale 1,000 cps/in Logging speed 20 fpm

Remarks: \_\_\_\_\_



U.S. GEOLOGICAL SURVEY

Hole No. BM-39 continued



U.S. GEOLOGICAL SURVEY

Hole No. BM-39 continued

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
		G	SP	RES	DEN	FT	M
660-740 Shale, gray; gray siltstone 740-758 Coal; interbedded carbonaceous shale						220	
						750	
						230	
						240	
						800	
						250	
						850	
						260	
						270	
						900	
						280	
						950	
						290	
						300	
						1000	
						350	
						1050	
						360	
						370	
						1100	

U.S. GEOLOGICAL SURVEY  
DRILL-HOLE LOG, YAMPA COAL FIELD

Hole No. BM-40 State Colorado County Routt Date logged 9-2-77 Elev. (ft) 7,740  
 Location: T. 5 N., R. 89 W., sec. 17, NE $\frac{1}{4}$ NE $\frac{1}{4}$  Cored:  Yes  No  
 Drilled depth 1,040' Logged depth 1,036' Drilling medium air Fluid level 597'

Geophysical logs:

Spontaneous potential (SP): Scale 50 mv/in Logging speed 20 fpm  
 Resistance (RES): Scale 50  $\Omega$ /in Logging speed 20 fpm  
 Gamma (G): T.C. 2 Scale 100 cps/in Logging speed 20 fpm  
 Density (DEN): T.C. 1 Scale 1,000 cps/in Logging speed 20 fpm  
 Remarks: NOTE: Neutron Density, not gamma-gamma

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
		G	SP	RES	DEN	FT	M
0-5 Colluvium; yellow-brown, weathered sandstone and shale; soil zone						0	0
5-80 Sandstone, yellow and gray, fine-grained, salt-and-pepper. Twentymile Sandstone Member of Williams Fork Formation			50			10	
80-230 Siltstone, gray; gray shale; gray, fine-grained, salt-and-pepper sandstone						20	
230-270 Sandstone, gray, fine-grained, salt-and-pepper			100			100	30
270-420 Siltstone, gray; gray shale						150	50
						200	60
						250	80
						300	90

U.S. GEOLOGICAL SURVEY

Hole No. BM-40 continued

LITHOLOGY		STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
			G	SP	RES	DEN	FT	M
698-728	Shale, gray; gray siltstone; gray fine-grained sandstone			<p>750</p> <p>850</p> <p>950</p> <p>1000</p>	<p>220</p> <p>750</p> <p>230</p> <p>240</p> <p>800</p> <p>250</p> <p>850</p> <p>260</p> <p>270</p> <p>900</p> <p>280</p> <p>950</p> <p>290</p> <p>300</p> <p>1000</p> <p>350</p> <p>1050</p> <p>360</p> <p>370</p> <p>1100</p>			
728-738	Coal							
738-753	Shale, gray; gray siltstone							
753-762	Coal							
762-764	Shale, carbonaceous							
764-773	Coal; some partings							
773-783	Shale, carbonaceous							
783-790	Coal							
790-810	Siltstone, gray; gray shale; thin coal bed							
810-839	Sandstone, gray, fine-grained, salt-and-pepper							
839-906	Siltstone, gray; gray shale							
906-915	Coal							
915-940	Siltstone, gray							
940-1038	Sandstone, gray, fine-grained, salt-and-pepper							

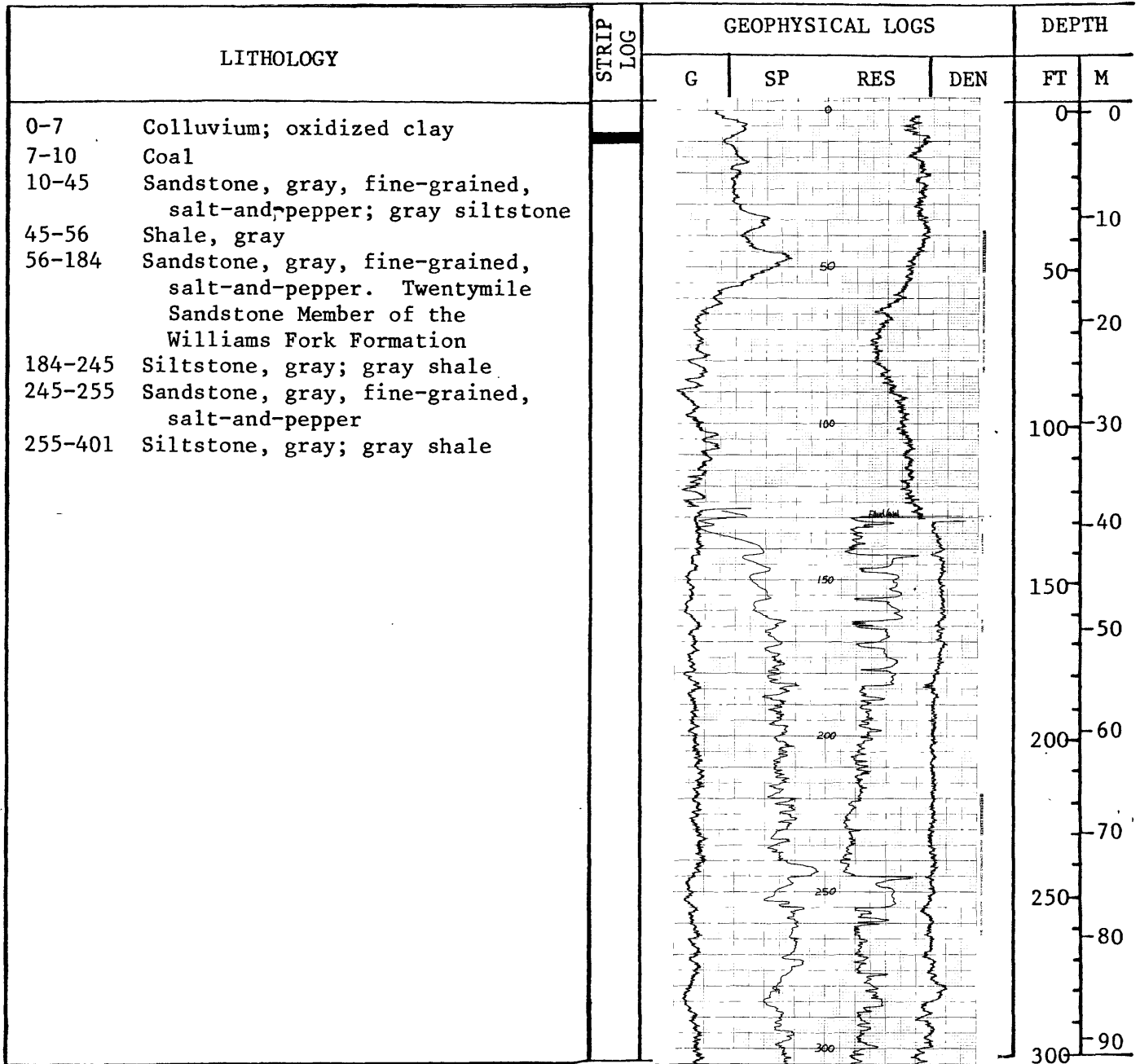
U.S. GEOLOGICAL SURVEY  
DRILL-HOLE LOG, YAMPA COAL FIELD

Hole No. BM-41 State Colorado County Moffat Date logged 9-5-77 Elev.(ft) 7,620  
 Location: T. 5 N., R. 90 W., sec. 11, SW  $\frac{1}{4}$  SE  $\frac{1}{4}$  Cored:  Yes  No  
 Drilled depth 800' Logged depth 762' Drilling medium air Fluid level 130'

Geophysical logs:

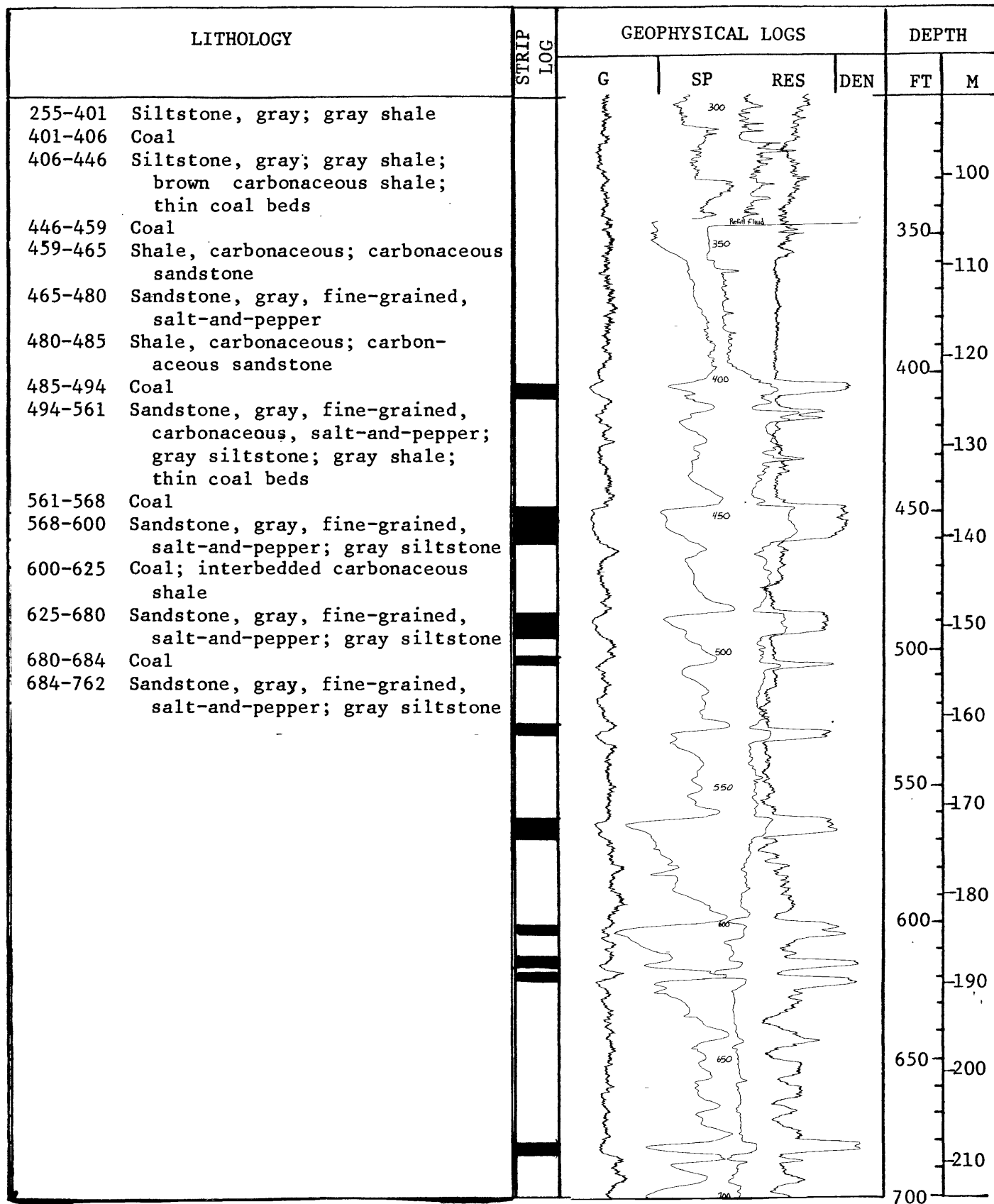
Spontaneous potential (SP): Scale 50 mv/in Logging speed 20 fpm  
 Resistance (RES): Scale 50  $\Omega$ /in Logging speed 20 fpm  
 Gamma (G): T.C. 2 Scale 100 cps/in Logging speed 20 fpm  
 Density (DEN): T.C. .5 Scale 1,000 cps/in Logging speed 20 fpm

Remarks: \_\_\_\_\_



U.S. GEOLOGICAL SURVEY

Hole No. BM-41 continued





U.S. GEOLOGICAL SURVEY

Hole No. BM-41 continued

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
		G	SP	RES	DEN	FT	M
684-762 Sandstone, gray, fine-grained, salt-and-pepper; gray siltstone						220	
						750	
						230	
						800	
						240	
						250	
						850	
						260	
						900	
						270	
280							
950							
290							
300							
1000							
350							
1050							
360							
370							
1100							

U.S. GEOLOGICAL SURVEY  
DRILL-HOLE LOG, YAMPA COAL FIELD

Hole No. BM-42 State Colorado County Houtt Date logged 9-10-77 Elev. (ft) 7,850  
 Location: T. 5 N., R. 89 W., sec. 21, SE 1/4 NW 1/4 Cored:  Yes  No  
 Drilled depth 800' Logged depth 790' Drilling medium air Fluid level 348'

Geophysical logs:

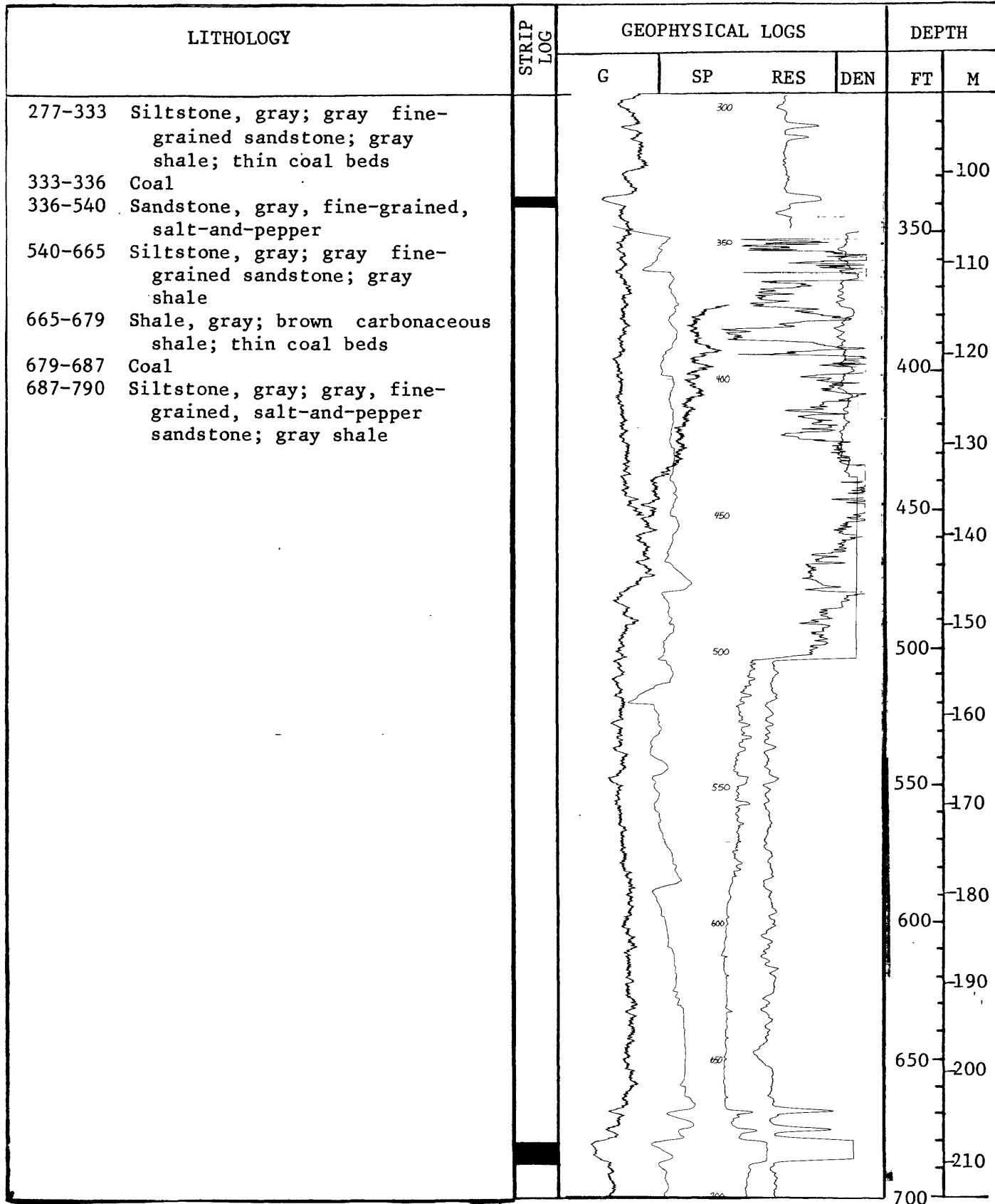
Spontaneous potential (SP): Scale 40 mv/in Logging speed 20 fpm  
 Resistance (RES): Scale 40 Ω/in Logging speed 20 fpm  
 Gamma (G): T.C. 2 Scale 10 cps/in Logging speed 20 fpm  
 Density (DEN): T.C. 1 Scale 500 cps/in Logging speed 20 fpm

Remarks: \_\_\_\_\_

LITHOLOGY		STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
			G	SP	RES	DEN	FT	M
0-21	Colluvium; rusty-brown sandstone; yellow-brown siltstone				0		0	0
21-27	Coal	█						
27-56	Shale, gray; brown carbonaceous shale; gray siltstone						10	
56-59	Coal	█			50		50	
59-61	Shale, brown, carbonaceous	█						
61-64	Coal	█						
64-72	Shale, gray; brown carbonaceous shale; gray siltstone						20	
72-76	Coal	█						
76-96	Shale, gray; gray siltstone; brown carbonaceous shale				100		100	30
96-98	Coal	█						
98-249	Siltstone, gray; gray, fine-grained, salt-and-pepper sandstone; gray shale; brown carbonaceous shale				150		150	40
249-254	Coal	█						
254-256	Shale, brown, carbonaceous	█						
256-258	Coal	█						
258-274	Siltstone, gray							
274-277	Coal	█						
277-333	Siltstone, gray; gray fine-grained sandstone; gray shale; thin coal beds				200		200	60
					250		250	70
					300		300	90

U.S. GEOLOGICAL SURVEY

Hole No. BM-42 continued



U.S. GEOLOGICAL SURVEY

Hole No. BM-42 continued

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
		G	SP	RES	DEN	FT	M
687-790 Siltstone, gray; gray, fine-grained, salt-and-pepper sandstone; gray shale						220	
						750	
						240	
						800	
						250	
						850	
						260	
						270	
						900	
						280	
						290	
						950	
						300	
						1000	
						310	
						1050	
						320	
						330	
						1100	



U.S. GEOLOGICAL SURVEY

Hole No. BM-43 continued

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
		G	SP	RES	DEN	FT	M
297-303 Coal							
303-370 Siltstone, gray; interbedded gray shale; brown carbonaceous shale and thin coal beds; fine-grained sandstone						100	
370-480 Sandstone, gray, fine-grained, salt-and-pepper. Twentymile Sandstone Member of the Williams Fork Formation						350	
						400	
						450	
						500	
						550	
						600	
						650	
						700	

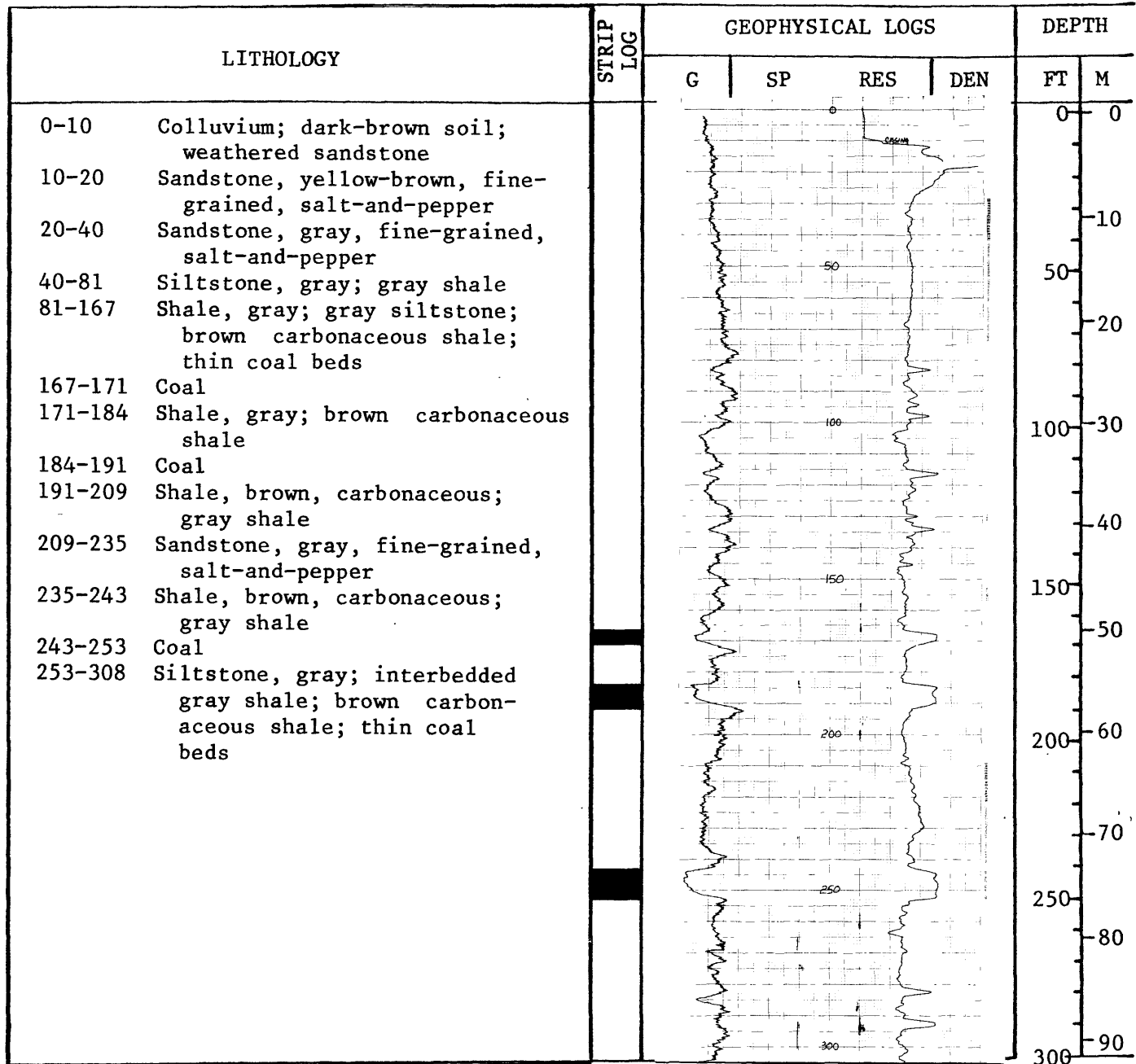
U.S. GEOLOGICAL SURVEY  
DRILL-HOLE LOG, YAMPA COAL FIELD

Hole No. BM-44 State Colorado County Moffat Date logged 8-23-77 Elev. (ft) 7,440  
 Location: T. 6 N., R. 90 W., sec. 35, NE $\frac{1}{4}$ SE $\frac{1}{4}$  Cored:  Yes  No  
 Drilled depth 880' Logged depth 876' Drilling medium air Fluid level 409'

Geophysical logs:

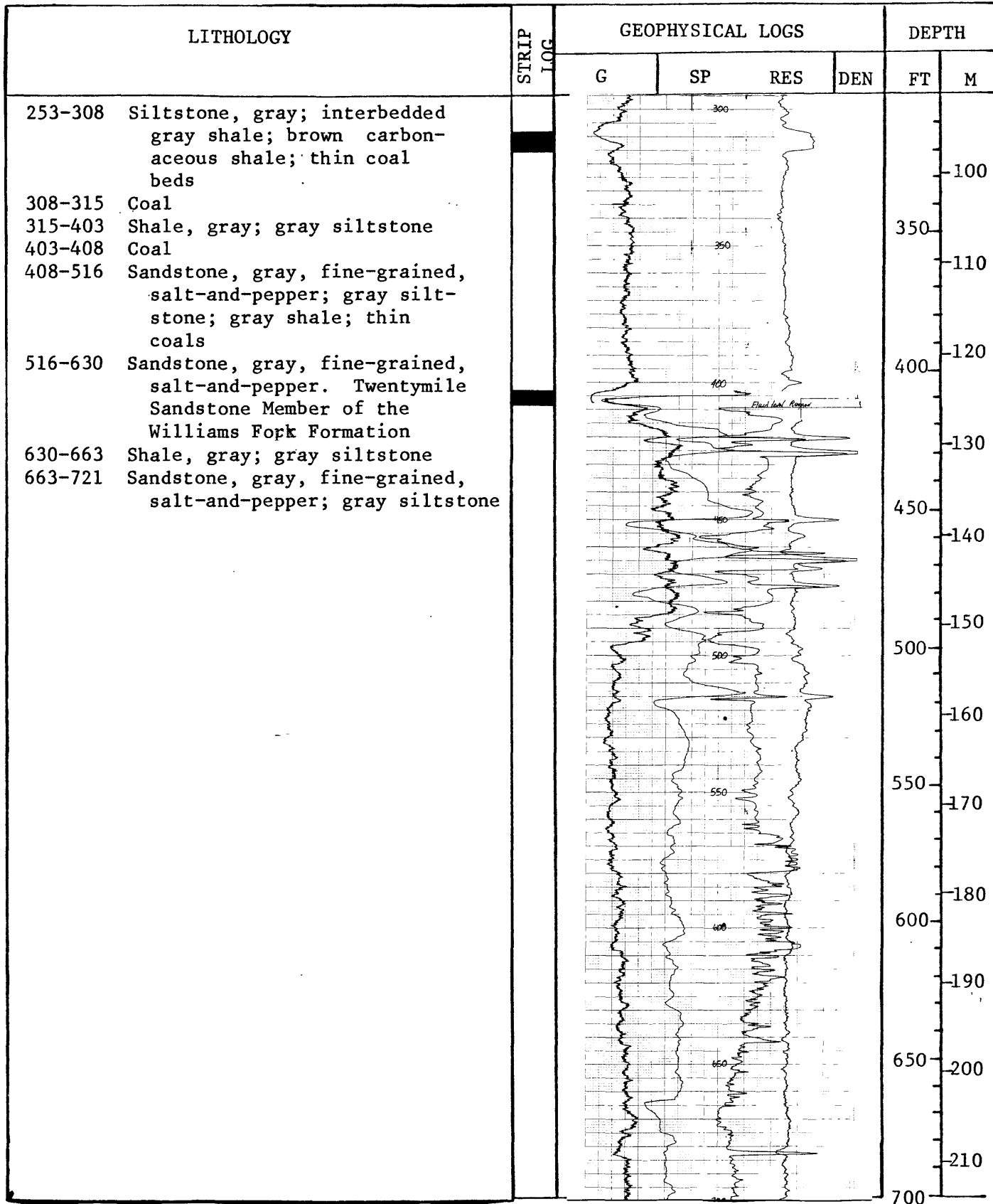
Spontaneous potential (SP): Scale 20 mv/in Logging speed 20 fpm  
 Resistance (RES): Scale 20  $\Omega$ /in Logging speed 20 fpm  
 Gamma (G): T.C. 2 Scale 100 cps/in Logging speed 20 fpm  
 Density (DEN): T.C. 1 Scale 500 cps/in Logging speed 20 fpm

Remarks: \_\_\_\_\_



U.S. GEOLOGICAL SURVEY

Hole No. BM-44 continued





U.S. GEOLOGICAL SURVEY

Hole No. BM-44 continued

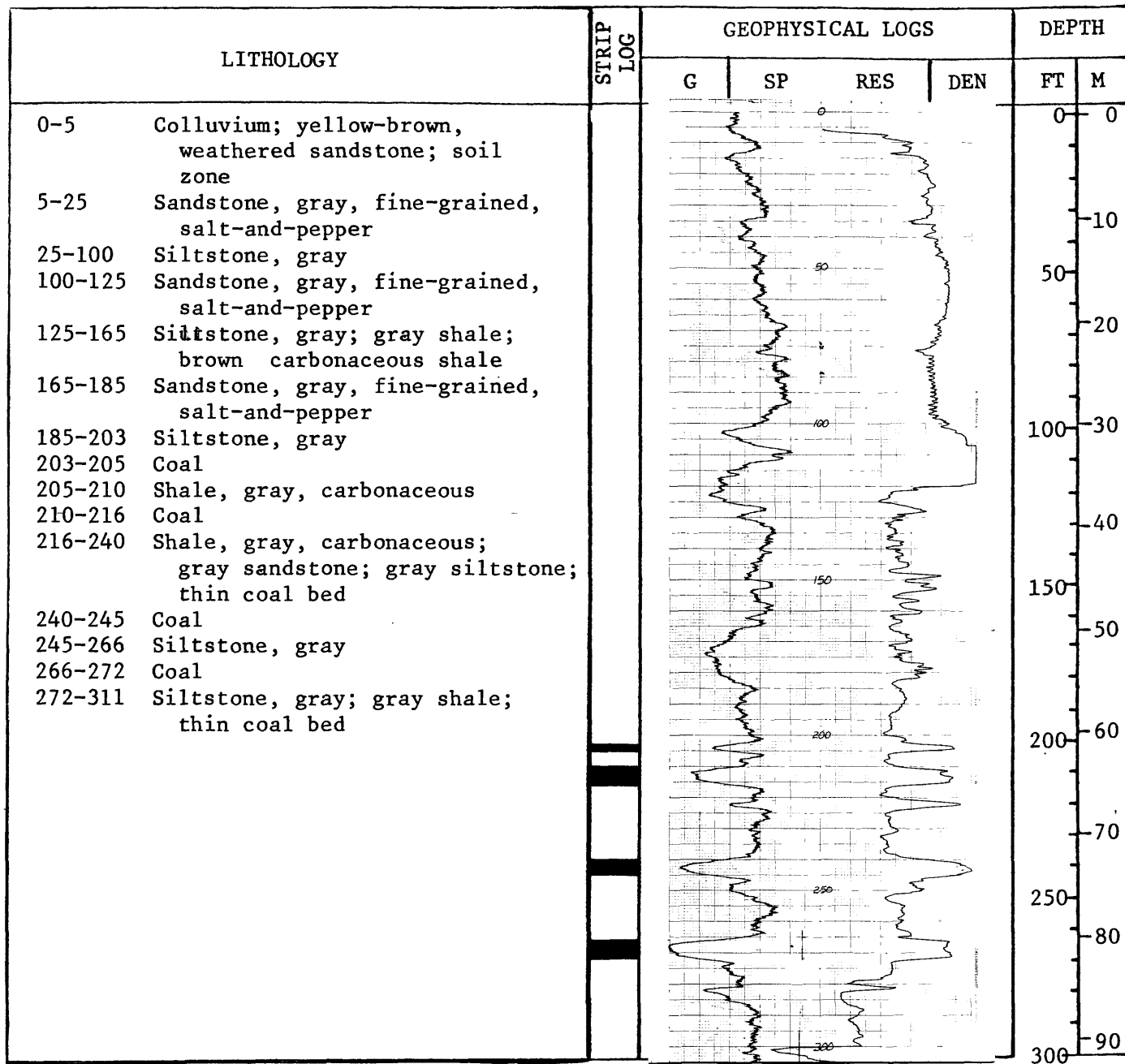
LITHOLOGY	STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
		G	SP	RES	DEN	FT	M
663-721 Sandstone, gray, fine-grained, salt-and-pepper; gray siltstone							
721-742 Shale, gray; gray siltstone						220	
742-876 Sandstone, gray, fine-grained, salt-and-pepper; thin coal bed at 789'-792'						750	
						230	
						800	
						240	
						250	
						850	
						260	
						270	
						900	
					280		
					950		
					290		
					300		
					1000		
					350		
					1050		
					360		
					370		
					1100		

U.S. GEOLOGICAL SURVEY  
DRILL-HOLE LOG, YAMPA COAL FIELD

Hole No. HAYG-9 State Colorado County Routt Date logged 9-8-77 Elev. (ft) 7,700  
 Location: T. 5 N., R. 89 W., sec. 25, NE $\frac{1}{4}$ NE $\frac{1}{4}$  Cored:  Yes  No  
 Drilled depth 770' Logged depth 766' Drilling medium air Fluid level 411'

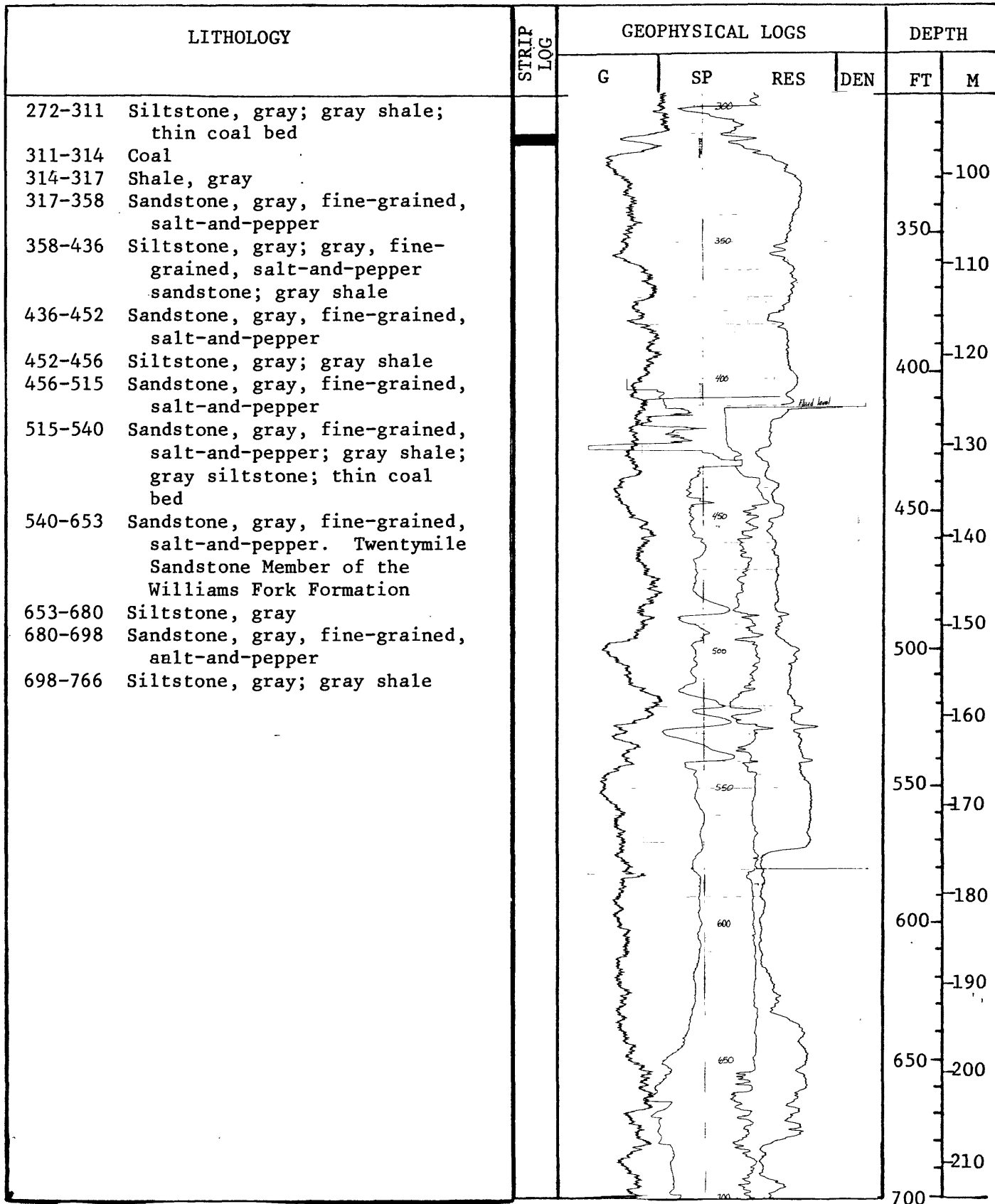
Geophysical logs:

Spontaneous potential (SP): Scale 40 mv/in Logging speed 20 fpm  
 Resistance (RES): Scale 40  $\Omega$ /in Logging speed 20 fpm  
 Gamma (G): T.C. 5 Scale 5 cps/in Logging speed 20 fpm  
 Density (DEN): T.C. 1 Scale 1,000 cps/in Logging speed 20 fpm  
 Remarks: \_\_\_\_\_



U.S. GEOLOGICAL SURVEY

Hole No. HAYG-9 continued



U.S. GEOLOGICAL SURVEY

Hole No. HAYG-9 continued

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
		G	SP	RES	DEN	FT	M
698-766 Siltstone, gray; gray shale						220	
						750	
						230	
						800	
						240	
						250	
						850	
						260	
						270	
						900	
						280	
						290	
						950	
						300	
						1000	
						350	
						1050	
						360	
						370	
						1100	

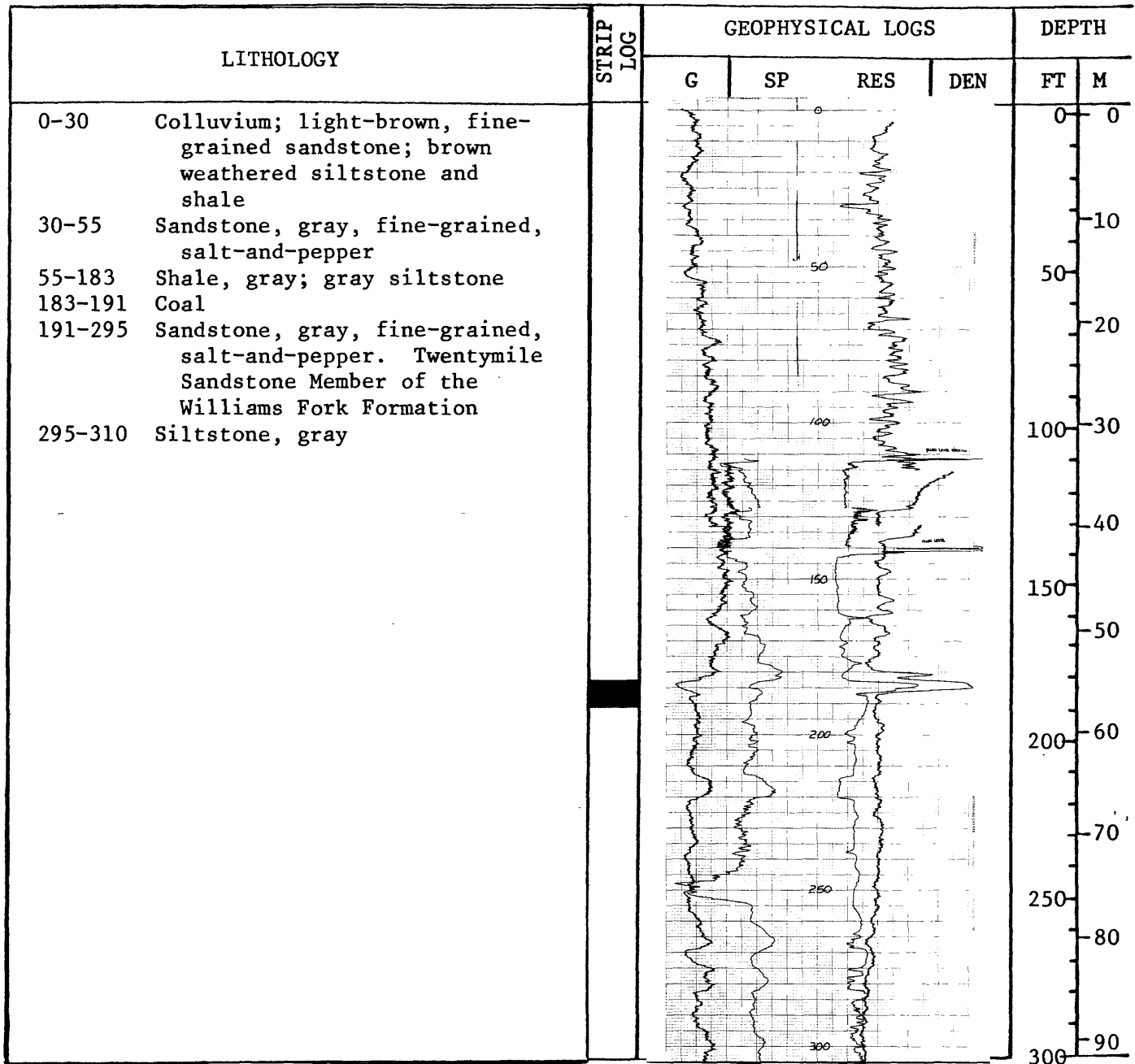
U.S. GEOLOGICAL SURVEY  
DRILL-HOLE LOG, YAMPA COAL FIELD

Hole No. HAYG-10 State Colorado County Routt Date logged 9-19-77 Elev. (ft) 7,275  
 Location: T. 5 N., R. 89 W., sec. 23, SW $\frac{1}{4}$ SW $\frac{1}{4}$  Cored:  Yes  No  
 Drilled depth 800' Logged depth 791' Drilling medium air Fluid level 141'

Geophysical logs:

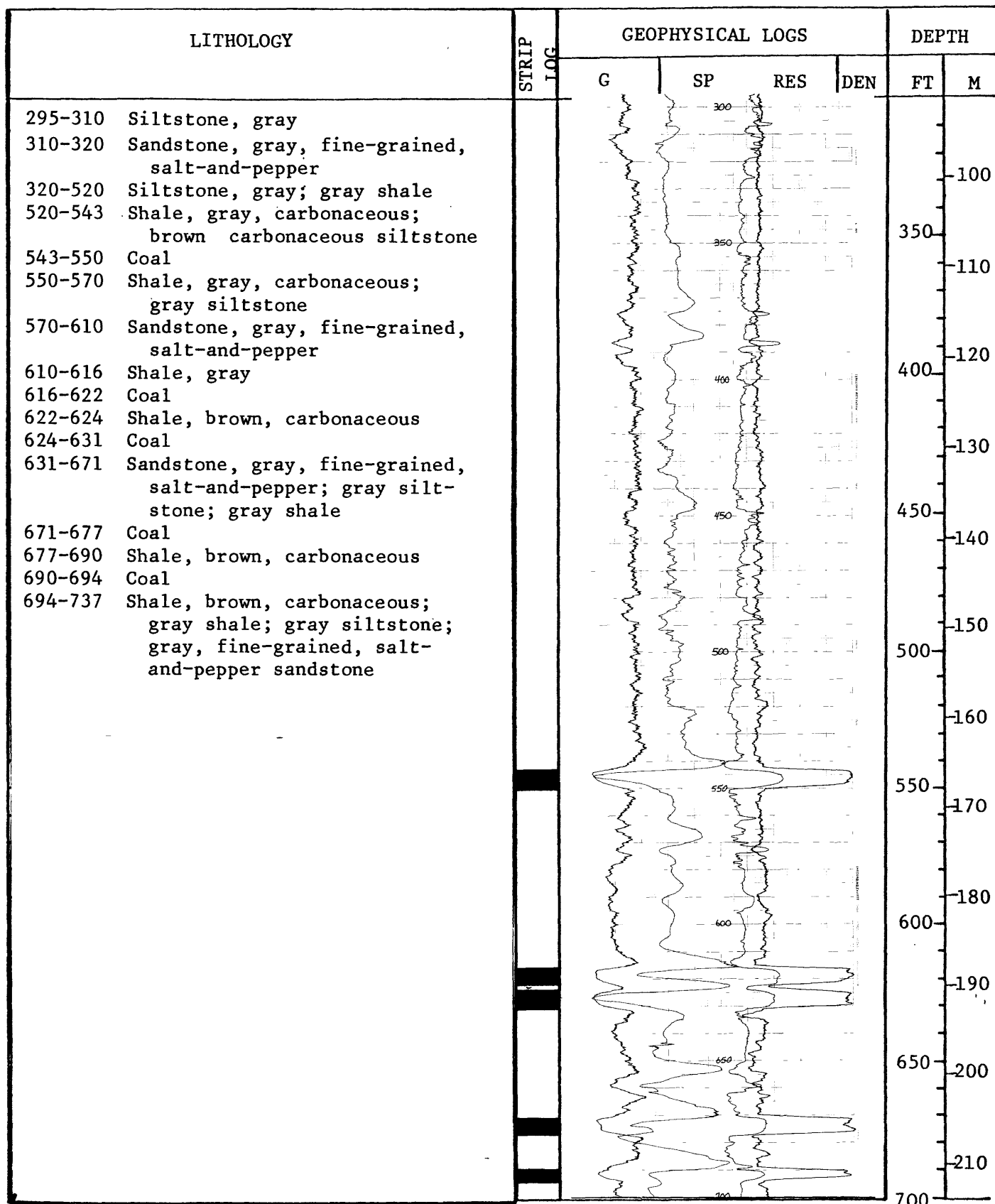
Spontaneous potential (SP): Scale 40 mv/in Logging speed 20 fpm  
 Resistance (RES): Scale 40  $\Omega$ /in Logging speed 20 fpm  
 Gamma (G): T.C. 2 Scale 10 cps/in Logging speed 20 fpm  
 Density (DEN): T.C. .5 Scale 60 cps/in Logging speed 20 fpm

Remarks: \_\_\_\_\_



U.S. GEOLOGICAL SURVEY

Hole No. HAYG-10 continued



U.S. GEOLOGICAL SURVEY

Hole No. HAYG-10 continued

LITHOLOGY		STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
			G	SP	RES	DEN	FT	M
694-737	Shale, brown, carbonaceous; gray shale; gray siltstone; gray, fine-grained, salt- and-pepper sandstone						220	
737-741	Coal						750	
741-763	Shale, brown, carbonaceous; gray carbonaceous shale						230	
763-769	Coal							
769-781	Shale, brown, carbonaceous; gray carbonaceous shale						240	
781-788	Coal							
788-791	Shale, brown, carbonaceous						800	
					250			
					850			
					260			
					900			
					270			
					950			
					280			
					1000			
					290			
					300			
					1050			
					350			
					360			
					370			
					1100			

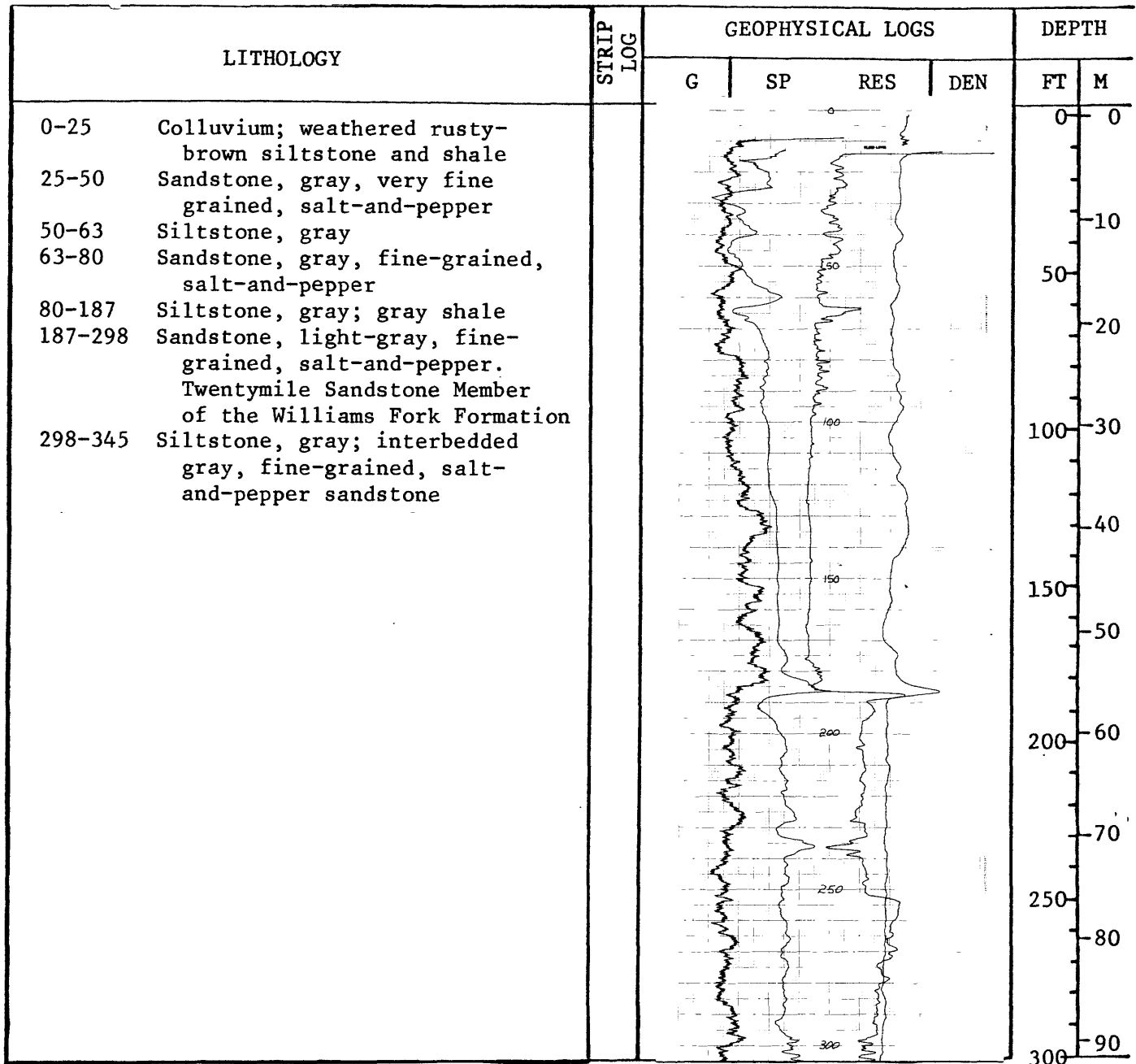
U.S. GEOLOGICAL SURVEY  
DRILL-HOLE LOG, YAMPA COAL FIELD

Hole No. HAYG-11 State Colorado County Routt Date logged 8-29-77 Elev. (ft) 7,900  
 Location: T. 5 N., R. 89 W., sec. 27, SW  $\frac{1}{4}$  NW  $\frac{1}{4}$  Cored:  Yes  No  
 Drilled depth 800' Logged depth 798' Drilling medium air Fluid level 14'

Geophysical logs:

Spontaneous potential (SP): Scale 40 mv/in Logging speed 20 fpm  
 Resistance (RES): Scale 40  $\Omega$ /in Logging speed 20 fpm  
 Gamma (G): T.C. 2 Scale 50 cps/in Logging speed 20 fpm  
 Density (DEN): T.C. 1 Scale 300 cps/in Logging speed 20 fpm

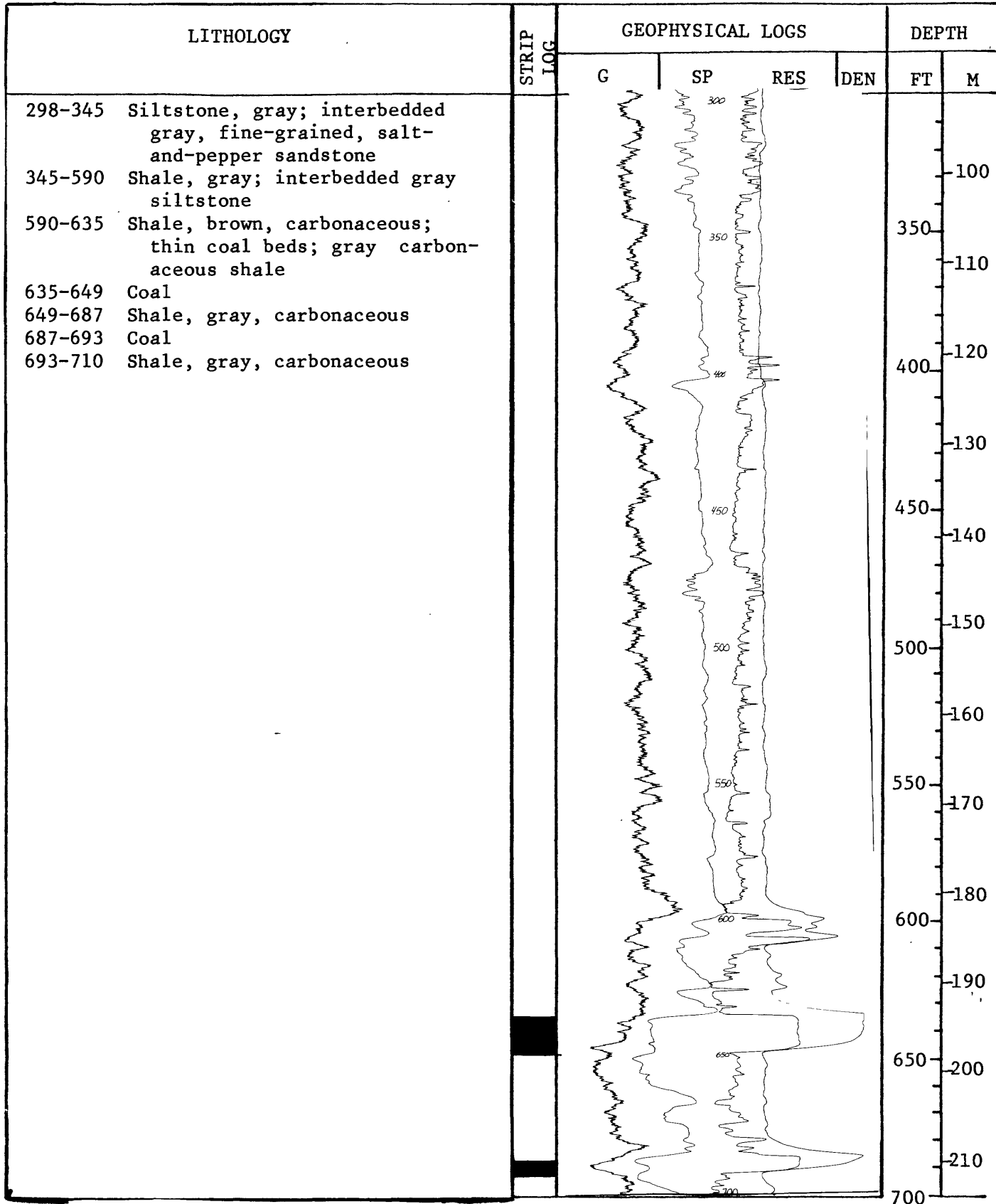
Remarks: \_\_\_\_\_





U.S. GEOLOGICAL SURVEY

Hole No. HAYG-11 continued



U.S. GEOLOGICAL SURVEY

Hole No. HAYG-11 continued

LITHOLOGY		STRIP LOG	GEOPHYSICAL LOGS				DEPTH		
			G	SP	RES	DEN	FT	M	
693-710	Shale, gray, carbonaceous								
710-713	Coal								
713-758	Sandstone, gray; fine-grained, salt-and-pepper; gray carbonaceous shale								220
758-764	Coal								750
764-780	Shale, gray, carbonaceous								230
780-787	Coal								240
787-798	Shale, gray, carbonaceous								800
									250
									850
									260
		270							
		900							
		280							
		290							
		950							
		300							
		1000							
		350							
		1050							
		360							
		370							
		100							

U.S. GEOLOGICAL SURVEY  
DRILL-HOLE LOG, YAMPA COAL FIELD

Hole No. HAYG-12 State Colorado County      Routt      Date logged 9-10-77 Elev. (ft) 7,320  
 Location: T. 5 N., R. 89 W., sec. 35, NW $\frac{1}{4}$ NE $\frac{1}{4}$  Cored:  Yes  No  
 Drilled depth 710' Logged depth 706' Drilling medium air Fluid level 158'

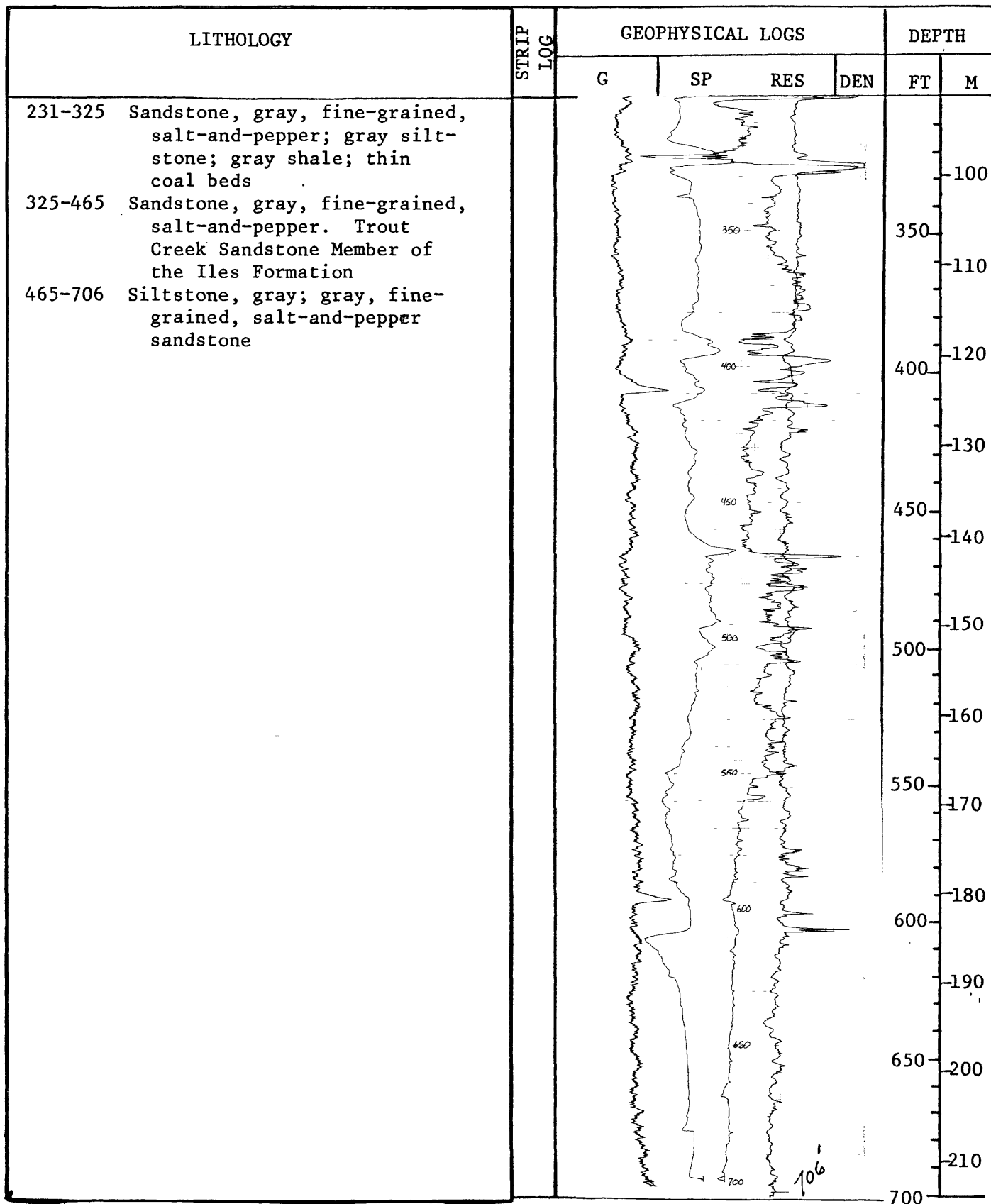
Geophysical logs:

Spontaneous potential (SP): Scale 40 mv/in Logging speed 20 fpm  
 Resistance (RES): Scale 40  $\Omega$ /in Logging speed 20 fpm  
 Gamma (G): T.C. 1 Scale 20 cps/in Logging speed 20 fpm  
 Density (DEN): T.C. 1 Scale 1,000 cps/in Logging speed 20 fpm  
 Remarks: Casing to 7'

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
		G	SP	RES	DEN	FT	M
0-10 Colluvium; weathered yellow-brown sandstone; soil zone						0	0
10-18 Sandstone, gray, fine-grained, salt-and-pepper							
18-25 Coal						10	
25-33 Shale, brown, carbonaceous							
33-38 Coal						50	
38-43 Shale, gray, carbonaceous							
43-65 Sandstone, gray, fine-grained, salt-and-pepper						20	
65-100 Shale, gray; brown, carbonaceous shale; gray siltstone							
100-109 Coal						100	30
109-120 Shale; gray, carbonaceous							
120-125 Coal							
125-134 Shale, gray, carbonaceous; brown, carbonaceous shale						40	
134-140 Coal							
140-144 Shale, brown, carbonaceous						150	
144-147 Coal							
147-179 Siltstone, gray; gray, carbonaceous shale; gray, fine-grained sandstone						50	
179-185 Coal							
185-231 Shale, gray; brown, carbonaceous shale; thin coal bed						200	60
231-325 Sandstone, gray, fine-grained, salt-and-pepper; gray siltstone; gray shale; thin coal beds							
						250	
						80	
						300	90

U.S. GEOLOGICAL SURVEY

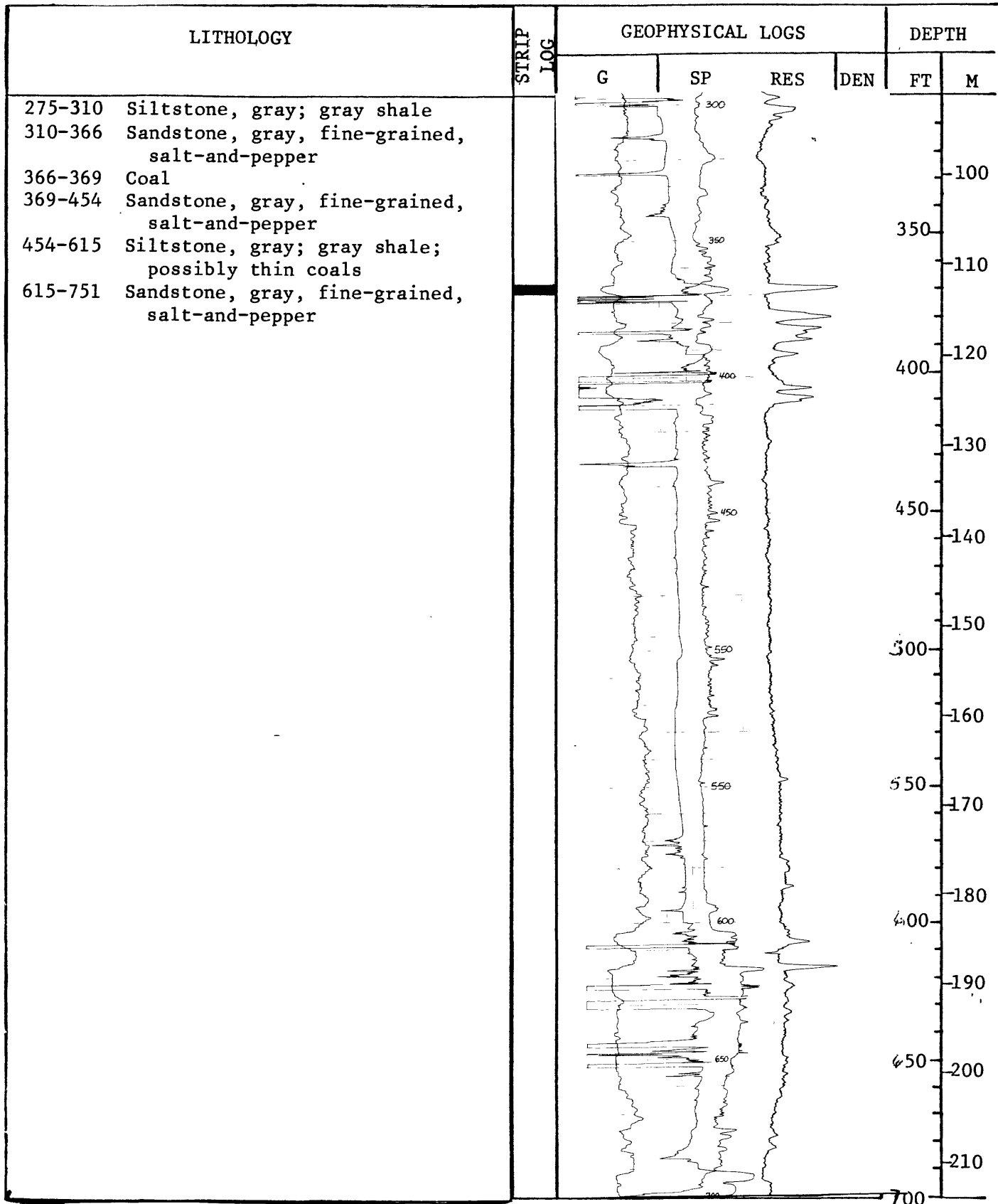
Hole No. HAYG-12 continued





U.S. GEOLOGICAL SURVEY

Hole No. HAY-7 continued



U.S. GEOLOGICAL SURVEY

Hole No. HAY-7 continued

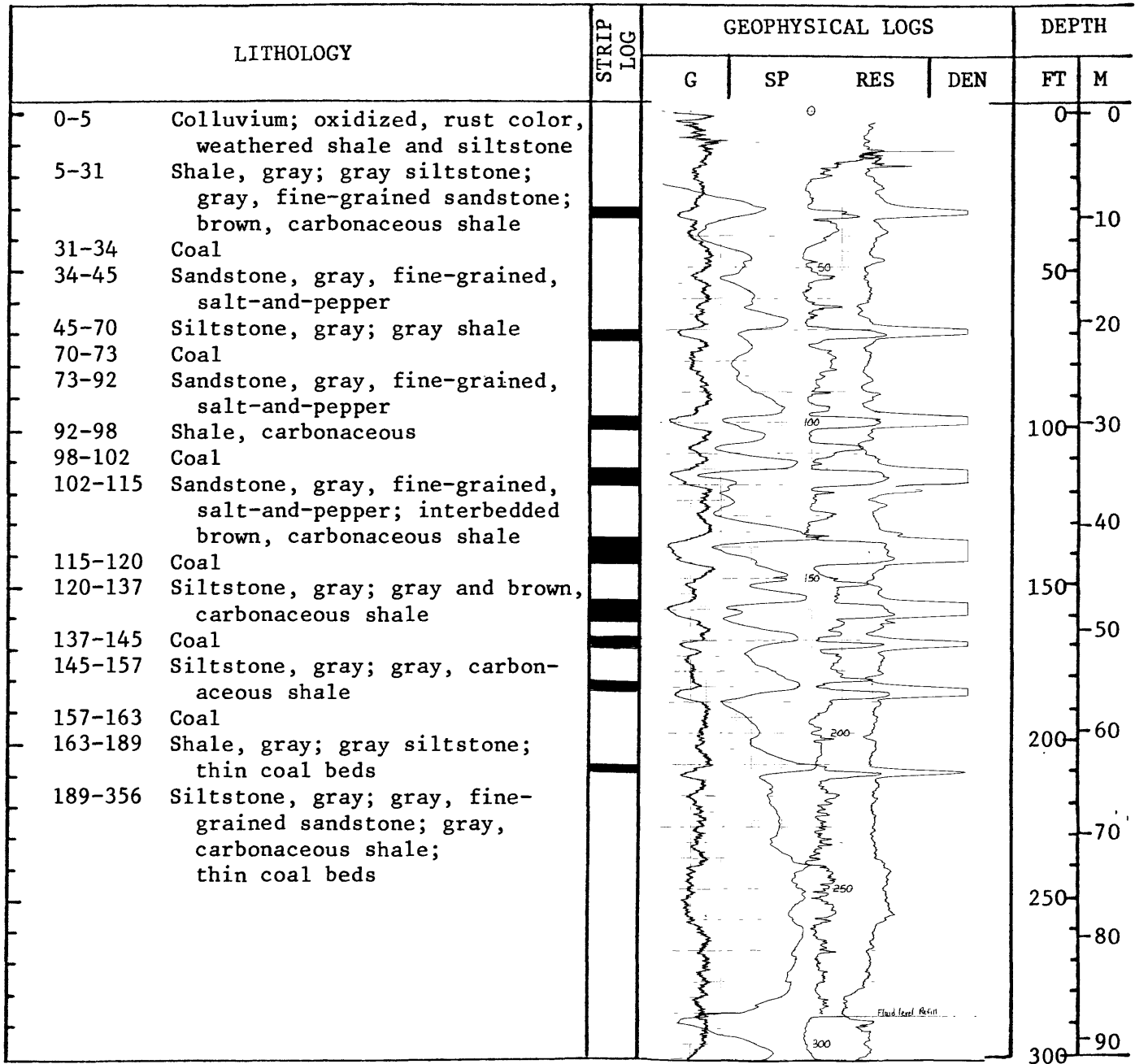
LITHOLOGY	STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
		G	SP	RES	DEN	FT	M
615-751 Sandstone, gray, fine-grained, salt-and-pepper					750		
					800		
					850		
					900		
					950		
					1000		
					1050		
					1100		

U.S. GEOLOGICAL SURVEY  
DRILL-HOLE LOG, YAMPA COAL FIELD

Hole No. HAY-8 State Colorado County Routt Date logged 9-9-77 Elev.(ft) 7,770  
 Location: T. 5 N., R. 89 W., sec. 21, NE $\frac{1}{4}$ NE $\frac{1}{4}$ . Cored:  Yes  No  
 Drilled depth 780' Logged depth 774' Drilling medium air Fluid level 13'

Geophysical logs:

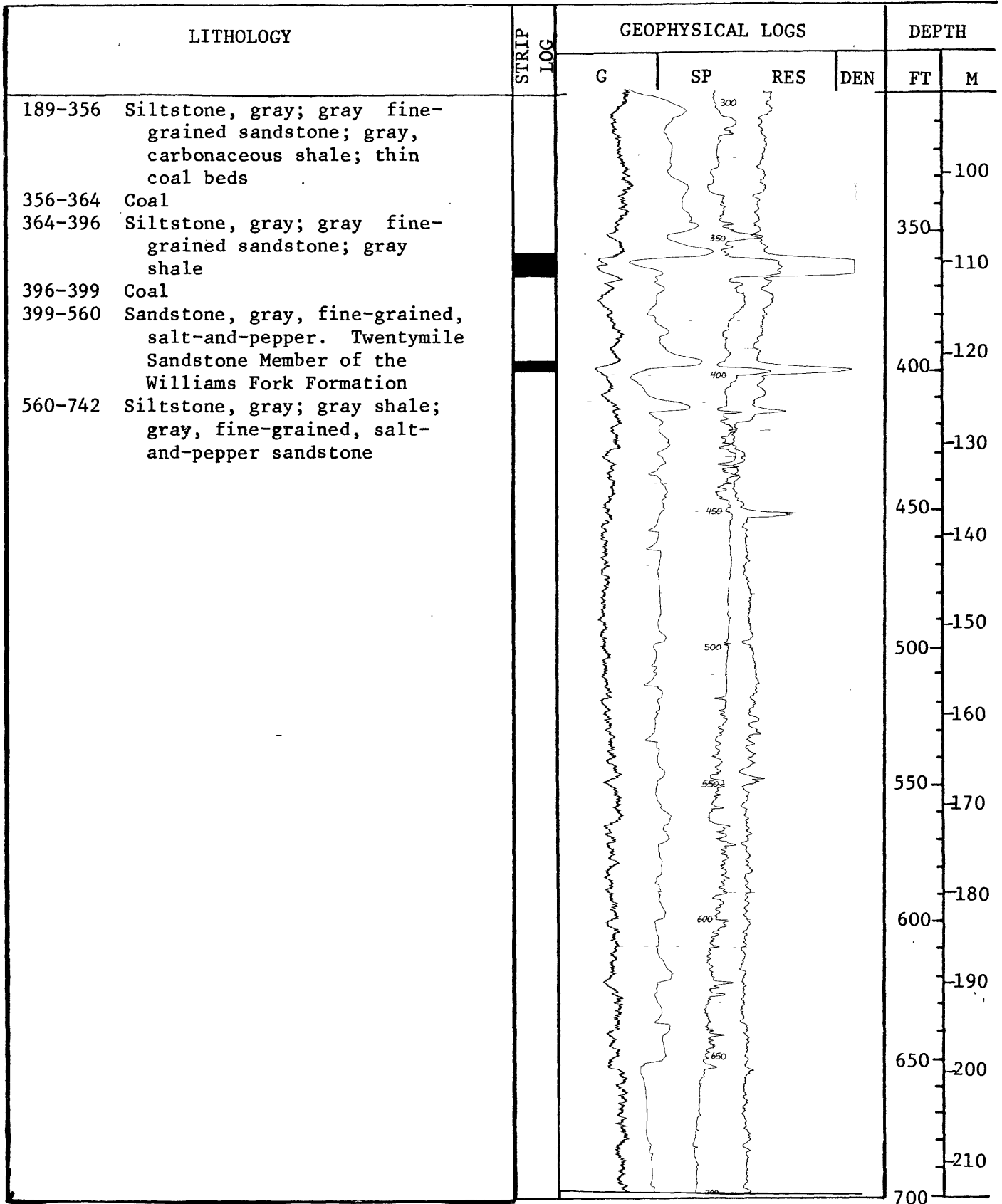
Spontaneous potential (SP): Scale 40 mv/in Logging speed 20 fpm  
 Resistance (RES): Scale 40  $\Omega$ /in Logging speed 20 fpm  
 Gamma (G): T.C. 2 Scale 100 cps/in Logging speed 20 fpm  
 Density (DEN): T.C. 1 Scale 500 cps/in Logging speed 20 fpm  
 Remarks: \_\_\_\_\_





U.S. GEOLOGICAL SURVEY

Hole No. HAY-8 continued



U.S. GEOLOGICAL SURVEY

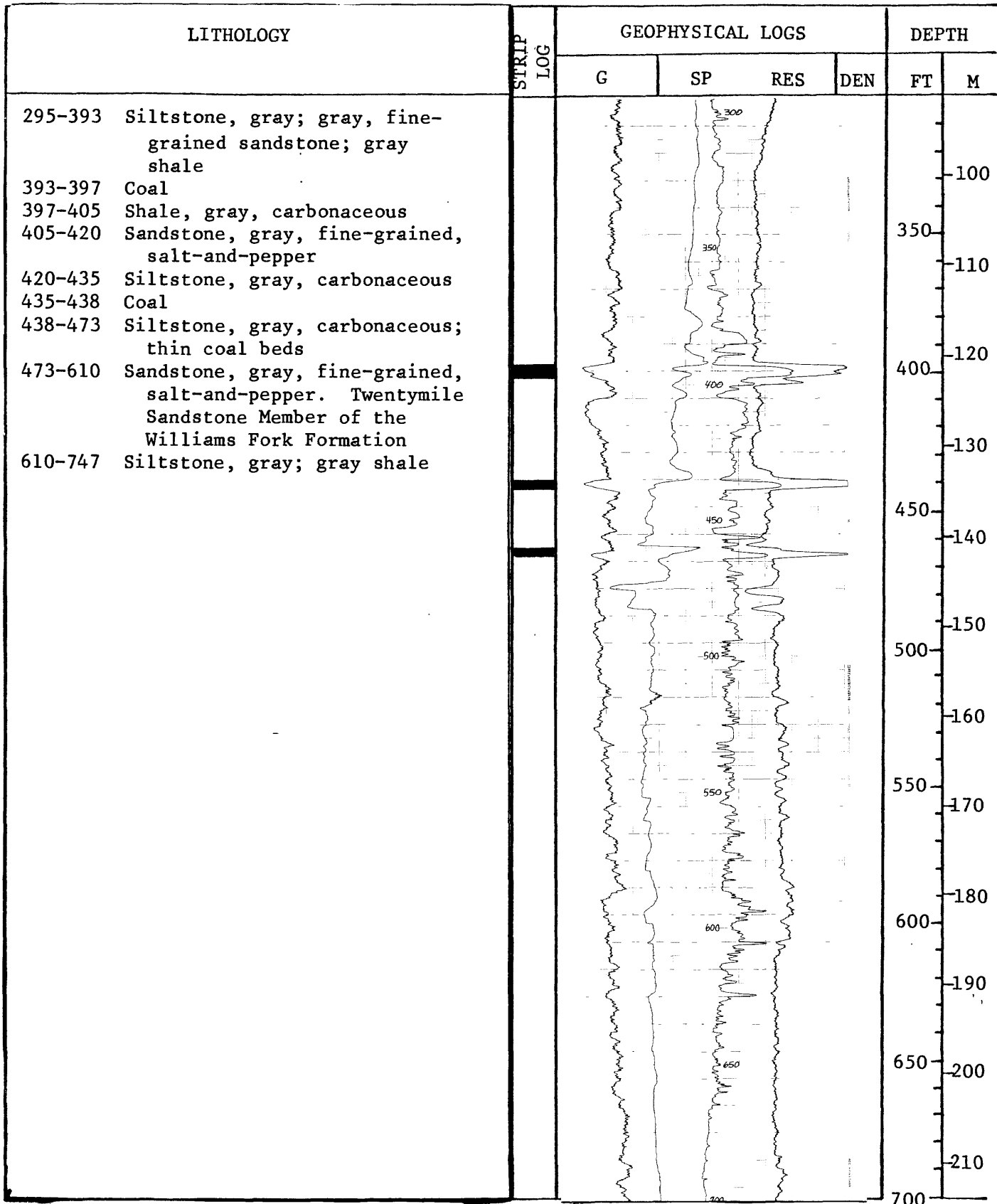
Hole No. HAY-8 continued

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOGS				DEPTH				
		G	SP	RES	DEN	FT	M			
560-742 Siltstone, gray; gray shale; gray, fine-grained, salt- and-pepper sandstone										
742-745 Coal									220	
745-774 Siltstone, gray; gray, fine- grained, salt-and-pepper sandstone									750	
						230				
						800	240			
							250			
						850	260			
							270			
						900	280			
							290			
						950	300			
							350			
						1000	360			
							370			
						1050				
							370			
						1100				



U.S. GEOLOGICAL SURVEY

Hole No. HAY-9 continued



U.S. GEOLOGICAL SURVEY

Hole No. HAY-9 continued

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOGS				DEPTH		
		G	SP	RES	DEN	FT	M	
610-747 Siltstone, gray; gray shale								
747-754 Coal; brown carbonaceous shale partings								
754-780 Sandstone, gray, fine-grained, salt-and-pepper								
					220			
					750			
					230			
					800			
					240			
					250			
					850			
					260			
					900			
					270			
					280			
					950			
					290			
					300			
					1000			
					350			
					1050			
					360			
					370			
					1100			

U.S. GEOLOGICAL SURVEY  
DRILL-HOLE LOG, YAMPA COAL FIELD

Hole No. RB-12 State Colorado County Routt Date logged 9-20-77 Elev. (ft) 7,540  
 Location: T. 4 N., R. 86 W., sec. 11, SW  $\frac{1}{4}$  SE  $\frac{1}{4}$  Cored:  Yes  No  
 Drilled depth 1,185' Logged depth 1,184' Drilling medium air Fluid level 504'

Geophysical logs:

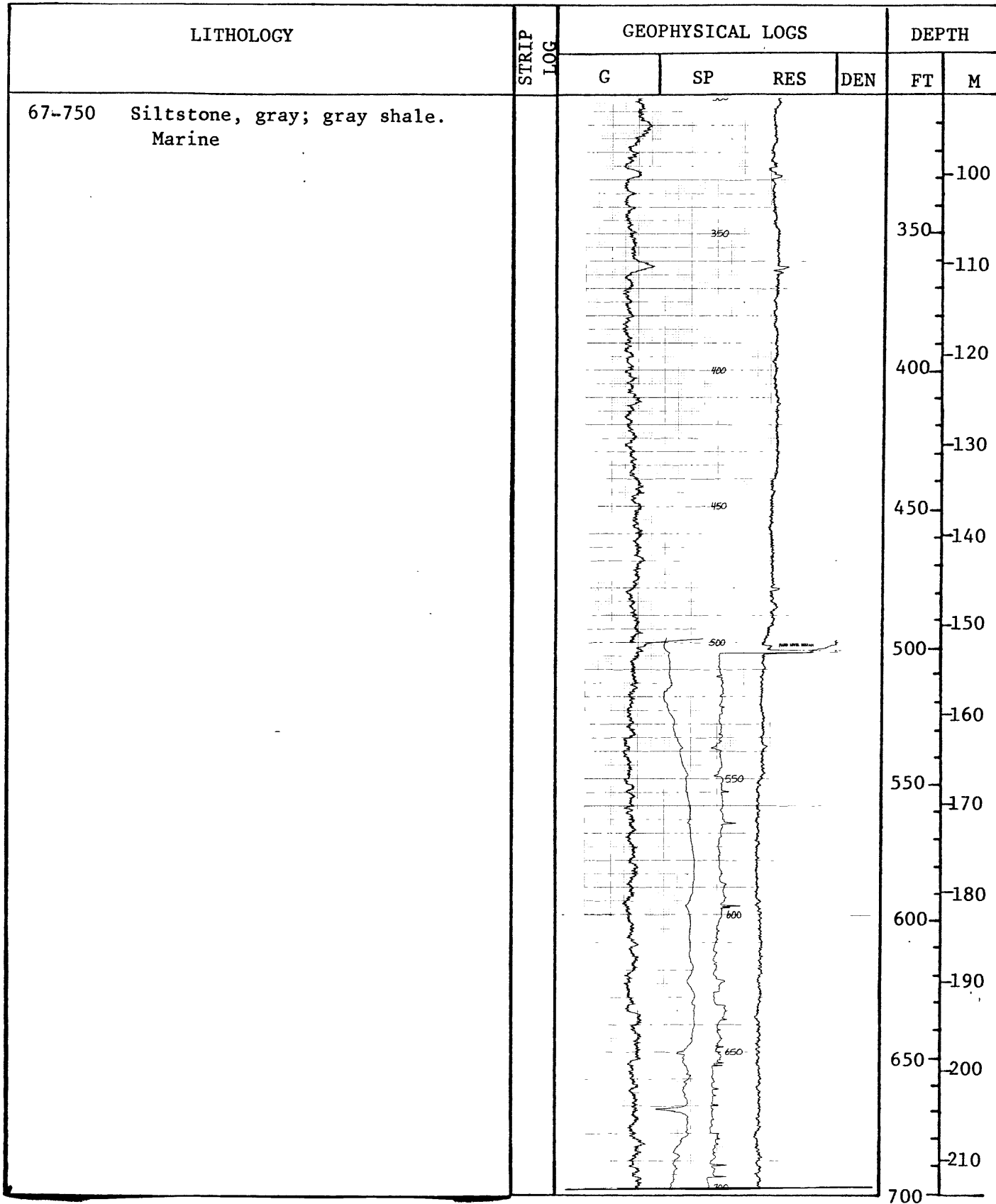
Spontaneous potential (SP): Scale 40 mv/in Logging speed 20 fpm  
 Resistance (RES): Scale 40  $\Omega$ /in Logging speed 20 fpm  
 Gamma (G): T.C. 2 Scale 10 cps/in Logging speed 20 fpm  
 Density (DEN): T.C. .5 Scale 60 cps/in Logging speed 20 fpm

Remarks: \_\_\_\_\_

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
		G	SP	RES	DEN	FT	M
0-67 Sandstone, gray, fine-grained, salt-and-pepper. Twentymile Sandstone Member of the Williams Fork Formation						0	0
67-750 Siltstone, gray; gray shale. Marine						10	
						50	
						100	30
						150	
						200	60
						250	
						300	90

U.S. GEOLOGICAL SURVEY

Hole No. RB-12 continued



U.S. GEOLOGICAL SURVEY

Hole No. RB-12 continued

LITHOLOGY		STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
			G	SP	RES	DEN	FT	M
67-750	Siltstone, gray; gray shale. Marine							
750-766	Sandstone, gray; fine-grained, salt-and-pepper		750					
766-770	Shale, gray, carbonaceous							
770-774	Coal							
774-837	Sandstone, gray, fine-grained, salt-and-pepper; gray silt- stone; gray shale; thin coal bed							
837-844	Coal							
844-880	Siltstone, gray; gray carbon- aceous shale; thin coal bed		800					
880-940	Sandstone, gray, fine-grained, salt-and-pepper							
940-987	Siltstone, gray; gray carbon- aceous shale							
987-990	Coal		850					
990-992	Shale, brown, carbonaceous							
992-999	Coal							
999-1070	Siltstone, gray; gray, fine- grained, salt-and-pepper							
1070-1184	Sandstone, light-gray, fine- grained, salt-and-pepper. Trout Creek Sandstone Member of the Iles Formation		900					
			950					
			1000					
		1050						
		1100						



U.S. GEOLOGICAL SURVEY

Hole No. RB-12 continued

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
		G	SP	RES	DEN	FT	M
1070-1184 Sandstone, light-gray, fine-grained, salt-and-pepper. Trout Creek Sandstone Member of the Iles Formation						380	
						390	
						400	
						1200	
						410	
						1250	
						420	
						430	
						1300	

U.S. GEOLOGICAL SURVEY  
DRILL-HOLE LOG, YAMPA COAL FIELD

Hole No. RB-13 State Colorado County Routt Date logged 9-23-77 Elev. (ft) 7,460  
 Location: T. 4 N., R. 86 W., sec. 11, SE 1/4 NE 1/4 Cored:  Yes  No  
 Drilled depth 1,130' Logged depth 1,102' Drilling medium air Fluid level 891'

Geophysical logs:

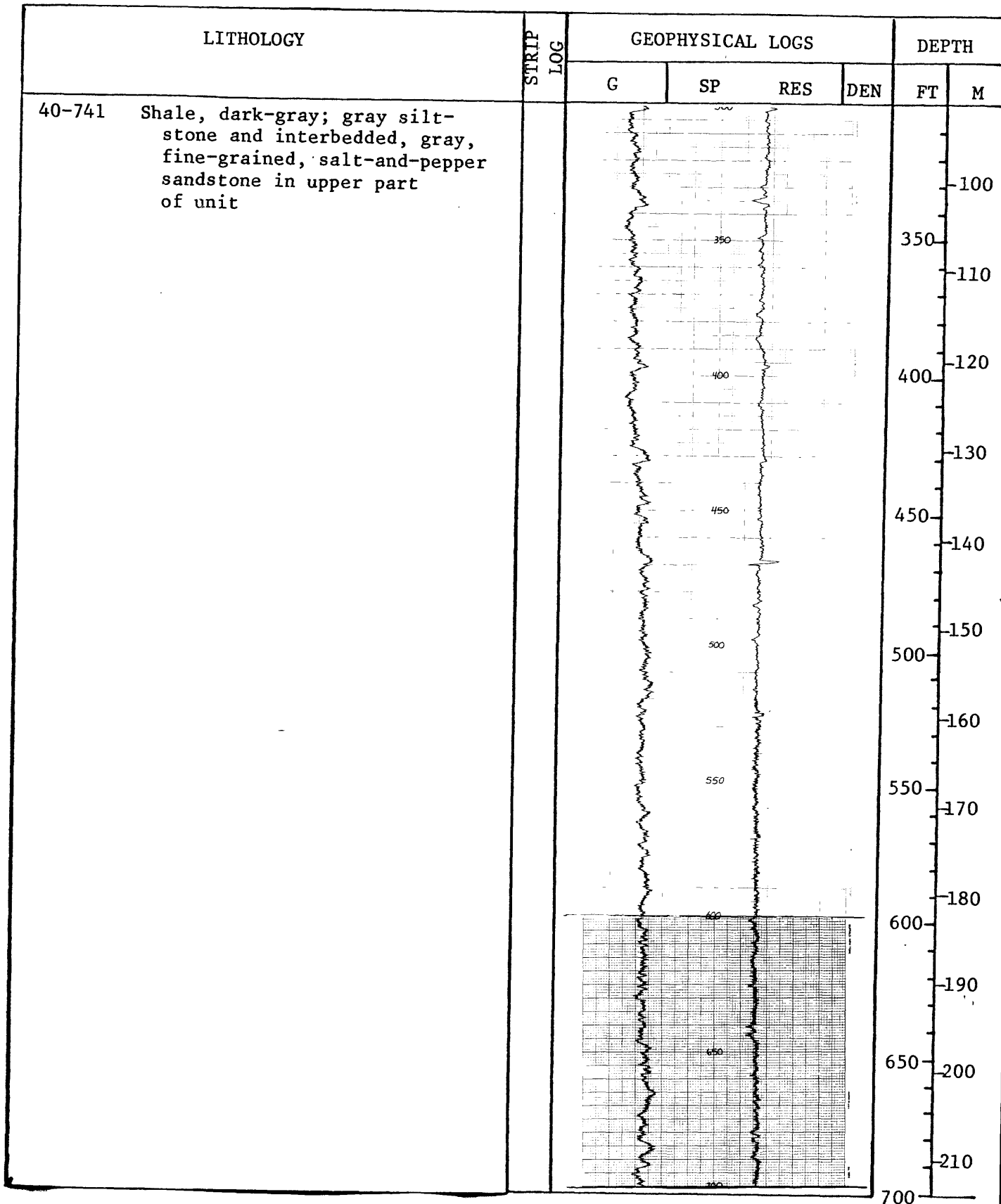
Spontaneous potential (SP): Scale 40 mv/in Logging speed 20 fpm  
 Resistance (RES): Scale 40 Ω/in Logging speed 20 fpm  
 Gamma (G): T.C. 2 Scale 10 cps/in Logging speed 20 fpm  
 Density (DEN): T.C. .5 Scale 60 cps/in Logging speed 20 fpm

Remarks: \_\_\_\_\_

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
		G	SP	RES	DEN	FT	M
Hole Started in Twentymile Sandstone						0	0
0-40 Sandstone, light-gray, fine-grained, well-sorted, well-rounded, salt-and-pepper. Oxidized near surface. Twentymile Sandstone Member of the Williams Fork Formation						10	50
40-741 Shale, dark-gray; gray siltstone and interbedded, gray, fine-grained, salt-and-pepper sandstone in upper part of unit		20	100				
		30	150				
		40	200				
		50	250				
		60	300				
		70					
		80					
		90					

U.S. GEOLOGICAL SURVEY

Hole No. RB-13 continued



U.S. GEOLOGICAL SURVEY

Hole No. RB-13 continued

LITHOLOGY		STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
			G	SP	RES	DEN	FT	M
40-741	Shale, dark-gray; gray siltstone and interbedded, gray, fine-grained, salt-and-pepper sandstone in upper part of unit						220	
741-758	Sandstone, gray, fine-grained, salt-and-pepper		750	750			750	
758-764	Shale, gray, carbonaceous						230	
764-768	Coal; with shale parting							
768-825	Shale, gray, carbonaceous; gray, fine-grained, salt-and-pepper sandstone						240	
825-831	Coal		800				800	
831-846	Shale, gray, carbonaceous							
846-849	Coal							
849-940	Sandstone, gray, fine-grained, salt-and-pepper; gray siltstone						250	
940-977	Shale, gray, carbonaceous		850				850	
977-982	Coal							
982-987	Shale, brown, carbonaceous							
987-994	Coal							
994-1050	Siltstone, gray, carbonaceous; gray carbonaceous shale		900				900	
1050-1102	Sandstone, light-gray, fine-grained, salt-and-pepper Trout Creek Sandstone Member of the Iles Formation						280	
		950				290		
		1000				300		
		1050				350		
		1100				360		
						370		
						1100		

U.S. GEOLOGICAL SURVEY  
DRILL-HOLE LOG, YAMPA COAL FIELD

Hole No. RB-14 State Colorado County Routt Date logged 9-18-77 Elev. (ft) 7,140  
 Location: T. 5 N., R. 86 W., sec. 34, NE $\frac{1}{2}$ NE $\frac{1}{4}$  Cored:  Yes  No  
 Drilled depth 1,230' Logged depth 1,230' Drilling medium air Fluid level 443'

Geophysical logs:

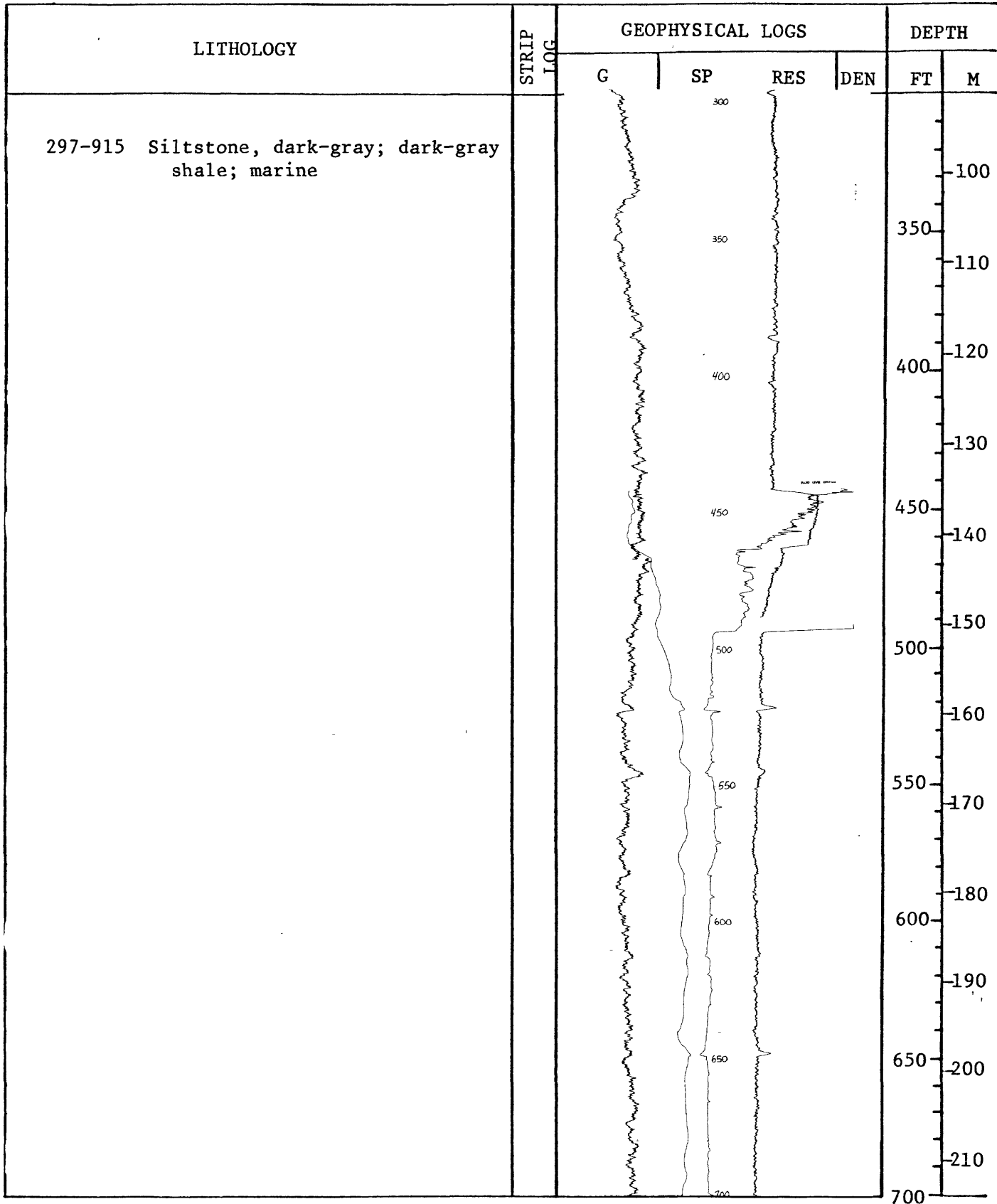
Spontaneous potential (SP): Scale 40 mv/in Logging speed 20 fpm  
 Resistance (RES): Scale 40  $\Omega$ /in Logging speed 20 fpm  
 Gamma (G): T.C. 2 Scale 10 cps/in Logging speed 20 fpm  
 Density (DEN): T.C. .5 Scale 60 cps/in Logging speed 20 fpm

Remarks: \_\_\_\_\_

LITHOLOGY		STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
			G	SP	RES	DEN	FT	M
0-2	Soil zone						0	0
2-62	Sandstone, gray, fine-grained, salt-and-pepper; oxidized to 35'							
62-116	Siltstone, gray; gray shale						10	
116-210	Sandstone, gray, fine-grained, salt-and-pepper. Twentymile Sandstone Member of the Williams Fork Formation			50			50	
210-245	Siltstone, gray						20	
245-265	Sandstone, gray, fine-grained, salt-and-pepper							
265-285	Siltstone, gray			100			100	30
285-297	Sandstone, gray, fine-grained, salt-and-pepper							
				150			150	50
				200			200	60
				250			250	80
				300			300	90

U.S. GEOLOGICAL SURVEY

Hole No. RB-14 continued



U.S. GEOLOGICAL SURVEY

Hole No. RB-14 continued

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
		G	SP	RES	DEN	FT	M
297-915 Siltstone, dark-gray; dark-gray shale; marine							
915-932 Shale, brown, carbonaceous							220
932-934 Coal							
934-998 Shale, brown, carbonaceous; gray carbonaceous shale; gray, fine-grained, salt-and-pepper sandstone; thin coal beds						750	230
998-1005 Coal							
1005-1040 Sandstone, gray, fine-grained, salt-and-pepper; thin coal bed						800	240
1040-1090 Shale, gray; gray siltstone							
1090-1105 Sandstone, gray, fine-grained, salt-and-pepper							250
						850	260
							270
						900	
							280
							290
						950	
							300
						1000	
							350
						1050	360
							370
						1100	

U.S. GEOLOGICAL SURVEY

Hole No. RB-14 continued

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
		G	SP	RES	DEN	FT	M
1105-1141 Shale, gray; carbonaceous gray siltstone; brown carbonaceous shale							380
1141-1147 Coal							
1147-1156 Shale, brown, carbonaceous							
1156-1160 Coal							
1160-1223 Sandstone, gray, fine-grained, salt-and-pepper; gray siltstone						1150	390
1123-1230 Sandstone, light-gray, fine- grained, salt-and-pepper. Trout Creek Sandstone Member of the Iles Formation						1200	400
						1250	420
							430
							1300



U.S. GEOLOGICAL SURVEY  
DRILL-HOLE LOG, YAMPA COAL FIELD

Hole No. RB-15 State Colorado County Routt Date logged 10-2-77 Elev. (ft) 7,560  
 Location: T. 5 N., R. 86 W., sec. 35, NE $\frac{1}{4}$ SW $\frac{1}{4}$  Cored:  Yes  No  
 Drilled depth 1,250' Logged depth 1,248' Drilling medium air Fluid level dry

Geophysical logs:

Spontaneous potential (SP): Scale \_\_\_\_\_ Logging speed \_\_\_\_\_ fpm  
 Resistance (RES): Scale \_\_\_\_\_ Logging speed \_\_\_\_\_ fpm  
 Gamma (G): T.C. 2 Scale 20 cps/in Logging speed 20 fpm  
 Density (DEN): T.C. .5 Scale 40 cps/in Logging speed 20 fpm  
 Remarks: Casing to 8'

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOGS		DEPTH	
		G	DEN	FT	M
0-48 Siltstone, gray; gray shale				0	0
48-165 Sandstone, light-gray, fine-grained, salt-and-pepper. Twentymile Sandstone Member of the Williams Fork Formation				10	
165-405 Siltstone, gray; interbedded gray, fine-grained, salt-and-pepper sandstone and gray shale				50	
				100	30
				150	45
				200	60
				250	75
				300	90

U.S. GEOLOGICAL SURVEY

Hole No. RB-15 continued

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOGS		DEPTH		
		G		DEN	FT	M
165-405 Siltstone, gray; interbedded gray, fine-grained, salt-and-pepper sandstone and gray shale						
405-845 Shale, dark-gray; gray siltstone						
					100	
			350		350	110
					400	120
			400		400	130
					450	140
			450		450	150
					500	160
			500		500	170
					550	180
			550		550	190
					600	200
			600		600	210
					650	200
			650		650	210
					700	700

U.S. GEOLOGICAL SURVEY

Hole No. RB-15 continued

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOGS		DEPTH	
		G	DEN	FT	M
405-845 Shale, dark-gray; gray siltstone					
845-857 Sandstone, gray, fine-grained, salt-and-pepper					220
857-864 Shale, gray, carbonaceous					
864-867 Coal					
867-930 Shale, gray, carbonaceous; gray siltstone; thin coal beds				750	230
930-936 Coal					
936-950 Shale, gray, carbonaceous					
950-952 Coal					
952-1045 Sandstone, gray, fine-grained, salt-and-pepper; gray siltstone				800	240
1045-1085 Shale, gray, carbonaceous; brown carbonaceous shale					250
1085-1091 Coal					
1091-1093 Shale, brown, carbonaceous					
1093-1099 Coal				850	260
1099-1166 Sandstone, gray, fine-grained, salt-and-pepper; gray shale; thin coal beds					
					270
				900	280
					290
				950	300
					310
				1000	320
					330
					340
				1050	350
					360
					370
				1100	

U.S. GEOLOGICAL SURVEY

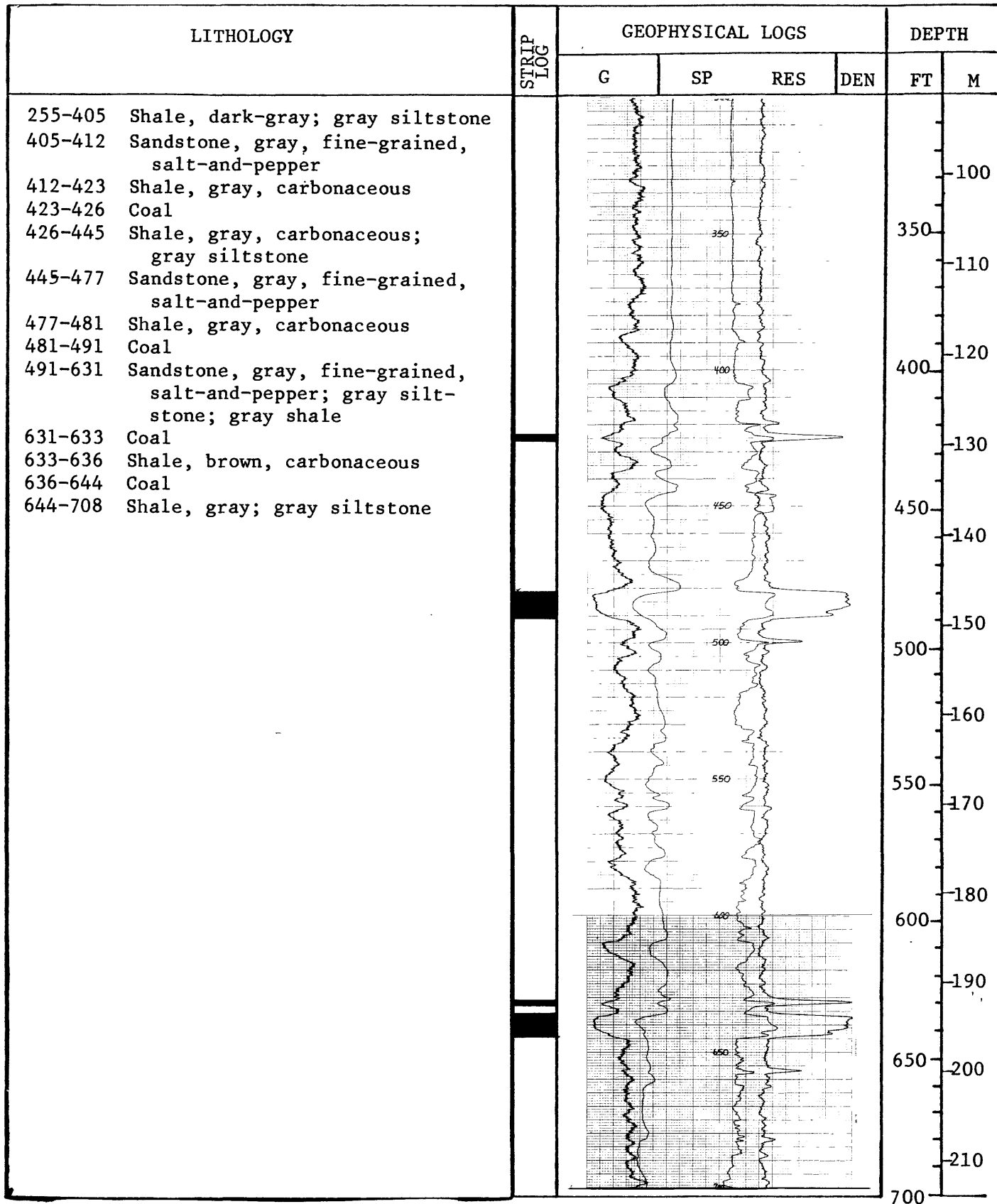
Hole No. RB-15 continued

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOGS		DEPTH	
		G	DEN	FT	M
1099-1166 Sandstone, gray, fine-grained, salt-and-pepper; gray shale; thin coal beds				380	
1166-1248 Sandstone, light-gray, very fine grained, well-rounded, well-sorted, salt-and-pepper. Trout Creek Sandstone Member of the Iles Formation		1150		1150	390
				400	
		1200		1200	410
				420	
		1250		1250	420
				430	
				1300	



U.S. GEOLOGICAL SURVEY

Hole No. M-3 continued



U.S. GEOLOGICAL SURVEY

Hole No. M-3 continued

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
		G	SP	RES	DEN	FT	M
644-708 Shale, gray; gray siltstone							
708-850 Sandstone, light-gray, fine-grained, well-sorted, salt-and-pepper. Trout Creek Sandstone Member of the Iles Formation						220	
						750	
850-1000 Shale, gray; gray siltstone; gray, fine-grained, salt-and-pepper sandstone						230	
						800	
						240	
						850	
						250	
						900	
						260	
					950		
					270		
					1000		
					280		
					300		
					350		
					1050		
					360		
					370		
					1100		

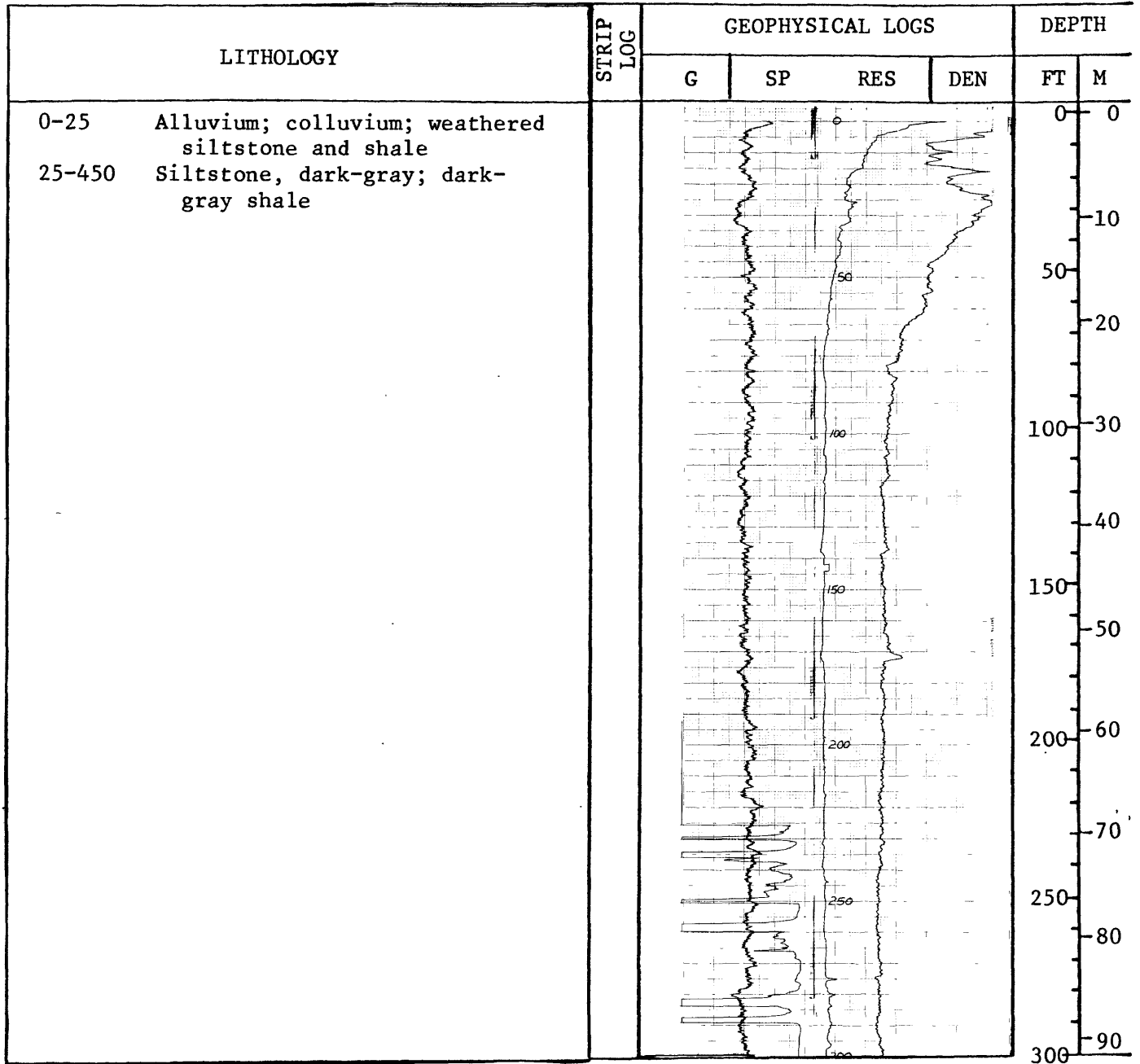
U.S. GEOLOGICAL SURVEY  
DRILL-HOLE LOG, YAMPA COAL FIELD

Hole No. M-4 State Colorado County Routt Date logged 10-1-77 Elev. (ft) 6,670  
 Location: T. 5 N., R. 86 W., sec. 3, NE $\frac{1}{4}$ NW $\frac{1}{4}$  Cored:  Yes  No  
 Drilled depth 1,005' Logged depth 1,002' Drilling medium air Fluid level surface

Geophysical logs:

Spontaneous potential (SP): Scale 50 mv/in Logging speed 20 fpm  
 Resistance (RES): Scale 50  $\Omega$ /in Logging speed 20 fpm  
 Gamma (G): T.C. 2 Scale 20 cps/in Logging speed 20 fpm  
 Density (DEN): T.C. .5 Scale 60 cps/in Logging speed 20 fpm

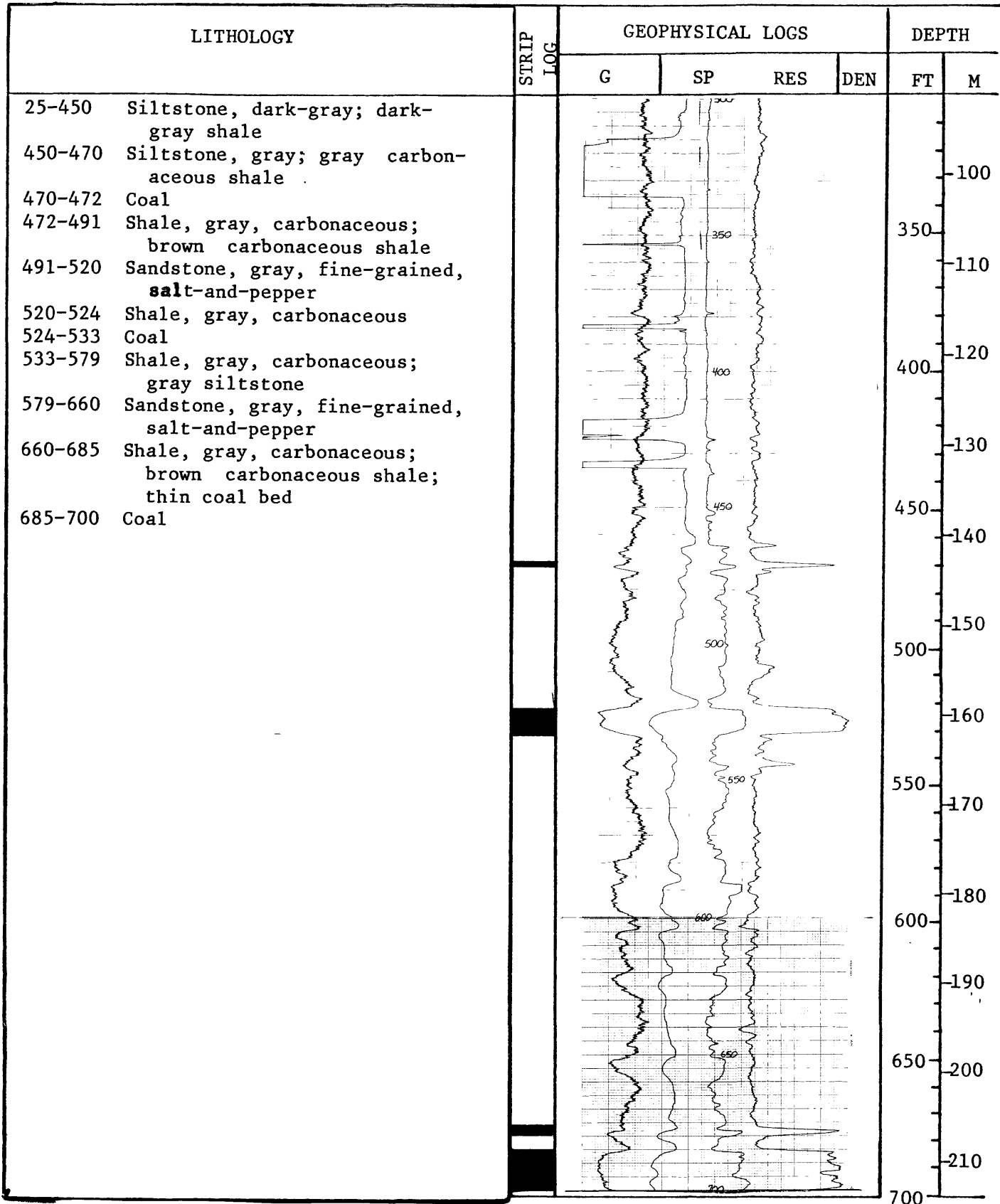
Remarks: \_\_\_\_\_





U.S. GEOLOGICAL SURVEY

Hole No. M-4 continued



U.S. GEOLOGICAL SURVEY

Hole No. M-4 continued

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
		G	SP	RES	DEN	FT	M
700-765 Shale, gray, carbonaceous; gray, fine-grained, salt- and-pepper sandstone							
765-848 Sandstone, light-gray, fine- grained, well-sorted, well- rounded, salt-and-pepper. Trout Creek Sandstone Member of the Iles Formation						750	
848-1002 Shale, gray, carbonaceous; gray siltstone						800	
						850	
						900	
						950	
						1000	
						1050	
						1100	

U.S. GEOLOGICAL SURVEY  
DRILL-HOLE LOG, YAMPA COAL FIELD

Hole No. M-5 State Colorado County Routt Date logged 9-29-77 Elev. (ft) 6,640  
 Location: T. 5 N., R. 86 W., sec. 3, SE $\frac{1}{4}$ NE $\frac{1}{4}$  Cored:  Yes  No  
 Drilled depth 807' Logged depth 806' Drilling medium air Fluid level surface

Geophysical logs:

Spontaneous potential (SP): Scale \_\_\_\_\_ Logging speed \_\_\_\_\_ fpm  
 Resistance (RES): Scale 40  $\Omega$ /in Logging speed 20 fpm  
 Gamma (G): T.C. 2 Scale 20 cps/in Logging speed 20 fpm  
 Density (DEN): T.C. .5 Scale 60 cps/in Logging speed 20 fpm  
 Remarks: No SP - to much foam in hole.

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOGS			DEPTH	
		G	RES	DEN	FT	M
0-17 Colluvium; soil zone					0	0
17-58 Siltstone, gray						
58-62 Sandstone, gray, fine-grained, salt-and-pepper						
62-69 Shale, gray, carbonaceous					10	
69-71 Coal						
71-77 Shale, gray, carbonaceous					50	
77-79 Coal						
79-125 Sandstone, gray, fine-grained, salt-and-pepper; gray siltstone					20	
125-129 Shale, gray, carbonaceous						
129-140 Coal						
140-277 Siltstone, gray; gray shale; brown carbonaceous shale; thin coal beds					100	30
277-291 Coal						
291-350 Siltstone, gray; interbedded gray, fine-grained, salt-and-pepper sandstone					40	
					150	
					200	60
					250	
					300	90

U.S. GEOLOGICAL SURVEY

Hole No. M-5 continued

LITHOLOGY		STRIP LOG	GEOPHYSICAL LOGS			DEPTH		
			G	RES	DEN	FT	M	
291-350	Siltstone, gray; interbedded gray, fine-grained, salt-and-pepper sandstone							
350-470	Sandstone, light-gray, fine-grained, well-sorted, well-rounded, salt-and-pepper. Trout Creek Sandstone Member of the Iles Formation							100
470-806	Sandstone, gray, fine-grained, salt-and-pepper; interbedded gray siltstone and gray shale							350
								110
								400
								120
								130
								450
								140
								500
							150	
							160	
							550	
							170	
							180	
							600	
							190	
							650	
							200	
							210	
							700	

U.S. GEOLOGICAL SURVEY

Hole No. M-5 continued

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOGS			DEPTH	
		G	RES	DEN	FT	M
470-806 Sandstone, gray, fine-grained, salt-and-pepper; interbedded gray siltstone and gray shale					220	
					750	
					230	
					240	
					800	
					250	
					850	
					260	
					270	
					900	
					280	
					290	
					950	
					300	
					1000	
					350	
					1050	
					360	
					370	
					1100	

U.S. GEOLOGICAL SURVEY  
DRILL-HOLE LOG, YAMPA COAL FIELD

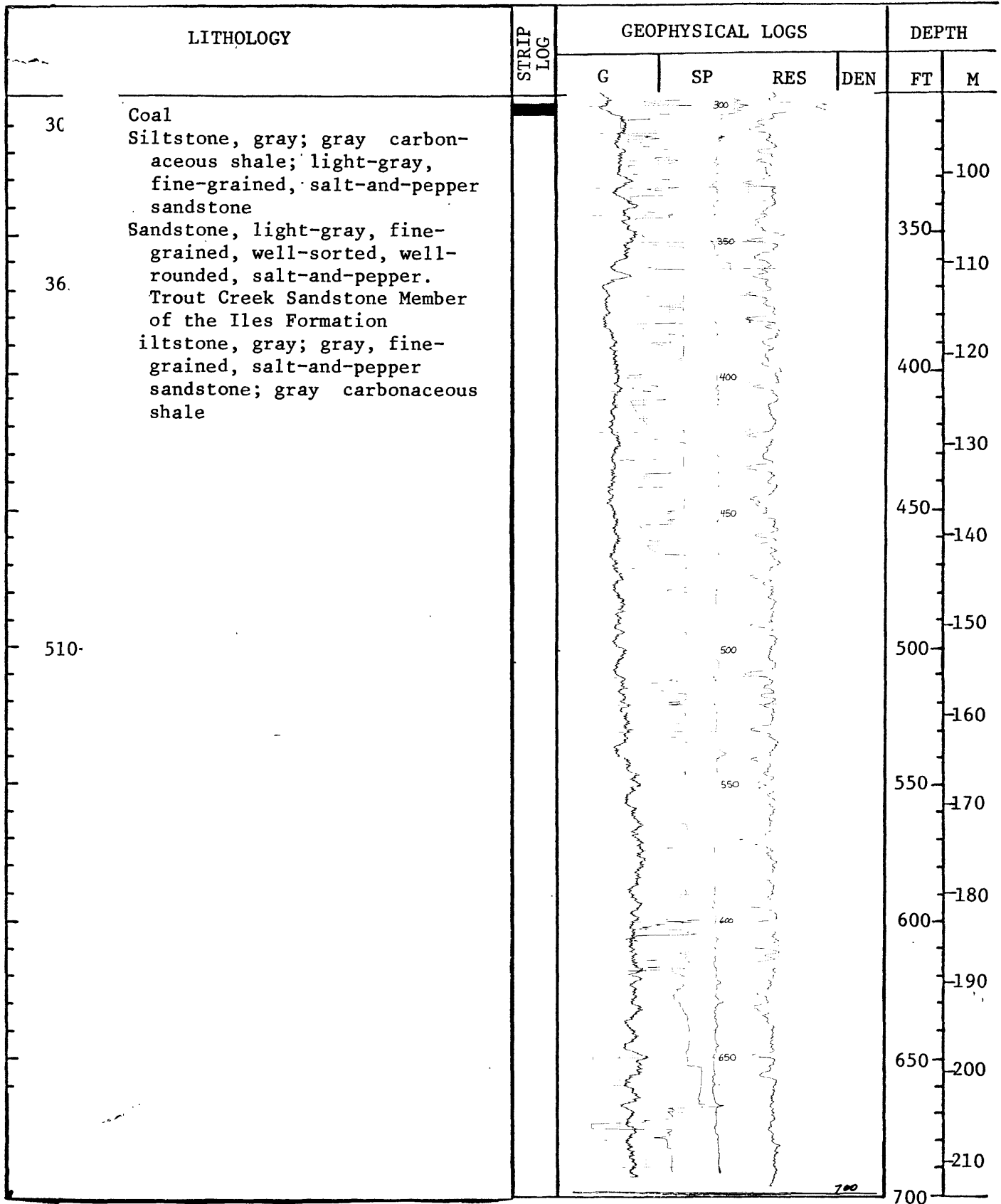
Hole No. CC-1 State Colorado County Routt Date logged 10-6-77 Elev. (ft) 6,720  
 Location: T. 5 N., R. 85 W., sec. 7, SE  $\frac{1}{4}$  NW  $\frac{1}{4}$ . Cored:  Yes  No  
 Drilled depth 700' Logged depth 698' Drilling medium air & mud Fluid level 6'  
 Geophysical logs:

Spontaneous potential (SP): Scale 50 mv/in Logging speed 20 fpm  
 Resistance (RES): Scale 50  $\Omega$ /in Logging speed 20 fpm  
 Gamma (G): T.C. 2 Scale 20 cps/in Logging speed 20 fpm  
 Density (DEN): T.C. .5 Scale 60 cps/in Logging speed 20 fpm  
 Remarks: \_\_\_\_\_

LITHOLOGY		STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
			G	SP	RES	DEN	FT	M
0-45	Colluvium; terrace gravels						0	0
45-70	Sandstone, gray, fine-grained, salt-and-pepper							
70-75	Shale, gray, carbonaceous							
75-78	Coal						10	
78-117	Sandstone, gray, fine-grained, salt-and-pepper; gray siltstone						50	
117-121	Coal							
121-123	Shale, brown, carbonaceous						20	
123-129	Coal							
129-260	Siltstone, gray; gray carbonaceous shale; gray, fine-grained, salt-and-pepper sandstone						100	30
260-262	Coal							
262-270	Shale, gray, carbonaceous							
270-273	Coal						40	
273-286	Shale, gray, carbonaceous							
286-290	Coal						150	
290-299	Shale, gray, carbonaceous						50	
299-303	Coal							
							200	60
							70	
							250	80
							80	
							300	90

U.S. GEOLOGICAL SURVEY

Hole No. CC-1 continued



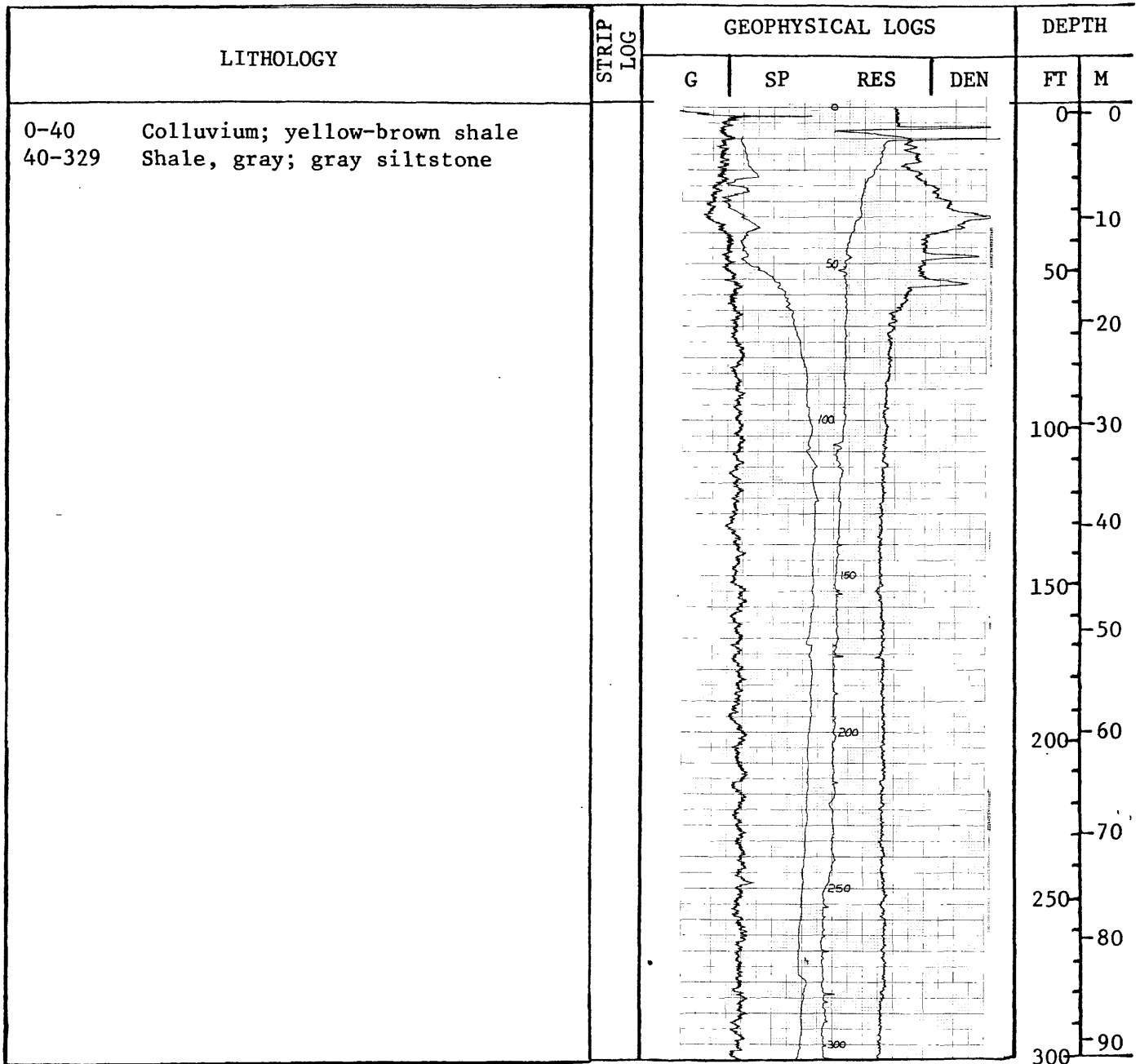
U.S. GEOLOGICAL SURVEY  
DRILL-HOLE LOG, YAMPA COAL FIELD

Hole No. OC-1 State Colorado County Routt Date logged 10-4-77 Elev. (ft) 7,280  
 Location: T. 4 N., R. 86 W., sec. 14, NE $\frac{1}{4}$ NE $\frac{1}{4}$  Cored:  Yes  No  
 Drilled depth 775' Logged depth 774' Drilling medium air Fluid level 11'

Geophysical logs:

Spontaneous potential (SP): Scale 50 mv/in Logging speed 20 fpm  
 Resistance (RES): Scale 50  $\Omega$ /in Logging speed 20 fpm  
 Gamma (G): T.C. 2 Scale 20 cps/in Logging speed 20 fpm  
 Density (DEN): T.C. .5 Scale 60 cps/in Logging speed 20 fpm

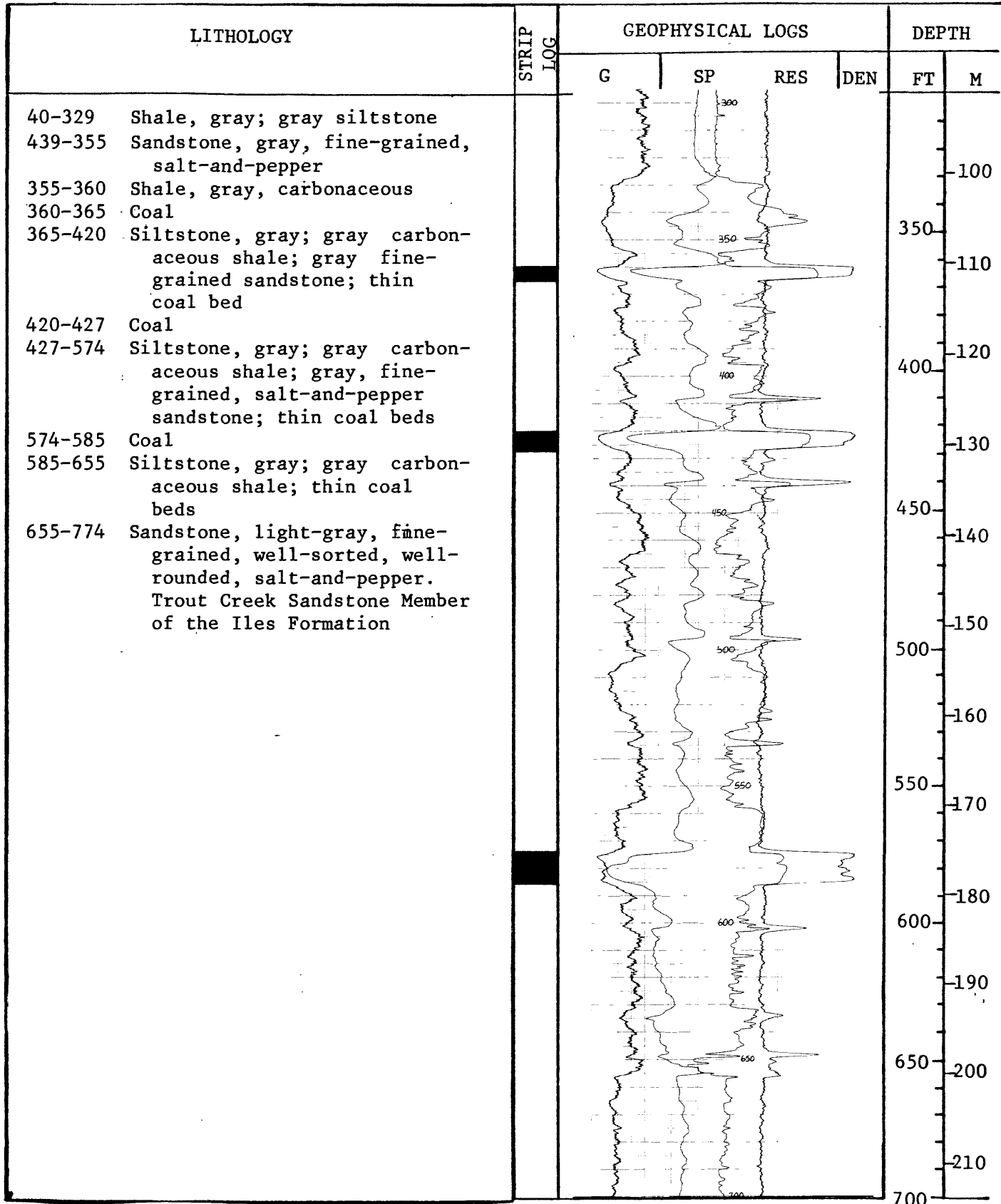
Remarks: \_\_\_\_\_





U.S. GEOLOGICAL SURVEY

Hole No. OC-1 continued



U.S. GEOLOGICAL SURVEY

Hole No. OC-1 continued

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
		G	SP	RES	DEN	FT	M
655-774 Sandstone, light-gray, fine-grained, well-sorted, well-rounded, salt-and-pepper. Trout Creek Sandstone Member of the Iles Formation						220	
						750	
						230	
						800	
						240	
						250	
						850	
						260	
						270	
						900	
						280	
						950	
						290	
						300	
						1000	
350							
1050							
360							
370							
1100							

U.S. GEOLOGICAL SURVEY  
DRILL-HOLE LOG, YAMPA COAL FIELD

Hole No. OC-2 State Colorado County Routt Date logged 10-5-77 Elev. (ft) 7,140  
 Location: T. 5 N., R. 86 W., sec. 36, NE $\frac{1}{4}$ SW $\frac{1}{4}$  Cored:  Yes  No  
 Drilled depth 770' Logged depth 763' Drilling medium air Fluid level 255'

Geophysical logs:

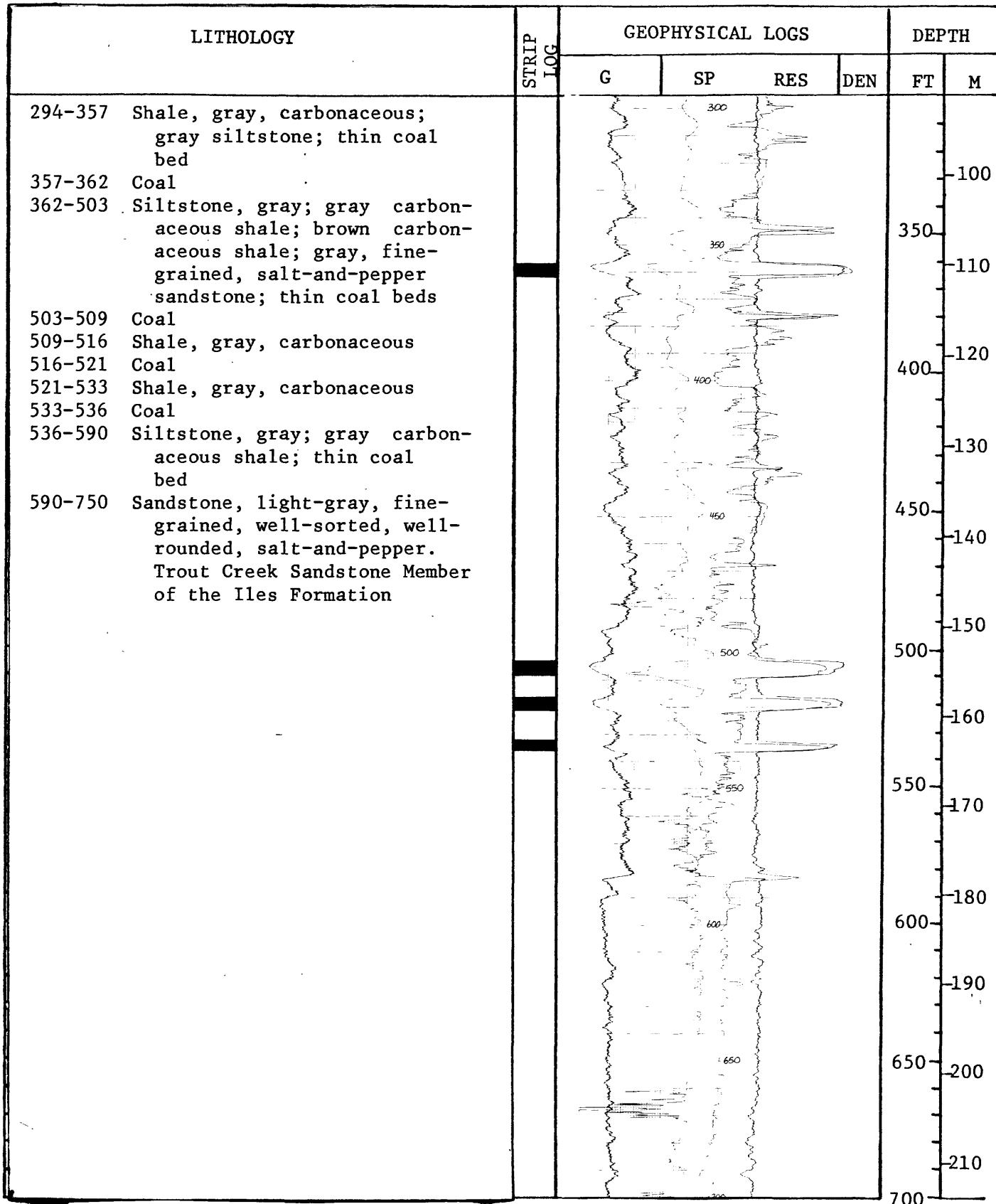
Spontaneous potential (SP): Scale 50 mv/in Logging speed 20 fpm  
 Resistance (RES): Scale 50  $\Omega$ /in Logging speed 20 fpm  
 Gamma (G): T.C. 2 Scale 20 cps/in Logging speed 20 fpm  
 Density (DEN): T.C. .5 Scale 60 cps/in Logging speed 20 fpm

Remarks: \_\_\_\_\_

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
		G	SP	RES	DEN	FT	M
0-29 Colluvium; weathered yellow-brown shale and siltstone						0	0
29-260 Shale, dark-gray; dark-gray siltstone						10	
260-283 Sandstone, gray, fine-grained, salt-and-pepper				50		50	
283-289 Shale, gray, carbonaceous						20	
289-290 Coal							
290-292 Shale, brown, carbonaceous							
292-294 Coal							
294-357 Shale, gray, carbonaceous; gray siltstone; thin coal bed				100		100	30
						40	
				150		150	50
						60	
				200		200	60
						70	
				250		250	80
						80	
				300		300	90
						90	

U.S. GEOLOGICAL SURVEY

Hole No. OC-2 continued



U.S. GEOLOGICAL SURVEY

Hole No. OC-2 continued

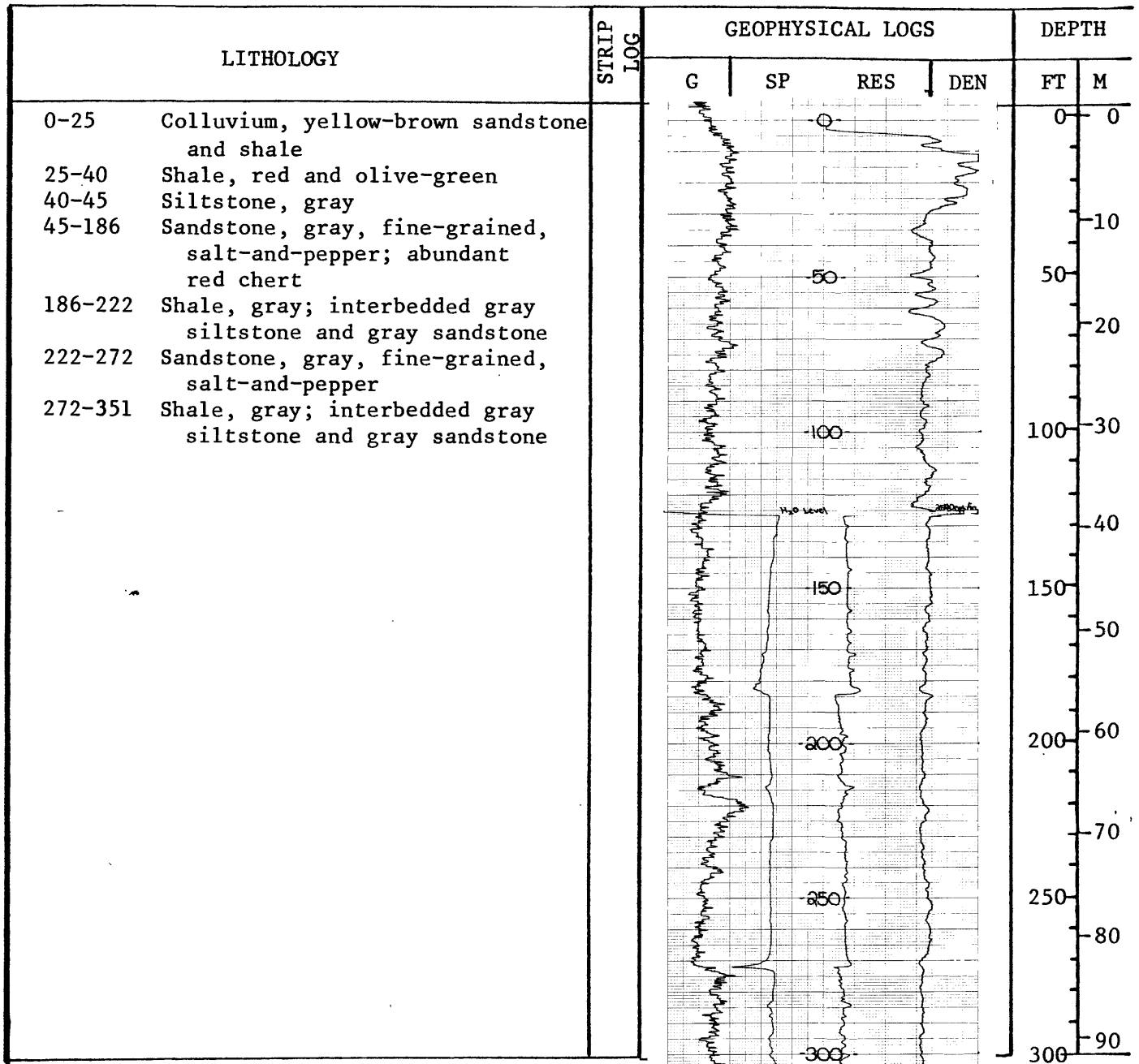
LITHOLOGY	STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
		G	SP	RES	DEN	FT	M
590-750 Sandstone, light-gray, fine-grained, well-sorted, well-rounded, salt-and-pepper. Trout Creek Sandstone Member of the Iles Formation							
750-763 Siltstone, gray; gray shale							
						220	
						750	
						230	
						240	
						800	
						250	
						850	
						260	
						270	
						900	
						280	
						950	
						290	
						300	
						1000	
						350	
						1050	
						360	
						370	
						1100	

U.S. GEOLOGICAL SURVEY  
DRILL-HOLE LOG, YAMPA COAL FIELD

Hole No. LAY-2 State Colorado County Moffat Date logged 8-11-77 Elev. (ft) 6,590  
 Location: T. 8 N., R. 94 W., sec. 25 SW $\frac{1}{4}$ SE $\frac{1}{4}$  Cored:  Yes  No  
 Drilled depth 850' Logged depth 829' Drilling medium air Fluid level 127'

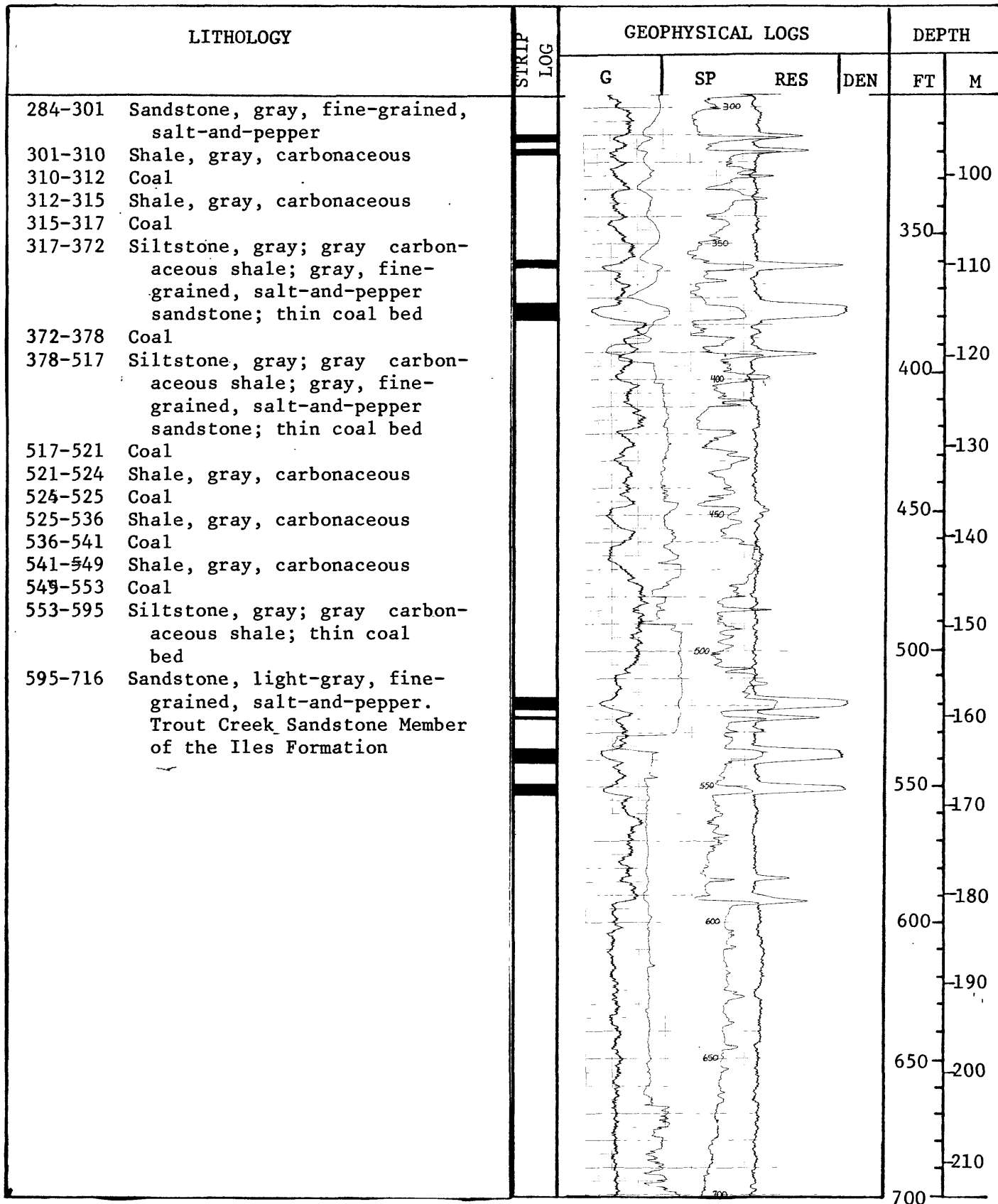
Geophysical logs:

Spontaneous potential (SP): Scale 50 mv/in Logging speed 20 fpm  
 Resistance (RES): Scale 25  $\Omega$ /in Logging speed 20 fpm  
 Gamma (G): T.C. 1 Scale 25 cps/in Logging speed 20 fpm  
 Density (DEN): T.C. 1 Scale 5,000 cps/in Logging speed 20 fpm  
 Remarks: Changed density scale to 2,500 cps/in at 127'




U.S. GEOLOGICAL SURVEY

Hole No. OC-3 continued



U.S. GEOLOGICAL SURVEY

Hole No. OC-3 continued

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOGS				DEPTH	
		G	SP	RES	DEN	FT	M
595-716 Sandstone, light-gray, fine-grained, salt-and-pepper. Trout Creek Sandstone Member of the Iles Formation						220	
		750					
		230					
		800					
		240					
		250					
		850					
		260					
		270					
		900					
		280					
		950					
		290					
		300					
		1000					
350							
1050							
360							
370							
1100							