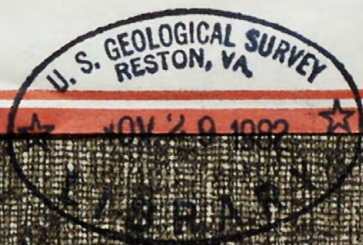
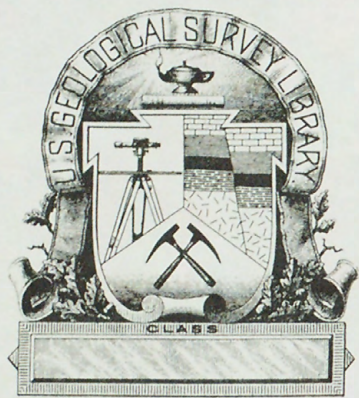


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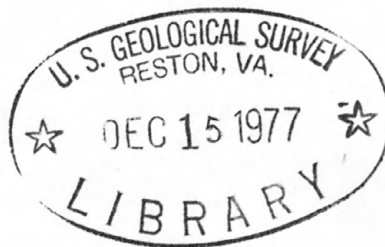
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LITHOLOGIC AND GEOPHYSICAL LOGS OF HOLES DRILLED IN THE
WILLOW SPRINGS QUADRANGLE, EMERY AND SEVIER COUNTIES, UTAH

By

Gary M. Edson and Cathy L. Barnosky

Open-File Report 77-866
1977



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

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LITHOLOGIC AND GEOPHYSICAL LOGS OF HOLES DRILLED IN THE
WILLOW SPRINGS QUADRANGLE, EMERY AND SEVIER COUNTIES, UTAH

By Gary M. Edson and Cathy L. Barnosky

INTRODUCTION

Eight holes were drilled in that part of T. 24 S., R. 5 E. which is in the Willow Springs 7½-minute quadrangle, Emery and Sevier Counties, Utah (fig. 1). This drilling was done from June 15 to July 14, 1977, to obtain information on the thickness and extent of coal in the Cretaceous Ferron Sandstone Member of the Mancos Shale and on the lithology of the enclosing rocks. The overall goal of the project is evaluation and classification of federally owned coal resources and lands in the Emery coal field.

The holes were drilled under Government contract no. 14-08-0001-15778. awarded by the U.S. Geological Survey to McCabe Bros. Drilling, Inc., Idaho Falls, Idaho, by contractors using truck-mounted rotary drilling rigs. The drilling fluids were air, air-water-biodegradable foam, and mud. Cuttings representative of each rock unit encountered were sampled and logged in the field.

Holes were logged by geophysical methods by Leerco Electric Logging Service, Salt Lake City, Utah, and Century Geophysical Corp., Tulsa, Oklahoma. Both companies ran resistivity, natural gamma, and gamma density logs; Leerco also ran spontaneous potential (S.P.) logs. All of the holes tended to close soon after drilling. For hole 18-WS, gamma and density were measured through the drill pipe, which attenuated the logs and produced spikes at pipe joints on the density logs. A useful S.P.-resistivity log was also difficult to obtain in this hole; therefore, this log is pieced together from the results of two or three runs.

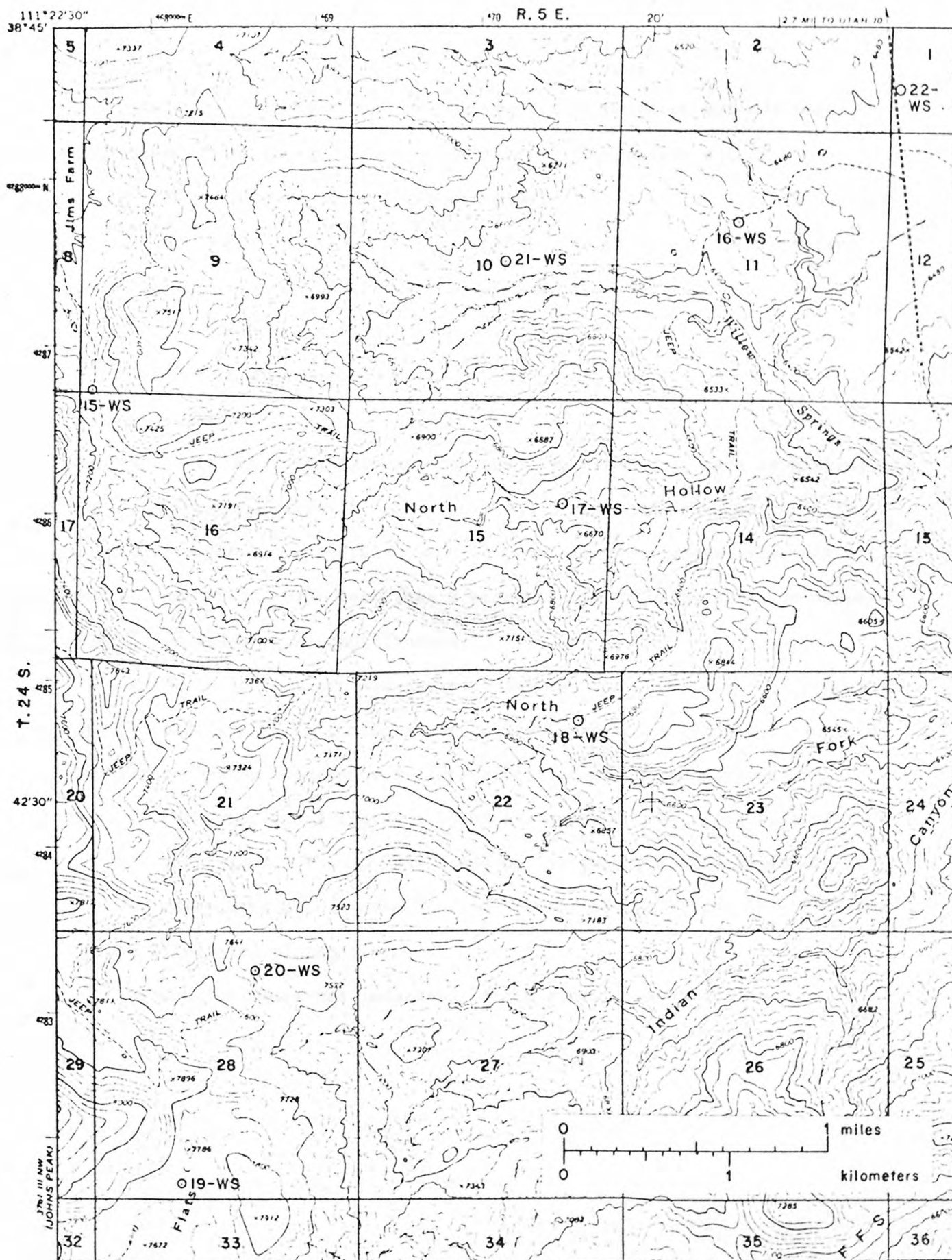
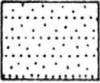
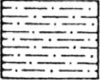
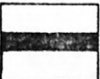


Figure 1.—Map showing U.S. Geological Survey drill-hole locations in the Willow Springs quadrangle, Utah.

Lithologic descriptions in this report are based on records made in the field by the sampler and are corrected by comparison with the geophysical logs. Color terms are from the Rock-color chart of the Geological Society of America (1970) and refer to dry samples. In this paper shale refers to fissile rock compositionally dominated by the clay-sized fraction. Silty shale means a fissile rock in which clay and silt are in subequal proportions. Rock composed mostly of the silt-sized fraction is called siltstone because fissility could not adequately be recognized in the drill cuttings. In reporting carbonaceous shale no attempt is made to distinguish particle size, composition, or proportions. Most carbonaceous shale is actually carbonaceous silty shale. In general, minor means less than 5 percent and trace means less than 2 percent, referring to relative abundances among rock and mineral constituents.

Where there is great disagreement between the lithologic and geophysical logs, the left portion of the strip log represents the lithologic log and the right portion represents an interpretation of the geophysical log. Because the geophysical logs for 18-WS are so poor, the right side of that strip log is blank. When a hole could not be geophysically logged to its drilled depth, the appropriate interval at the bottom of the hole is blank on the right side of the strip log.

Rock lithologies are indicated in the strip logs as follows:

	Sandstone
	Siltstone
	Silty shale
	Shale
	Interbedded sandstone and siltstone
	Interbedded sandstone and shale
	Carbonaceous shale
	5 Coal and coal thickness

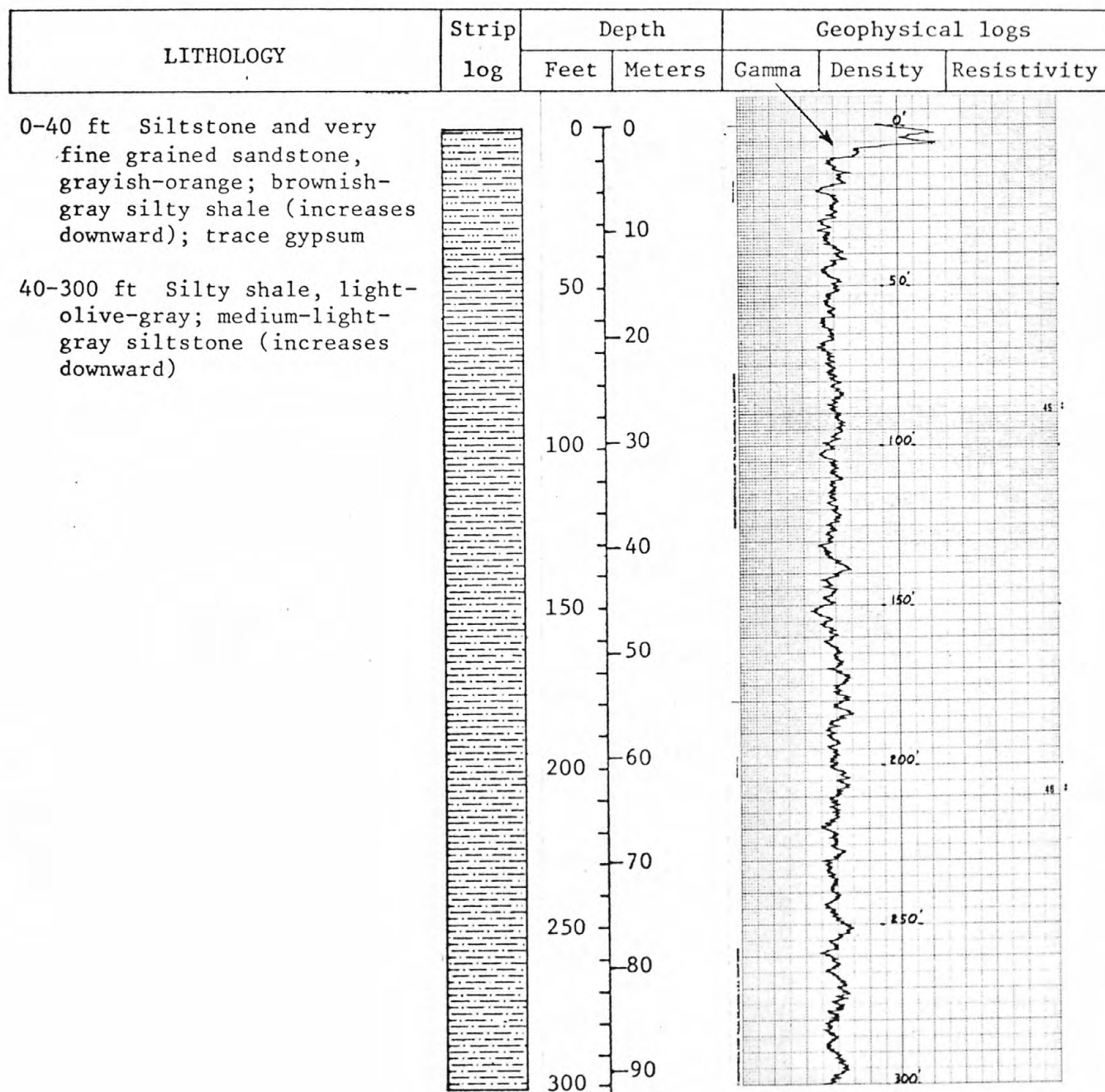
Depths and thicknesses are given in feet; to convert to meters, multiply by 0.3048.

DRILL-HOLE LOGS

Hole no. 15-WS Date logged 7-15-77 Surface elevation (ft) 7,130
 Loc.: State Utah Cty. Sevier T. 24 S., R. 5 E., Sec. 9 ; 25 FS L, 275 FW L
 Drilled depth (ft) 1,240 Logged depth (ft) 1,143 Water Level (ft) 583
 Drilling fluid: ☒ Air ☐ Water ☒ Foam ☒ Mud

Geophysical logs:

Spontaneous potential: Scale _____ Logging speed _____ fpm
 Resistivity: Scale 50 Ω = 5 in Logging speed 20 fpm
 Gamma: T.C. 2 Scale 25 cps/in, full scale Logging speed 20 fpm
 Gamma dens.: T.C. 1 Scale 2.5 k cps/in, full scale Logging speed 20 fpm

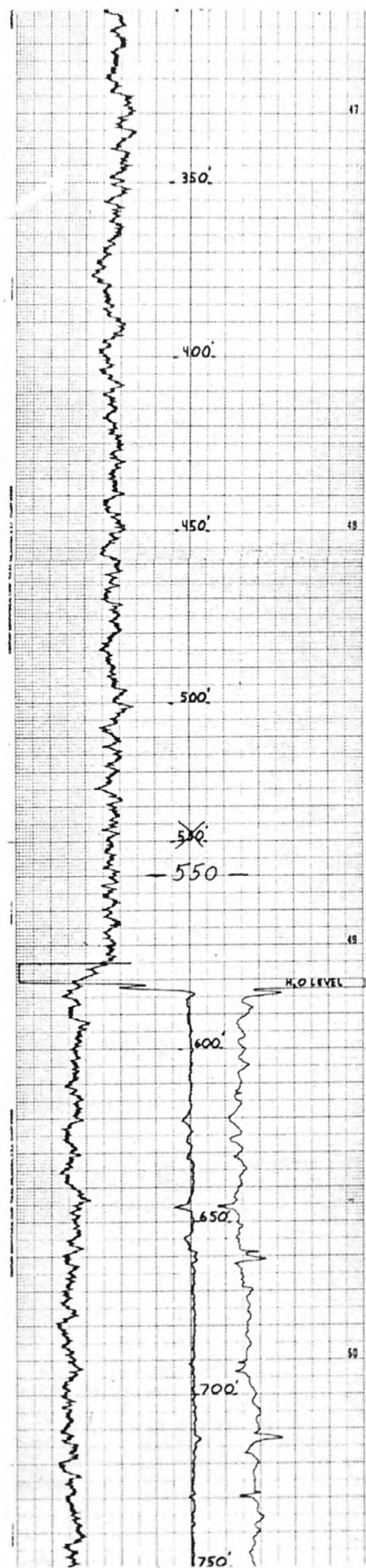


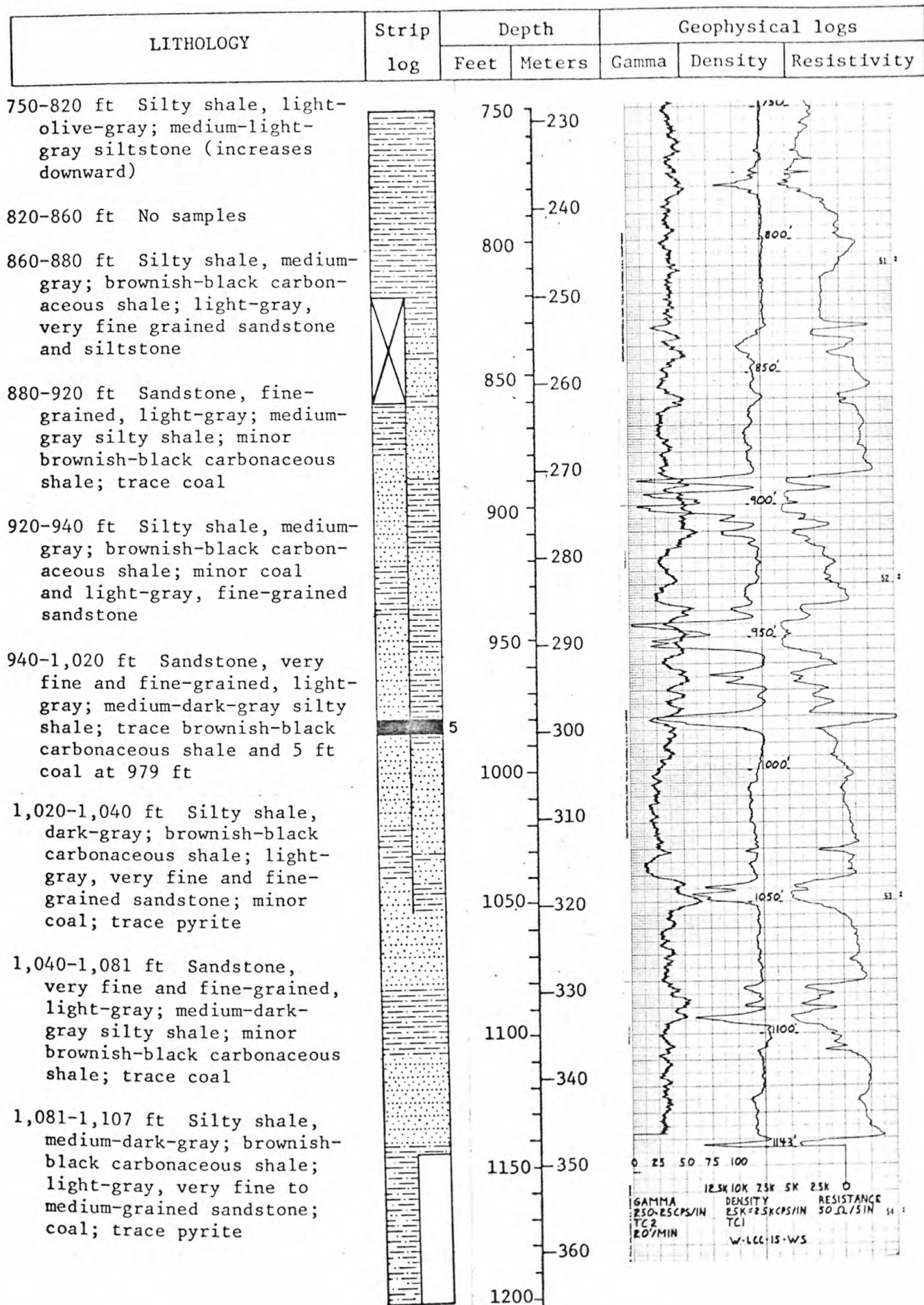
LITHOLOGY	Strip log	Depth		Geophysical logs		
		Feet	Meters	Gamma	Density	Resistivity

300-750 ft Silty shale, light-
olive-gray; medium-light-
gray siltstone (increases
downward)



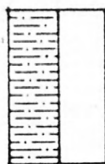
300
100
350
110
400
120
450
130
500
140
550
150
600
160
650
170
700
180
750
190
200
210
220
230





LITHOLOGY	Strip log	Depth		Geophysical logs		
		Feet	Meters	Gamma	Density	Resistivity

1,107-1,140 ft Sandstone,
very fine to medium-grained,
light-gray; medium-dark-
gray silty shale; brownish-
black carbonaceous shale;
coal



1200
370
1250
380

1,140-1,240 ft Silty shale,
medium-dark-gray; brownish-
black carbonaceous shale;
light-gray, very fine to
medium-grained sandstone;
minor coal

DRILL-HOLE LOGS

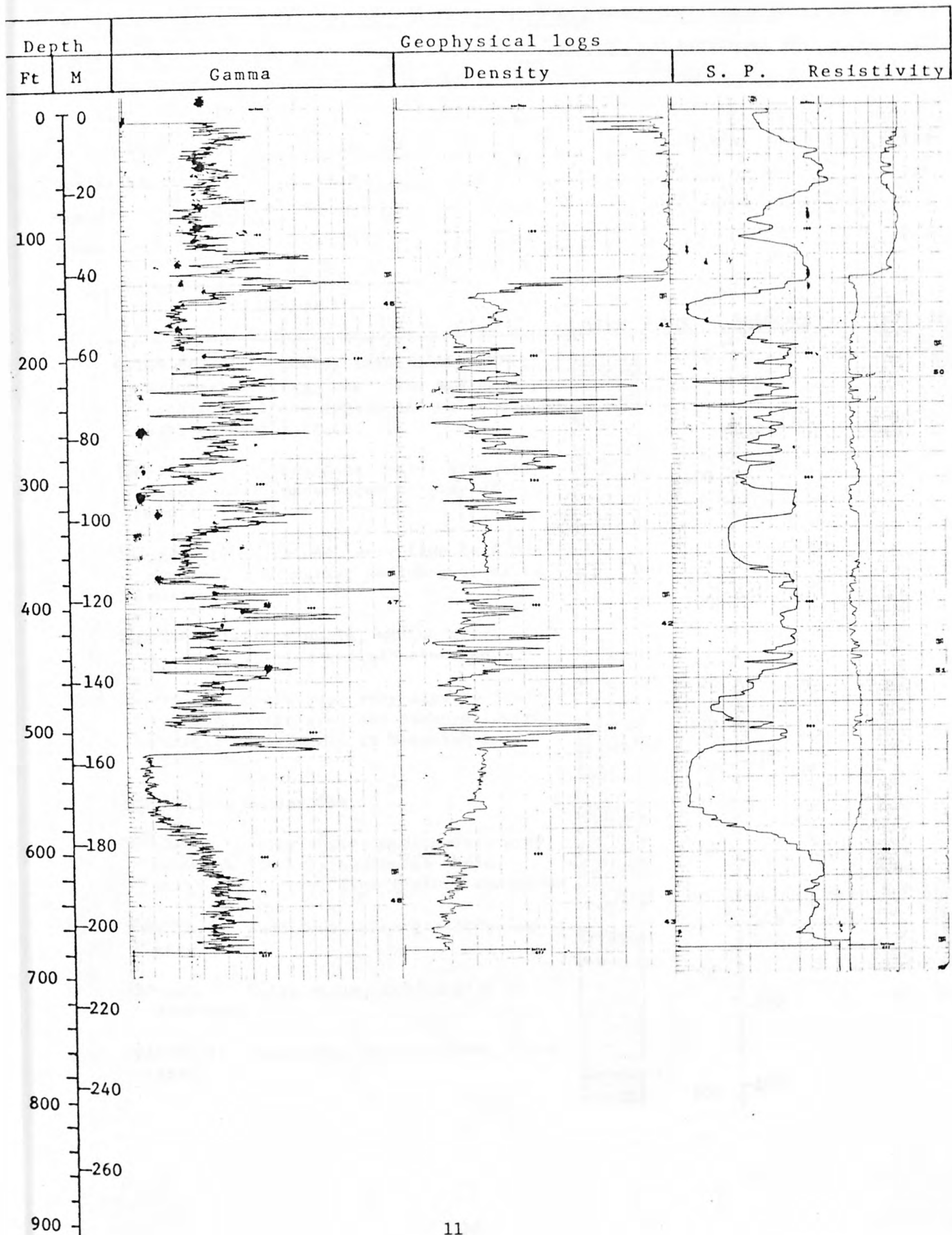
Hole no. 16-WS Date logged 6-17-77 Surface elevation (ft) 6,500
 Loc.: State Utah Cty. Sevier T. 24 S., R. 5 E., Sec. 11; 1,750 FN L, 2,360 FW L
 Drilled depth (ft) 695 Logged depth (ft) 677 Water level (ft) 140
 Drilling fluid: ☒ Air ☐ Water ☒ Foam ☐ Mud

Geophysical logs:

Spontaneous potential: Scale 300 mv = 5 in Logging speed 25 fpm
 Resistivity: Scale 10 Ω = 5 in Logging speed 25 fpm
 Gamma: T.C. 1 Scale 125 cps, full scale Logging speed 20 fpm
 Gamma dens.: T.C. 1 Scale 5 k cps, full scale Logging speed 20 fpm

LITHOLOGY	Strip log	Depth	
		Feet	Meters
0-10 ft Silt and siltstone, very pale yellowish brown; very pale yellowish brown, very fine sand and sandstone; pebbles		0	0
		20	
10-65 ft Silty shale and siltstone, pale-yellowish-brown to light-olive-gray; trace gypsum		100	
		40	
65-110 ft Sandstone, fine-grained, very pale orange and white; very pale orange siltstone; caliche; pebbles		200	60
110-136 ft Siltstone, medium-gray; medium-light-gray silty shale; very light brown, fine-grained sandstone	3	3	80
136-144 ft Silty shale, medium-light-gray		300	100
144-174 ft Sandstone, fine-grained, very light gray; medium-gray and brownish-gray silty shale (increases downward)		400	120
174-218 ft Silty shale, medium-dark-gray; medium-gray, fine-grained sandstone; minor brownish-black carbonaceous shale and coal		400	140
218-221 ft Coal	2	500	160
221-237 ft Silty shale and siltstone, medium-gray; minor brownish-black carbonaceous shale and coal		500	160
237-240 ft Coal		600	180

LITHOLOGY	Strip log	Depth	
		Feet	Meters
240-290 ft Silty shale, light-gray; medium-gray siltstone		600	
290-307 ft Sandstone, fine-grained, light- gray; minor light-brownish-gray silt- stone		200	
307-328 ft Silty shale, medium-light- gray; medium-gray, fine-grained sand- stone		700	
328-375 ft Sandstone, fine-grained, medium-light-gray; medium-light-gray silty shale			
375-450 ft Silty shale, medium-gray; light-gray siltstone and very fine grained sandstone			
450-492 ft Sandstone, fine-grained, medium-light-gray; medium-light-gray silty shale			
492-512 ft Carbonaceous shale, brownish- black; coal; dark-gray to medium-gray silty shale			
512-580 ft Sandstone, fine-grained, light-gray; reddish-light-brown silt- stone; minor medium-gray silty shale; trace gypsum			
580-600 ft Silty shale, medium-gray; pale-yellowish-orange siltstone; trace gypsum			
600-695 ft Silty shale, medium-gray; pale-yellowish-orange siltstone; trace gypsum			

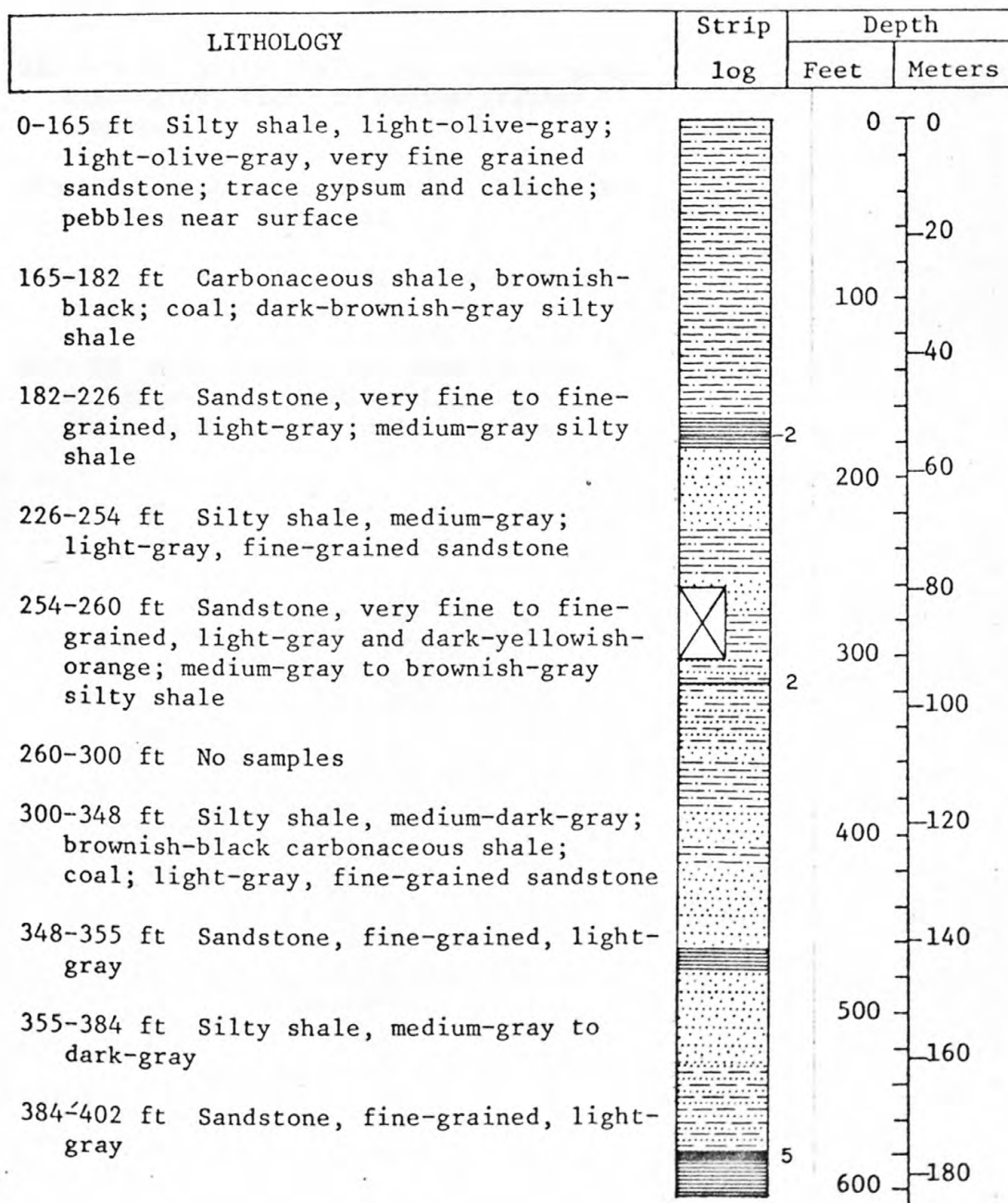


DRILL-HOLE LOGS

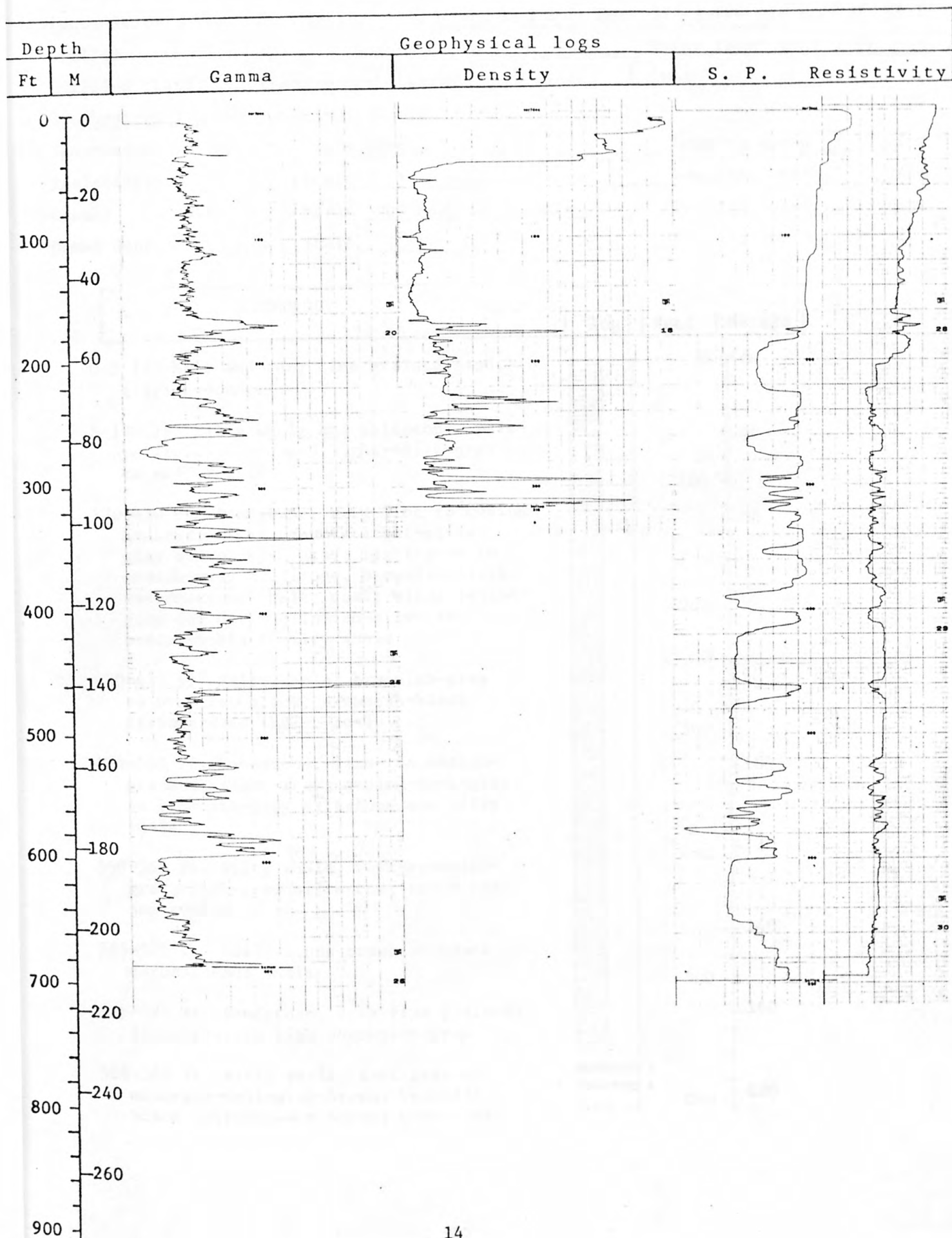
Hole no. 17-WS Date logged 6-19-77 Surface elevation (ft) 6,525
 Loc.: State Utah Cty. Sevier T. 24 S., R. 5 E., Sec. 15; 2,060 FN L, 940 FE L
 Drilled depth (ft) 760 Logged depth (ft) 698 Water level (ft) 40
 Drilling fluid: ☒ Air ☐ Water ☒ Foam ☐ Mud

Geophysical logs:

Spontaneous potential: Scale 400 mv = 5 in Logging speed 30 fpm
 Resistivity: Scale 10 Ω = 5 in Logging speed 30 fpm
 Gamma: T.C. 2 Scale 100 cps, full scale Logging speed 20 fpm
 Gamma dens.: T.C. 1 Scale 5 k cps, full scale Logging speed 20 fpm



LITHOLOGY	Strip log	Depth	
		Feet	Meters
402-415 ft Silty shale, medium-gray to dark-gray		600	
415-460 ft Sandstone, fine-grained, light-gray		200	
460-474 ft Carbonaceous shale, brownish-black; medium-dark-gray silty shale; bony coal; trace gypsum		700	
		220	
474-525 ft Sandstone, fine-grained, light-gray		240	
525-575 ft Silty shale, medium-dark-gray; light-gray, fine- to medium-grained sandstone		800	
575-600 ft Carbonaceous shale, brownish-black; coal; bony coal			
600-688 ft Sandstone, fine- to medium-grained, light-gray			
688-760 Silty shale, dark-medium-gray to brownish-gray; minor light-gray, fine- to medium-grained sandstone			



DRILL-HOLE LOGS

Hole no. 18-WS Date logged 6-22-77 Surface elevation (ft) 6,665
 Loc.: State Utah Cty. Sevier T. 24 S., R. 5 E., Sec. 22; 900 FN L, 850 FE L
 Drilled depth (ft) 780 Logged depth (ft) 770 Water level (ft) 90
 Drilling fluid: ☒ Air ☐ Water ☒ Foam ☐ Mud

Geophysical logs:

Spontaneous potential: Scale 125 mv = 5 in Logging speed 30 fpm
 Resistivity: Scale 10 Ω = 5 in Logging speed 30 fpm
 Gamma: T.C. 2 Scale 200 cps, full scale Logging speed 20 fpm
 Gamma dens.: T.C. 2 Scale 10 k cps, full scale Logging speed 20 fpm

LITHOLOGY	Strip log	Depth	
		Feet	Meters

0-5 ft Silt and very fine grained sand, grayish-orange

5-170 ft Silty shale and siltstone, pale-yellowish-brown and light-olive-gray to medium-gray

170-430 ft Sandstone, very fine to medium-grained, light-gray to light-olive-gray and pinkish-gray; light-gray to medium-gray siltstone; brownish-black carbonaceous shale; coal; minor medium-gray and dark-yellowish-brown to brownish-black silty shale

430-435 ft Silty shale, brownish-gray to brownish-black; brownish-black carbonaceous shale; coal

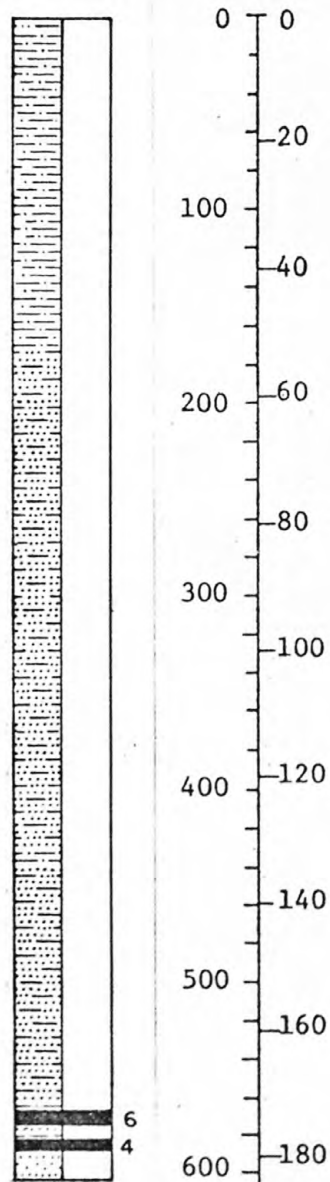
435-560 ft Sandstone, fine- to medium-grained, light-gray; medium-dark-gray to brownish-gray siltstone and silty shale

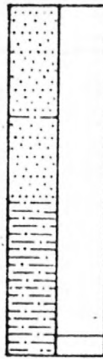
560-565 ft Silty shale, dark-brownish-gray; dark-gray siltstone; trace coal and gypsum

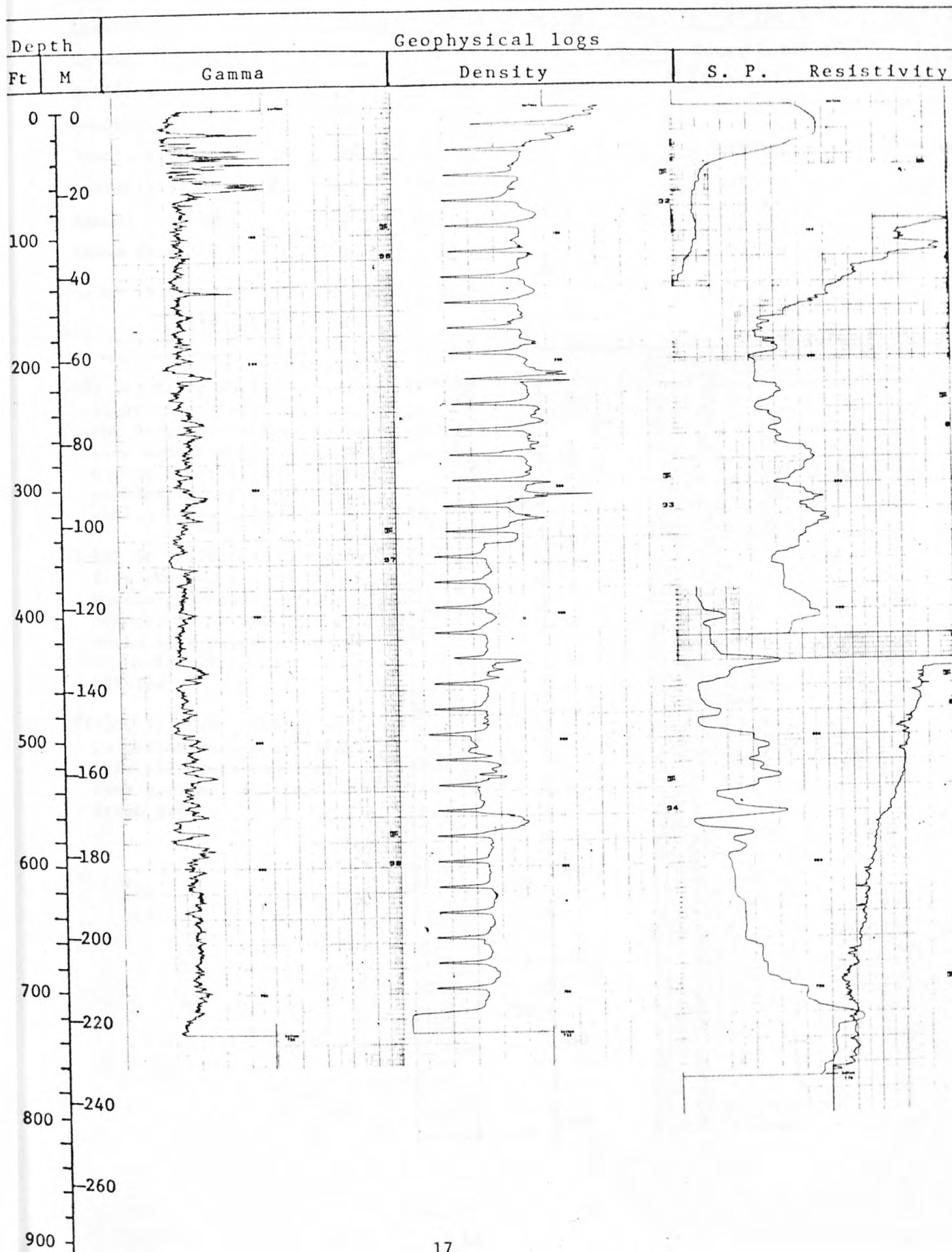
565-575 ft Coal; minor brownish-black carbonaceous shale

575-580 ft Sandstone, very fine grained; light-gray to light-brownish-gray

580-585 ft silty shale, dark-gray to moderate-yellowish-brown; brownish-black carbonaceous shale; minor coal



LITHOLOGY	Strip log	Depth	
		Feet	Meters
585-600 ft Sandstone, fine-grained, light-gray to light-brownish-gray		600	
600-655 ft Sandstone, fine-grained, light-gray to light-brownish-gray; minor dark-brownish-gray and moderate-yellowish-brown silty shale		200	
655-660 ft Silty shale, dark-gray to dark-brownish-gray; coal; brownish-black carbonaceous shale		700	
		220	
		240	
660-700 ft Sandstone, very fine grained, light-gray to light-brownish-gray; minor dark-gray to dark-brownish-gray silty shale		800	
700-780 ft Silty shale, dark-brownish-gray; light-gray, fine-grained sandstone (decreases downward)			

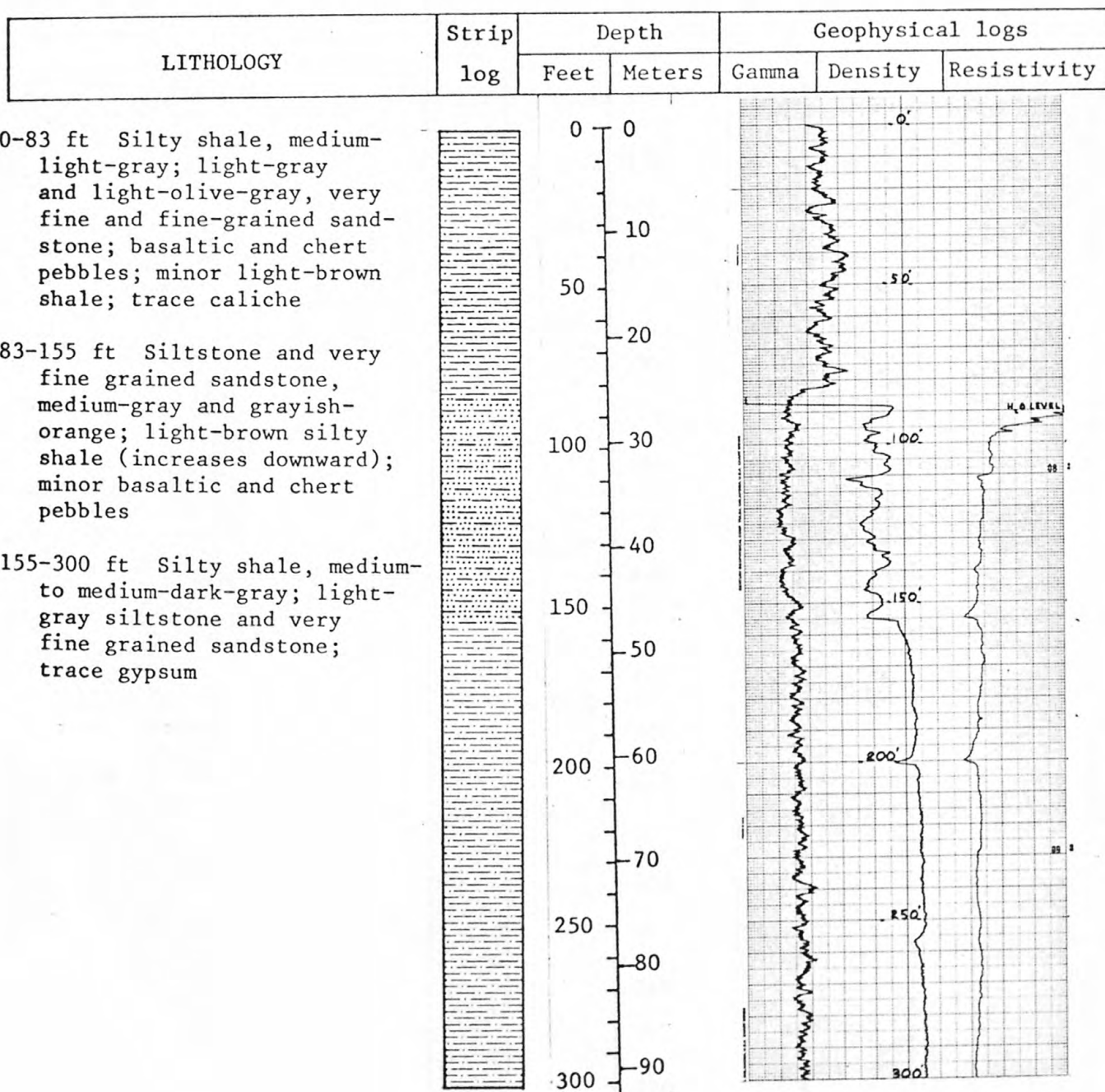


DRILL-HOLE LOGS

Hole no. 19-WS Date logged 7-7-77 Surface elevation (ft) 7,700
 Loc.: State Utah Cty. Sevier T. 24 S. R. 5 E., Sec. 28; 290 FSL, 1,720 FWL
 Drilled depth (ft) 1,300 Logged depth (ft) 1,295 Water Level (ft) 91
 Drilling fluid: ☒ Air ☐ Water ☐ Foam ☒ Mud

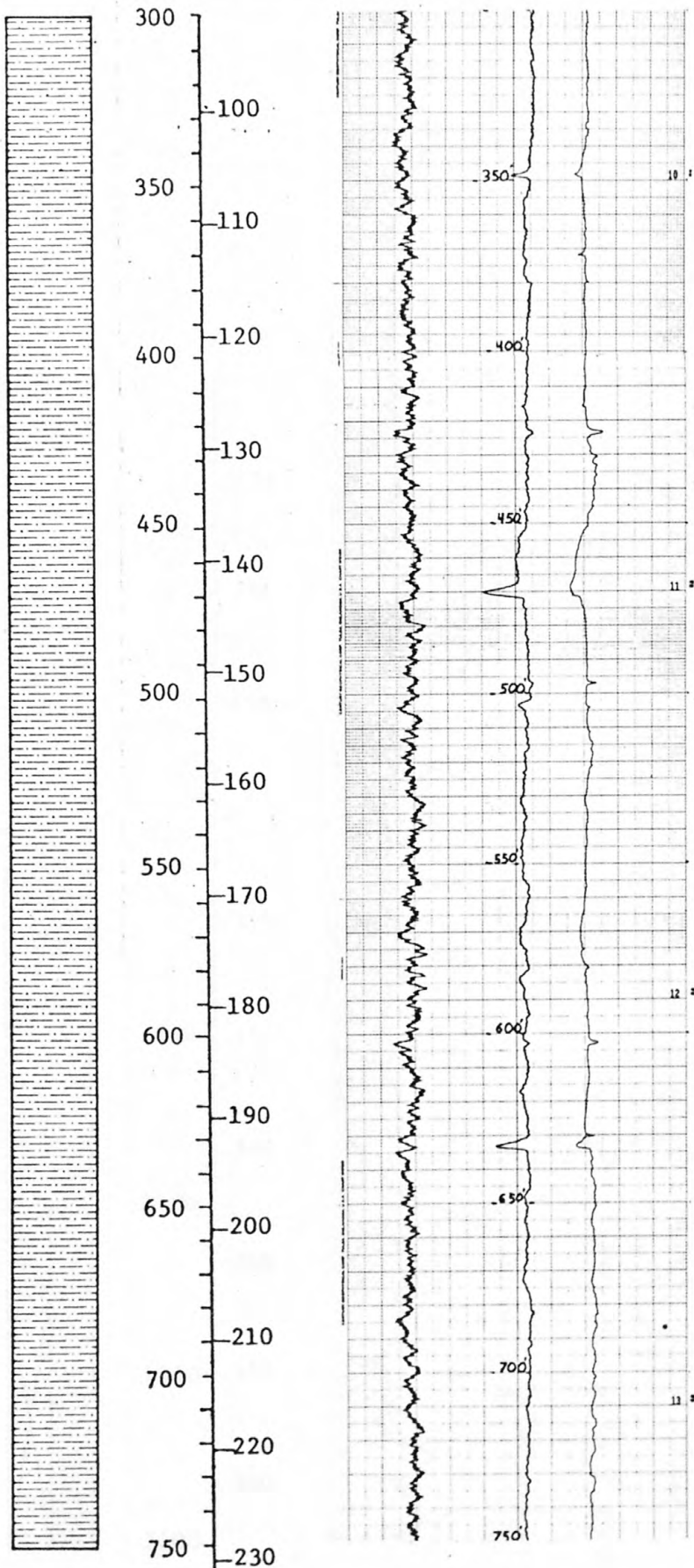
Geophysical logs:

Spontaneous potential: Scale _____ Logging speed _____ fpm
 Resistivity: Scale 100 Ω = 5 in Logging speed 20 fpm
 Gamma: T.C. 2 Scale 25 cps/in, full scale Logging speed 20 fpm
 Gamma dens.: T.C. 1 Scale 2.5 k cps/in, full scale Logging speed 20 fpm



LITHOLOGY	Strip log	Depth		Geophysical logs		
		Feet	Meters	Gamma	Density	Resistivity

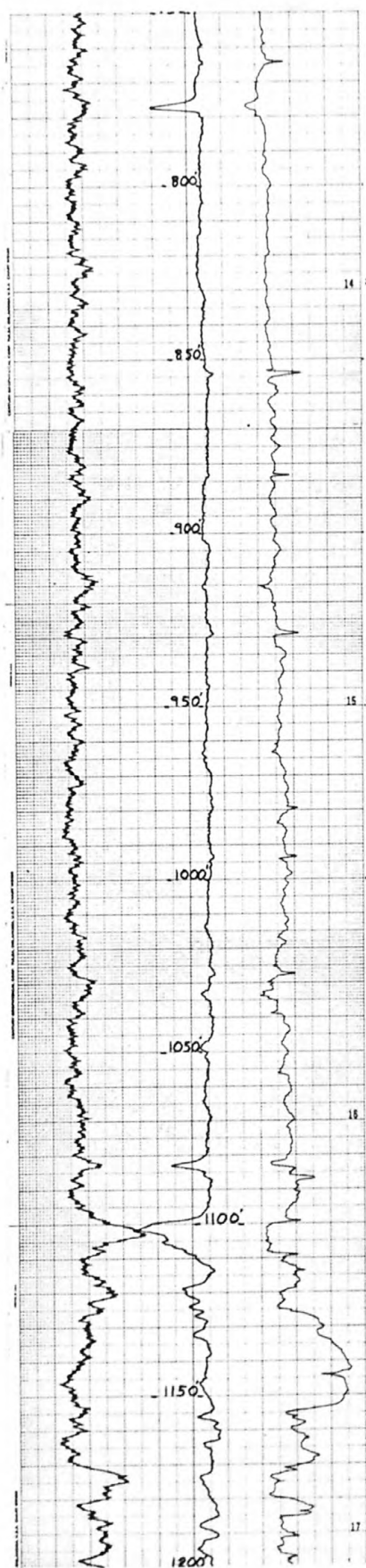
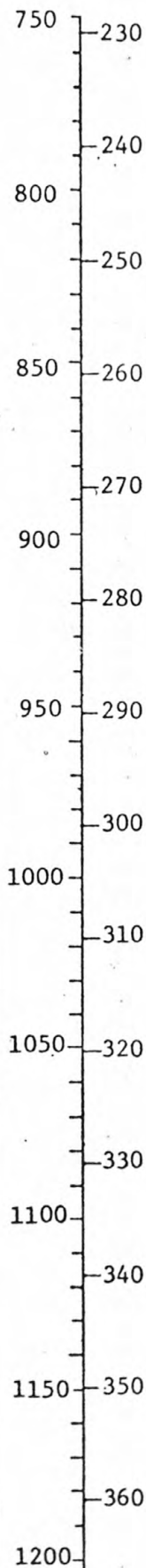
300-750 ft Silty shale, medium-
to medium-dark-gray; light-
gray siltstone and very
fine grained sandstone;
trace gypsum



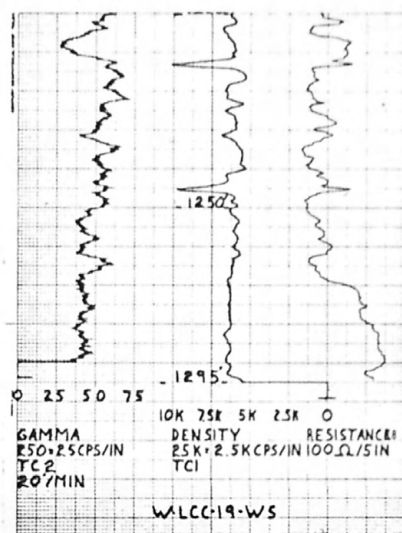
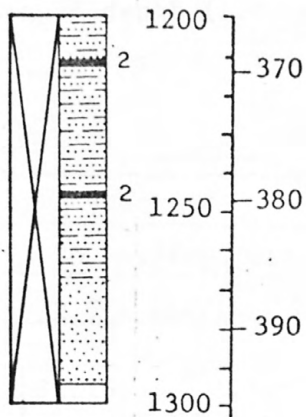
LITHOLOGY	Strip log	Depth		Geophysical logs		
		Feet	Meters	Gamma	Density	Resistivity

750-1,125 ft Silty shale,
medium- to medium-dark-
gray; light-gray siltstone
and very fine grained sand-
stone; trace gypsum

1,125-1,300 ft No samples



LITHOLOGY	Strip log	Depth		Geophysical logs		
		Feet	Meters	Gamma	Density	Resistivity

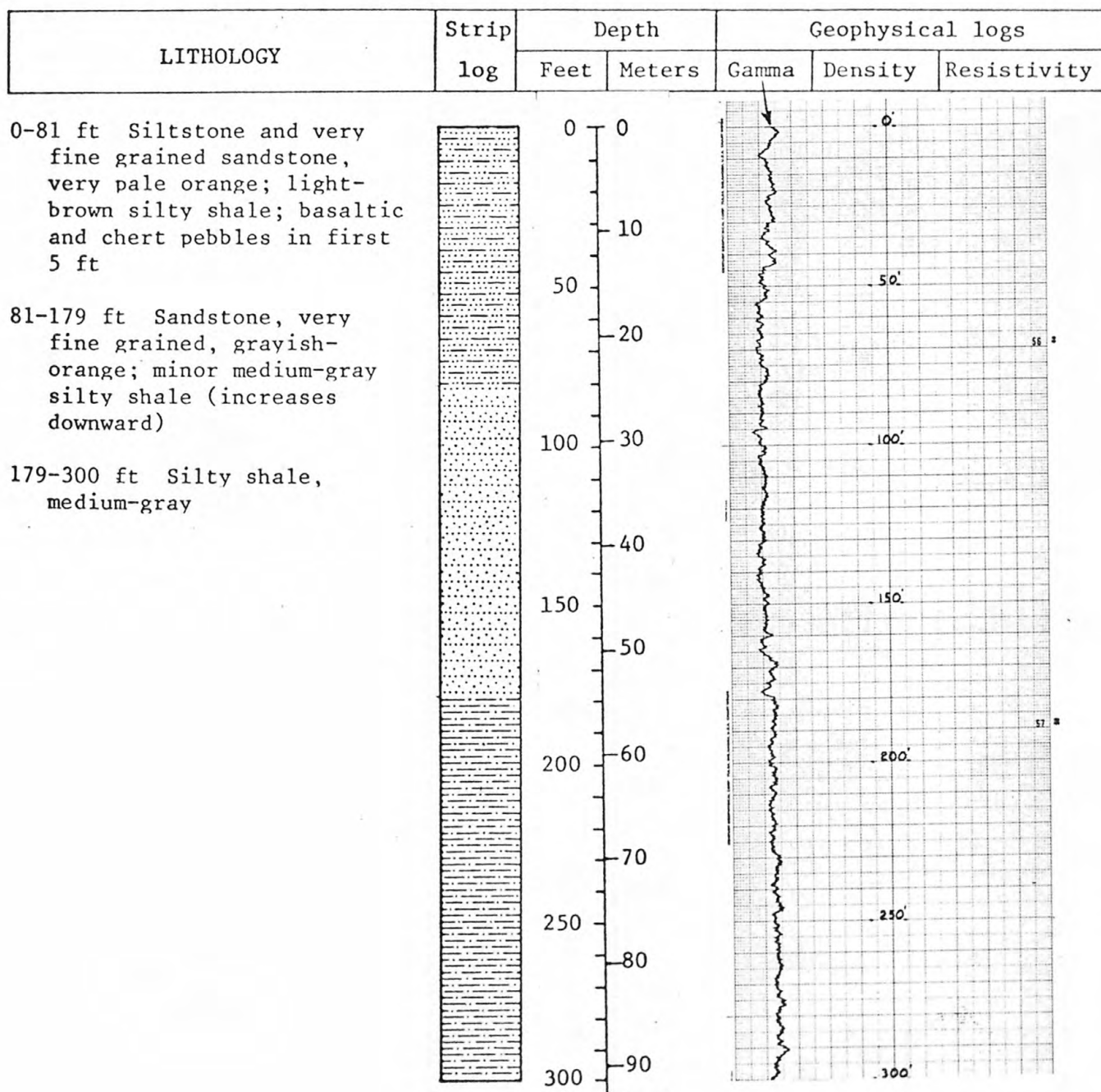


DRILL-HOLE LOGS

Hole no. 20-WS Date logged 7-15-77 Surface elevation (ft) 7,485
 Loc.: State Utah Cty. Sevier T. 24 S., R. 5 E., Sec. 28; 730 FNL, 2,050 FE L
 Drilled depth (ft) 1,480 Logged depth (ft) 1,292 Water Level (ft) 617
 Drilling fluid: ☒ Air ☐ Water ☒ Foam ☐ Mud

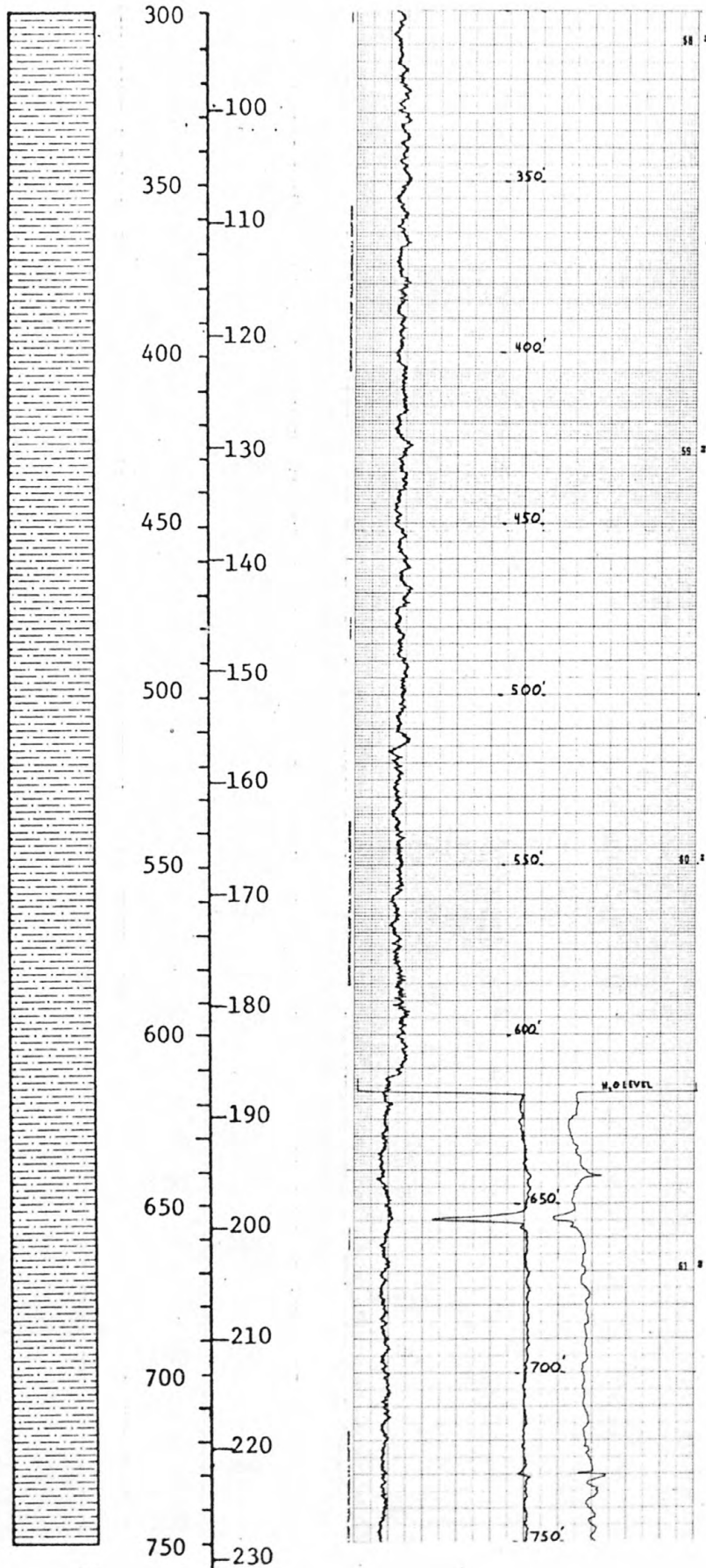
Geophysical logs:

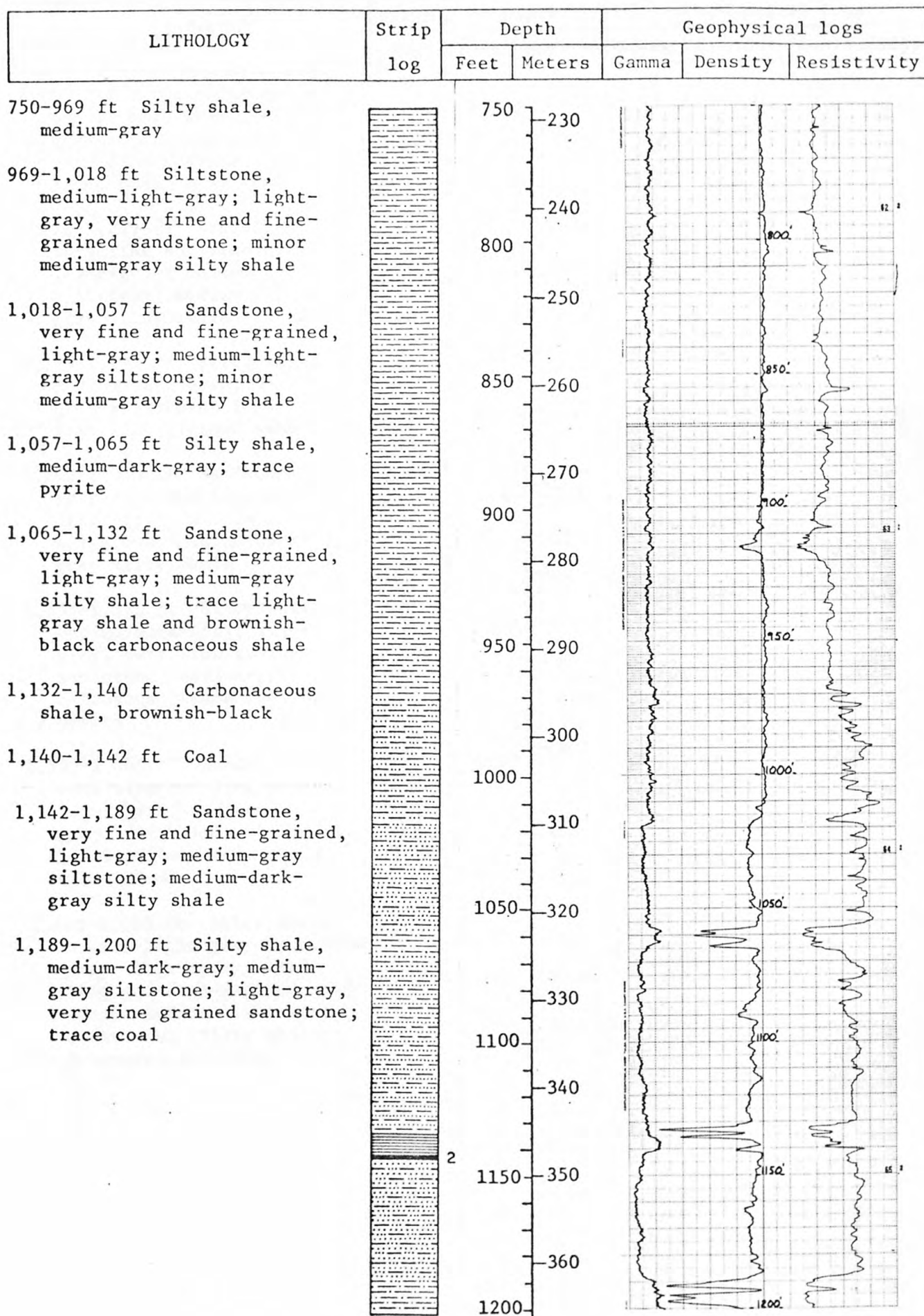
Spontaneous potential: Scale _____ Logging speed _____ fpm
 Resistivity: Scale 50 Ω = 5 in Logging speed 20 fpm
 Gamma: T.C. 2 Scale 50 cps/in, full scale Logging speed 20 fpm
 Gamma dens.: T.C. 1 Scale 2.5 k cps/in, full scale Logging speed 20 fpm

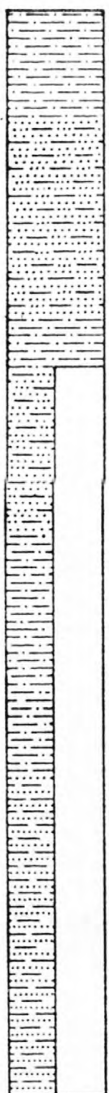
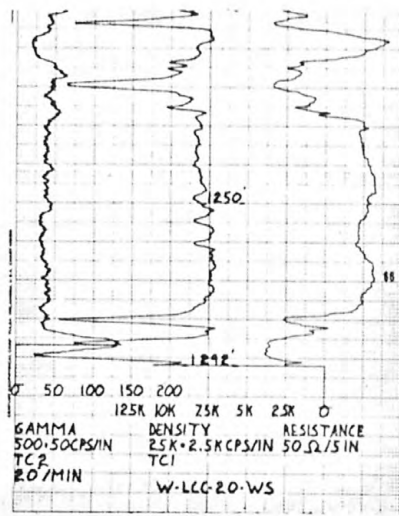


LITHOLOGY	Strip log	Depth		Geophysical logs		
		Feet	Meters	Gamma	Density	Resistivity

300-750 ft Silty shale,
medium-gray





LITHOLOGY	Strip log	Depth		Geophysical logs		
		Feet	Meters	Gamma	Density	Resistivity
1,200-1,228 ft Silty shale, medium-dark-gray; medium-gray siltstone; light-gray, very fine grained sandstone; trace coal		1200	370			
1,228-1,279 ft Sandstone, very fine and fine-grained, light-gray; medium-gray siltstone; medium-dark-gray silty shale		1250	380			
1,279-1,292 ft Silty shale, medium-dark-gray; medium-gray siltstone; light-gray, very fine grained sandstone		1300	390			
1,292-1,335 ft Sandstone, very fine and fine-grained, light-gray; medium-gray siltstone; medium-dark-gray silty shale		1350	410			
1,335-1,395 ft Silty shale, medium-dark-gray; light-gray, very fine grained sandstone; medium-gray siltstone; trace coal and pyrite		1400	420			
1,395-1,440 ft Sandstone, very fine and fine-grained, light-gray; medium-dark-gray silty shale; brownish-black carbonaceous shale; minor coal		1450	430			
1,440-1,480 ft Silty shale, medium-light-gray to medium-gray; light-gray, very fine and fine-grained sandstone; medium-light-gray siltstone. Silty shale increases downward		1500	450			

DRILL-HOLE LOGS

Hole no. 21-WS Date logged 7-6-77 Surface elevation (ft) 6,475
 Loc.: State Utah Cty. Sevier T. 24 S., R. 5E., Sec. 10; 2,590 FN L, 2,210 FE L
 Drilled depth (ft) 720 Logged depth (ft) 720 Water Level (ft) 189
 Drilling fluid: ☒ Air ☐ Water ☒ Foam ☐ Mud

Geophysical logs:

Spontaneous potential: Scale _____ Logging speed _____ fpm
 Resistivity: Scale 250 Ω = 5 in Logging speed 20 fpm
 Gamma: T.C. 2 Scale 25 cps/in, full scale Logging speed 20 fpm
 Gamma dens.: T.C. 1 Scale 5 k cps/in, full scale Logging speed 20 fpm

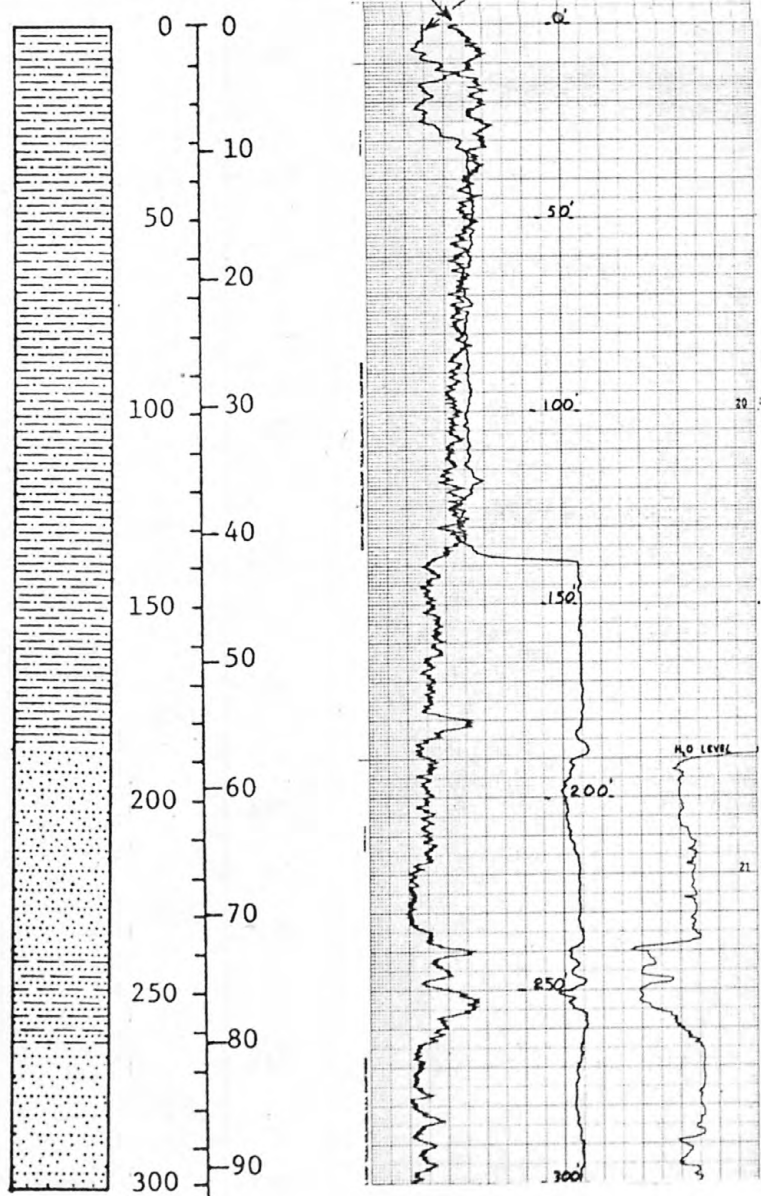
LITHOLOGY	Strip log	Depth		Geophysical logs		
		Feet	Meters	Gamma	Density	Resistivity

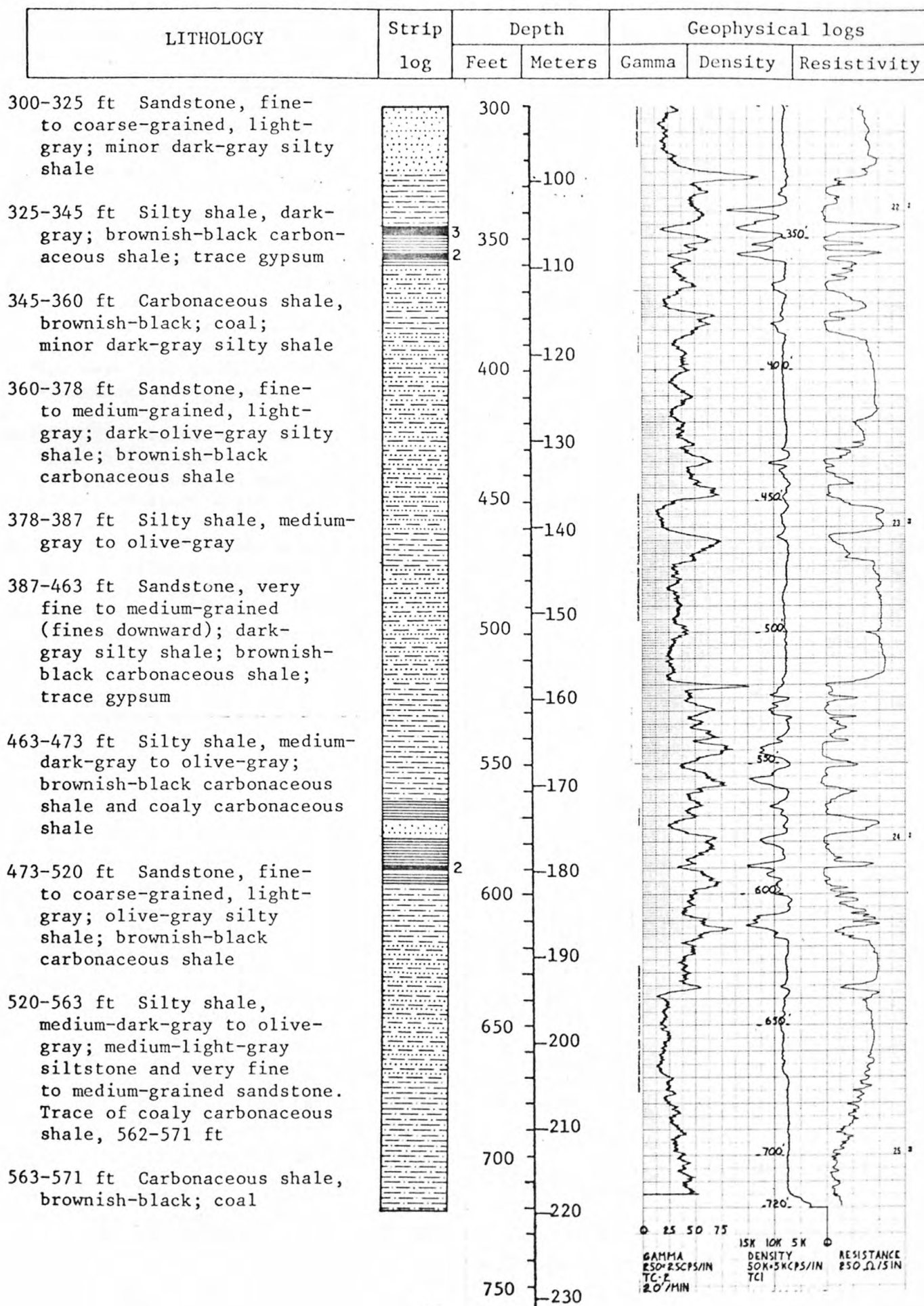
0-186 ft Silty shale, medium-gray to olive-gray; medium-gray siltstone; trace light-brown shale and gypsum

186-238 ft Sandstone, very fine and fine-grained, light-gray; minor dark-gray to brown-gray silty shale; trace coal

238-263 ft Silty shale, dark-gray; light-gray, very fine and fine-grained sandstone

263-300 ft Sandstone, fine-to medium-grained, light-gray; minor dark-gray silty shale and brownish-black carbonaceous shale





Hole no. 21-WS (continued)

LITHOLOGY	Strip log	Depth		Geophysical logs		
		Feet	Meters	Gamma	Density	Resistivity

571-577 ft Sandstone, very
fine to fine-grained, light-
gray; dark-gray shale and
silty shale

577-597 ft Carbonaceous shale,
brownish-black; coal; dark-
gray silty shale

597-617 ft Silty shale, medium-
dark-gray and pale-yellowish-
brown; light-gray siltstone
and very fine to fine-grained
sandstone; trace gypsum

617-670 ft Sandstone, very
fine to fine-grained, light-
gray; olive-gray to medium-
dark-gray silty shale

670-720 ft Silty shale, medium-
gray to olive-gray; minor
light-gray, very fine and
fine-grained sandstone.
Silty shale increases downward

DRILL-HOLE LOGS

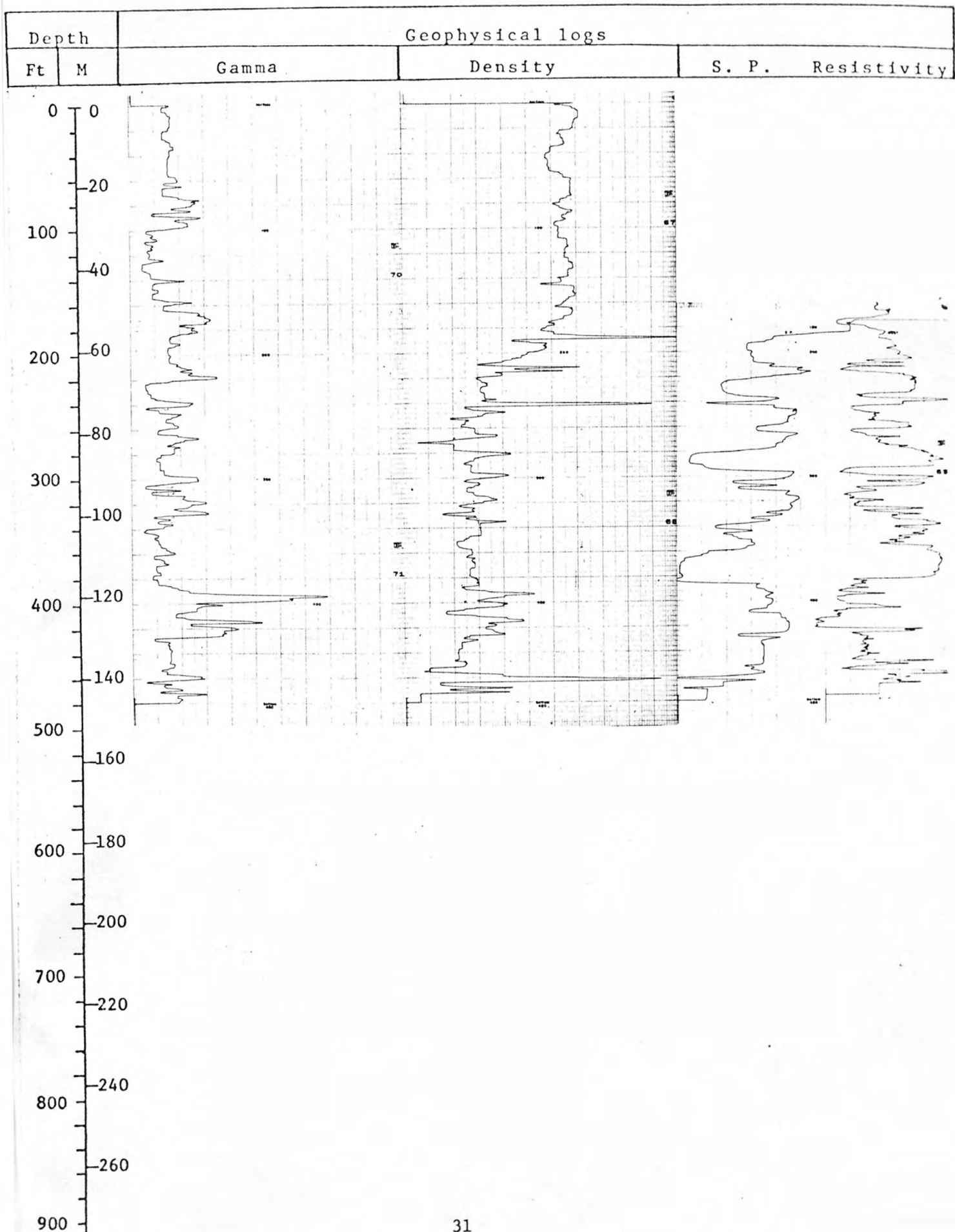
Hole no. 22-WS Date logged 6-30-77 Surface elevation (ft) 6,470
 Loc.: State Utah Cty. Sevier T. 24 S., R. 5 E., Sec. 1; 810 FS L, 160 FW L
 Drilled depth (ft) 480 Logged depth (ft) 480 Water level (ft) 185
 Drilling fluid: ☒ Air ☐ Water ☐ Foam ☐ Mud

Geophysical logs:

Spontaneous potential: Scale 250 mv = 5 in Logging speed 25 fpm
 Resistivity: Scale 50 Ω = 5 in Logging speed 25 fpm
 Gamma: T.C. 2 Scale 300 cps, full scale Logging speed 20 fpm
 Gamma dens.: T.C. 2 Scale 5 k cps, full scale Logging speed 20 fpm

LITHOLOGY	Strip log	Depth	
		Feet	Meters
0-5 ft Silt, pale-yellowish-brown		0	0
5-56 ft Siltstone, pale-yellowish-brown; pale-brownish-gray to olive-gray silty shale; minor light-gray, very fine grained sandstone; trace gypsum		20	
56-85 ft Sandstone, very fine to fine- grained, light-gray; medium-dark-gray silty shale		40	
85-90 ft Carbonaceous shale, brownish- black; coal		60	
90-165 ft Sandstone, very fine to fine- grained, light-gray; light-gray silt- stone; minor brownish-gray to medium- gray silty shale. Brownish-black carbonaceous shale and coal at about 135 and 165 ft		80	
165-184 ft Silty shale, medium-gray; light-gray, very fine grained sand- stone and siltstone		100	
184-210 ft Sandstone, very fine to fine- grained, light-gray; medium-dark-gray silty shale; light-gray siltstone; dark-brownish-gray carbonaceous shale; trace coal		120	
210-220 ft Silty shale, medium-gray; brownish-gray carbonaceous shale; dark- brown coal		140	
220-235 ft Sandstone, very fine grained, light-gray; dark-brownish-gray silty shale		160	
		180	

LITHOLOGY	Strip log	Depth	
		Feet	Meters
235-255 ft Silty shale, brownish-gray; brownish-black carbonaceous shale; coal			
255-265 ft Sandstone, very fine to fine- grained, light-gray; light-brownish- gray siltstone			
265-280 ft Silty shale, medium-gray; minor brownish-black carbonaceous shale			
280-296 ft Sandstone, very fine to fine- grained, light-gray			
296-360 ft Silty shale, dark-gray; light- gray, fine-grained sandstone; brownish- black carbonaceous shale; coal			
360-386 ft Sandstone, fine-grained, light- gray; medium-dark-gray to brownish- gray silty shale; brownish-black car- bonaceous shale; minor coal. Sandstone decreases downward			
386-480 ft Silty shale, dark-gray; minor light-gray, very fine grained sandstone and siltstone			





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