

UNITED STATES DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY

LITHOLOGIC AND GEOPHYSICAL LOGS OF 24 COAL TEST HOLES DRILLED  
DURING 1977 IN THE CARBON BASIN, CARBON COUNTY, WYOMING

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

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INTRODUCTION

Twenty-four coal test holes were drilled between October 4, 1977, and November 13, 1977, in Tps. 20, 21, and 22 N., R. 80 W., Carbon, Elk Mountain, and Halfway Hill quadrangles, Carbon County, Wyo. The purpose of the drilling was to evaluate the thickness and lateral extent of the federally owned coal of the Tertiary Hanna Formation in the Carbon Basin coal field. The Federal lands investigated were deemed suitable for potential coal leasing in the near future.

Drill-hole locations were selected and drilling was supervised by U.S. Geological Survey personnel. Drilling was done by McCabe Bros. Drilling Inc.-Hugh M. Harris Drilling Co. of Idaho Falls, Idaho, under U.S. Geological Survey contract number 14-08-0001-17110. Drill-hole locations are shown on figure 1, and a summary of drill-hole locations and depths is given in table 1.

All holes were drilled by truck-mounted rotary drilling rigs using 4-3/4- to 5-1/8-in. tricone rock bits and three-way blade bits. Drilling fluids used were air, water, air-water-biodegradable foam, and mud. Upon completion, all holes were cemented from bottom to top, reclaimed and reseeded with native grasses.

Geophysical logging of all drill holes was done by Rocky Mountain Logging Service of Casper, Wyoming, or Digilog, Inc. of Broomfield,

Colorado. Geophysical logging included natural gamma, spontaneous-potential, gamma-gamma (density), and resistivity. All geophysical logs were produced with a single sonde. Geophysical logs were photographically reduced to a vertical scale of 1 in. to 50 ft and a horizontal scale of 1 in. to 5 in. The reduced scale is shown near the top of all geophysical logs. All measurements are in feet; to convert to meters, multiply by 0.3048.

Problems encountered during drilling were minimal, except on holes drilled near the west flank of the basin. Drill-holes CB-2-C, CB-3-C, and CB-3C-C were abandoned after drill-hole circulation was lost and could not be restored.

Lithologic interpretations were made by a field examination of drill-hole cuttings at 5-ft intervals and were corrected by a comparison to the geophysical logs. Only very general lithologic descriptions were made, and lithologic descriptions should be considered as an interpretation.



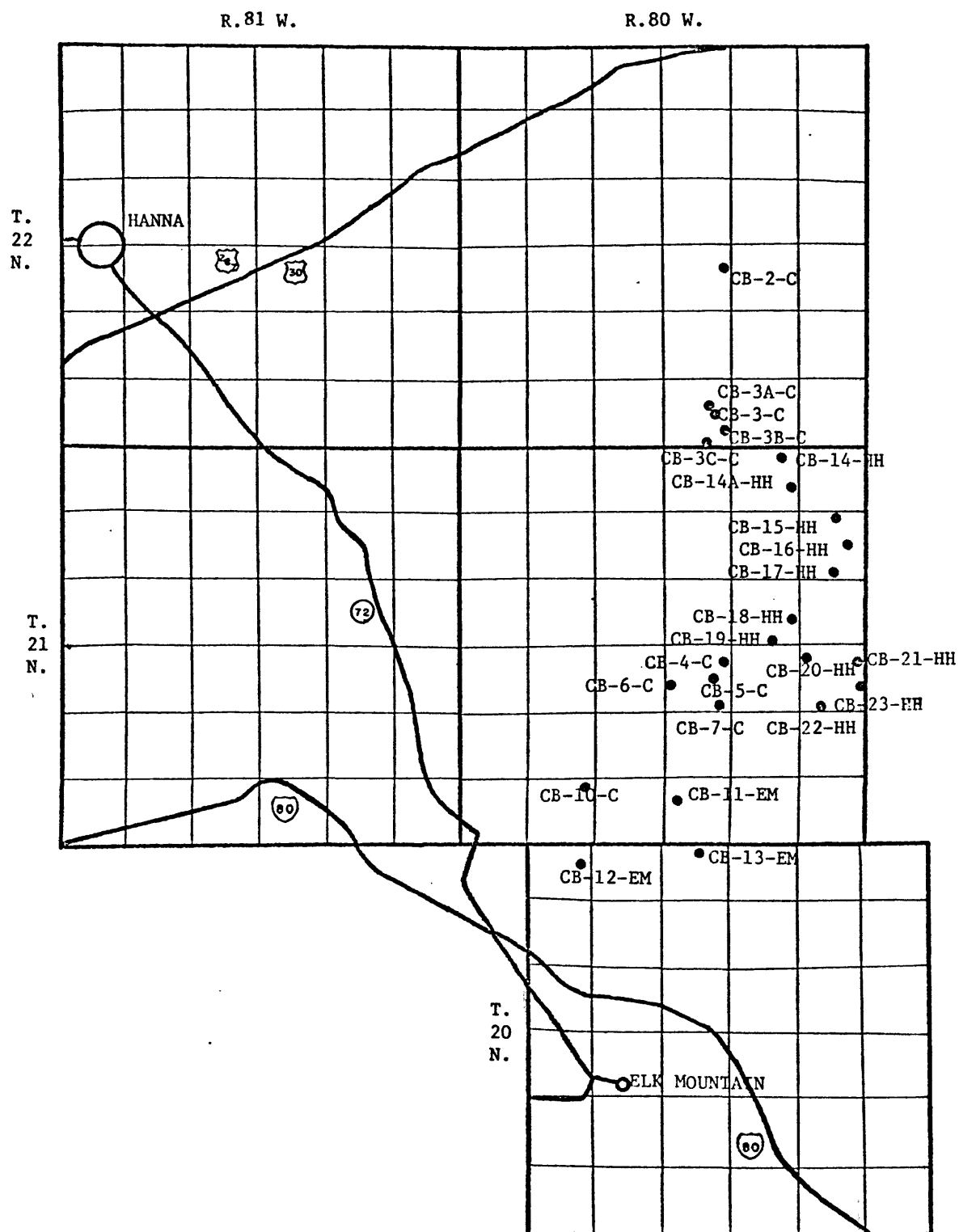


Figure 1.--Map showing drill-hole locations in the Carbon Basin, Wyoming.

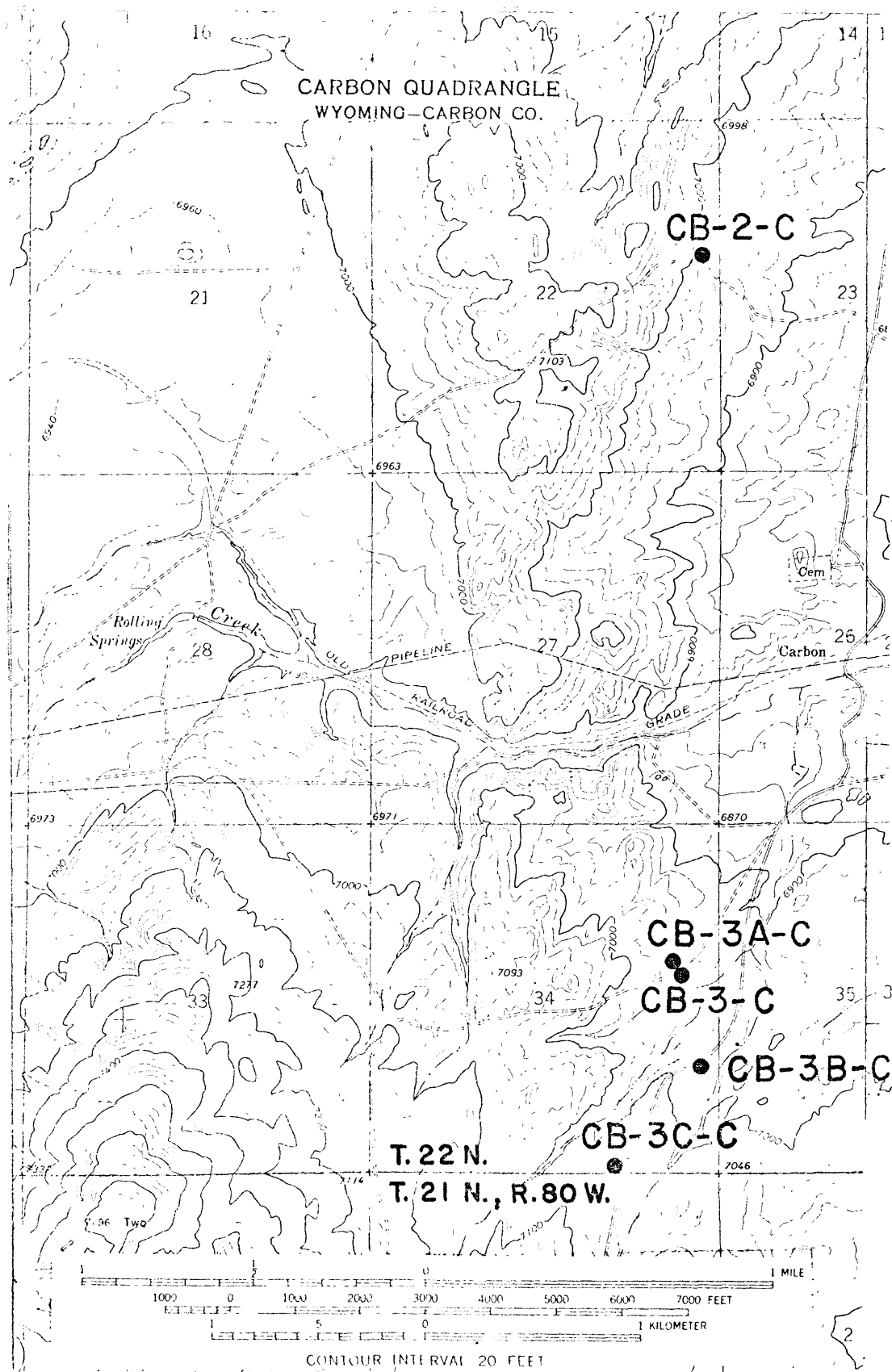


Figure 2.--Map showing drill-hole locations in the Carbon quadrangle, Wyoming.

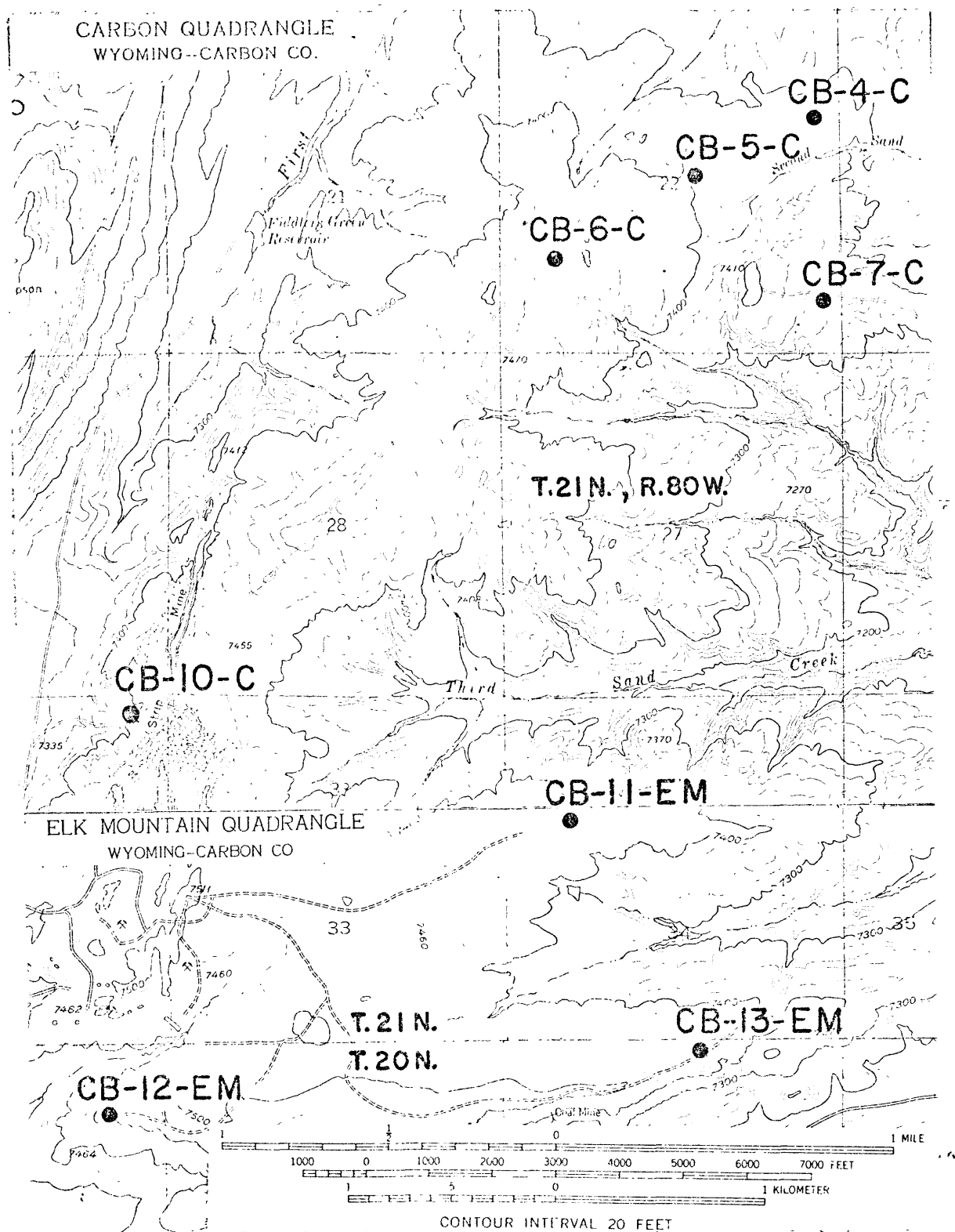


Figure 3.--Map showing drill-hole locations in the Carbon and Elk Mountain quadrangles, Wyoming.

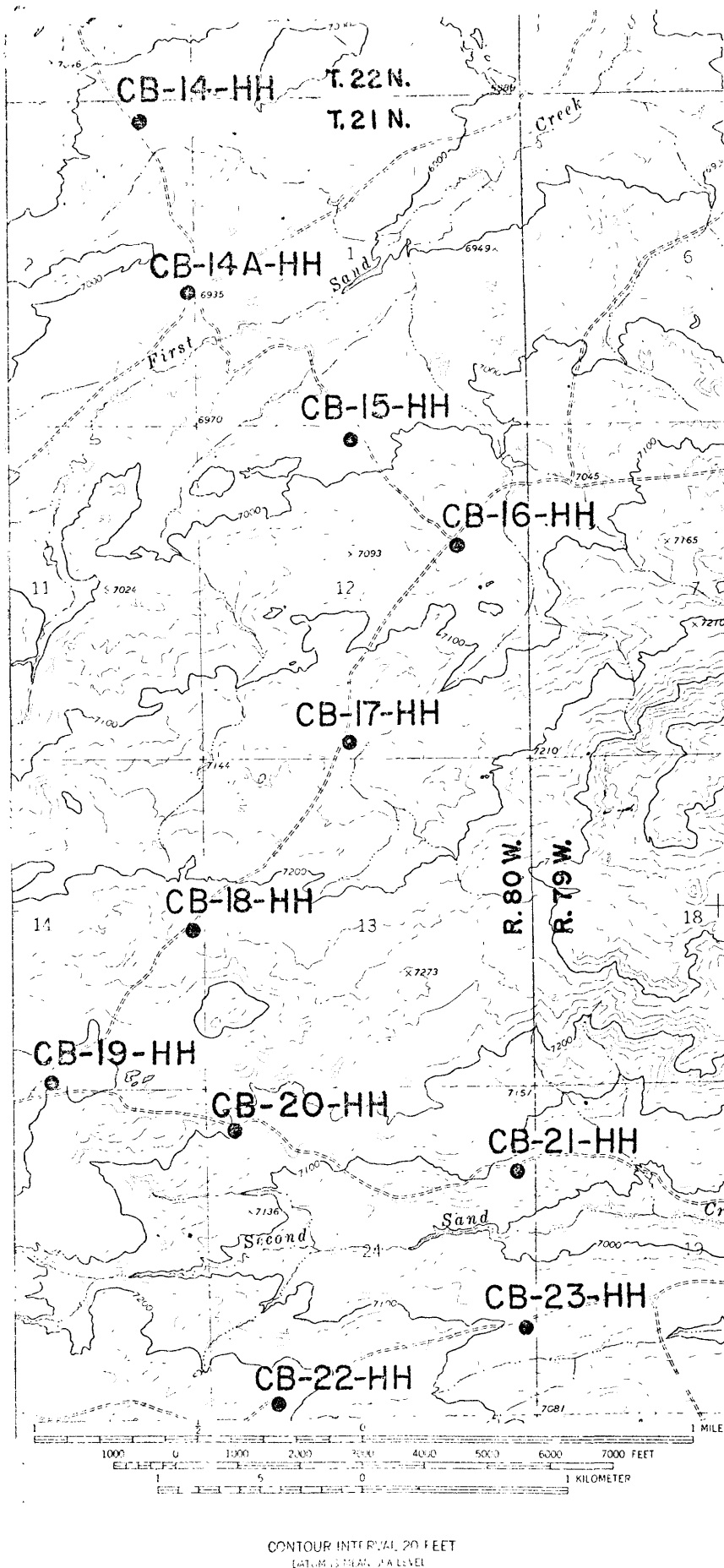


Figure 4.--Map showing drill-hole locations in the Halfway Hill quadrangle, Wyoming.

Table 1.--Summary of information for 24 drill holes in the Carbon Basin coal field, Carbon County, Wyoming

Drill-hole No.	Location	Drilled depth (feet)	Logged depth (feet)
Carbon quadrangle			
CB-2-C*	NE $\frac{1}{4}$ sec. 22, T. 22 N., R. 80 W.	407	353
CB-3-C†	NE $\frac{1}{4}$ sec. 34, T. 22 N., R. 80 W.	367	356
CB-3A-C	NE $\frac{1}{4}$ sec. 34, T. 22 N., R. 80 W.	660	640
CB-3B-C	SE $\frac{1}{4}$ sec. 34, T. 22 N., R. 80 W.	840	839
CB-3C-C§	SE $\frac{1}{4}$ sec. 34, T. 22 N., R. 80 W.	390	388
CB-4-C	NE $\frac{1}{4}$ sec. 22, T. 21 N., R. 80 W.	826	825
CB-5-C	NE $\frac{1}{4}$ sec. 22, T. 21 N., R. 80 W.	906	906
CB-6-C	SW $\frac{1}{4}$ sec. 22, T. 21 N., R. 80 W.	720	720
CB-7-C	SE $\frac{1}{4}$ sec. 22, T. 21 N., R. 80 W.	884	884
CB-10-C	NE $\frac{1}{4}$ sec. 32, T. 21 N., R. 80 W.	426	420
Elk Mountain quadrangle			
CB-11-EM	NW $\frac{1}{4}$ sec. 34, T. 21 N., R. 80 W.	561	561
CB-12-EM	NE $\frac{1}{4}$ sec. 6, T. 20 N., R. 80 W.	221	221
CB-13-EM	NE $\frac{1}{4}$ sec. 4, T. 20 N., R. 80 W.	300	280
Halfway Hill quadrangle			
CB-14-HH	NE $\frac{1}{4}$ sec. 2, T. 21 N., R. 80 W.	816	816
CB-14A-HH	SE $\frac{1}{4}$ sec. 2, T. 21 N., R. 80 W.	943	943
CB-15-HH	NW $\frac{1}{4}$ sec. 12, T. 21 N., R. 80 W.	1,506	1,502
CB-16-HH	NE $\frac{1}{4}$ sec. 12, T. 21 N., R. 80 W.	1,612	1,612
CB-17-HH	SW $\frac{1}{4}$ sec. 12, T. 21 N., R. 80 W.	1,610	1,608
CB-18-HH	SE $\frac{1}{4}$ sec. 14, T. 21 N., R. 80 W.	1,030	1,027
CB-19-HH	SE $\frac{1}{4}$ sec. 14, T. 21 N., R. 80 W.	966	966
CB-20-HH	NW $\frac{1}{4}$ sec. 24, T. 21 N., R. 80 W.	1,006	1,006
CB-21-HH	NE $\frac{1}{4}$ sec. 24, T. 21 N., R. 80 W.	1,405	1,405
CB-22-HH	SW $\frac{1}{4}$ sec. 24, T. 21 N., R. 80 W.	1,780	1,780
CB-23-HH	SE $\frac{1}{4}$ sec. 24, T. 21 N., R. 80 W.	965	963

\*Circulation lost at 405 ft; hole abandoned at 407 ft

†Circulation lost at 320 ft; hole abandoned at 367 ft

§Circulation lost at 360 ft; hole abandoned at 390 ft

## LITHOLOGIC AND GEOPHYSICAL LOGS

Hole no. CB-2-C Date logged 10-5-77 Surface elevation (ft) 6981  
 Loc.: State Wyo. Cty. Carbon T. 22N., R. 80W., Sec. 22; 2,000 FNL, 250 FEL  
 Drilled depth (ft) 407 Logged depth (ft) 353 Water Level (ft) \_\_\_\_\_  
 Drilling fluid: ☒ Air ☒ Water ☐ Foam ☒ Mud

Geophysical logs:

Spontaneous potential: Scale 10 mv/in Logging speed 20 fpm  
 Resistivity: Scale 25 ohm/in Logging speed 20 fpm  
 Gamma: T.C. 1 Scale 25 cps/in Logging speed 20 fpm  
 Gamma dens.: T.C. 1 Scale 10K cps/in Logging speed 20 fpm

LITHOLOGY		Strip log	Geophysical Logs				Depth	
			Gamma	S.P.	Res.	Density	ft.	m.
0-150	Sandstone, yellow-brown, fine- to coarse-grained, conglom- eratic. Minor shale beds						0	0
150-165	Siltstone, dark-gray						10	
165-215	Sandstone, yellow-brown to white- brown, fine- to medium-grained. Minor siltstone						50	
215-405	Sandstone, medium-gray to bluish- gray, fine- to medium-grained. Trace of coal at 315 to 325 ft. Water at 375 ft. Circulation was lost at 405 ft and the hole was abandoned. The hole caved at 353 ft and was logged to that depth						200	

Hole No.

CB-2-C

(continued)

LITHOLOGY	Strip log	Geophysical Logs				Depth	
		Gamma	S.P.	Res.	Density	ft.	m.
						300	
						350	
		<b>Rocky Mountain Logging Service</b> CARBON, WYOMING      HARRIS      HOLE NO. CB-2-C LOCATION CARBON STATE WYO      PROBE TYPE 201-COAL COUNTY CARBON STATE WYO      SERIAL SCALE 25 CPS/IN H.P. 6981      K FACTOR N/A DATE 22      TIME 22 N      HRS 80 W      DEAD TIME N/A TIME 1:30      HRS 50      TIME CONSTANT 1 PROBE DIA. 1 1/2 CALIBER DIRECTIONAL SURV DIGITAL OTHER OPERATOR VINT. 188 DRILLER BULLARD CONTRACTOR HARRIS FLUID LEVEL 85' TYPE SEAL PLUG N/A LAST 4.0 FT RUN 1ST RUN      2ND RUN      3RD RUN TOTAL FEET SCALE					

# DRILL-HOLE LOGS

Hole no. CB-3-C Date logged 10-6-77 Surface elevation (ft) 6,945  
 Loc.: State Wyo. Cty. Carbon T. 22N., R. 80W., Sec. 34; 2,300 FNL, 550 FEL  
 Drilled depth (ft) 367 Logged depth (ft) 356 Water Level (ft) \_\_\_\_\_  
 Drilling fluid: ☒ Air ☒ Water ☐ Foam ☒ Mud

## Geophysical logs:

Spontaneous potential: Scale 10 mv/in Logging speed 20 fpm  
 Resistivity: Scale 25 ohm/in Logging speed 20 fpm  
 Gamma: T.C. 1 Scale 25 cps/in Logging speed 20 fpm  
 Gamma dens.: T.C. 1 Scale 10K cps/in Logging speed 20 fpm

LITHOLOGY		Strip log	Geophysical Logs				Depth	
			Gamma	S.P.	Res.	Density	ft.	m.
0-25	Sandstone, yellow-brown, fine- to medium-grained, conglomer- eratic. Minor gray shale						0	0
25-32	Claystone, gray, sandy and silty						10	
32-65	Sandstone, yellow-brown, fine- to coarse-grained, slightly conglomeratic						50	
65-121	Sandstone, bluish-gray, medium- grained						20	
121-125.6	Shale, carbonaceous, dark- brown							
125.6-126.2	Coal						100	30
126.2-141	Shale, sandstone, and siltstone, interbedded. Shale is black- ish gray and carbonaceous. Sandstone is gray and fine grained. Siltstone is dark gray						40	
141-186.5	Sandstone, gray, fine- to medium-grained, silty						150	
186.5-188	Coal						50	
188-192.5	Shale, carbonaceous, blackish- brown, silty							
192.5-193.2	Coal						200	60
193.2-199	Siltstone, dark-gray, sandy							
199-209	Sandstone, light- to dark-gray, fine- to medium-grained, thin carbonaceous stringers						70	
209-227	Claystone, gray, silty							
227-231	Shale, carbonaceous, dark- gray, coaly						250	
231-236	Sandstone, light-gray, fine- grained						80	
236-240	Shale, carbonaceous, dark-gray, coaly						90	



LITHOLOGY		Strip Log	Geophysical Logs				Depth	
			Gamma	S.P.	Res.	Density	ft.	m.
240-240.7	Coal						300	
240.7-259.5	Claystone, medium-gray, coaly							
259.5-260.5	Coal							
260.5-281	Claystone and siltstone, interbedded. Claystone is dark gray and silty. Siltstone is dark gray and clayey							
281-356	Sandstone, light-gray, fine-grained, silty and clayey. Minor dark-gray claystone. Water at 318 ft. Circulation lost at 320 ft. Hole was drilled from 320 to 360 ft with no sample return. Hole abandoned at 365 ft							

Hole no. CB-3A-C Date logged 10-19-77 Surface elevation (ft) 6,943  
 Loc.: State Wyo. Cty. Carbon T. 22N., R. 80W., Sec. 34; 2,100 FN-L, 700 FE-L  
 Drilled depth (ft) 660 Logged depth (ft) 640 Water Level (ft) \_\_\_\_\_  
 Drilling fluid: ☐ Air ☒ Water ☐ Foam ☒ Mud

Geophysical logs:

Spontaneous potential: Scale 10 mv/in Logging speed 20 fpm  
 Resistivity: Scale 25 ohm/in Logging speed 20 fpm  
 Gamma: T.C. 1 Scale 25 cps/in Logging speed 20 fpm  
 Gamma dens.: T.C. 1 Scale 5K cps/in Logging speed 20 fpm

LITHOLOGY		Strip log	Geophysical Logs				Depth	
			Gamma	S.P.	Res.	Density	ft.	m
0-49	Sandstone, yellow-brown, fine- to medium-grained, clayey from 0 to 25 ft						0	0
49-62	Siltstone and shale. Siltstone is medium gray and sandy. Shale is gray and clayey						10	
62-97	Sandstone, medium-gray, very fine grained, silty						50	
97-113	Claystone and shale. Claystone is medium gray and silty. Shale is dark gray, silty and clayey						20	
113-166	Sandstone, light- to medium- gray, very fine grained to fine-grained, and some medium- grained, silty						100	30
166-169	Claystone, medium-gray, silty						40	
169-172	Sandstone, medium-gray, medium- grained						150	
172-174	Coal						50	
174-175	Sandstone							
175-176.8	Shale, dark-gray, silty							
176.8-177.8	Coal							
177.8-182	Shale, medium-gray, clayey, silty						200	60
182-190	Sandstone, light-gray, very fine grained							
190-207	Claystone, greenish-gray, silty and sandy						70	
207-223	Sandstone and siltstone. Sandstone is light gray, very fine grained and silty. Siltstone is light gray						250	80
223-225	Shale, carbonaceous							
225-226	Coal							
226-226.9	Shale, carbonaceous						300	90

LITHOLOGY		Strip log	Geophysical Logs				Depth ft.
			Gamma	S.P.	Res.	Density	
226.9-228	Coal				300		300
228-243.2	Siltstone and shale. Siltstone is light gray. Shale is brownish black, carbonaceous, and silty						1
243.2-244.8	Coal				350		350
244.8-248	Shale, carbonaceous						1
248-260	Claystone, medium-gray, silty and sandy						1
260-280	Shale, medium-gray, clayey and silty						1
280-430	Sandstone, whitish-gray to light-gray, medium- to coarse-grained. Minor siltstone and shale				400		400
430-452	Claystone, medium-gray, sandy. Minor coal and carbonaceous shale						1
452-462	Siltstone, light- to medium-gray, clayey				450		450
462-538	Sandstone, light-gray, fine- to medium-grained						1
538-556.1	Claystone, medium-gray, very sandy and silty						1
556.1-556.8	Coal				500		500
556.8-570	Claystone, medium-gray, very sandy and silty						1
570-640	Sandstone, medium-gray, silty and clayey				550		550
					600		600
					640		640
							650

**Rocky Mountain Logging Service**  
Casper, Wyoming

LOCATION: CARBON BLANK WYO.  
CO. 24 22N 20W  
TWP. 22N 20W 22E  
SEAL DEPTH 660  
HOLE DEPTH 660  
HOLE DIAMETER 2 1/2  
HOLE POTENTIAL 18.000  
WATER FACTOR 0  
FLUID LEVEL None  
TYPE WELL Oil  
DATE 10-1-51  
LOGGED BY H. H. H.  
CHECKED BY H. H. H.  
TOTAL FEET 660  
SCALE

Hole no. CB-3B-C Date logged 11-10-77 Surface elevation (ft) 6,980  
 Loc.: State Wyo. Cty. Carbon T. 22N., R. 80W., Sec. 34; 1,600 FSL, 300 FE  
 Drilled depth (ft) 840 Logged depth (ft) 839 Water Level (ft) \_\_\_\_\_  
 Drilling fluid: ☐ Air ☒ Water ☐ Foam ☒ Mud

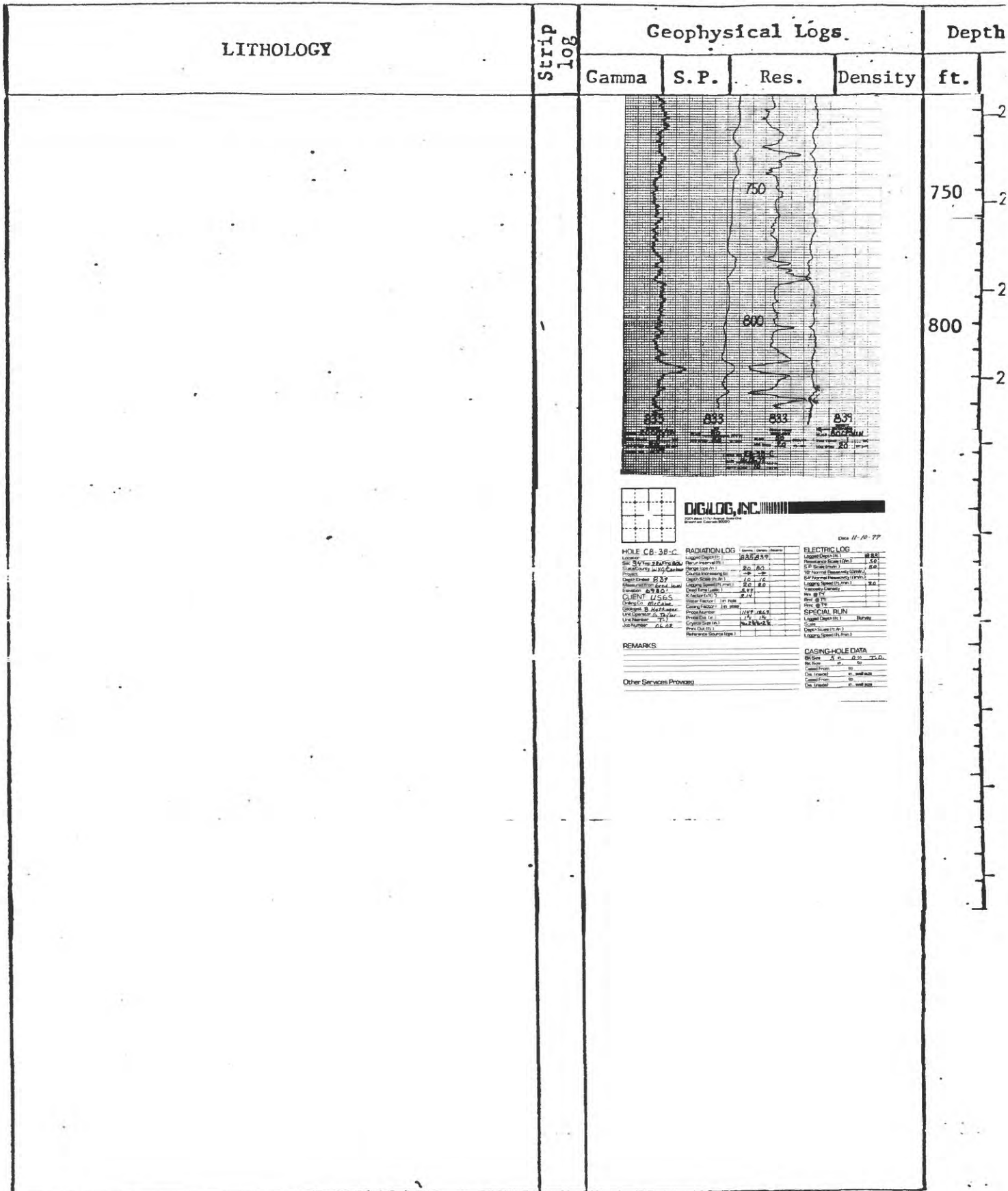
Geophysical logs:

Spontaneous potential: Scale 50 mv/in Logging speed 20 fp  
 Resistivity: Scale 50 ohm/in Logging speed 20 fp  
 Gamma: T.C. 2 Scale 20 cps/in Logging speed 20 fp  
 Gamma dens.: T.C. 1 Scale 80 cps/in Logging speed 20 fp

LITHOLOGY		Strip log	Geophysical Logs				Depth	
			Gamma	S.P.	Res.	Density	ft.	
0-60	Sandstone, yellow-brown, medium- to coarse-grained						0	0
60-107	Sandstone, whitish-gray, medium- grained							1
107-119	Siltstone, whitish-gray, sandy							
119-137	Sandstone, light-gray, fine- to medium-grained						50	
137-138	Coal							2
138-145.4	Shale, carbonaceous, coaly							
145.4-146.4	Coal							
146.4-160	Claystone, dark-gray, silty							
160-201	Sandstone, light-gray, fine- to medium-grained						100	3
201-202	Shale, carbonaceous							
202-204.5	Coal							
204.5-208.8	Shale, carbonaceous, dark-gray, coaly							4
208.8-209.8	Coal							
209.8-266	Claystone, sandstone, and silt- stone, interbedded. Claystone is dark to medium gray and silty. Sandstone is medium gray, fine grained, and silty. Siltstone is gray and clayey to sandy						150	5
266-267	Coal							
267-267.5	Shale, carbonaceous							
267.5-269	Coal							7
269-287.8	Shale, claystone, and siltstone, interbedded. Shale is dark brown, carbonaceous, and coaly. Claystone is medium gray, silty, and sandy. Siltstone is gray and clayey						200	6
							250	8
							300	9



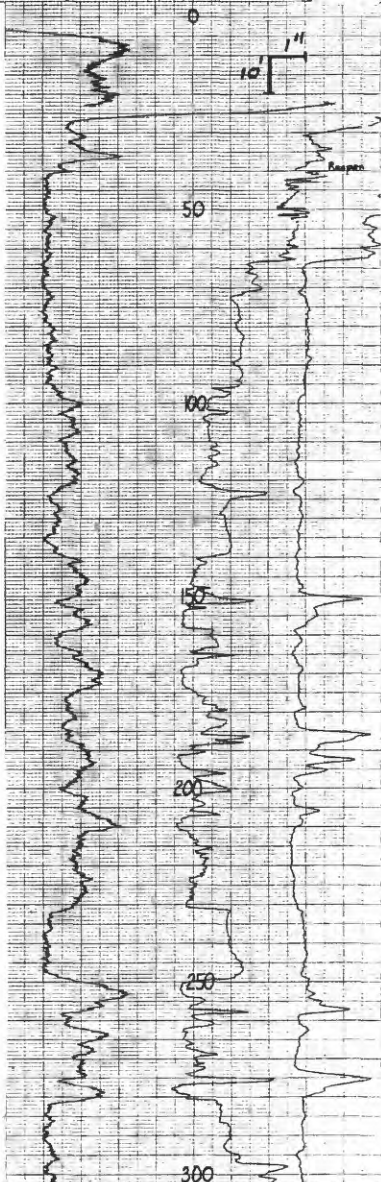
LITHOLOGY		Strip log	Geophysical Logs				Depth	
			Gamma	S. P.	Res.	Density	ft.	m
287.8-289	Coal							
289-323	Claystone, medium-gray, silty and shaly. Minor siltstone							10
323-337	Sandstone, light-gray, fine-grained							
337-354	Claystone, medium-gray, silty				350		350	
354-430	Sandstone, whitish-gray, fine- to medium-grained, occasional coarse-grained lenses							11
430-468	Siltstone and sandstone, interbedded. Siltstone is light gray and sandy. Sandstone is light gray and medium grained				400		400	12
468-545	Sandstone, light-gray, medium-grained							13
545-547	Shale, carbonaceous							
547-547.8	Coal				450		450	
547.8-557	Shale, carbonaceous, and siltstone							14
557-559	Coal with 0.5 ft carbonaceous shale parting							
559-576	Siltstone and carbonaceous shale				500		500	15
576-577	Coal							
577- 593	Claystone, gray, silty. Minor siltstone							16
593-839	Sandstone, light-gray, medium- to coarse-grained. Minor thin gray shale beds				550		550	17
								18
					600		600	19
								20
					650		650	21
					700		700	



Hole no. CB-3C-C Date logged 11-12-77 Surface elevation (ft) 7,040  
 Loc.: State Wyo. Cty. Carbon T. 22N., R. 80W., Sec. 34; 100 FS L, 1,600 FE 1  
 Drilled depth (ft) 390 Logged depth (ft) 388 Water Level (ft)             
 Drilling fluid: ☒ Air ☒ Water ☐ Foam ☒ Mud

Geophysical logs:

Spontaneous potential: Scale 50 mv/in Logging speed 20 fpr  
 Resistivity: Scale 50 ohm/in Logging speed 20 fpr  
 Gamma: T.C. 2 Scale 20 cps/in Logging speed 20 fpr  
 Gamma dens.: T.C. 1 Scale 80 cps/in Logging speed 20 fpr

LITHOLOGY		Strip log	Geophysical Logs				Depth	
			Gamma	S.P.	Res.	Density	ft.	
0-100	Sandstone, yellow-brown, fine-grained, silty from 0 to 15 ft						0	0
100-105	Sandstone, light- to medium-gray, very silty, dark-brown carbonaceous stringers						1	
105-140	Siltstone, light-gray, sandy, very fine sand						50	
140-150.4	Claystone, light-gray, coaly						2	
150.4-152	Coal							
152-152.8	Claystone, gray, carbonaceous							
152.8-153.2	Coal							
153.2-159	Claystone, light-gray						100	3
159-186	Siltstone, dark-gray, shaly. Minor gray silty claystone and brownish-black carbonaceous shale. Water at 180 ft							4
186-187	Coal						150	
187-187.5	Shale, carbonaceous							
187.5-188.2	Coal						50	
188.2-195	Shale, carbonaceous							
195-231	Siltstone, medium- to dark-gray, clayey and sandy							
231-250	Sandstone, medium-grained, fine-grained						200	6
250-257.2	Claystone and shale, interbedded. Claystone is medium gray. Shale is brownish black, carbonaceous, and coaly							7
257.2-258.2	Coal						250	
258.2-275	Sandstone, claystone, and siltstone, thinly interbedded							8
275-276.4	Coal						300	9

Hole No. CB-3C-C (continued)

LITHOLOGY		Strip log	Geophysical Logs				Depth ft.
			Gamma	S.P.	Res.	Density	
276.4-280	Shale, brownish-black, silty, and carbonaceous						
280-388	Sandstone, light-gray, medium-grained. Water at 300 ft						

**HOLE C-8-SC-C**

Location: ...

Depth: ...

Client: ...

Remarks: ...

**RADIATION LOG**

Gamma: ...

S.P.: ...

Res.: ...

Density: ...



Hole no. CB-4-C Date logged 10-29-77 Surface elevation (ft) 7,325  
 Loc.: State Wyo. Cty. Carbon T. 21N., R. 80W., Sec. 22; 1,650 FNL, 400 FE  
 Drilled depth (ft) 826 Logged depth (ft) 825 Water Level (ft) \_\_\_\_\_  
 Drilling fluid: ☒ Air ☒ Water ☒ Foam ☒ Mud

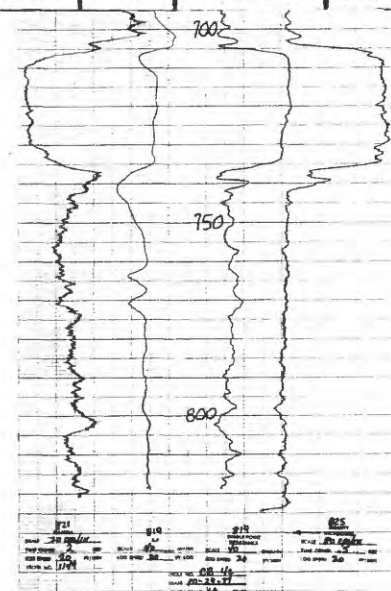
Geophysical logs:

Spontaneous potential: Scale 40 mv/in Logging speed 20 fp  
 Resistivity: Scale 40 ohm/in Logging speed 20 fp  
 Gamma: T.C. 2 Scale 20 cps/in Logging speed 20 fp  
 Gamma dens.: T.C. 0.5 Scale 80 cps/in Logging speed 20 fp

LITHOLOGY		Strip log	Geophysical Logs				Depth	
			Gamma	S.P.	Res.	Density	ft.	
0-73	Sandstone, yellow-brown to gray-brown, fine- to coarse-grained						0	0
73-81	Shale, brownish-gray, clayey							
81-82	Coal							
82-89	Shale, brownish-gray, carbonaceous						50	
89-90	Coal							
90-91	Shale, carbonaceous							
91-131	Sandstone, brownish-gray to light-gray, fine-grained, silty						100	
131-154	Siltstone, medium-gray, shaly, sandy							
154-200	Sandstone, whitish-gray, very fine grained to fine-grained							
200-209.2	Shale, brownish-gray, carbonaceous, coaly						150	
209.2-210.2	Coal							
210.2-225	Shale, brownish-gray, carbonaceous, coaly							
225-348	Sandstone, whitish-gray to medium-gray, very fine grained to fine-grained, silty. Minor thinly interbedded gray claystone						200	
							250	
							300	

LITHOLOGY	Strip log	Geophysical Logs				Depth ft.
		Gamma	S.P.	Res.	Density	
348-360.4 Shale, medium-gray, silty, slightly carbonaceous						
360.4-362 Coal						
362-373 Shale, grayish-brown, clayey, carbonaceous						
373-377 Coal						
377-388 Shale, sandstone, and carbonaceous shale, interbedded				350		350
388-403 Sandstone, light-gray, fine-grained						
403-410 Claystone, gray, shaly						
410-439 Sandstone, medium-gray, fine-grained				400		400
439-444 Shale, medium-gray to black						
444-483 Sandstone, medium-gray, fine-to medium-grained						
483-493 Shale, medium-gray to black, clayey				450		450
493-502 Sandstone, medium-gray, fine-grained						
502-523.2 Shale, grayish-black, clayey. Minor sandstone						
523.2-524.1 Coal						
524.1-525.2 Shale, carbonaceous				500		500
525.2-527 Coal						
527-527.8 Shale, carbonaceous						
527.8-529 Coal						
529-530 Shale, carbonaceous						
530-541 Coal, 2-foot parting at 537 feet						
541-543 Shale, carbonaceous				550		550
543-546.5 Coal						
546.5-547.2 Shale, carbonaceous						
547.2-550.5 Coal						
550.5-552.6 Shale, carbonaceous						
552.6-553.5 Coal						
553.5-558 Shale, carbonaceous				600		600
558-562.5 Coal						
562.5-581 Shale and sandstone, interbedded						
581-582.2 Coal						
582.2-583 Shale, carbonaceous						
583-591 Coal						
591-619 Siltstone, blackish-gray, shaly				650		650
619-621 Coal						
621-623 Shale, carbonaceous						
623-624 Coal						
624-626 Shale, carbonaceous						
626-626.8 Coal?						
626.8-627.6 Shale, carbonaceous						
627.6-628.2 Coal?						

LITHOLOGY		Strip log	Geophysical Logs				Depth ft.
			Gamma	S.P.	Res.	Density	
628.2-635	Claystone, blackish-gray, silty. Minor siltstone						700
635-661	Sandstone, yellow-brown, fine- grained						
661-663	Shale, carbonaceous						
663-665	Coal						
665-668.5	Shale, carbonaceous						750
668.5-669.2	Coal						
669.2-671	Shale, carbonaceous						
671-673	Coal						
673-675.2	Shale, carbonaceous						
675.2-676	Coal						
676-676.8	Shale, carbonaceous						800
676.8-679	Coal						
679-682	Shale, carbonaceous						
682-684	Coal						
684-684.8	Shale, carbonaceous						
684.8-687	Coal						
687-702.2	Carbonaceous shale, and silt- stone, interbedded						
702.2-704	Coal						
704-705	Shale, carbonaceous						
705-736	Coal						
736-739	Shale, carbonaceous						
739-741	Coal						
741-750	Shale, medium-gray, clayey						
750-825	Sandstone, light-gray, very fine grained, very silty, shaly						



DIGILOG, INC.

Date: 10-29-77

HOLE	CASING	LOG	ELECTRIC LOG
CB-4-C	2 1/2" ID	10' 10"	10' 10"
Location	Log Depth (ft.)	Log Depth (ft.)	Log Depth (ft.)
Site #	Log Depth (ft.)	Log Depth (ft.)	Log Depth (ft.)
State	Log Depth (ft.)	Log Depth (ft.)	Log Depth (ft.)
County	Log Depth (ft.)	Log Depth (ft.)	Log Depth (ft.)
Project	Log Depth (ft.)	Log Depth (ft.)	Log Depth (ft.)
Operator	Log Depth (ft.)	Log Depth (ft.)	Log Depth (ft.)
Client	Log Depth (ft.)	Log Depth (ft.)	Log Depth (ft.)
Log Date	Log Depth (ft.)	Log Depth (ft.)	Log Depth (ft.)
Log Time	Log Depth (ft.)	Log Depth (ft.)	Log Depth (ft.)
Log Operator	Log Depth (ft.)	Log Depth (ft.)	Log Depth (ft.)
Log Number	Log Depth (ft.)	Log Depth (ft.)	Log Depth (ft.)
Log Title	Log Depth (ft.)	Log Depth (ft.)	Log Depth (ft.)
Log Author	Log Depth (ft.)	Log Depth (ft.)	Log Depth (ft.)

REMARKS:

Other Services Provided:

CASING-HOLE DATA:

Hole no. CB-5-C Date logged 11-1-77 Surface elevation (ft) 7,400  
 Loc.: State Wyo. Cty. Carbon T. 21N., R. 80W., Sec. 22; 2,550 FNL, 2,250 FE 1  
 Drilled depth (ft) 906 Logged depth (ft) 906 Water Level (ft) \_\_\_\_\_  
 Drilling fluid: ☒ Air ☒ Water ☒ Foam ☒ Mud

Geophysical logs:

Spontaneous potential: Scale 40 mv/in Logging speed 20 fpr  
 Resistivity: Scale 40 ohm/in Logging speed 20 fpr  
 Gamma: T.C. 2 Scale 20 cps/in Logging speed 20 fpr  
 Gamma dens.: T.C. 1 Scale 80 cps/in Logging speed 20 fpr

LITHOLOGY		Strip log	Geophysical Logs				Depth	
			Gamma	S.P.	Res.	Density	ft.	
0-5	Sandstone, yellow-brown, fine- to medium-grained						0	0
5-17	Shale, dark-brown, carbonaceous clayey							1
17-18	Coal							
18-22.1	Shale, dark-brown, carbonaceous clayey						50	
22.1-23.2	Coal							2
23.2-30	Sandstone, light-gray, very fine grained							
30-34	Shale, carbonaceous							
34-35	Coal							
35-40	Shale, carbonaceous						100	3
40-50	Siltstone, light-gray, slightly sandy							
50-150	Sandstone, white, fine- to medium-grained							4
150-156	Shale, dark-brown, carbonaceous coaly						150	
156-157	Coal							5
157-172	Shale, dark-brown, carbonaceous coaly							
172-191	Sandstone, light-gray, fine- grained							
191-199	Sandstone, light-gray, very fine grained, very silty						200	6
199-205	Shale, dark-brown, carbonaceous coaly							
205-227	Sandstone, light-gray, fine- grained							7
227-243	Shale, black, clayey							
243-269	Sandstone, light- to medium- gray, fine- to medium-grained						250	8
269-277	Claystone, blackish-gray, shaly							



LITHOLOGY		Strip log	Geophysical Logs				Depth
			Gamma	S.P.	Res.	Density	ft.
277-291	Sandstone, medium-gray, fine- to medium-grained				300		300
291-300	Shale, gray, silty						
300-301	Coal						
301-311	Sandstone, medium-gray, fine- to medium-grained						
311-316	Shale, dark-brown, carbonaceous				350		350
316-320	Coal						
320-330	Shale, gray, silty. Minor interbedded silty sandstone						
330-440	Sandstone, light-gray, very fine grained to fine-grained				400		400
440-450	Shale, gray, silty						
450-488	Sandstone, light-gray, very fine grained, silty						
488-518	Shale, dark-gray, clayey. Minor coal						
518-521.8	Coal				450		450
521.8-522.2	Shale, carbonaceous						
522.2-535	Coal						
535-536.6	Shale, carbonaceous						
536.6-539.8	Coal						
539.8-540.4	Shale, carbonaceous						
540.4-544	Coal				500		500
544-544.5	Shale, carbonaceous						
544.5-545.5	Coal						
545.5-547.6	Shale, carbonaceous						
547.6-555	Coal						
555-575.6	Shale, dark-gray, clayey and silty				550		550
575.6-585.8	Coal						
585.8-598.4	Shale, dark-gray, clayey and silty. Minor interbedded sandstone						
598.4-599.6	Coal						
599.6-601.8	Shale, coaly				600		600
601.8-605	Shale						
605-606	Coal						
606-608.9	Shale						
608.9-609.6	Coal						
609.6-613.2	Shale						
613.2-614.8	Coal						
614.8-615.2	Shale				650		650
615.2-617	Coal						
617-618	Shale						
618-620.6	Coal						
620.6-622.4	Shale						
622.4-623.2	Coal						
623.2-624.8	Shale						

LITHOLOGY		Strip log	Geophysical Logs				Depth	
			Gamma	S.P.	Res.	Density	ft.	
624.8-628	Coal						700	
628-629.5	Shale							
629.5-631	Coal, shaly							
631-633	Shale							
633-634.2	Coal							
634.2-634.8	Shale							
634.8-635.5	Coal							
635.5-638	Shale							
638-672	Sandstone, white, very fine grained, silty. Minor clayey shale							750
672-680	Shale, gray, clayey							
680-681	Coal							
681-682	Shale							
682-713.8	Coal							800
713.8-722	Shale, dark-gray, clayey							
722-848	Sandstone and shale, interbedded. Sandstone is gray, fine grained and silty. Shale is dark gray, sandy and silty							850
848-906	Shale, black, very silty and very sandy							900

DIGLOG, INC.

200 West 17th Avenue, Suite 100  
Denver, Colorado 80202

DATE: 11-1-77

LOG: CA-5-C

LOGGERS: J. J. Smith, J. J. Smith  
SURVEILLANCE: J. J. Smith  
CORRECTION: J. J. Smith  
CHECKED: J. J. Smith  
REVIEWED: J. J. Smith  
APPROVED: J. J. Smith

LOG: CA-5-C

LOGGERS: J. J. Smith, J. J. Smith  
SURVEILLANCE: J. J. Smith  
CORRECTION: J. J. Smith  
CHECKED: J. J. Smith  
REVIEWED: J. J. Smith  
APPROVED: J. J. Smith

RADIATION LOG

LOGGERS: J. J. Smith, J. J. Smith  
SURVEILLANCE: J. J. Smith  
CORRECTION: J. J. Smith  
CHECKED: J. J. Smith  
REVIEWED: J. J. Smith  
APPROVED: J. J. Smith

ELECTRIC LOG

LOGGERS: J. J. Smith, J. J. Smith  
SURVEILLANCE: J. J. Smith  
CORRECTION: J. J. Smith  
CHECKED: J. J. Smith  
REVIEWED: J. J. Smith  
APPROVED: J. J. Smith

SPECIAL RUN

LOGGERS: J. J. Smith, J. J. Smith  
SURVEILLANCE: J. J. Smith  
CORRECTION: J. J. Smith  
CHECKED: J. J. Smith  
REVIEWED: J. J. Smith  
APPROVED: J. J. Smith

CASING-HOLE DATA

LOGGERS: J. J. Smith, J. J. Smith  
SURVEILLANCE: J. J. Smith  
CORRECTION: J. J. Smith  
CHECKED: J. J. Smith  
REVIEWED: J. J. Smith  
APPROVED: J. J. Smith

REMARKS:

Other Services Provided:



OGELOG, INC.

1100 West 11th Street, Tulsa, Oklahoma 74103

## HOLE: CB-5-C

Log Date: 11/1/77

Log Time: 10:00 AM

Log Depth: 906

Log Interval: 100

Log Scale: 1000

Log Unit: ft.

Log Type: Gamma

Log Source: 100

Log Error: 0.1

Log Note: 100

Log Remark: 100

Log Comment: 100

Log Footer: 100

Log Page: 100

Log Total: 100

Log End: 100

Log Done: 100

Log Print: 100

Log Copy: 100

Log Mail: 100

Log File: 100

Log Dir: 100

Log Sub: 100

Log Obj: 100

Log Typ: 100

Log Ver: 100

Log Rev: 100

Log Desc: 100

Log Code: 100

Log Unit: 100

Log Type: 100

Log Source: 100

Log Error: 100

Log Note: 100

Log Remark: 100

Log Comment: 100

Log Footer: 100

Log Page: 100

Log Total: 100

Log End: 100

Log Done: 100

Log Print: 100

Log Copy: 100

Log Mail: 100

Log File: 100

Log Dir: 100

Log Sub: 100

Log Obj: 100

Log Typ: 100

Log Ver: 100

Log Rev: 100

Log Desc: 100

Log Code: 100

Log Unit: 100

Log Type: 100

Log Source: 100

Log Error: 100

Log Note: 100

Log Remark: 100

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Log Mail: 100

Log File: 100

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Log Obj: 100

Log Typ: 100

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Log Code: 100

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Log Total: 100

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Log Print: 100

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Log Typ: 100

Log Ver: 100

Log Rev: 100

Log Desc: 100

Log Code: 100

Log Unit: 100

Log Type: 100

Log Source: 100

Log Error: 100

Log Note: 100

Hole no. CB-6-C Date logged 11-3-77 Surface elevation (ft) 7,478  
 Loc.: State Wyo. Cty. Carbon T. 21N., R. 80W., Sec. 22; 1,450 FSL, 850 FW 1  
 Drilled depth (ft) 720 Logged depth (ft) 720 Water Level (ft)         
 Drilling fluid: ☒ Air ☒ Water ☒ Foam ☒ Mud

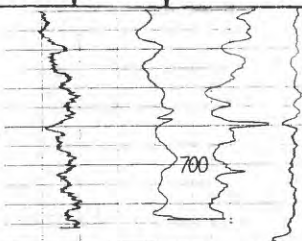

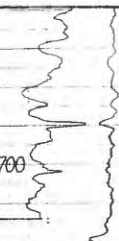



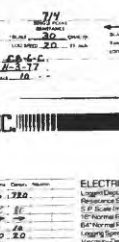



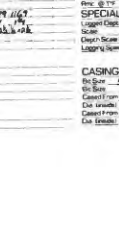
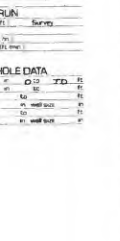
Geophysical logs:

Spontaneous potential: Scale 30 mv/in Logging speed 20 fpr  
 Resistivity: Scale 30 ohm/in Logging speed 20 fpr  
 Gamma: T.C. 2 Scale 20 cps/in Logging speed 20 fpr  
 Gamma dens.: T.C. 1 Scale 80 cps/in Logging speed 20 fpr

LITHOLOGY		Strip log	Geophysical Logs				Depth	
			Gamma	S. P.	Res.	Density	ft.	
0-28	Sandstone, yellow-brown, fine- to medium-grained, occasional thin carbonaceous stringers				0		0	0
28-36	Shale, gray, clayey							1
36-46	Sandstone, yellow-brown, fine- to medium-grained				50		50	
46-50	Shale, gray, clayey							
50-83	Sandstone, yellow-brown, medium-grained				100		100	3
83-156	Siltstone and shale, inter- bedded. Siltstone is light to dark gray, shaly, and slightly sandy. Shale is blackish gray, carbonaceous, and coaly							
156-166	Sandstone, light-gray, fine- grained, silty				150		150	5
166-183	Siltstone, light-gray, sandy							
183-190	Sandstone, light-gray, fine- grained, silty				200		200	6
190-218	Siltstone, light-gray, sandy							
218-241	Sandstone, light-gray, fine- grained							
241-247	Shale, carbonaceous							
247-248.4	Coal							
248.4-254	Sandstone, light-gray, fine- grained				250		250	8
254-258	Shale, carbonaceous							
258-261.8	Coal							
261.8-266	Shale, carbonaceous							
266-281	Sandstone, medium-gray, fine- grained. Minor siltstone							
281-310	Siltstone, medium-gray, shaly				300		300	9

LITHOLOGY		Strip log	Geophysical Logs				Depth	
			Gamma	S.P.	Res.	Density	ft.	m
310-410	Sandstone and siltstone, interbedded. Sandstone is medium gray, fine to medium grained and silty. Siltstone is gray and shaly							10
410-425	Siltstone, gray, clayey						350	11
425-435.2	Shale, black, clayey							
435.2-436.5	Coal							
436.5-452	Siltstone, medium-gray, shaly							
452-456.5	Shale, carbonaceous						400	12
456.5-459.8	Coal							
459.8-460.2	Shale, carbonaceous							
460.2-468.8	Coal							
468.8-469.4	Shale, carbonaceous							13
469.4-471.6	Coal							
471.6-473.5	Shale, carbonaceous						450	14
473.5-476	Coal							
476-477	Shale, carbonaceous							
477-481.5	Coal							
481.5-483.5	Shale, carbonaceous							
483.5-489	Coal							
489-494	Claystone, dark-gray, silty, carbonaceous						500	15
494-497	Siltstone, gray							
497-498	Shale, carbonaceous							
498-507.5	Coal							16
507.5-509	Shale, carbonaceous							
509-511	Coal							
511-512	Shale, carbonaceous						550	17
512-513	Coal							
513-514.8	Shale, carbonaceous							
514.8-516.5	Coal							
516.5-518	Shale, carbonaceous							
518-518.5	Coal						600	18
518.5-521	Shale, carbonaceous							
521-529	Siltstone							
529-532	Shale, carbonaceous							
532-534.8	Coal							19
534.8-536	Shale, carbonaceous							
536-536.6	Coal							
536.6-537.5	Shale, carbonaceous						650	20
537.5-541	Coal							
541-543	Shale, carbonaceous							
543-543.5	Coal							
543.5-543.8	Shale, carbonaceous							
543.8-544.8	Coal							
544.8-545.8	Shale, carbonaceous							



LITHOLOGY	Strip log	Geophysical Logs				Depth	
		Gamma	S.P.	Res.	Density	ft.	m
545.8-547 Coal						700	21
547-547.8 Shale, carbonaceous							
547.8-549 Coal							
549-552 Claystone							
552-582 Sandstone, siltstone, and shale, interbedded. Sandstone is light gray, fine to medium grained. Siltstone is dark gray and clayey. Shale is dark gray and clayey							
582-611.2 Coal						700	22
611.2-612.2 Shale, carbonaceous							
612.2-614 Coal							
614-628 Sandstone, gray, medium-grained, silty							
628-640 Shale and siltstone. Shale is dark gray and silty. Siltstone is gray and sandy							
640-697 Sandstone and siltstone, interbedded. Sandstone is light gray and very fine grained. Siltstone is light gray and clayey. Minor dark-gray clayey shale						700	23
697-720 Siltstone, gray, clayey and sandy							

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Hole no. CB-7-C Date logged 11-5-77 Surface elevation (ft) 7,374  
 Loc.: State Wyo. Cty. Carbon T. 21N., R. 80W., Sec. 22; 850 FSL, 250 FE L  
 Drilled depth (ft) 884 Logged depth (ft) 884 Water Level (ft) \_\_\_\_\_  
 Drilling fluid: ☐ Air ☒ Water ☐ Foam ☒ Mud

Geophysical logs:

Spontaneous potential: Scale 40 mv/in Logging speed 20 fpm  
 Resistivity: Scale 50 ohm/in Logging speed 20 fpm  
 Gamma: T.C. 2 Scale 20 cps/in Logging speed 20 fpm  
 Gamma dens.: T.C. 1 Scale 80 cps/in Logging speed 20 fpm

LITHOLOGY		Strip log	Geophysical Logs				Depth	
			Gamma	S.P.	Res.	Density	ft.	m.
0-14.4	Sandstone, brown, clayey, silty						0	0
14.4-16	Coal							
16-30	Claystone, light- to dark-gray							10
30-48	Sandstone, light-brown, very fine grained, silty						50	
48-56	Siltstone, light-gray							20
56-59	Sandstone, yellow-brown, fine-grained, silty							
59-63	Claystone, light-gray, silty							
63-64	Coal							
64-78.6	Claystone, light-gray						100	30
78.6-82.8	Coal							
82.8-89.6	Claystone, light-gray, silty							
89.6-91	Coal							40
91-92.8	Shale, carbonaceous							
92.8-94	Coal							
94-100	Claystone, light-gray						150	50
100-128	Shale, gray, silty and clayey. Minor interbedded sandstone							
128-136	Siltstone, light-gray							
136-137.6	Coal							
137.6-143	Siltstone, light-gray						200	60
143-144	Coal							
144-147	Siltstone, light-gray							
147-148.2	Coal							
148.2-153.2	Siltstone, light-gray							70
153.2-154.4	Coal							
154.4-269	Sandstone, gray, very fine grained to fine-grained. Minor thinly interbedded gray siltstone						250	80
269-293.5	Claystone, light-gray							
293.5-294.8	Coal							
294.8-302.5	Claystone, light-gray							

LITHOLOGY		Strip log	Geophysical Logs				Depth	
			Gamma	S.P.	Res.	Density	ft.	m
302.5-303	Coal				300		300	
303-306.5	Claystone, light-gray							
306.5-307	Coal							10
307-320	Claystone, gray, silty							
320-328	Sandstone, gray, fine-grained							
328-427	Claystone, siltstone, and sandstone, interbedded. Claystone is light gray and silty. Siltstone is gray and clayey. Sandstone is gray and very fine grained				350		350	11
427-429	Coal							
429-446.8	Siltstone, light-gray, clayey				400		400	12
446.8-451	Coal							
451-465	Siltstone, light-gray, clayey to sandy							13
465-475	Sandstone, gray, medium-grained							
475-584.8	Siltstone, claystone, and sandstone, interbedded. Siltstone is gray and clayey to sandy. Claystone is light gray and silty. Sandstone is gray and fine to medium grained				450		450	14
584.8-585.8	Coal							
585.8-586.4	Claystone							
586.4-588	Coal							16
588-589	Claystone							
589-598	Coal							
598-599	Claystone							
599-601.5	Coal				550		550	17
601.5-603.2	Claystone							
603.2-606	Coal							
606-607.2	Claystone							
607.2-610	Coal							18
610-611	Claystone							
611-611.5	Coal				600		600	19
611.5-615.8	Claystone							
615.8-623	Coal							
623-635	Siltstone, gray, sandy							
635-648	Sandstone, gray, medium-grained							
648-663.5	Siltstone, gray, clayey. Minor gray claystone				650		650	20
663.5-673	Coal							
673-682	Claystone, light-gray, silty							
682-683	Coal							
683-684.5	Claystone							
684.5-685.6	Coal							

LITHOLOGY	Strip log	Geophysical Logs				Depth	
		Gamma	S.P.	Res.	Density	ft.	m
685.6-689 Claystone						700	21
689-691 Coal							
691-692.5 Claystone							
692.5-693.2 Coal						720	22
693.2-704.5 Claystone, light-gray, silty							
704.5-706 Coal							
706-706.5 Claystone						750	23
706.5-710 Coal							
710-713.5 Claystone							
713.5-715.5 Coal						800	24
715.5-720 Claystone and sandstone, interbedded							
720-724 Coal, shaly							
724-747 Sandstone and shale, interbedded. Sandstone is gray and medium to coarse grained. Shale is gray and clayey						850	26
747-753 Claystone							
753-784 Coal							
784-884 Sandstone and shale, interbedded. Sandstone is light gray, fine grained, and very silty. Shale is gray, silty and clayey							

**HOLE: CB-7-C**

**RADIATION LOG**

Depth (ft.)	Gamma	S.P.	Res.	Density
685.6	880	878	878	884

**ELECTRIC LOG**

Depth (ft.)	Gamma	S.P.	Res.	Density
685.6	880	878	878	884

**REMARKS:**

Other Services Provided:



Hole no. CB-10-C Date logged 11-4-77 Surface elevation (ft) 7,400  
 Loc.: State Wyo. Cty. Carbon T. 21N., R. 80W., Sec. 32; 300 F NL, 500 FE I  
 Drilled depth (ft) 426 Logged depth (ft) 420 Water Level (ft)           
 Drilling fluid: ☐ Air ☒ Water ☐ Foam ☒ Mud

Geophysical logs:

Spontaneous potential: Scale 50 mv/in Logging speed 20 fpm  
 Resistivity: Scale 50 ohm/in Logging speed 20 fpm  
 Gamma: T.C. 2 Scale 20 cps/in Logging speed 20 fpm  
 Gamma dens.: T.C. 1 Scale 80 cps/in Logging speed 20 fpm

LITHOLOGY		Strip log	Geophysical Logs				Depth	
			Gamma	S. P.	Res.	Density	ft.	r
0-10	Soil, fill from mine						0	0
10-31	Sandstone, yellow-brown, very fine grained, silty							
31-38	Shale, dark-brown, carbonaceous, silty and sandy						1	
38-47	Siltstone, gray, sandy						50	
47-73	Claystone, dark-brown, carbonaceous, coaly						2	
73-84	Siltstone, brownish-gray, shaly, sandy							
84-87	Burn, red, baked siltstone and shale	DATA					100	3
87-92	Shale, blackish-gray, silty, coaly							
92-100	Shale, carbonaceous, blackish-brown, coaly						4	
100-159	Sandstone, light- to medium-gray, very fine grained to medium-grained, silty						150	
159-169	Claystone, medium-gray						5	
169-170	Coal							
170-170.4	Shale, carbonaceous							
170.4-188	Coal							
188-188.5	Shale, carbonaceous						200	6
188.5-190	Coal							
190-194	Shale, carbonaceous							
194-200	Claystone, light-gray, silty and sandy						7	
200-420	Sandstone, light-gray, fine- to medium-grained, very silty clayey, and shaly						250	8
							300	9



Hole no. CB-11-EM Date logged 11-7-77 Surface elevation (ft) 7,460  
 Loc.: State Wyo. Cty. Carbon T. 21N., R. 80W., Sec. 34; 1,900 FN L, 1,000 FW  
 Drilled depth (ft) 561 Logged depth (ft) 561 Water Level (ft) \_\_\_\_\_  
 Drilling fluid: ☒ Air ☒ Water ☒ Foam ☒ Mud

Geophysical logs:

Spontaneous potential: Scale 40 mv/in Logging speed 20 fp  
 Resistivity: Scale 50 ohm/in Logging speed 20 fp  
 Gamma: T.C. 2 Scale 20 cps/in Logging speed 20 fp  
 Gamma dens.: T.C. 1 Scale 80 cps/in Logging speed 20 fp

LITHOLOGY		Strip log	Geophysical Logs				Depth	
			Gamma	S.P.	Res.	Density	ft.	
0-2	Soil, sandy and silty						0	0
2-4	Coal, shaly							
4-25.6	Shale and siltstone. Shale is blackish brown, coaly, and carbonaceous. Siltstone is brownish gray, clayey, and carbonaceous							
25.6-27	Coal							
27-31	Claystone, brownish-black, carbonaceous							
31-125	Sandstone, light-gray, fine-grained, silty. Minor brownish-black carbonaceous shale and gray shaly siltstone							
125-126.5	Shale, carbonaceous							
126.5-128	Coal							
128-137.4	Shale, carbonaceous, and siltstone, interbedded							
137.4-140	Coal							
140-148	Siltstone and carbonaceous shale							
148-249	Sandstone and siltstone, interbedded. Sandstone is light gray, fine grained, and silty. Siltstone is light gray and sandy							
249-251	Shale, dark-gray, silty and clayey							
251-280	Sandstone, white, fine-grained, quartz sand							
280-281	Coal							
281-284	Shale, carbonaceous							
284-288	Sandstone, white, fine-grained							
288-290.5	Shale, carbonaceous							

LITHOLOGY	Strip log	Geophysical Logs				Depth ft.
		Gamma	S.P.	Res.	Density	
290.5-294.2 Coal				300		300
294.2-295.2 Shale, carbonaceous						
295.2-296 Coal						1
296-302 Shale, carbonaceous						
302-304 Coal, shaly						
304-332.2 Shale, siltstone, and sandstone, interbedded. Shale is blackish brown, carbonaceous, and silty. Siltstone is gray and sandy. Sandstone is light gray and fine grained				350		350
332.2-334 Coal						1
334-335 Shale, carbonaceous				400		400
335-351 Sandstone, light-gray, fine-grained						1
351-352.6 Shale, carbonaceous						
352.6-356.8 Coal				450		450
356.8-362.2 Shale, carbonaceous						1
362.2-373.5 Coal						
373.5-440 Siltstone, shale, and sandstone, interbedded. Siltstone is medium gray and clayey. Shale is blackish brown, carbonaceous, and coaly. Sandstone is light gray and fine grained. Coal from 401 to 402 ft				500		500
440-443.5 Shale, brownish-black, carbonaceous, silty						1
443.5-444 Coal				550		550
444-445 Shale, carbonaceous						1
445-446 Coal						
446-454.2 Claystone, dark-gray						
454.2-456.5 Coal						
456.5-459 Shale, carbonaceous						
459-511 Sandstone, siltstone, and claystone, interbedded. Sandstone is light gray, fine grained, and silty. Siltstone is light gray, sandy and clayey. Claystone is grayish brown and carbonaceous						
511-516.4 Shale, carbonaceous						
516.4-541 Coal						
541-544 Claystone, grayish-brown, silty, carbonaceous						
544-561 Sandstone, light-gray, medium-grained, silty lenses						

557 555 555 561  
 2000/100 40 100 2000/100  
 100 100 100 100  
 100 100 100 100

DEWIDE & COMPANY  
 1000 1000 1000 1000

HOLE: CB-11-EM  
 LOGGERS: J. S. G. S.  
 DATE: 11/27/64  
 SCALE: 1:1000  
 CORRECTIONS: 1.00, 1.00, 1.00, 1.00  
 REMARKS: 1.00, 1.00, 1.00, 1.00

REMARKS:  
 Other Services Provided:



Hole no. CB-12-EM Date logged 11-6-77 Surface elevation (ft) 7,524  
 Loc.: State Wyo. Cty. Carbon T. 20N., R. 80W., Sec. 6; 1,100 FN L, 850 F E  
 Drilled depth (ft) 221 Logged depth (ft) 221 Water Level (ft) \_\_\_\_\_  
 Drilling fluid: ☒ Air ☒ Water ☐ Foam ☒ Mud

Geophysical logs:

Spontaneous potential: Scale 50 mv/in Logging speed 20 fp  
 Resistivity: Scale 50 ohm/in Logging speed 20 fp  
 Gamma: T.C. 2 Scale 20 cps/in Logging speed 20 fp  
 Gamma dens.: T.C. 1 Scale 80 cps/in Logging speed 20 fp

LITHOLOGY		Strip log	Geophysical Logs				Depth	
			Gamma	S.P.	Res.	Density	ft.	
0-5	Sandstone, grayish-brown, fine-grained, silty						0	0
5-16	Shale, blackish-brown, carbonaceous, silty, coaly						1	
16-19	Coal						50	
19-23	Shale, blackish-brown, carbonaceous, silty, coaly						100	3
23-34.1	Coal						150	
34.1-54.5	Shale, gray, silty, carbonaceous						200	6
54.5-55.6	Coal							
55.6-62	Shale, gray, silty							
62-70	Sandstone, grayish-brown, very fine grained, silty							
70-81.5	Shale, brownish-black, carbonaceous, coaly							
81.5-82.6	Coal							
82.6-84.6	Shale, carbonaceous							
84.6-86.8	Coal							
86.8-89	Shale, carbonaceous							
89-92.5	Sandstone, brownish-gray, fine-grained, silty							
92.5-93.5	Coal							
93.5-124	Sandstone, white, fine-grained							
124-127	Shale, carbonaceous							
127-132.5	Siltstone							
132.5-139	Coal							
139-175	Sandstone, white, fine-grained							
175-195	Sandstone, greenish-gray, very fine-grained, silty							
195-221	Sandstone, gray, very fine grained, very silty							



Hole no. CB-14-HH Date logged 10-12-77 Surface elevation (ft) 6,961  
 Loc.: State Wyo. Cty. Carbon T. 21N., R. 80W., Sec. 2; 350 FNL, 850 FEI  
 Drilled depth (ft) 816 Logged depth (ft) 816 Water Level (ft)           
 Drilling fluid: ☐ Air ☒ Water ☐ Foam ☒ Mud

Geophysical logs:

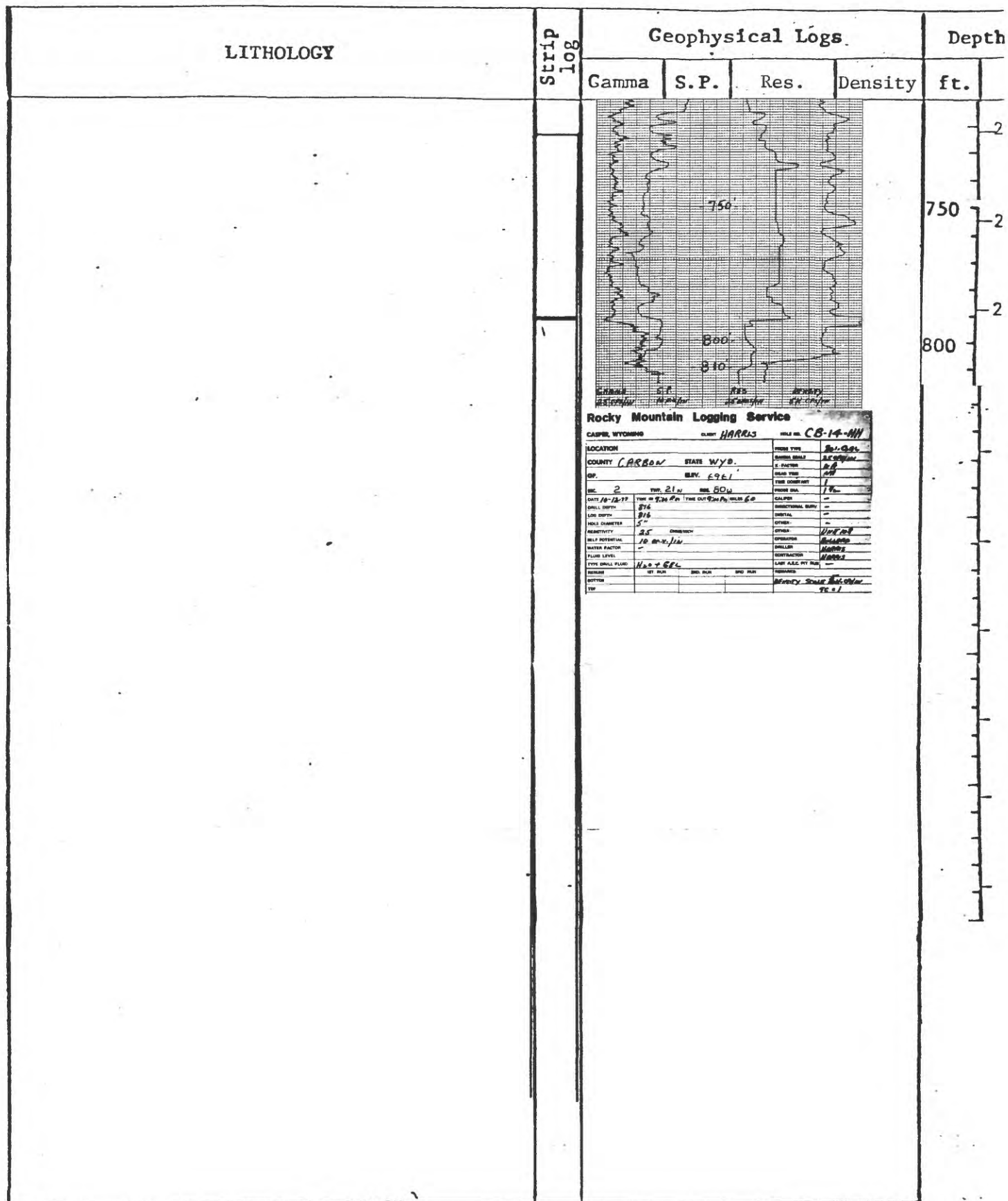
Spontaneous potential: Scale 10 mv/in Logging speed 20 fpr  
 Resistivity: Scale 25 ohms/in Logging speed 20 fpr  
 Gamma: T.C. 1 Scale 25 cps/in Logging speed 20 fpr  
 Gamma dens.: T.C. 1 Scale 5K cps/in Logging speed 20 fpr

LITHOLOGY		Strip log	Geophysical Logs				Depth	
			Gamma	S.P.	Res.	Density	ft.	
0-10	Sandstone, yellow-brown, fine- to medium-grained, clayey						0	0
10-24	Siltstone and claystone. Siltstone is grayish yellow and clayey. Claystone is grayish yellow and silty						1	1
24-55	Sandstone, yellow to white, medium- to coarse-grained, conglomeratic						50	2
55-89	Sandstone, gray, medium- to coarse-grained, conglomeratic							
89-125	Shale, blackish-brown, carbonaceous, coaly, silty. Minor gray carbonaceous siltstone						100	3
125-302	Sandstone, gray, fine- to medium-grained from 125 to 220 ft, medium- to coarse-grained from 220 to 302 ft, clayey						150	4
302-321	Shale, brownish-gray, carbonaceous, coaly, silty. Minor interbedded, gray, sandy, siltstone						200	5
321-393	Sandstone, brownish-gray, fine- to medium-grained. Minor siltstone and carbonaceous shale						250	6
393-415	Claystone, brownish-gray, silty. Minor light-gray siltstone and gray fine-grained sandstone							7
415-553	Sandstone, light-gray to brownish-gray, fine-grained. Minor siltstone and carbonaceous shale						300	8
								9



LITHOLOGY		Strip log	Geophysical Logs				Depth ft.
			Gamma	S.P.	Res.	Density	
453-481	Sandstone, whitish-gray, medium-grained						300
481-482.2	Shale, carbonaceous						1
482.2-484	Coal						
484-491	Shale, blackish-brown, carbonaceous, coaly						350
491-493.2	Coal						1
493.2-495	Shale, brownish-black, carbonaceous, coaly						
495-496	Coal						400
496-502	Shale, brownish-black, carbonaceous, coaly						1
502-521.5	Shale, brownish-black, carbonaceous, silty						
521.5-522.3	Coal						450
522.3-523.4	Shale, carbonaceous						1
523.4-524.8	Coal						
524.8-529	Shale, dark-brown, carbonaceous, coaly						500
529-533	Sandstone, gray, fine-grained						1
533-537.8	Shale, dark-brown, carbonaceous						
537.8-539.8	Coal						550
539.8-565	Shale, dark-brown, carbonaceous, coaly, silty						1
565-613	Claystone, dark-gray, silty. Minor gray medium-grained sandstone						
613-686	Sandstone, whitish-gray, medium-grained						600
686-700	Sandstone, whitish-gray, fine-to medium-grained, silty						1
700-715	Claystone, gray, silty. Minor dark-gray siltstone						
715-791	Sandstone, light-gray, fine-to medium-grained, occasionally silty. Minor siltstone						650
791-792	Coal						1
792-816	Claystone, light-gray, silty, sandy						
							700

Hole No. CB-14-HH (continued)



Hole no. CB-14A-HH Date logged 11-7-77 Surface elevation (ft) 6,935  
 Loc.: State Wyo. Cty. Carbon T. 21N., R. 80W., Sec. 2; 2,150 FSL, 100 FE  
 Drilled depth (ft) 943 Logged depth (ft) 943 Water Level (ft)           
 Drilling fluid: ☐ Air ☒ Water ☐ Foam ☒ Mud

Geophysical logs:

Spontaneous potential: Scale 40 mv/in Logging speed 20 f  
 Resistivity: Scale 50 ohm/in Logging speed 20 f  
 Gamma: T.C. 2 Scale 20 cps/in Logging speed 20 f  
 Gamma dens.: T.C. 1 Scale 80 cps/in Logging speed 20 f

LITHOLOGY		Strip log	Geophysical Logs				Depth
			Gamma	S.P.	Res.	Density	ft.
0-20	Sandstone, dark-brown, coarse-grained, silty						0
20-24.5	Shale, dark-brown, silty, carbonaceous						
24.5-25.6	Coal						
25.6-32	Shale, dark-brown, silty, carbonaceous						50
32-43	Sandstone, yellow-brown, fine-grained, silty						
43-57	Claystone, light-gray, silty						
57-148	Sandstone, gray, coarse-grained. Minor thinly bedded claystone						100
148-157	Claystone, gray, silty						
157-190	Sandstone, light-gray, coarse-grained						
190-208	Claystone, and minor, interbedded siltstone and sandstone						
208-330.5	Sandstone, gray, medium-to coarse-grained, slightly silty						150
330.5-331.3	Shale, carbonaceous						
331.3-333	Coal						
333-371.3	Shale, sandstone, and siltstone. Shale is dark gray and silty. Sandstone is gray and coarse grained. Siltstone is gray						200
371.3-372.8	Coal						
372.8-391	Sandstone, gray, silty, and thinly interbedded siltstone, claystone, and shale						250
391-393	Shale, gray, silty						
393-394.2	Coal						
394.2-395.3	Shale, carbonaceous						
395.3-396	Coal						
396-398.5	Shale, carbonaceous						300

LITHOLOGY		Strip log	Geophysical Logs				Depth
			Gamma	S.P.	Res.	Density	ft.
398.5-399.8	Coal						
399.8-401	Shale, carbonaceous						
401-406.5	Siltstone, light-gray, clayey						1
406.5-412	Sandstone						
412-419.5	Shale, dark-gray, silty						
419.5-421	Coal				350		350
421-426	Shale and siltstone, interbedded. Shale is light gray and clayey. Siltstone is gray and clayey						1
426-427	Coal						
427-427.8	Shale, carbonaceous				400		400
427.8-429.2	Coal						
429.2-442	Shale, sandstone, and siltstone, interbedded. Shale is light gray and clayey. Sandstone is gray and fine grained. Siltstone is light gray and clayey				450		450
442-443.8	Coal						
443.8-486	Shale, sandstone, siltstone, and claystone, interbedded. Shale is light gray, clayey and silty. Sandstone is gray, fine grained, and silty. Siltstone is gray. Claystone is light gray and silty				500		500
486-501	Sandstone, gray, coarse-grained						
501-509	Siltstone						
509-520	Sandstone, gray, coarse-grained				550		550
520-548	Claystone, light-gray, silty						
548-601.5	Sandstone, gray, coarse-grained. Minor interbedded siltstone and shale						
601.5-602.3	Coal						
602.3-603.5	Shale, carbonaceous				600		600
603.5-604.4	Coal						
604.4-624	Claystone and sandstone, interbedded. Claystone is light gray. Sandstone is light gray and coarse grained						
624-709	Sandstone, gray, coarse-grained, occasionally fine-to medium-grained. Minor siltstone and shale				650		650
709-710.2	Coal						
710.2-728	Siltstone, light-gray, sandy						
728-730.4	Claystone, light-gray, silty				700		700
730.4-731	Coal						



[illegible]



Hole no. CB-15-HH Date logged 10-17-77 Surface elevation (ft) 6,980  
 Loc.: State Wyo. Cty. Carbon T. 21N., R. 80W., Sec. 12; 200 FNL, 2,450 FW  
 Drilled depth (ft) 1,506 Logged depth (ft) 1,502 Water Level (ft) \_\_\_\_\_  
 Drilling fluid: ☐ Air ☒ Water ☐ Foam ☒ Mud

Geophysical logs:

Spontaneous potential: Scale 10 mv/in Logging speed 20 fpi  
 Resistivity: Scale 25 ohm/in Logging speed 20 fpi  
 Gamma: T.C. 1 Scale 25 cps/in Logging speed 20 fpi  
 Gamma dens.: T.C. 1 Scale 5K cps/in Logging speed 20 fpi

LITHOLOGY		Strip log	Geophysical Logs				Depth	
			Gamma	S.P.	Res.	Density	ft.	
0-5	Soil, yellow-brown, clayey and sandy, fine to medium sand						0	0
5-76	Sandstone, grayish-brown to yellow-brown, fine- to coarse-grained, silty. Minor dark-brown claystone						1	
76-78.5	Shale, carbonaceous, dark-brown						2	
78.5-79.8	Coal							
79.8-80.2	Shale, carbonaceous							
80.2-81	Coal							
81-83	Shale, carbonaceous						3	
83-83.8	Coal							
83.8-86.8	Shale, carbonaceous							
86.8-87.4	Coal						4	
87.4-93	Claystone, gray, silty							
93-94	Coal							
94-111.5	Claystone, carbonaceous shale, and sandstone, interbedded. Claystone is medium gray and silty. Carbonaceous shale is brownish black. Sandstone is medium gray, fine grained and silty						5	
111.5-113	Coal							
113-116	Shale, carbonaceous							
116-124	Siltstone, gray, shaly						7	
124-125.7	Shale, carbonaceous							
125.7-126.5	Coal							
126.5-132.5	Shale, carbonaceous						8	
132.5-133.4	Coal							

LITHOLOGY	Strip log	Geophysical Logs				Depth ft.
		Gamma	S.P.	Res.	Density	
133.4-148.4 Shale and siltstone, interbedded. Shale is dark brown, carbonaceous, and coaly. Siltstone is gray and clayey				300		300
148.4-149.2 Coal						1
149.2-154 Siltstone and carbonaceous shale, interbedded				350		350
154-155 Coal						1
155-156 Shale, carbonaceous						
156-157 Coal						
157-164 Siltstone, medium-gray, sandy; very fine sand				400		400
164-166 Coal						
166-177 Siltstone, gray. Minor interbedded carbonaceous shale						1
177-188 Shale and siltstone, interbedded. Shale is dark brown, carbonaceous, and silty. Siltstone is gray				450		450
188-212 Siltstone, gray, shaly						1
212-235 Sandstone, light-gray, fine-grained, silty						
235-303 Sandstone, light-gray, medium-to coarse-grained				500		500
303-320 Claystone, siltstone, and shale. Claystone is medium to dark gray and silty. Siltstone is medium gray and clayey. Shale is brownish black and carbonaceous				550		550
320-321 Coal						1
321-321.8 Shale, carbonaceous						
321.8-323 Coal						
323-351 Claystone, medium-gray. Minor siltstone and carbonaceous shale				600		600
351-363 Siltstone, gray, sandy. Minor interbedded very fine grained sandstone						1
363-416 Sandstone, light-gray, medium-to coarse-grained, silty						
416-424.2 Shale and siltstone, interbedded. Shale is brownish gray, carbonaceous, and coaly. Siltstone is dark gray				650		650
424.2-425.2 Coal						2
425.2-426.8 Shale, carbonaceous						
426.8-427.6 Coal				700		700

LITHOLOGY	Strip log	Geophysical Logs				Depth
		Gamma	S.P.	Res.	Density	ft.
427.6-440.1 Claystone, light-gray, shaly, silty						2
440.1-441 Coal						
441-464 Claystone, light-gray, silty. Minor dark-gray siltstone			-750-			750 2
464-701 Sandstone, light-gray, fine- to coarse-grained, occasionally silty. Minor siltstone and shale						2
701-706 Siltstone			-800-			800 2
706-733 Sandstone, light-gray, medium-grained						
733-754 Siltstone and carbonaceous shale, interbedded						2
754-793 Sandstone, light-gray, medium-grained			-850-			850 2
793-830 Siltstone and shale, interbedded						
830-834 Coal						
834-834.6 Shale, carbonaceous						2
834.6-835.8 Coal						
835.8-837 Shale, carbonaceous			-900-			900 2
837-839 Coal						
839-841.8 Shale, carbonaceous						2
841.8-842.6 Coal						
842.6-845 Shale, carbonaceous						
845-848 Coal			-950-			950 2
848-849.1 Shale, carbonaceous						
849.1-851 Coal						
851-865 Claystone and siltstone. Claystone is medium gray and silty. Siltstone is dark gray. Minor carbonaceous shale			-1000-			1000 2
865-1008 Sandstone, medium- to dark-gray, fine- to medium-grained, some coarse-grained lenses. Minor claystone and siltstone lenses						
1008-1015 Shale and siltstone			-1050-			1050 2
1015-1111 Sandstone, medium- to dark-gray, fine- to medium-grained. Minor clayey and silty lenses						
1111-1158 Shale and siltstone, interbedded. Shale is dark brown, carbonaceous, and coaly. Siltstone is medium gray. Minor sandstone			-1100-			1100 2

[illegible]



Hole no. CB-16-HH Date logged 10-20-77 Surface elevation (ft) 7,055  
 Loc.: State Wyo. Cty. Carbon T. 21N., R. 80W., Sec. 12; 1,900 FN-L, 1,150 FE 1  
 Drilled depth (ft) 1,612 Logged depth (ft) 1,612 Water Level (ft)           
 Drilling fluid: ☐ Air ☒ Water ☐ Foam ☒ Mud

Geophysical logs:

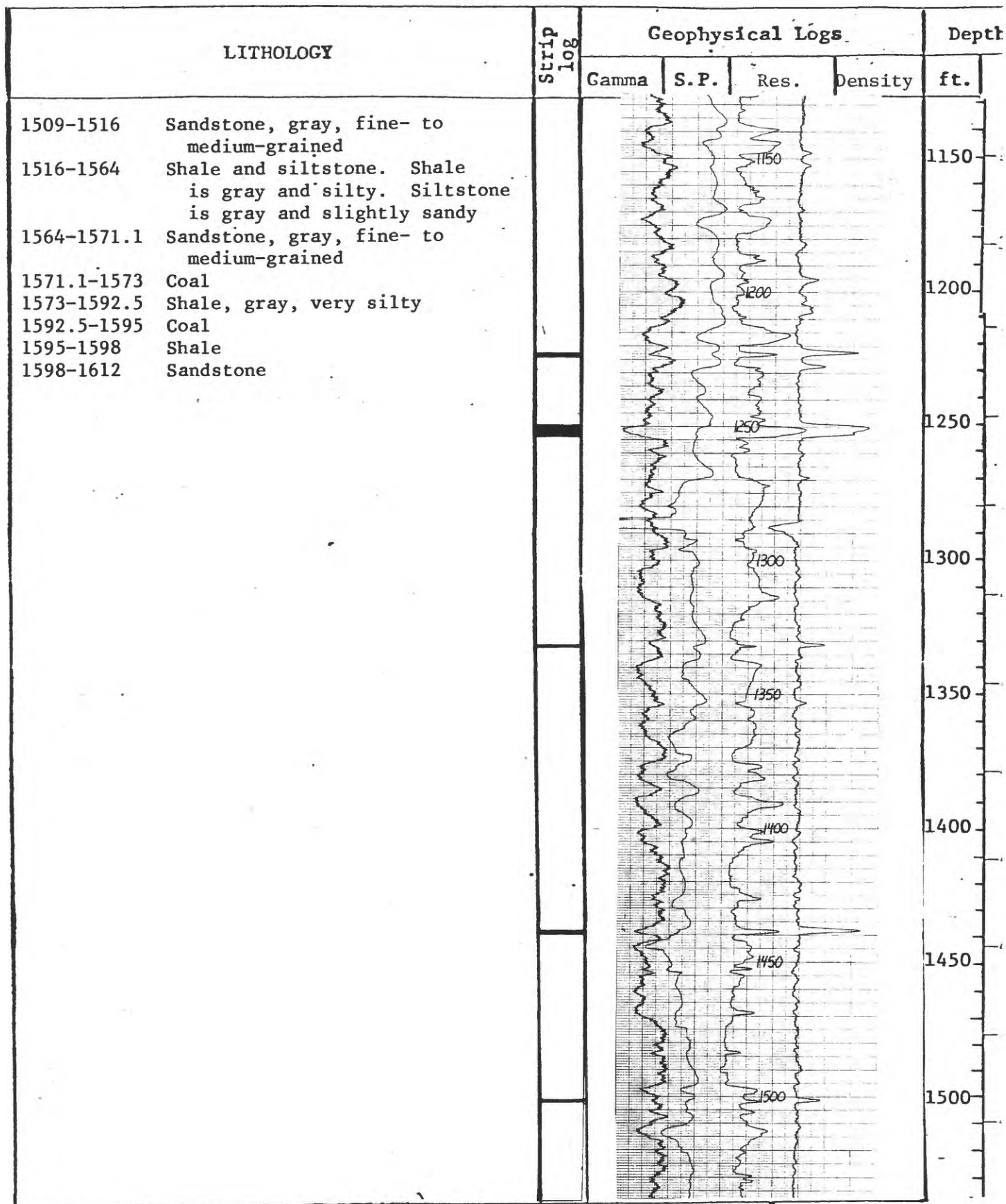
Spontaneous potential: Scale 40 mv/in Logging speed 20 fpm  
 Resistivity: Scale 40 ohm/in Logging speed 20 fpm  
 Gamma: T.C. 2 Scale 20 cps/in Logging speed 20 fpm  
 Gamma dens.: T.C. 0.5 Scale 80 cps/in Logging speed 20 fpm

LITHOLOGY		Strip log	Geophysical Logs				Depth	
			Gamma	S.P.	Res.	Density	ft.	r
0-33	Sandstone, light-brown, fine-to medium-grained, silty, coarse-grained lenses from 25-33 ft						0	0
33-34	Shale, carbonaceous						10	
34-35.5	Coal						50	
35.5-45	Shale, blackish-brown, carbonaceous, coaly. Minor siltstone						20	
45-46	Coal						100	
46-50.2	Shale, blackish-brown, carbonaceous coaly						30	
50.2-52	Coal, shaly						40	
52-65.4	Shale, blackish-brown, carbonaceous, coaly, silty. Minor dark-gray carbonaceous siltstone						150	
65.4-66.8	Coal						50	
66.8-68	Shale, carbonaceous						200	
68-78	Siltstone, gray, sandy						250	
78-86	Sandstone, gray, very fine grained, silty						300	
86-87.8	Shale, carbonaceous							
87.8-88.8	Coal							
88.8-111	Sandstone and shale, interbedded. Sandstone is gray to dark gray, fine grained and silty. Shale is brownish black, carbonaceous, and coaly							
111-124.5	Siltstone, dark-gray, clayey							
124.5-125.5	Coal							
125.5-129.8	Shale, carbonaceous							
129.8-130.6	Coal							
130.6-131.2	Shale, carbonaceous							
131.2-133.3	Coal							

LITHOLOGY	Strip log	Geophysical Logs.				Depth ft.
		Gamma	S.P.	Res.	Density	
133.3-138.5 Shale, carbonaceous						
138.5-140 Coal						
140-146 Siltstone, dark-gray						
146-160 Shale, dark-brown, carbonaceous, coaly. Minor siltstone						
160-187 Siltstone, gray. Minor interbedded carbonaceous shale				350		350
187-296. Sandstone, light- to dark-gray, coarse-grained. Minor interbedded gray sandy siltstone						
296-297.4 Shale, carbonaceous				400		400
297.4-298.5 Coal						
298.5-299 Shale, carbonaceous						
299-300.2 Coal						
300.2-304 Shale, carbonaceous						
304-320 Sandstone, gray, coarse-grained						
320-344 Claystone and siltstone. Claystone is dark gray, silty, and sandy. Siltstone is gray and sandy				450		450
344-391 Sandstone, gray, coarse-grained						
391-395.2 Shale, carbonaceous						
395.2-396.5 Coal				500		500
396.5-397.8 Shale, carbonaceous						
397.8-398.5 Coal						
398.5-475. Sandstone and siltstone, interbedded. Sandstone is gray to dark gray, very fine grained and silty. Siltstone is gray				550		550
475-726 Sandstone, gray, coarse-grained. Minor gray siltstone						
726-728.5 Shale, gray, silty and clayey						
728.5-729.4 Coal						
729.4-775 Shale, siltstone, and sandstone, interbedded. Shale is dark gray to black and carbonaceous. Siltstone is dark gray. Sandstone is fine grained and silty				600		600
775-781.5 Coal						
781.5-782 Shale, carbonaceous				650		650
782-784 Coal						
784-785.8 Shale, carbonaceous						
785.8-786.6 Coal						
786.6-789 Shale, carbonaceous						
789-794.5 Coal						
794.5-809 Shale, gray. Minor siltstone				700		700



LITHOLOGY		Strip log	Geophysical Logs				Depth
			Gamma	S.P.	Res.	Density	ft.
809-818	Sandstone, gray, medium-gray						
818-824	Shale, gray, silty						
824-1037	Sandstone, gray, medium- to coarse-grained, occasional silty lenses				150		750
1037-1047	Shale, gray, silty						
1047-1066	Sandstone, gray, fine- to medium-grained						
1066-1080	Shale and siltstone. Shale is gray and silty. Siltstone is dark gray and sandy				800		800
1080-1148	Sandstone, gray, fine- to medium-grained, silty						
1148-1222.5	Sandstone, shale, and siltstone, interbedded. Sandstone is gray and fine to medium grained. Shale is gray and silty. Siltstone is gray and sandy to shaly				850		850
1222.5-1223.8	Coal						
1223.8-1228	Shale, dark-gray, silty						
1228-1250	Sandstone, gray, fine- to medium-grained				900		900
1250-1253.8	Coal						
1253.8-1270	Siltstone						
1270-1280	Sandstone, gray, fine-grained						
1280-1303	Shale, gray, silty						
1303-1323	Sandstone, gray, fine-grained, silty				950		950
1323-1331.4	Shale, gray, silty						
1331.4-1332.1	Coal						
1332.1-1407	Sandstone, siltstone, and shale, interbedded. Sandstone is gray and fine to medium grained. Siltstone is gray and shaly to sandy. Shale is gray and silty				1000		1000
1407-1438	Shale, gray, silty. Minor gray fine-grained sandstone						
1438-1439.5	Coal						
1439.5-1443	Shale				1050		1050
1443-1470	Sandstone, gray, fine- to medium-grained						
1470-1501.4	Shale, gray, silty. Minor gray, fine- to medium-grained sandstone						
1501.4-1502	Coal				1100		1100
1502-1509	Shale, gray, silty. Minor gray, fine-grained sandstone						



LITHOLOGY	Strip log	Geophysical Logs				Depth																																			
		Gamma	S.P.	Res.	Density	ft.																																			
<div style="text-align: center; font-size: 2em; margin-top: 100px;">L</div>						1550																																			
						1600																																			
		<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p><b>HOLE: CA-16-HH</b></p> <p>Location: <u>      </u></p> <p>Well: <u>      </u></p> <p>Project: <u>      </u></p> <p>Client: <u>      </u></p> <p>Operator: <u>      </u></p> <p>Log Date: <u>      </u></p> <p>Log Time: <u>      </u></p> <p>Log By: <u>      </u></p> <p>Log Check: <u>      </u></p> <p>Log Number: <u>      </u></p> <p>Log Status: <u>      </u></p> </div> <div style="width: 45%;"> <p><b>RADIATION LOG</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Depth (ft.)</th> <th>Gamma (cpm)</th> <th>S.P. (mv)</th> <th>Res. (ohm-ft)</th> <th>Density (g/cc)</th> </tr> </thead> <tbody> <tr><td>1550</td><td>150</td><td>100</td><td>10</td><td>1.25</td></tr> <tr><td>1560</td><td>140</td><td>110</td><td>12</td><td>1.26</td></tr> <tr><td>1570</td><td>130</td><td>120</td><td>15</td><td>1.27</td></tr> <tr><td>1580</td><td>120</td><td>130</td><td>18</td><td>1.28</td></tr> <tr><td>1590</td><td>110</td><td>140</td><td>20</td><td>1.29</td></tr> <tr><td>1600</td><td>100</td><td>150</td><td>22</td><td>1.30</td></tr> </tbody> </table> </div> </div>				Depth (ft.)	Gamma (cpm)	S.P. (mv)	Res. (ohm-ft)	Density (g/cc)	1550	150	100	10	1.25	1560	140	110	12	1.26	1570	130	120	15	1.27	1580	120	130	18	1.28	1590	110	140	20	1.29	1600	100	150	22	1.30	
Depth (ft.)	Gamma (cpm)	S.P. (mv)	Res. (ohm-ft)	Density (g/cc)																																					
1550	150	100	10	1.25																																					
1560	140	110	12	1.26																																					
1570	130	120	15	1.27																																					
1580	120	130	18	1.28																																					
1590	110	140	20	1.29																																					
1600	100	150	22	1.30																																					
		<p><b>REMARKS:</b></p> <p>      </p> <p>      </p> <p>      </p> <p>Other Services Provided: <u>      </u></p>																																							

Hole no. CB-17-HH Date logged 10-19-77 Surface elevation (ft) 7,145  
 Loc.: State Wyo. Cty. Carbon T. 21N., R. 80W., Sec. 12; 2,350 FWL, 250 FS  
 Drilled depth (ft) 1,610 Logged depth (ft) 1,608 Water Level (ft)           
 Drilling fluid: ☐ Air ☒ Water ☐ Foam ☒ Mud

Geophysical logs:

Spontaneous potential: Scale 40 mv/in Logging speed 20 fp  
 Resistivity: Scale 40 ohm/in Logging speed 20 fp  
 Gamma: T.C. 2 Scale 20 cps/in Logging speed 20 fp  
 Gamma dens.: T.C. 0.5 Scale 60 cps/in Logging speed 20 fp

LITHOLOGY		Strip log	Geophysical Logs				Depth	
			Gamma	S. P.	Res.	Density	ft.	
0-30	Shale, blackish-brown, carbonaceous, coaly						0	0
30-65	Claystone, brownish-gray, silty							1
65-125	Sandstone, brown to gray, coarse-grained						50	
125-130	Shale, brownish-gray, carbonaceous, clayey							2
130-139.2	Claystone, gray, carbonaceous, silty							
139.2-140	Coal							
140-149	Claystone, gray, carbonaceous						100	3
149-150	Coal							
150-203	Claystone, light-gray, silty. Minor thinly interbedded, fine-grained, silty sandstone							4
203-208	Siltstone, gray, sandy							
208-340	Sandstone, light- to dark-gray, coarse-grained. Minor thinly interbedded dark-gray claystone						150	5
340-342	Shale, carbonaceous							
342-345.3	Coal							
345.3-348	Claystone, light-gray						200	6
348-416	Sandstone, light-gray, coarse-grained							
416-423	Claystone, light-gray							7
423-430	Sandstone, gray, medium-grained, silty							
430-438.5	Claystone, light-gray						250	
438.5-439.8	Coal							8
439.8-443.2	Shale, carbonaceous							
443.2-446	Coal							
446-453	Shale, carbonaceous; and claystone						300	9

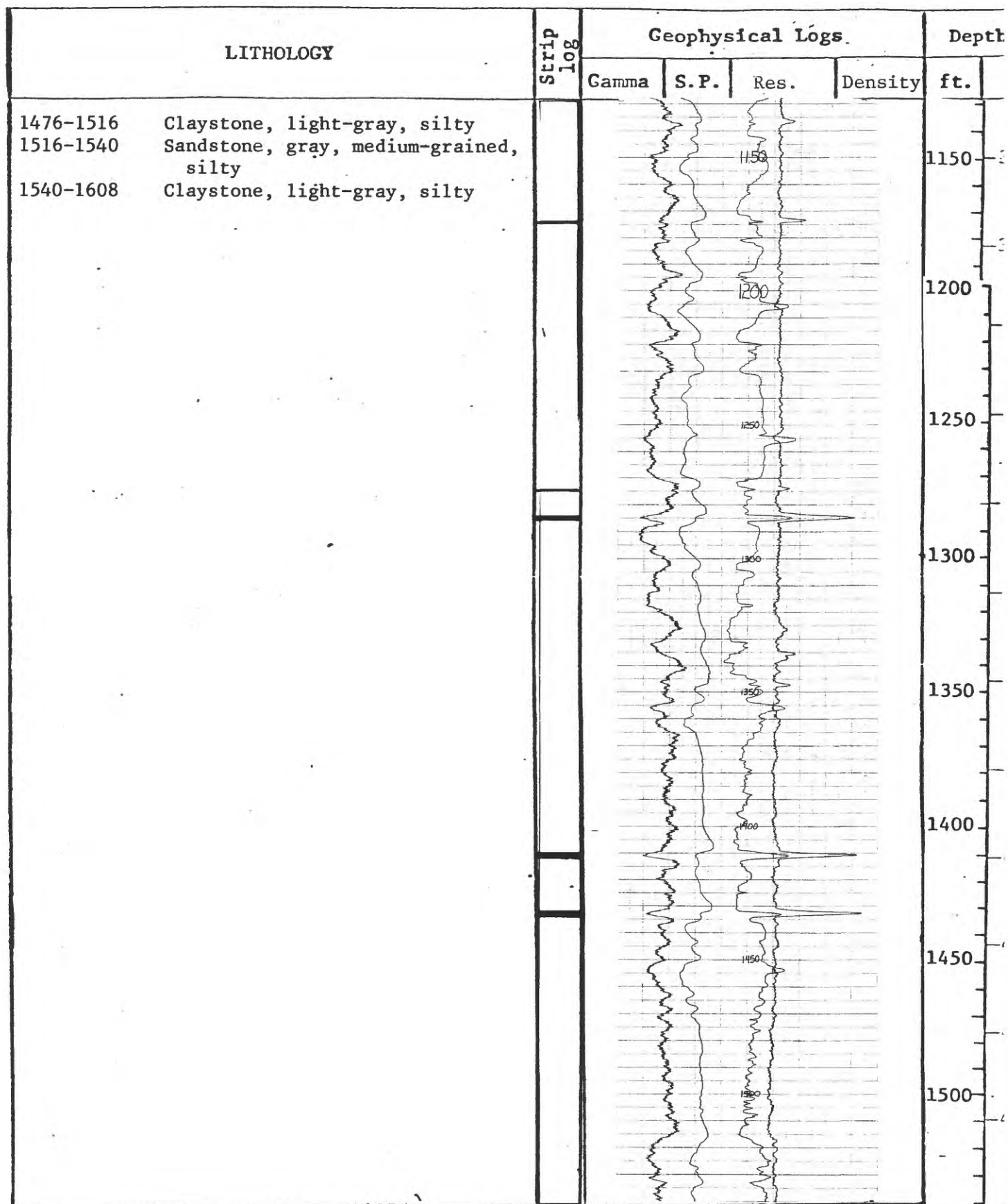


LITHOLOGY		Strip log	Geophysical Logs				Depth
			Gamma	S.P.	Res.	Density	ft.
453-453.8	Coal						
453.8-492	Siltstone and claystone, interbedded. Claystone is light gray and silty. Siltstone is light gray and sandy. Minor interbedded, silty, fine-grained sandstone				350		350
492-520	Sandstone, light-gray, coarse-grained						
520-529	Claystone, light-gray, silty, sandy						
529-545	Sandstone, gray, medium- to coarse-grained, silty				400		400
545-563	Claystone, light-gray						
563-642	Sandstone, light-gray, coarse-grained						
642-650	Claystone, light-gray, silty						
650-789	Sandstone, gray, coarse-grained. Minor thinly interbedded gray siltstone and claystone				450		450
789-793	Shale, light-gray, silty						
793-797	Sandstone, gray, medium-grained						
797-802	Shale, carbonaceous						
802-803	Coal				500		500
803-808.5	Shale, carbonaceous; and siltstone						
808.5-810.6	Coal						
810.6-814	Claystone, dark-gray, silty						
814-823	Sandstone, gray, silty						
823-831	Shale, carbonaceous				550		550
831-842	Coal						
842-843	Shale, carbonaceous						
843-844.3	Coal						
844.3-845.8	Shale, carbonaceous						
845.8-853.8	Coal						
853.8-854.8	Shale, carbonaceous				600		600
854.8-856.6	Coal						
856.6-858	Shale, carbonaceous						
858-859.5	Coal						
859.5-861.2	Shale, carbonaceous						
861.2-862.6	Coal						
862.6-883	Shale and siltstone, interbedded. Shale is light gray and silty. Siltstone is light gray and clayey				650		650
					700		700

LITHOLOGY	Strip log	Geophysical Logs				Depth ft.
		Gamma	S.P.	Res.	Density	
883-1030 Sandstone, medium-gray, medium- to coarse-grained. Minor thinly interbedded dark-gray siltstone and clayey shale				750		750
1030-1045 Sandstone, shale, and siltstone, thinly interbedded. Sandstone is light gray and medium to coarse grained. Shale is light gray and clayey to silty. Siltstone is gray and clayey				800		800
1045-1067 Claystone, light-gray				850		850
1067-1070 Coal						
1070-1095 Sandstone, gray, medium-grained, silty						
1095-1098 Claystone						
1098-1101.6 Coal						
1101.6-1118 Shale, light-gray, clayey, and silty						
1118-1129 Sandstone, gray, medium-grained				900		900
1129-1171 Sandstone and claystone, thickly interbedded						
1171-1173 Sandstone						
1173-1174 Coal						
1174-1271 Sandstone and claystone, inter- bedded. Sandstone is gray, medium to coarse grained, and silty. Claystone is gray and silty. Minor thinly interbedded siltstone				950		950
1271-1274 Claystone						
1274-1274.8 Coal						
1274.8-1284 Claystone, gray, silty				1000		1000
1284-1286 Coal						
1286-1366 Sandstone and claystone, thickly interbedded. Sandstone is gray and medium grained. Claystone is gray, slightly silty, and shaly. Minor siltstone				1050		1050
1366-1410 Claystone, light-gray, silty						
1410-1412 Coal						
1412-1432 Claystone, light-gray, silty						
1432-1434 Coal						
1434-1460 Sandstone, gray, medium-grained, silty				1100		1100
1460-1476 Siltstone, light-gray, sandy to clayey						



Hole No. CB-17-HH (continued)





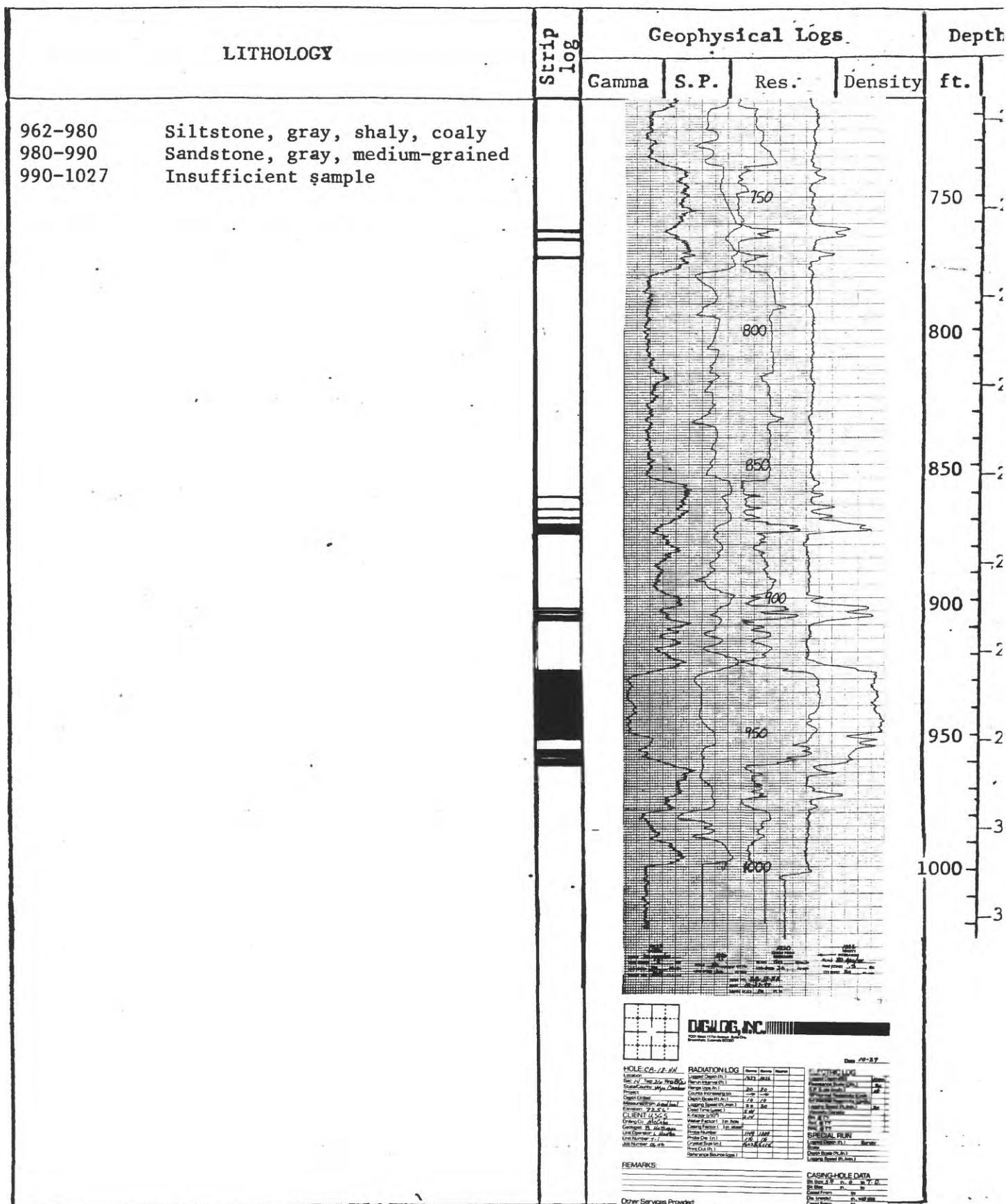
Hole no. CB-18-HH Date logged 10-27-77 Surface elevation (ft) 7,256  
 Loc.: State Wyo. Cty. Carbon T. 21N., R. 80W., Sec. 14; 2,550 FSL, 200 FEL  
 Drilled depth (ft) 1,030 Logged depth (ft) 1,027 Water Level (ft) \_\_\_\_\_  
 Drilling fluid: ☐ Air ☒ Water ☐ Foam ☒ Mud

Geophysical logs:

Spontaneous potential: Scale 40 mv/in Logging speed 20 fpm  
 Resistivity: Scale 50 ohm/in Logging speed 20 fpm  
 Gamma: T.C. 2 Scale 20 cps/in Logging speed 20 fpm  
 Gamma dens.: T.C. 0.5 Scale 80 cps/in Logging speed 20 fpm

LITHOLOGY		Strip log	Geophysical Logs				Depth	
			Gamma	S.P.	Res.	Density	ft.	m.
0-10	Sandstone, brown, very fine grained						0	0
10-28	Claystone, dark-grayish-brown							10
28-61	Sandstone, gray, fine- to coarse-grained							50
61-65	Claystone, light-gray							20
65-66.2	Coal							
66.2-80	Sandstone, gray, fine-grained							
80-84.2	Siltstone							
84.2-86	Coal							
86-86.5	Shale, carbonaceous							100
86.5-87.5	Coal							30
87.5-89.5	Shale, carbonaceous							
89.5-90.6	Coal							
90.6-144	Claystone and siltstone, interbedded. Claystone is light gray and silty. Siltstone is light gray and shaly							40
144-267	Sandstone, light-gray, fine- to coarse-grained. Minor gray silty shale							150
267-285	Siltstone, light-gray, sandy							50
285-410	Sandstone, light-gray, fine-grained. Minor lenses of sandy siltstone							60
410-502	Shale, gray, silty and clayey. Minor thin beds of gray siltstone and fine-grained sandstone							70
502-509	Sandstone, gray, medium-grained							250
509-512.2	Shale, dark-gray, carbonaceous							80
512.2-516	Coal							
516-521	Shale, brown, carbonaceous, silty							90
							300	

LITHOLOGY		Strip log	Geophysical Logs				Depth
			Gamma	S.P.	Res.	Density	ft.
521-521.8	Coal						
521.8-523	Shale, carbonaceous						
523-523.8	Coal						1
523.8-549.5	Shale and siltstone, interbedded. Shale is dark gray and silty. Siltstone is gray and sandy				350		350
549.5-550.5	Coal						1
550.5-552.2	Shale, carbonaceous						
552.2-553	Coal						1
553-557	Shale, carbonaceous				400		400
557-558.6	Coal						1
558.6-559.6	Shale, carbonaceous						
559.6-565	Coal						1
565-570.2	Shale, dark-gray, silty						
570.2-571.6	Coal						1
571.6-574	Shale				450		450
574-575	Coal						1
575-575.5	Shale						
575.5-577	Coal						1
577-590	Shale and siltstone. Shale is dark gray and silty. Siltstone is gray and sandy				500		500
590-710	Sandstone, gray, fine- to coarse-grained, silty						1
710-717	Shale, gray, silty						
717-739	Sandstone, gray, coarse-grained						1
739-761.8	Claystone, light-gray, silty						
761.8-762.8	Coal				550		550
762.8-764.5	Shale, gray, clayey						1
764.5-765.2	Coal						
765.2-771.5	Shale, gray, clayey						1
771.5-772.5	Coal						
772.5-779	Shale, light-gray						1
779-856	Sandstone, gray, coarse-grained				600		600
856-872.4	Shale, gray, silty. Minor coal						1
872.4-875.2	Coal						
875.2-883	Siltstone, gray, shaly						1
883-898	Sandstone, fine- to medium-grained, silty						
898-903	Shale, gray, silty				650		650
903-905	Coal						2
905-905.8	Shale, carbonaceous						
905.8-908	Coal						1
908-926	Sandstone and shale, interbedded						
926-952	Coal						2
952-955.2	Shale, gray, carbonaceous, coaly				700		700
955.2-962	Coal						





Hole no. CB-19-HH Date logged 10-27-77 Surface elevation (ft) 7,303  
 Loc.: State Wyo. Cty. Carbon T. 21N., R. 80W., Sec. 14; 100 FS-L, 2,500 FE  
 Drilled depth (ft) 966 Logged depth (ft) 966 Water Level (ft)       
 Drilling fluid: ☐ Air ☒ Water ☐ Foam ☒ Mud

Geophysical logs:

Spontaneous potential: Scale 40 mv/in Logging speed 20 fp  
 Resistivity: Scale 50 ohm/in Logging speed 20 fp  
 Gamma: T.C. 2 Scale 20 cps/in Logging speed 20 fp  
 Gamma dens.: T.C. 1 Scale 80 cps/in Logging speed 20 fp

LITHOLOGY		Strip log	Geophysical Logs				Depth	
			Gamma	S.P.	Res.	Density	ft.	
0-96	Sandstone, yellow-brown, medium- to coarse-grained, conglom- eratic lenses from 10 to 20 ft. Minor thin gray shale						0	0
96-102	Shale, grayish-black, carbona- ceous, coaly						1	
102-103.5	Coal				50		50	
103.5-130	Shale and claystone. Shale is grayish black, carbonaceous, and coaly. Claystone is medium gray, silty, and shaly. Minor fine-grained sandstone						2	
130-131.8	Coal				100		100	3
131.8-135.8	Claystone, medium-gray, silty							
135.8-136.5	Coal							
136.5-141.8	Claystone, medium-gray, silty							4
141.8-145	Coal							
145-149	Claystone, gray, silty							
149-150	Coal				150		150	
150-156	Siltstone, gray, clayey, silty							5
156-165	Claystone, gray, silty, shaly							
165-315	Sandstone, light- to medium- gray, fine- to coarse-grained							
315-320	Siltstone, light-gray, sandy							
320-320.8	Coal				200		200	6
320.8-325.6	Claystone, medium-gray, shaly							
325.6-327	Coal							
327-361	Claystone, light-gray, shaly							7
361-472	Sandstone, whitish-gray, fine- to coarse-grained. Minor medium-gray claystone lenses				250		250	
472-526	Claystone, medium-gray, shaly							8
526-540	Sandstone, light-gray, medium- grained							
540-549	Shale, blackish-gray, clayey, coaly							
549-551	Coal				300		300	9



LITHOLOGY		Strip log	Geophysical Logs				Depth
			Gamma	S.P.	Res.	Density	ft.
551-602	Shale, medium-gray, clayey. Minor thin coal bed						
602-606	Coal						1
606-607.2	Shale, carbonaceous						
607.2-608.2	Coal						
608.2-682	Claystone, medium- to dark- gray, silty, shaly. Minor thinly interbedded, fine- grained sandstone				350		350
682-682.8	Coal						1
682.8-686.6	Shale, carbonaceous						
686.6-688	Coal				400		400
688-689	Shale, carbonaceous						
689-690	Coal						1
690-692	Shale, carbonaceous						
692-702	Coal						1
702-705.5	Shale, carbonaceous				450		450
705.5-707	Coal						
707-708	Shale, carbonaceous						1
708-709	Coal						
709-709.6	Shale, carbonaceous						
709.6-713	Coal						1
713-718	Shale, dark-brown, carbonaceous, coaly				500		500
718-721	Sandstone, white, fine-grained						
721-771	Shale, dark-gray, clayey						1
771-774	Coal						
774-778	Shale, dark-gray, clayey						1
	Siltstone, shale, and sandstone, interbedded: Siltstone is gray and sandy to clayey.				550		550
778-791	Shale is dark gray and clayey. Sandstone is gray and fine grained						1
791-793	Coal, shaly						
793-795.4	Shale, dark-gray, clayey				600		600
795.4-797	Coal, shaly						
797-801.4	Shale, dark-gray, silty and clayey						1
801.4-804	Coal						
804-817.5	Shale, dark-gray, silty and clayey, coaly				650		650
817.5-820	Coal						2
820-820.8	Shale, dark-gray, silty						
820.8-821.4	Coal				700		700

LITHOLOGY	Strip Log	Geophysical Logs				Depth ft.
		Gamma	S.P.	Res.	Density	
821-4-851.5 Sandstone, siltstone, and shale, thinly interbedded. Sandstone is light gray, fine grained, and silty. Siltstone is gray, sandy, and clayey. Shale is dark gray and silty						750
851.5-852 Coal						
852-859.8 Shale, dark-gray						
859.8-861.5 Coal						
861.5-864.2 Shale, dark-gray, silty and sandy						800
864.2-867 Coal						
867-870 Shale, dark-gray						
870-879 Sandstone, whitish-gray, fine-grained						
879-881.8 Shale						850
881.8-883.2 Coal						
883.2-884 Shale, carbonaceous						
884-885.8 Coal						
885.8-888 Shale						
888-904 Sandstone, whitish-gray, fine-grained. Minor interbedded gray shale						900
904-906.5 Shale, carbonaceous						
906.5-938.5 Coal						
938.5-940.4 Shale, carbonaceous						
940.4-942.5 Coal						
942.5-944.5 Shale						950
944.5-946 Coal						
946-966 Sandstone						

Hole no. CB-20-HH Date logged 10-28-77 Surface elevation (ft) 7,190  
 Loc.: State Wyo. Cty. Carbon T. 21N., R. 80W., Sec. 24; 650 F.N.L., 450 F.W.  
 Drilled depth (ft) 1,006 Logged depth (ft) 1,006 Water Level (ft)           
 Drilling fluid: ☐ Air ☒ Water ☐ Foam ☒ Mud

Geophysical logs:

Spontaneous potential: Scale 40 mv/in Logging speed 20 f;  
 Resistivity: Scale 50 ohm/in Logging speed 20 f;  
 Gamma: T.C. 2 Scale 20 cps/in Logging speed 20 f;  
 Gamma dens.: T.C. 0.5 Scale 80 cps/in Logging speed 20 f;

LITHOLOGY		Strip log	Geophysical Logs				Depth ft.
			Gamma	S.P.	Res.	Density	
0-58	Sandstone, light-brown, to light-gray, fine- to medium-grained, silty						0
58-63	Claystone, dark-grayish-black, silty						
63-65.5	Coal						
65.5-86	Siltstone, sandstone, and claystone, interbedded. Siltstone is gray, sandy, and clayey. Sandstone is dark gray and silty. Claystone is dark-gray and carbonaceous						50
86-106	Claystone, dark-gray, silty, sandy, carbonaceous. Minor gray fine-grained sandstone						100
106-125	Sandstone, gray to dark-gray, fine-grained, silty						
125-134.2	Shale, dark-gray, silty, sandy						
134.2-136	Coal						150
136-137	Shale, carbonaceous						
137-138.5	Coal						
138.5-141.2	Shale, dark-brown, carbonaceous, coaly						
141.2-142.2	Coal						
142.2-155	Siltstone and shale						200
155-298	Sandstone, light-gray, fine- to medium-grained, occasional coarse-grained lenses, silty						
298-305	Shale, dark-brown, silty, carbonaceous						250
305-306	Coal						
306-311	Shale, dark-brown, clayey						300

LITHOLOGY		Strip log	Geophysical Logs				Depth
			Gamma	S.P.	Res.	Density	ft.
311-474	Sandstone, light-gray to gray, fine- to medium-grained, occasional coarse-grained lenses, slightly silty. Minor light-gray siltstone and shale lenses				350		350
474-487	Shale, black, carbonaceous, coaly						1
487-493	Sandstone, light-gray, medium-grained silty						1
493-498	Shale, black, carbonaceous, coaly				400		400
498-504	Sandstone, gray, medium-grained, silty						1
504-515	Shale, black, carbonaceous, coaly						1
515-521	Siltstone, light-gray, sandy				450		450
521-552	Sandstone, gray, medium-grained						1
552-605.8	Shale and siltstone. Shale is dark gray, carbonaceous, silty and clayey. Siltstone is gray and clayey						1
605.8-610	Coal				500		500
610-612	Shale, carbonaceous						1
612-613	Coal						1
613-631	Sandstone and claystone, interbedded. Sandstone is gray, fine grained, and silty. Claystone is dark gray						1
631-646	Siltstone, gray, clayey				550		550
646-646.5	Coal						1
646.5-650.5	Shale, carbonaceous						1
650.5-651.8	Coal						1
651.8-653	Shale, carbonaceous						1
653-654	Coal				600		600
654-656.5	Shale, carbonaceous						1
656.5-658.5	Coal						1
658.5-659	Shale, carbonaceous						1
659-663.8	Coal						1
663.8-664.5	Shale, carbonaceous						1
664.5-667	Coal				650		650
667-672.8	Shale, carbonaceous						2
672.8-673.6	Coal						2
673.6-676	Shale, carbonaceous						2
676-678.8	Coal						2
678.8-677.8	Shale, carbonaceous						2
677.8-680	Coal				700		700
680-688	Shale, gray, clayey and silty						



# DOW LOG, INC.

200 West 1<sup>st</sup> Avenue, Suite 200  
Denver, Colorado 80202

Date 10-19-77

HOLE CB 20-101

Location 101-101

Log # 101-101

Log # 101-101

Log # 101-101

Log # 101-101

Log # 101-101

Log # 101-101

Log # 101-101

Log # 101-101

Log # 101-101

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Log # 101-101

Log # 101-101

Log # 101-101

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Log # 101-101

## RADIATION LOG

Log #	Cement	Grout	Water
1	100%	100%	
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## ELECTRIC LOG

Log #	Cement	Grout	Water
1	100%	100%	
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## SPECIAL RUN

Log #	Cement	Grout	Water
1	100%	100%	
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100			

## CASING-HOLE DATA

Log #	Cement	Grout	Water
1	100%	100%	
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## REMARKS:

Other Services Provided



Hole No. CB-20-HH (continued)

LITHOLOGY		Strip log	Geophysical Logs				Depth
			Gamma	S.P.	Res.	Density	ft.
960-961	Coal						
961-969.5	Sandstone, gray, fine-grained, silty. Minor dark-gray shale						
969.5-973	Coal						
973-1006	Sandstone, gray, fine- to medium-grained, silty, shaly						

Hole no. CB-21-HH Date logged 11-2-77 Surface elevation (ft) 7,080  
 Loc.: State Wyo. Cty. Carbon T. 21N., R. 80W., Sec. 24; 1,350 FN-L, 300 FE  
 Drilled depth (ft) 1,405 Logged depth (ft) 1,405 Water Level (ft)           
 Drilling fluid: ☐ Air ☒ Water ☐ Foam ☒ Mud

Geophysical logs:

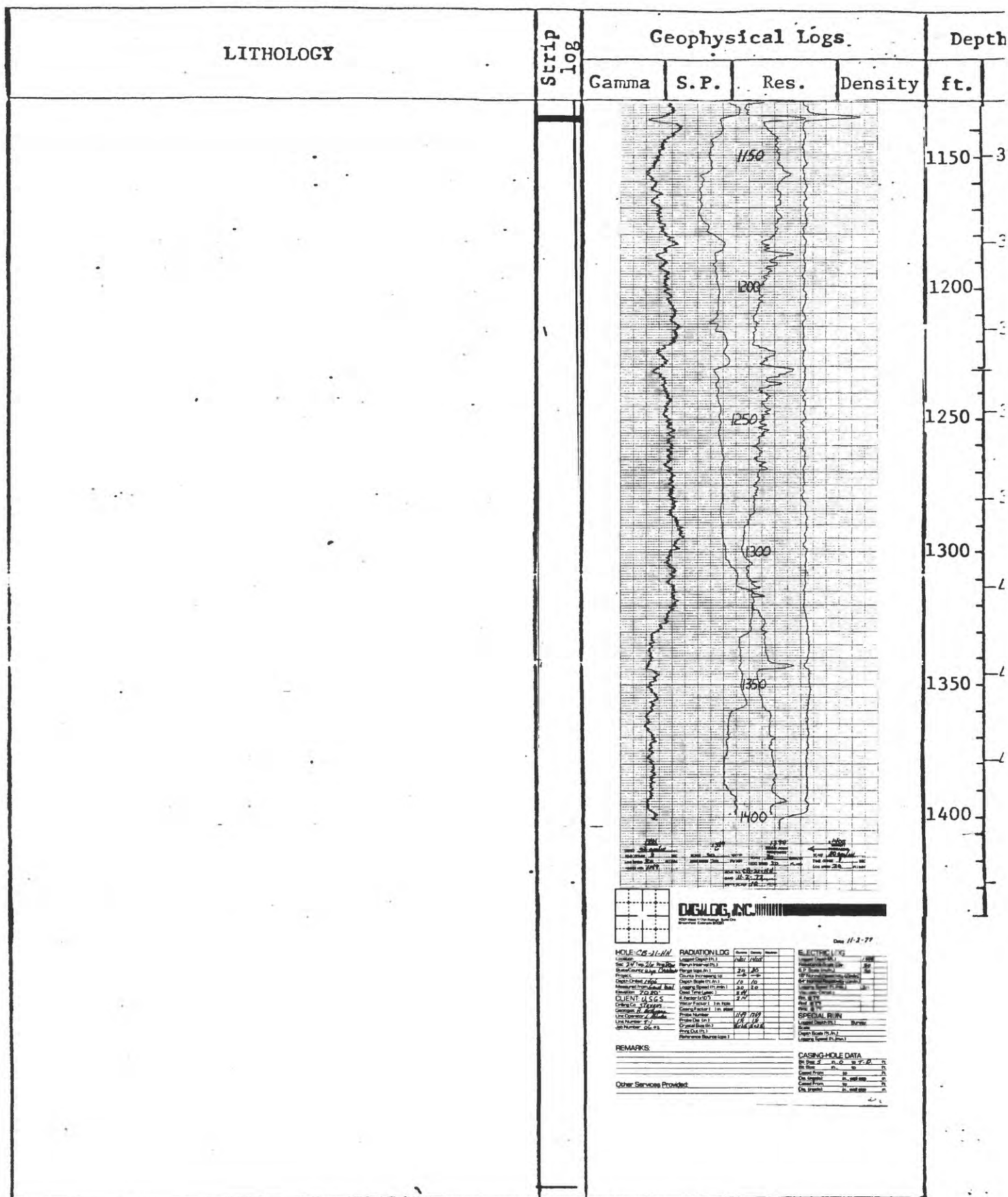
Spontaneous potential: Scale 30 mv/in Logging speed 20 fpr  
 Resistivity: Scale 30 ohm/in Logging speed 20 fpr  
 Gamma: T.C. 2 Scale 20 cps/in Logging speed 20 fpr  
 Gamma dens.: T.C. 1 Scale 80 cps/in Logging speed 20 fpr

LITHOLOGY		Strip log	Geophysical Logs				Depth	
			Gamma	S.P.	Res.	Density	ft.	
0-18	Sandstone, light-brown, fine-to medium-grained, slightly silty						0	0
18-22.5	Shale, brownish-black, carbonaceous, coaly						1	
22.5-23.8	Coal						50	
23.8-27.5	Shale, carbonaceous						2	
27.5-28.6	Coal						3	
28.6-30.2	Shale, carbonaceous						100	
30.2-31	Coal						150	
31-32.2	Shale, carbonaceous						200	
32.2-33.4	Coal						250	
33.4-35	Shale, carbonaceous						300	
35-49	Sandstone and claystone, interbedded. Sandstone is gray, fine grained, and silty. Claystone is dark gray and silty						4	
49-52.5	Shale, black, carbonaceous, coaly						5	
52.5-53	Coal						6	
53-56.8	Shale, dark-brown, carbonaceous, coaly						7	
56.8-57.2	Coal						8	
57.2-181	Sandstone, gray, fine- to medium-grained, silty from 52.2 to 70 ft						9	
181-211	Shale, gray, silty							
211-385	Sandstone, gray, fine- to medium-grained, silty to very silty							
385-399	Shale, gray, silty. Minor siltstone							
399-413	Sandstone, gray, fine- to medium-grained, silty							
413-427	Shale, gray, silty							

LITHOLOGY	Strip log	Geophysical Logs.				Depth
		Gamma	S.P.	Res.	Density	ft.
427-439 Sandstone, gray, fine- to medium-grained						
439-440 Shale, carbonaceous						1
440-444.5 Coal						
444.5-449 Shale, dark-gray, carbonaceous, silty				350		350
449-450 Coal						1
450-466 Shale and siltstone, interbedded. Shale is gray and silty. Siltstone is gray and sandy						
466-469 Sandstone, gray, fine-grained, silty				400		400
469-473.8 Shale, brownish-black, carbonaceous, silty						
473.8-474.5 Coal						1
474.5-484 Shale and sandstone. Shale is dark gray and silty. Sandstone is gray, fine grained, and silty				450		450
484-485 Coal						1
485-488.4 Shale, carbonaceous						
488.4-492 Coal						
492-502.5 Shale, black, carbonaceous, coaly				500		500
502.5-503.4 Coal						
503.4-511 Shale, gray, silty						1
511-512 Coal						
512-513.8 Shale						
513.8-514.5 Coal						
514.5-541 Shale and sandstone, interbedded. Shale is gray and silty. Sandstone is gray, fine-grained, and silty				550		550
541-621 Sandstone, gray, medium- to coarse-grained						1
621-635 Shale, gray, silty				600		600
635-640 Sandstone, gray, medium-grained						
640-659.6 Siltstone, gray, clayey						1
659.6-662 Coal						
662-663.5 Shale, carbonaceous						
663.5-664.6 Coal						
664.6-669 Shale, carbonaceous				650		650
669-670 Coal						2
670-703 Siltstone, gray, very sandy						
703-774 Sandstone, light-gray, very fine grained to fine-grained						2
774-779 Shale, gray, silty						
779-785 Sandstone, gray, fine-grained				700		700
785-790 Siltstone, gray, shaly						

LITHOLOGY		Strip log	Geophysical Logs				Dep
			Gamma	S.P.	Res.	Density	ft.
790-793	Coal						
793-796	Shale						
796-808	Sandstone, light-gray, fine-grained				750		750
808-810	Shale, carbonaceous						
810-815	Coal						
815-818	Shale						
818-824	Sandstone, light-gray, fine-grained						
824-826.5	Shale, carbonaceous				800		800
826.5-851.6	Coal						
851.6-852.5	Shale, carbonaceous						
852.5-859	Coal. Minor carbonaceous shale partings						
859-864	Shale						
864-871	Siltstone				850		850
871-872	Shale, carbonaceous						
872-874	Coal, shaly						
874-879	Siltstone						
879-881	Coal						
881-1232	Sandstone, siltstone, and shale, thickly interbedded. Sandstone is gray, very fine grained to fine grained, and silty. Siltstone is gray and shaly. Shale is gray to dark gray and silty to clayey. Minor coal				900		900
1232-1330	Siltstone and shale. Siltstone is gray and sandy. Shale is dark gray and silty to clayey				950		950
1330-1405	Sandstone, gray, fine-grained, silty				1000		1000
					1050		1050
					1100		1100







Hole no. CB-22-HH Date logged 11-1-77 Surface elevation (ft) 7,223  
 Loc.: State Wyo. Cty. Carbon T. 21N., R. 80W., Sec. 24; 250 F.S.L. 1,050 F.W.  
 Drilled depth (ft) 1,780 Logged depth (ft) 1,780 Water Level (ft)       
 Drilling fluid: ☐ Air ☒ Water ☐ Foam ☒ Mud

Geophysical logs:

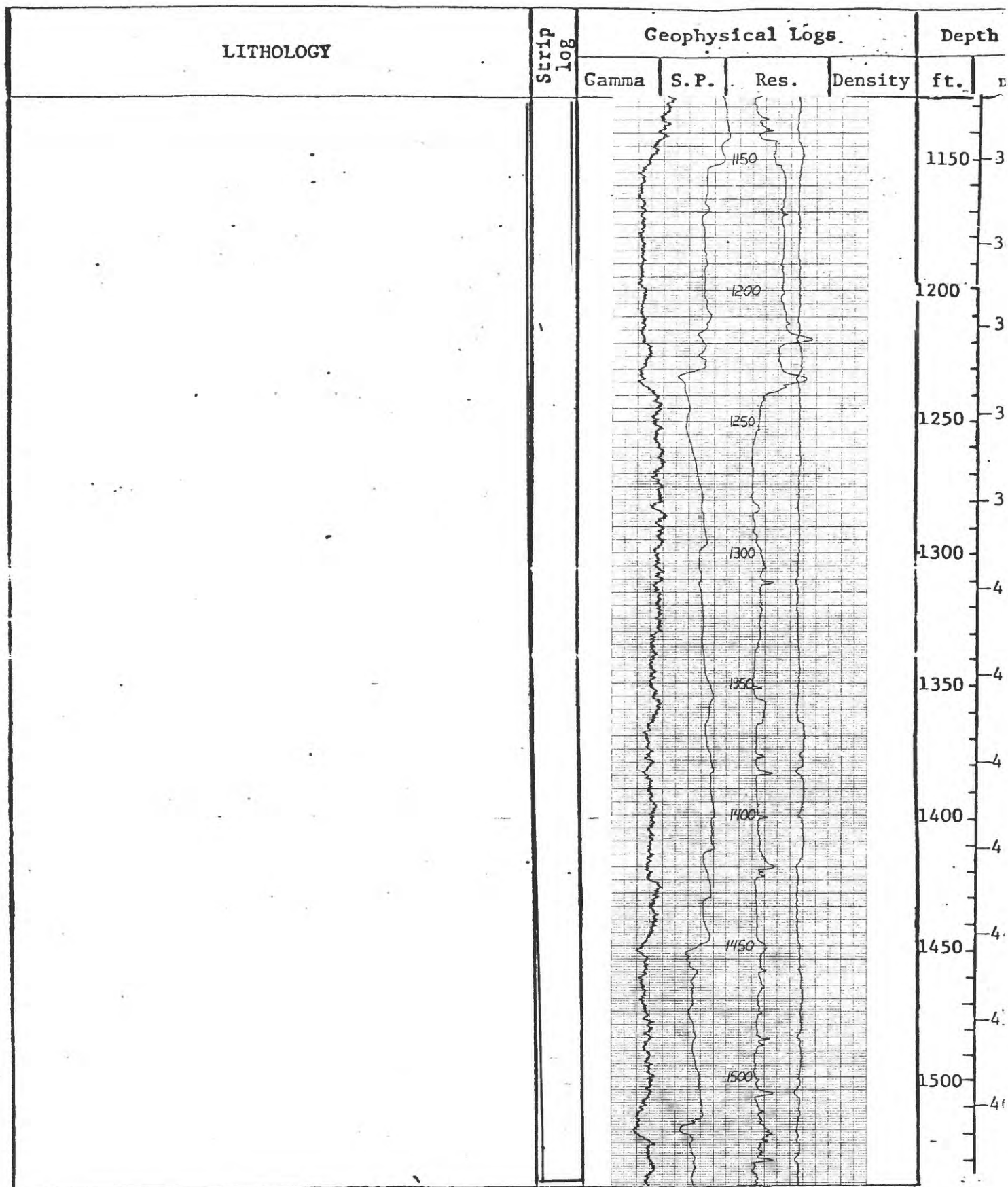
Spontaneous potential: Scale 30 mv/in Logging speed 20 f.  
 Resistivity: Scale 30 ohm/in Logging speed 20 f.  
 Gamma: T.C. 2 Scale 20 cps/in Logging speed 20 f.  
 Gamma dens.: T.C. 1 Scale 80 cps/in Logging speed 20 f.

LITHOLOGY		Strip log	Geophysical Logs				Depth ft.
			Gamma	S.P.	Res.	Density	
0-65	Sandstone, light-brown, fine- to medium-grained						0
65-187.5	Siltstone, sandstone, and claystone, interbedded. Siltstone is gray and sandy to clayey. Sandstone is gray to brown, fine to medium grained and silty. Claystone is light gray						50
187.5-189.2	Coal						100
189.2-190	Shale, carbonaceous						150
190-192	Coal						200
192-195	Shale, carbonaceous						250
195-196.5	Coal						300
198.5-222	Claystone, light-gray, sandy						350
222-254	Sandstone, light-gray, fine- to medium-grained						400
254-311	Claystone and siltstone, interbedded. Claystone is light gray and silty. Siltstone is gray, clayey, and sandy						450
311-334	Siltstone, light-gray, clayey						500
334-465	Sandstone, gray, fine- to medium-grained, occasional coarse-grained lenses						550
465-482.8	Shale, light-gray, silty						600
482.8-483.6	Coal						650
483.6-541	Siltstone and shale, inter- bedded. Siltstone is gray and clayey. Shale is gray and clayey to silty						700

LITHOLOGY		Strip log	Geophysical Logs.				Dep
			Gamma	S.P.	Res.	Density	ft.
541-569	Sandstone and claystone, interbedded. Sandstone is light gray, very fine grained, and silty. Claystone is light gray and silty						1
569-580	Shale, light-gray, clayey				350	350	1
580-600	Sandstone, gray, fine- to coarse-grained. Interbedded siltstone						1
600-605	Claystone, dark-gray						1
605-606	Coal						1
606-607.2	Shale, carbonaceous				400	400	1
607.2-609	Coal, shaly						1
609-627	Sandstone, gray, coarse-grained						1
627-629	Shale, carbonaceous						1
629-633.8	Coal						1
633.8-634.2	Shale, carbonaceous						1
634.2-635	Coal				450	450	1
635-650.2	Shale, siltstone, and sandstone, thinly interbedded. Shale is gray and silty. Siltstone is gray and clayey to sandy. Sandstone is gray and medium to coarse grained						1
650.2-652	Coal, shaly				500	500	1
652-656	Shale, gray, silty						1
656-664	Sandstone, gray, medium-grained						1
664-678.5	Shale						1
678.5-680.5	Coal, shaly						1
680.5-683.8	Claystone, light-gray				550	550	1
683.8-685	Coal						1
685-685.8	Shale, carbonaceous						1
685.8-687	Coal						1
687-688.5	Shale, carbonaceous						1
688.5-697.5	Coal						1
697.5-717	Shale, gray, silty				600	600	1
717-720	Sandstone, gray, medium-grained						1
720-729	Shale, gray, silty and clayey						1
729-730	Coal						1
730-734.2	Shale, carbonaceous						1
734.2-737.8	Coal						1
737.8-748.2	Sandstone and siltstone				650	650	2
748.2-749	Coal						2
749-757.8	Shale, gray, silty						2
757.8-762.5	Coal						2
762.5-776	Siltstone, gray, shaly						2
776-777.6	Coal						2
777.6-779.4	Shale, carbonaceous						2
779.4-781	Coal				700	700	2

LITHOLOGY		Strip log	Geophysical Logs.				Depth ft.
			Gamma	S. P.	Res.	Density	
781-790	Siltstone						
790-792.4	Coal						
792.4-793.2	Shale, carbonaceous						
793.2-795	Coal						
795-796.2	Shale, carbonaceous						750
796.2-798.1	Coal						
798.1-798.6	Shale, carbonaceous						
798.6-799.2	Coal						
799.2-835.6	Sandstone, gray, medium-grained, silty. Minor interbedded claystone						800
835.6-838	Coal						
838-839.5	Shale, carbonaceous						
839.5-840.2	Coal						
840.2-843	Shale, carbonaceous						
843-845	Coal						850
845-847	Shale, carbonaceous						
847-850	Coal						
850-861	Siltstone, gray, shaly						
861-864.5	Coal						
864.5-876	Siltstone, gray, clayey						
876-885	Sandstone, light-gray, medium-grained, silty						900
885-889	Claystone, light-gray, silty						
889-918	Coal						
918-1110	Sandstone and siltstone, interbedded. Sandstone is gray, fine to coarse grained, and silty to very silty. Siltstone is gray and clayey to sandy						950
1110-1142	Shale, gray, silty and clayey						
1142-1239	Sandstone, gray, medium-grained. Minor interbedded gray siltstone						1000
1239-1780	Shale and sandstone. Shale is gray, very silty, and very sandy. Sandstone is gray, fine to coarse grained, and silty. Sample return was very contaminated with up-hole cuttings in this interval						1050
							1100

Hole No. CB-22-HH (continued)









Hole no. CB-23-HH Date logged 11-3-77 Surface elevation (ft) 7,080  
 Loc.: State Wyo. Cty. Carbon T. 21N., R. 80W., Sec. 24; 1,350 F.S.L., 150 F.E.  
 Drilled depth (ft) 965 Logged depth (ft) 963 Water Level (ft)             
 Drilling fluid: ☐ Air ☒ Water ☐ Foam ☒ Mud

Geophysical logs:

Spontaneous potential: Scale 40 mv/in Logging speed 20 f<sub>i</sub>  
 Resistivity: Scale 40 ohm/in Logging speed 20 f<sub>i</sub>  
 Gamma: T.C. 2 Scale 20 cps/in Logging speed 20 f<sub>i</sub>  
 Gamma dens.: T.C. 1 Scale 80 cps/in Logging speed 20 f<sub>i</sub>

LITHOLOGY		Strip log	Geophysical Logs				Depth ft.
			Gamma	S.P.	Res.	Density	
0-5	Sandstone, gray-brown, fine-grained, clayey and silty						0
5-30	Claystone, light-gray, silty						
30-50	Sandstone, grayish-brown, fine-grained						
50-74	Sandstone, grayish-brown, coarse-grained						50
74-88.6	Claystone, dark-brown, silty						
88.6-90	Coal						
90-93.8	Claystone, dark-brown, silty						
93.8-94.8	Coal						
94.8-96	Claystone, dark-brown, silty						100
96-97	Coal						
97-98.2	Claystone, dark-brown, silty						
98.2-99.2	Coal						
99.2-152	Claystone and siltstone, interbedded. Claystone is light gray. Siltstone is light gray and sandy. Minor thinly bedded sandstone						150
152-238	Sandstone, gray, fine-grained, silty. Occasional coarse-grained sandstone lenses						
238-243	Claystone, light-gray, silty, carbonaceous						200
243-244	Coal						
244-252	Claystone, light-gray, silty, carbonaceous						
252-265	Sandstone, gray, coarse-grained						
265-307	Claystone, light-gray, silty. Minor thinly interbedded sandstone						250
307-428	Sandstone, gray, medium- to coarse-grained. Minor thinly interbedded gray claystone						300

LITHOLOGY		Strip log	Geophysical Logs.				Depth ft.
			Gamma	S.P.	Res.	Density	
428-529	Claystone, light-gray, silty, shaly						
529-540	Sandstone, gray, medium-grained						
540-544.8	Claystone, light-gray, silty						
544.8-549.8	Coal						
549.8-552	Claystone, light-gray, silty				350		350
552-552.8	Coal						
552.8-558	Claystone, light-gray, silty, shaly						
558-559	Coal						
559-567.8	Claystone, light-gray, silty				400		400
567.8-570	Coal, shaly						
570-575	Claystone, gray, silty						
575-576	Coal						
576-577.4	Claystone, gray, silty						
577.4-578	Coal						
578-583.2	Claystone, gray, silty				450		450
583.2-584.2	Coal						
584.2-585	Claystone						
585-586	Coal						
586-588	Claystone						
588-589.8	Coal						
589.8-590.5	Claystone				500		500
590.5-592.5	Coal						
592.5-606.5	Claystone, light-gray, silty, shaly						
606.5-607	Coal						
607-609	Claystone						
609-611	Coal, shaly				550		550
611-612	Claystone						
612-614	Coal						
614-626	Claystone, light-gray, silty, coaly, shaly						
626-694	Sandstone, gray, medium- to coarse-grained				600		600
694-695	Claystone						
695-698	Coal						
698-707.5	Claystone and sandstone. Claystone is light gray and silty. Sandstone is gray and fine grained						
707.5-709	Coal				650		650
709-715	Claystone, light-gray, silty						
715-716.4	Coal						
716.4-747.8	Claystone, light-gray, silty, shaly						
747.8-750	Coal				700		700
750-750.6	Shale, carbonaceous						
750.6-752	Coal						

LITHOLOGY	Strip log	Geophysical Logs.				Depth ft.
		Gamma	S.P.	Res.	Density	
752-753 Shale, carbonaceous						
753-755 Coal						
755-762 Claystone, gray, silty, shaly						
762-766 Sandstone, gray, fine-grained, silty				750		750
766-768.5 Claystone, gray, silty, coaly.						
768.5-770.5 Coal						
770.5-772 Claystone						
772-773.5 Coal, shaly						
773.5-777.4 Claystone, gray, silty				800		800
777.4-779.5 Coal						
779.5-780 Shale, carbonaceous						
780-781 Coal						
781-782 Shale, carbonaceous						
782-786 Coal						
786-816 Sandstone, gray, medium-grained				850		850
816-817 Shale, carbonaceous						
817-818 Coal						
818-819.5 Shale, carbonaceous						
819.5-824 Coal						
824-827 Claystone, gray, silty				900		900
827-830 Sandstone						
830-833 Shale, carbonaceous						
833-860.6 Coal						
860.6-862 Claystone						
862-963 Sandstone and siltstone, interbedded. Sandstone is gray, medium to coarse grained, and silty. Siltstone is gray, sandy, and shaly				950		950

**HOLE: CB-23-HH**

Location: \_\_\_\_\_

Depth: \_\_\_\_\_

Operator: \_\_\_\_\_

Client: \_\_\_\_\_

Date: \_\_\_\_\_

**RADIATION LOG**

Depth (ft)	Gamma	S.P.	Res.	Density
752				
753				
755				
762				
766				
770				
772				
773				
777				
779				
780				
781				
782				
786				
816				
817				
818				
819				
824				
827				
830				
833				
860				
862				
963				

**REMARKS:**

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Other Services Provided: \_\_\_\_\_