

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

GEOPHYSICAL LOGS OF NINE HOLES DRILLED IN 1978 IN THE
YAMPA COAL FIELD, HAMILTON AND PAGODA QUADRANGLES,
MOFFAT COUNTY, COLORADO

By

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INTRODUCTION

Under contract no. 14-08-0001-17329, awarded by the U.S. Geological Survey, McCabe Brothers Drilling, Inc. drilled nine holes in the Yampa coal field, Moffat County, Colorado (figs. 1 and 2). All of the holes were drilled with truck-mounted rotary drill rigs between August 4 and September 28, 1978. The holes were drilled with 5 1/8-in. bits except for hole C-1C-H which was a core hole and was started with a 5 5/8-in. rock bit.

The purpose of the drilling was part of the Survey's ongoing program to obtain information on the thickness, quality, depth, and continuity of coal beds in the Upper Cretaceous Williams Fork Formation in the Yampa coal field. Many of the holes reached the Trout Creek Sandstone Member of the Upper Cretaceous Iles Formation and a few holes were drilled through the Trout Creek Sandstone and intersected some of the coals in the upper part of the Iles Formation. All of the holes were located within areas of interest to industry for future coal leasing.

U.S. Geological Survey personnel selected the drill-hole locations, obtained permission for access, supervised the drilling and geophysical logging, took part in the pre-drilling site inspections by the Bureau of Land Management, and participated in the post-drilling reclamation. Post-drilling reclamation met the specifications of the Bureau of Land Management. Rodney Noah and Pete Lackey, U.S. Geological Survey, assisted in the drilling program and were especially helpful in describing samples.

Under contract to McCabe Brothers Drilling, Inc., a total of 8,479 ft of hole were geophysically logged by Digilog, Inc., Broomfield, Colo. The density spacing on the sonde was 19.75 in. in all holes except hole C-1A-H in which a sonde with a density spacing of 14.75 in. was used, and hole C-1C-H in which a sonde with a high-resolution density spacing of 2 in. was used for the second run. Three geophysical logs were recorded from one sonde on the second run in hole C-1C-H. These and other unusual characteristics of each particular hole are noted in the remarks section of the individual logs.

Hole C-1C-H is a twin of hole C-1-H. Hole C-1C-H was drilled to obtain cores of the coals. These cores were submitted to the U.S. Geological Survey Analytical Laboratory in Denver, Colo., for coal quality analyses.

The geophysical logs were originally run at a vertical scale of 1 in. to 10 ft, but to facilitate reproduction of this report, they were reduced to 1 in. to 50 ft. All measurements are in feet; to convert to meters, multiply by 0.3048.

Table 1.--Drill-hole locations, elevations, and drilled and logged depths

Hole No.		Location			Ground eleva- tion (ft)	Total depth drilled (ft)	Depth logged (ft)
		Sec.	T. N.	R. W.			
C-1-H	SW $\frac{1}{4}$ SW $\frac{1}{4}$	23	4	91	7,610	1,175	906
C-1A-H	SW $\frac{1}{4}$ SW $\frac{1}{4}$	23	4	91	7,615	875	829
C-1C-H	SW $\frac{1}{4}$ SW $\frac{1}{4}$	23	4	91	7,615	876	779
H-36-H	NW $\frac{1}{4}$ NE $\frac{1}{4}$	24	4	91	7,350	1,825	1,825
H-38-H	SW $\frac{1}{4}$ NW $\frac{1}{4}$	13	4	91	7,180	1,020	1,020
H-39-H	NE $\frac{1}{4}$ NW $\frac{1}{4}$	13	4	91	7,420	1,101	1,101
H-40-H	NW $\frac{1}{4}$ SW $\frac{1}{4}$	22	4	91	7,235	631	631
H-41-P	NW $\frac{1}{4}$ NE $\frac{1}{4}$	3	3	90	8,270	960	958
H-41A-P	NW $\frac{1}{4}$ NE $\frac{1}{4}$	3	3	90	8,275	430	430

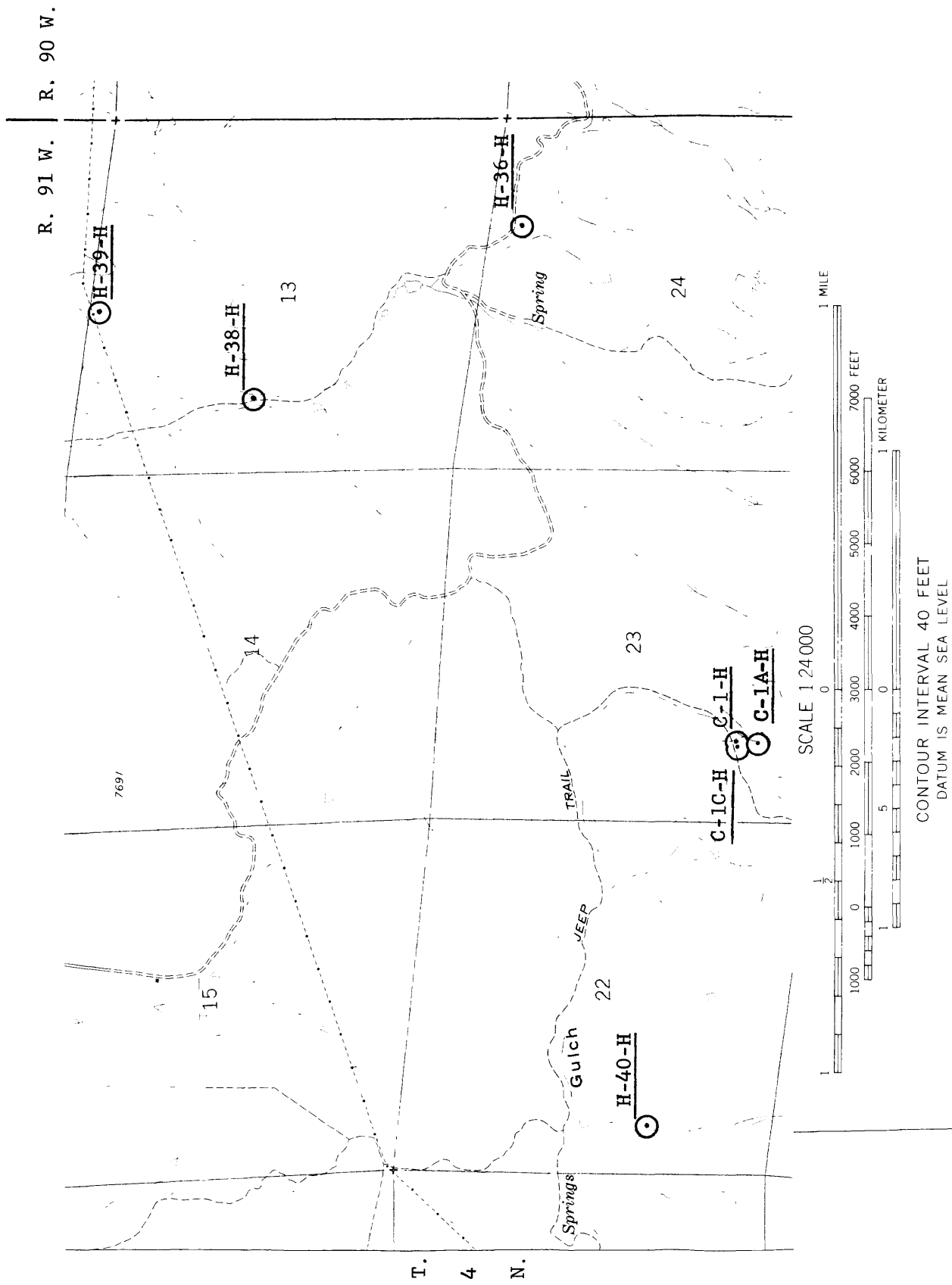


Figure 1. -- Location of drill holes, Hamilton quadrangle, Moffat County, Colorado

R. 90 W.

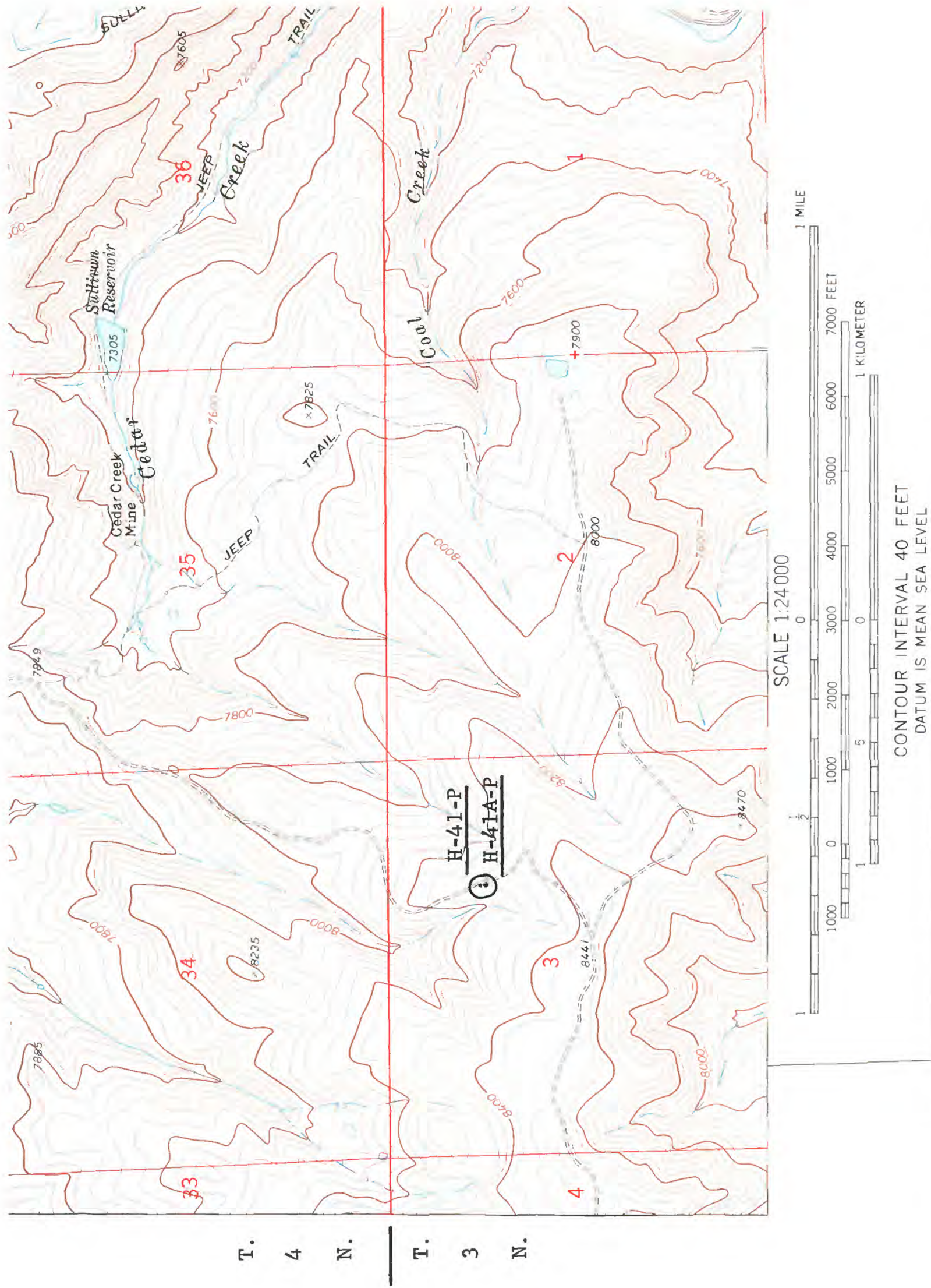


Figure 2. -- Location of drill holes, Pagoda quadrangle, Moffat County, Colorado

U.S. GEOLOGICAL SURVEY
GEOPHYSICAL LOG, MOFFAT COUNTY, COLORADO
HAMILTON QUADRANGLE

Hole no. C-1-H Date logged 8-28-78 Ground elevation 7,610'

T. 4 N., R. 91 W., Sec. 23 : 1,140 f s 1, 1,110 f w 1

Drilling medium mud Drilled depth 1,175' Fluid level 40'

Logging speed: (1st) 20'/min (2nd) 10'/min Logged depth 906'

Natural gamma (NG) Scale 10 cps/in. T.C. 2 sec

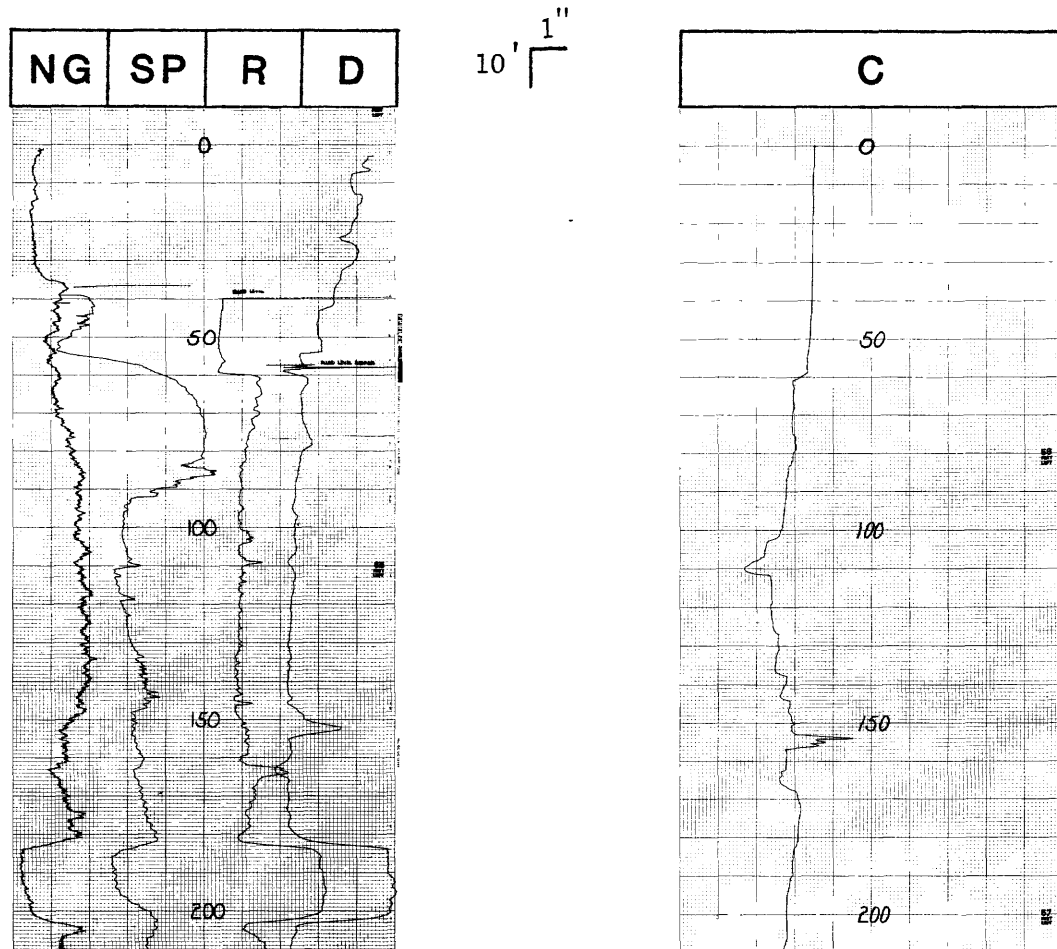
Spontaneous potential (SP) Scale 10 mv/in.

Single point resistance (R) Scale 10 ohms/in.

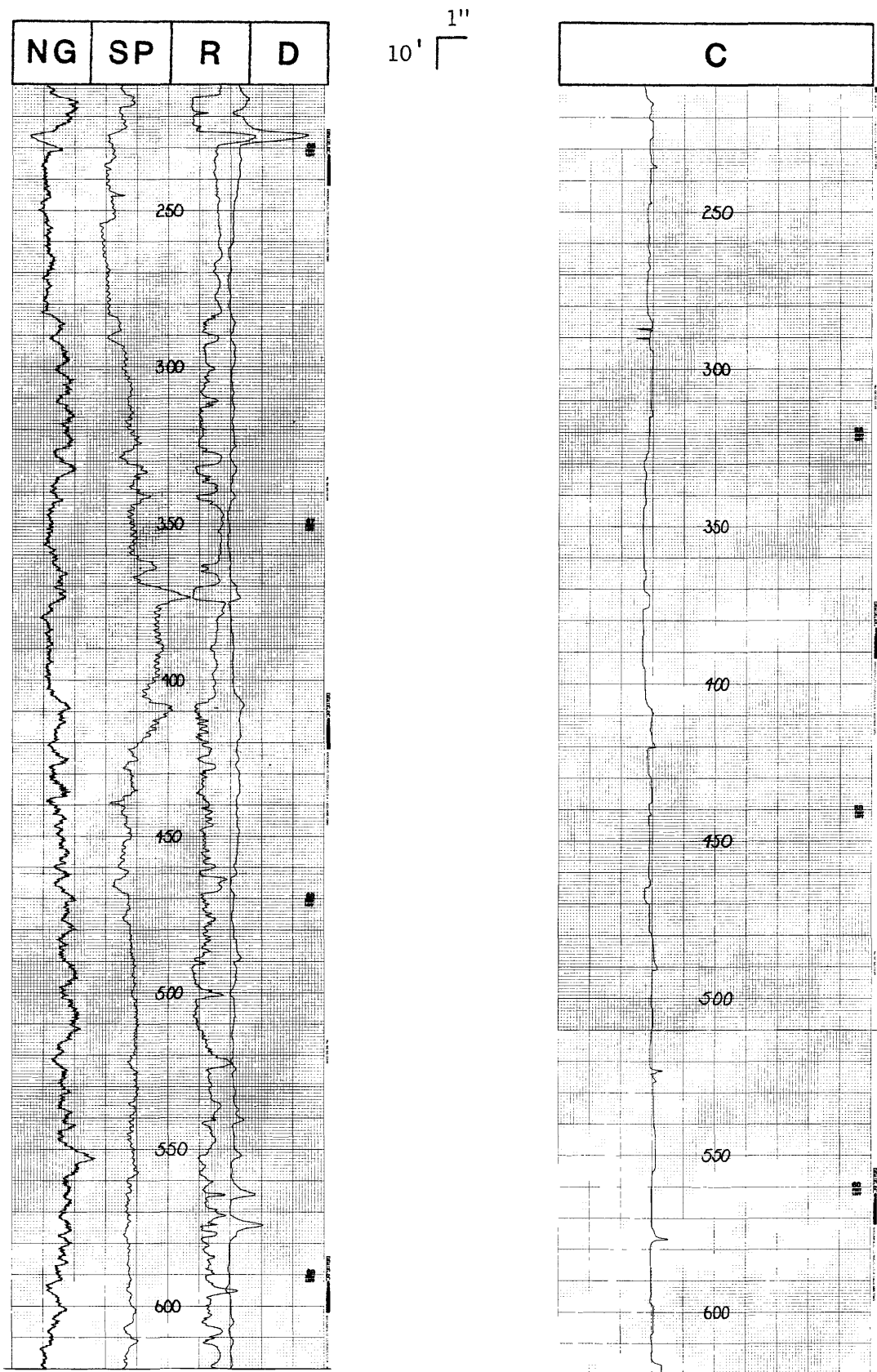
Density (gamma-gamma) (D) Scale 50 cps/in. T.C. 2 sec

Caliper (C) Scale 2 in./in.

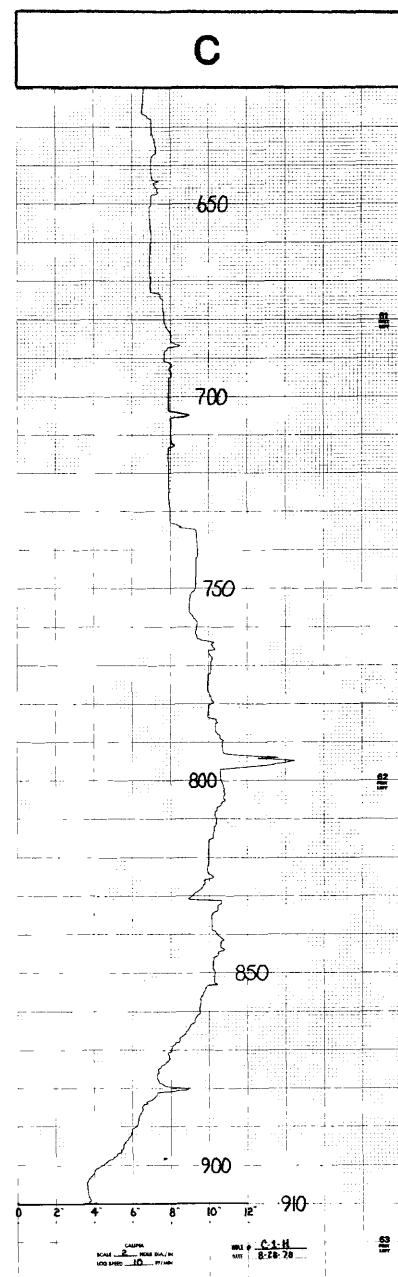
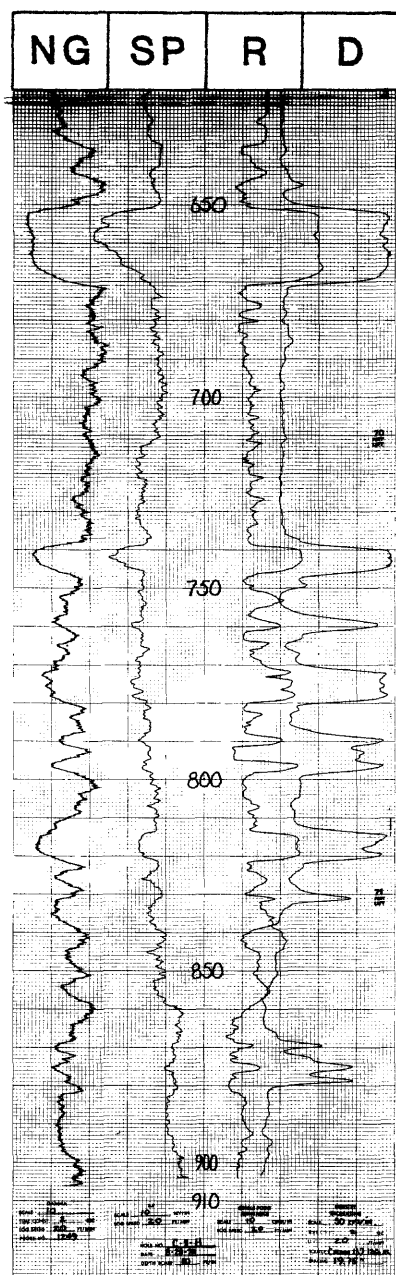
Remarks: Drill pipe twisted off in the hole from 920' to 1,175' while drilling.
Attempts to retrieve lost drill pipe were unsuccessful. Therefore, the hole was
only logged to 906'.



Hole no. C-1-H (continued)



Hole no. C-1-H (continued)



U.S. GEOLOGICAL SURVEY
GEOPHYSICAL LOG, MOFFAT COUNTY, COLORADO
HAMILTON QUADRANGLE

Hole no. C-1A-H Date logged 9-6-78 Ground elevation 7,615'

T. 4 N., R. 91 W., Sec. 23 : 830 f s 1, 1,100 f w 1

Drilling medium mud Drilled depth 875' Fluid level 8'

Logging speed: (1st) 20'/min (2nd) 20'/min Logged depth 829'

Natural gamma (NG) Scale 20 cps/in. T.C. 2 sec

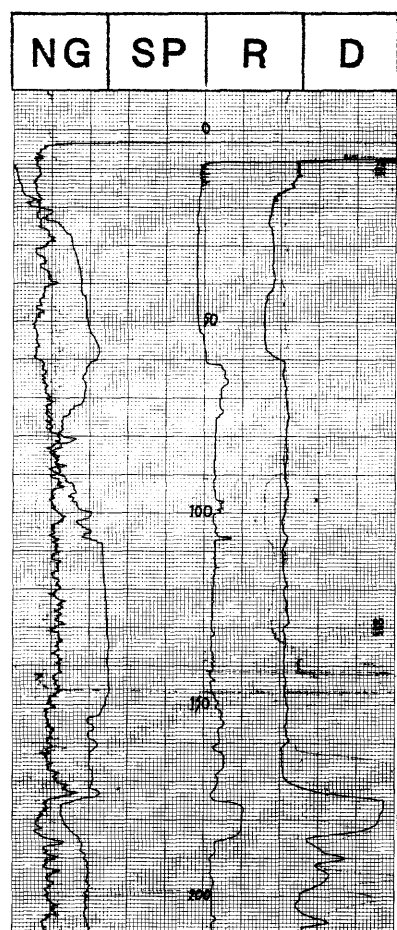
Spontaneous potential (SP) Scale 5 mv/in.

Single point resistance (R) Scale 10 ohms/in.

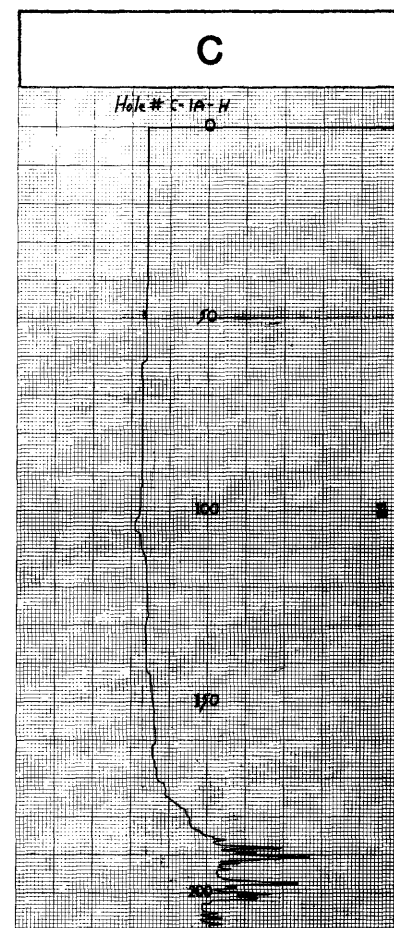
Density (gamma-gamma) (D) Scale 70 cps/in. T.C. 2 sec

Caliper (C) Scale 2 in./in.

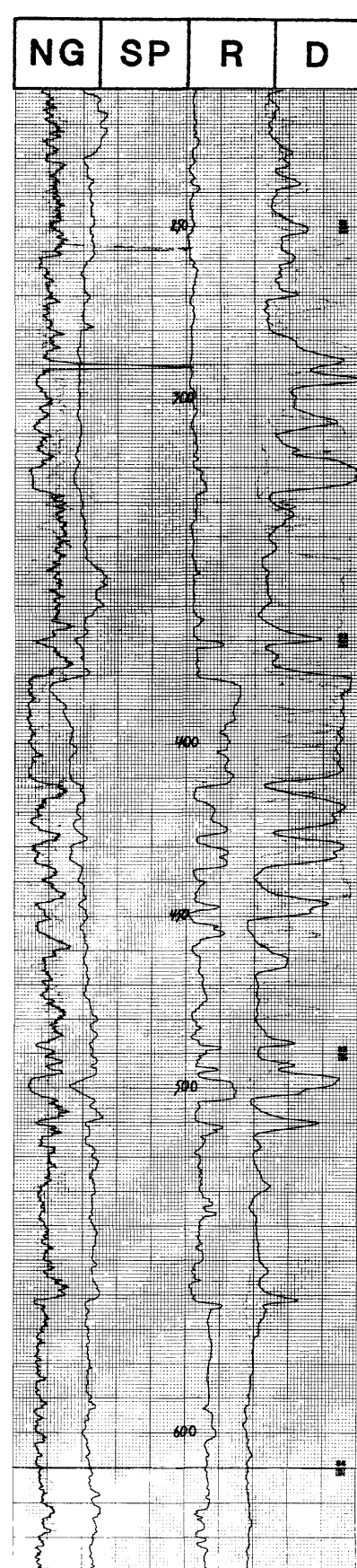
Remarks: Hole cased from 0' to 60'. Density spacing 14.75". Density readings on log are 1' low. Caliper log has bias adjustment at 807' in order to rescale for tight hole conditions. Large washouts from 180' to 223' and 252' to 326'.



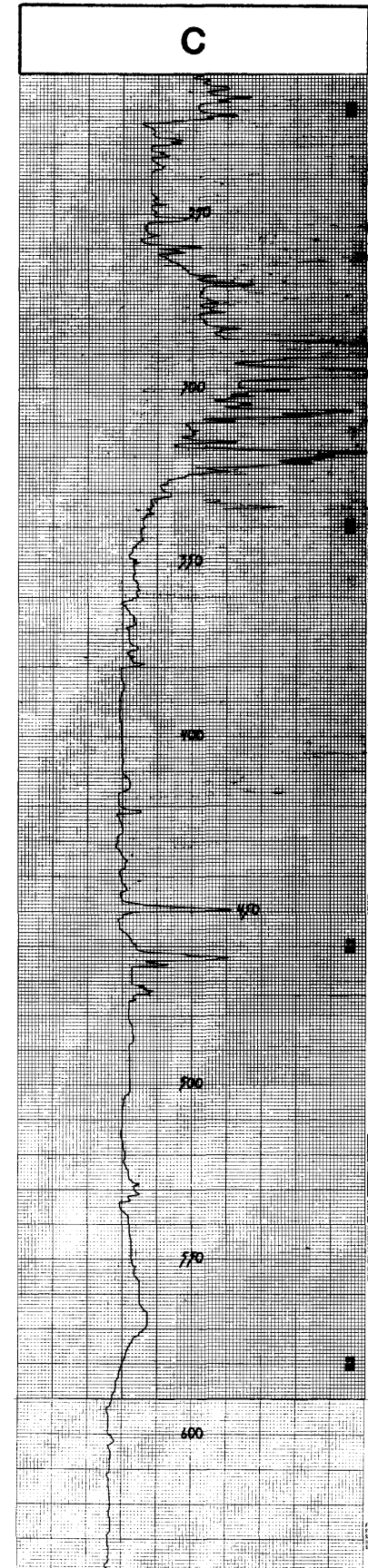
10' $\frac{1''}{1}$



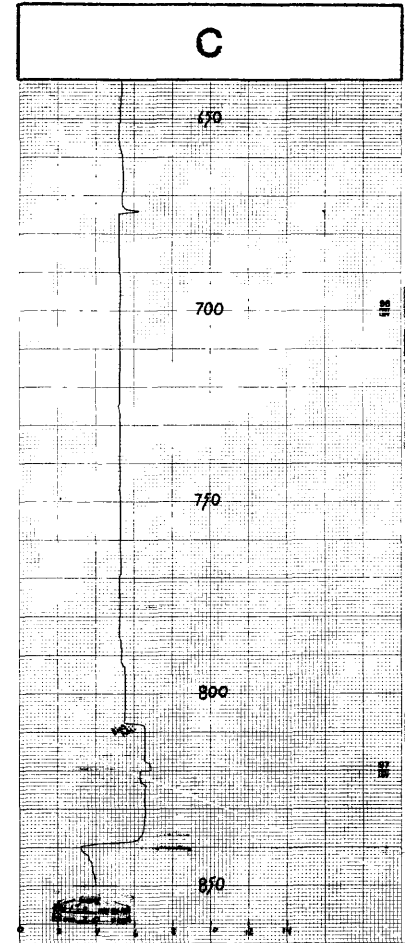
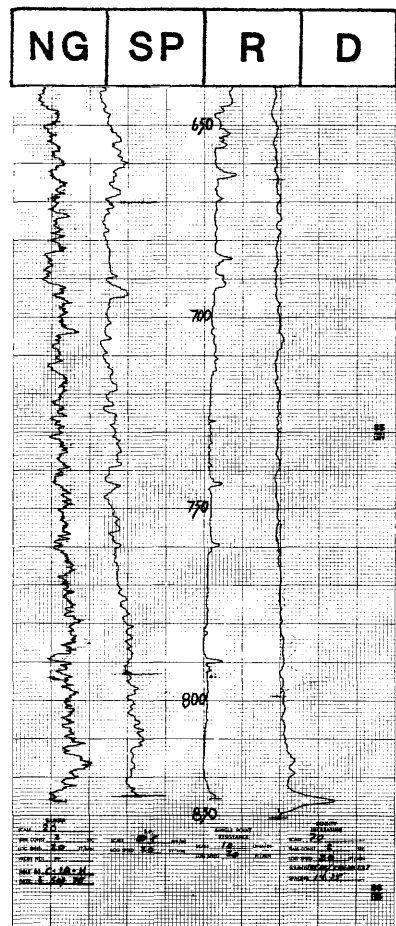
Hole no. C-1A-H (continued)



10' $\frac{1''}{10'}$



Hole no. C-1A-H (continued)



U.S. GEOLOGICAL SURVEY
GEOPHYSICAL LOG, MOFFAT COUNTY, COLORADO
HAMILTON QUADRANGLE

Hole no. C-1C-H Date logged 9-28-78 Ground elevation 7,615'

T. 4 N., R. 91 W., Sec. 23 : 1,100 f s 1, 1,040 f w 1

Drilling medium mud Drilled depth 876' Fluid level 62'

Logging speed: (1st) 20'/min (2nd) 15'/min Logged depth 789'

Natural gamma (NG) Scale 20 cps/in. T.C. 2 sec

Spontaneous potential (SP) Scale 5 mv/in.

Single point resistance (R) (1st run) Scale 10 ohms/in.

Density (gamma-gamma) (D) Scale 50 cps/in. T.C. 2 sec

Caliper (C) Scale 2 in./in.

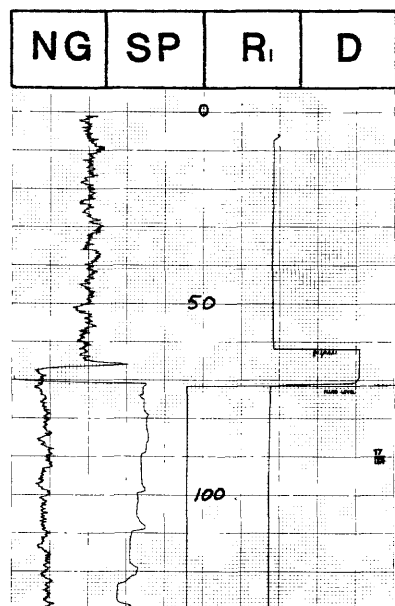
Single point resistance (R) (2nd run) Scale 25 ohms/in.

High resolution density (HRD) Scale 30 cps/in. T.C. 2 sec

Remarks: Core hole. Hole started with 5 5/8" rock bit. Hole cased to 140'.

Closed caliper at 150' to avoid casing. High resolution density spacing 2 inches.

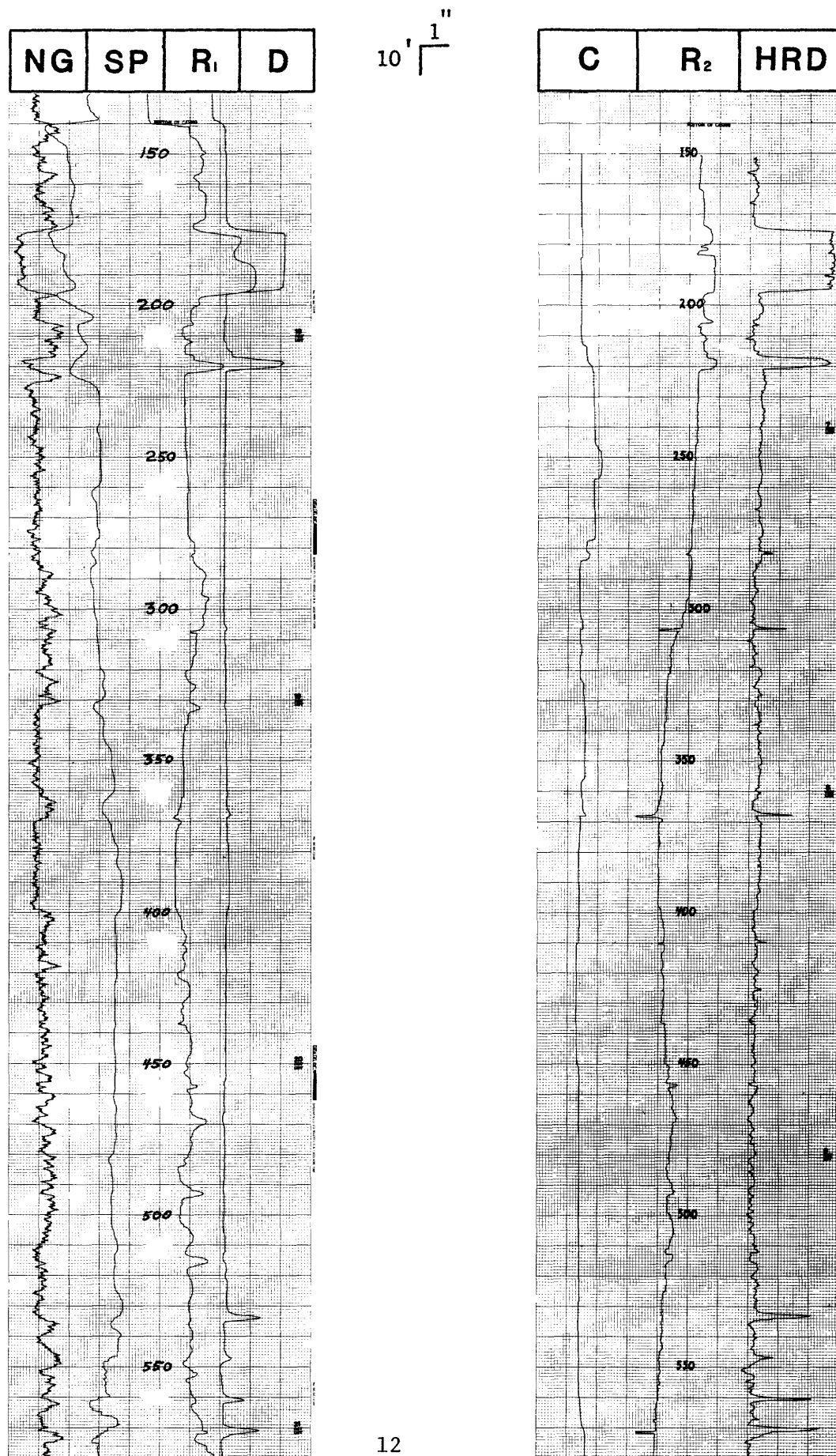
Hole was squeezing shut from 792' to 817' during drilling. Potash salts used during drilling.



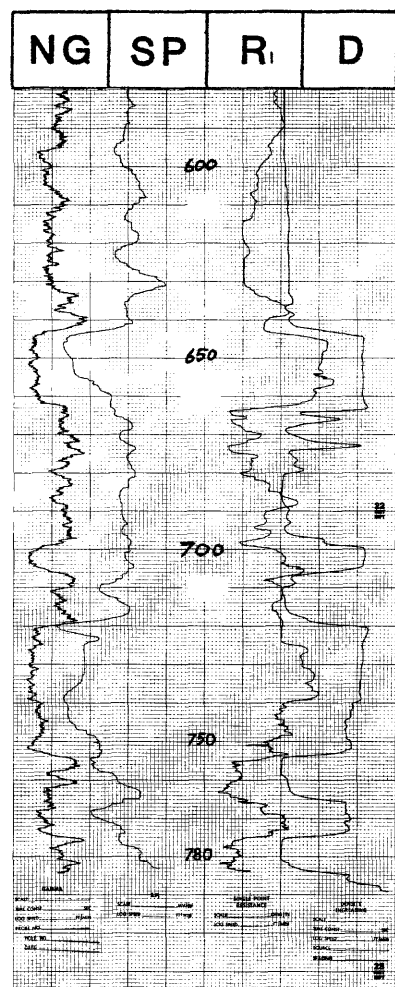
10' $\frac{1''}{10'}$

C	R ₂	HRD
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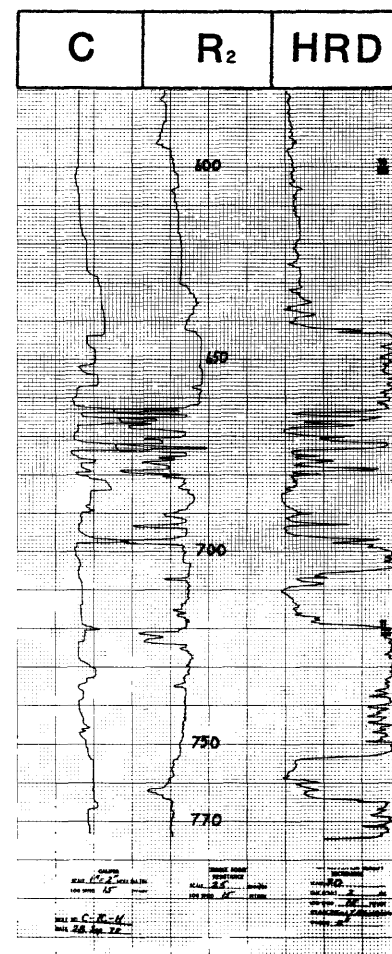
The caliper, single point resistance (2nd run), and high resolution density logs begin on the next page.



Hole no. C-1C-H (continued)



10' $\frac{1''}{1}$



U.S. GEOLOGICAL SURVEY
GEOPHYSICAL LOG, MOFFAT COUNTY, COLORADO
HAMILTON QUADRANGLE

Hole no. H-36-H Date logged 8-11-78 Ground elevation 7,350'

T. 4 N., R. 91 W., Sec. 24 : 420 f n 1, 1,470 f e 1

Drilling medium mud Drilled depth 1,825' Fluid level 55'

Logging speed: (1st) 20'/min (2nd) 10'/min Logged depth 1,825'

Natural gamma (NG) Scale 10 cps/in. T.C. 2 sec

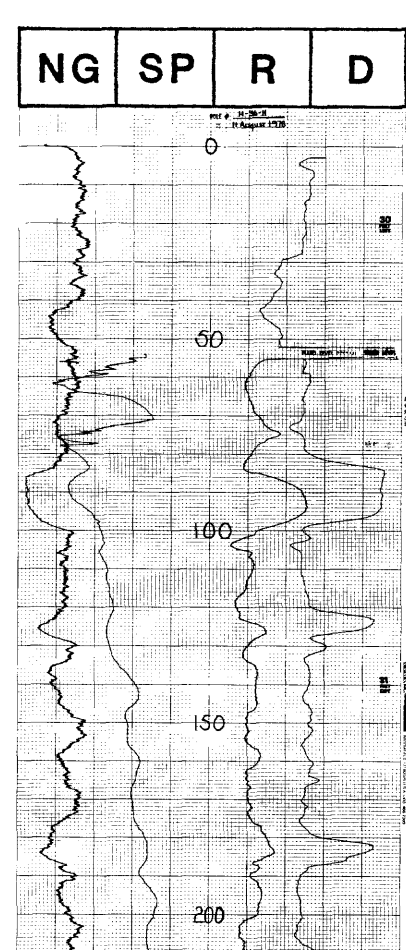
Spontaneous potential (SP) Scale 20 mv/in.

Single point resistance (R) Scale 5 ohms/in.

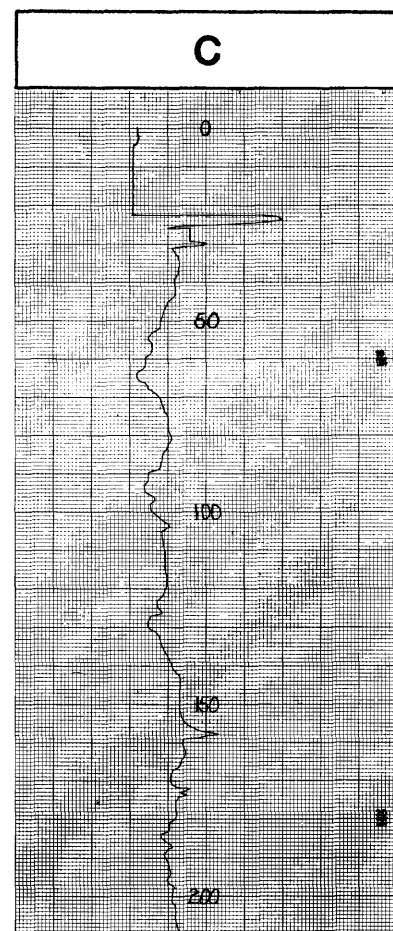
Density (gamma-gamma) (D) Scale 60 cps/in. T.C. 2 sec

Caliper (C) Scale 2 in./in.

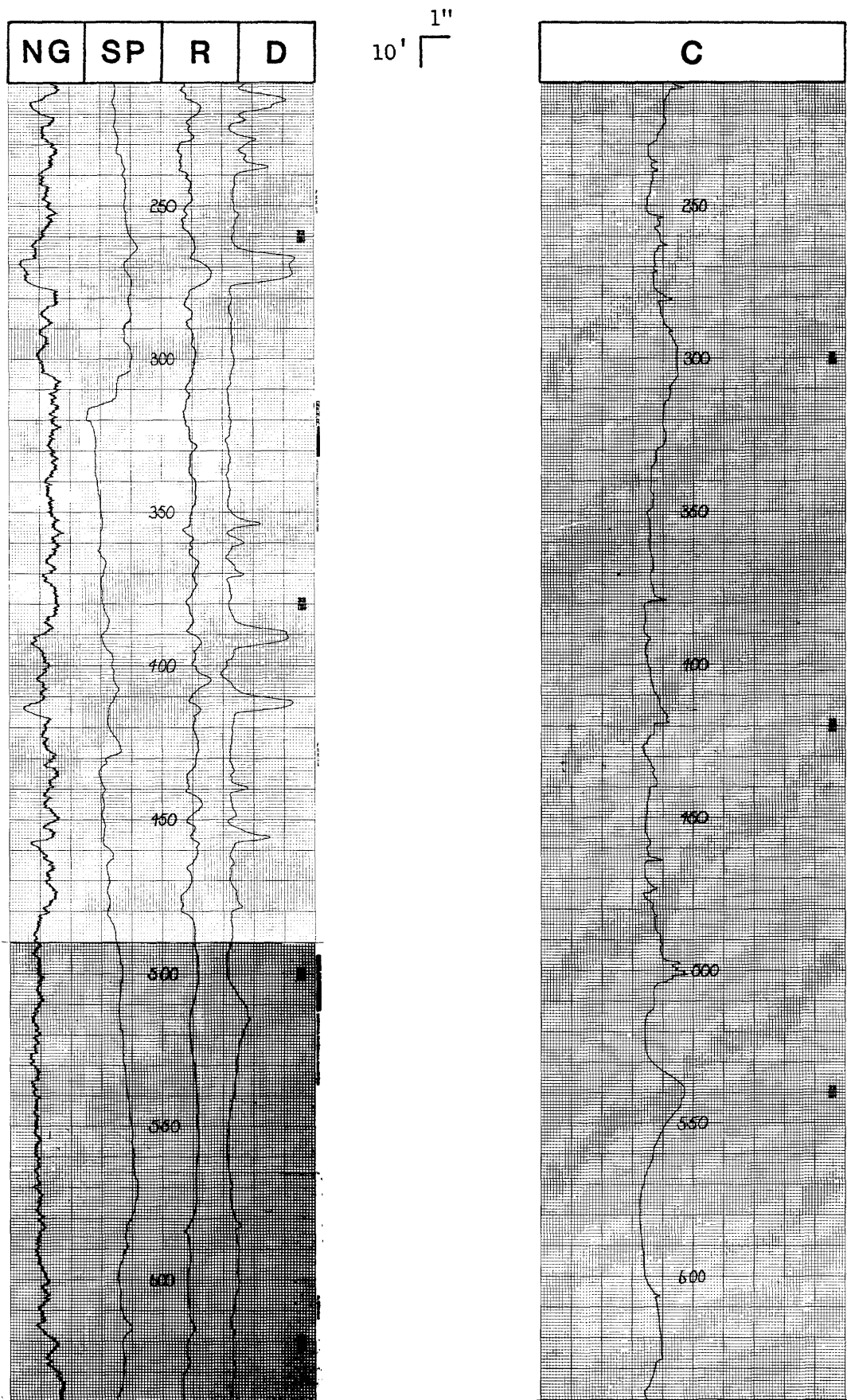
Remarks: Potash salt mixed in mud. Fresh H₂O in top of hole. Narrow "squeeze zone"
encountered at approximately 1,700' by drill bit when drill "string" and bit were
pulled out after the hole was completed.



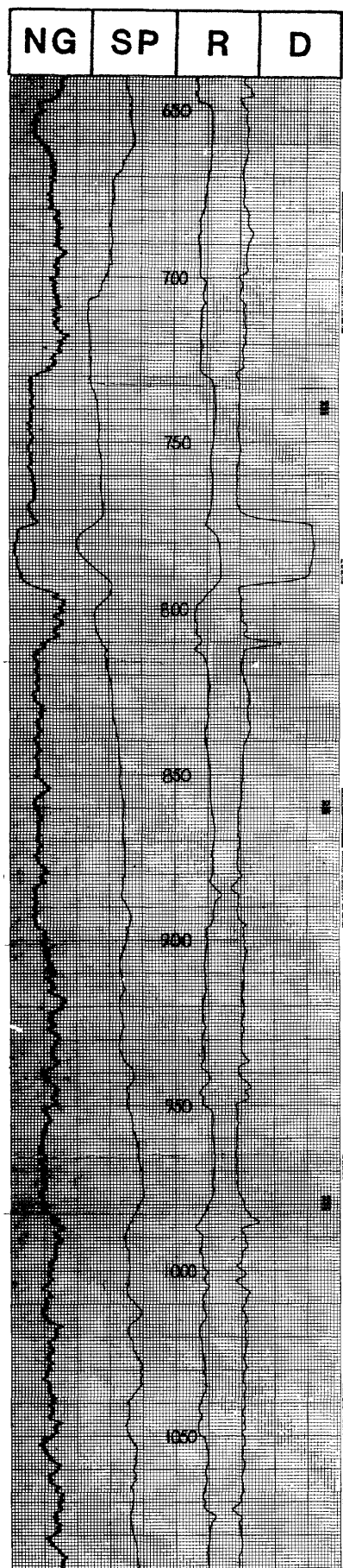
10' 1"



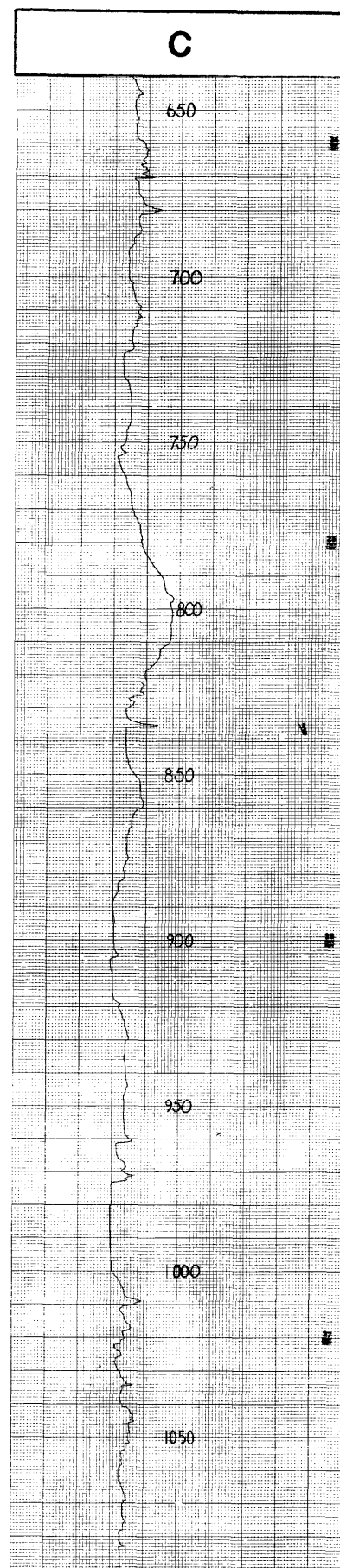
Hole no. H-36-H (continued)



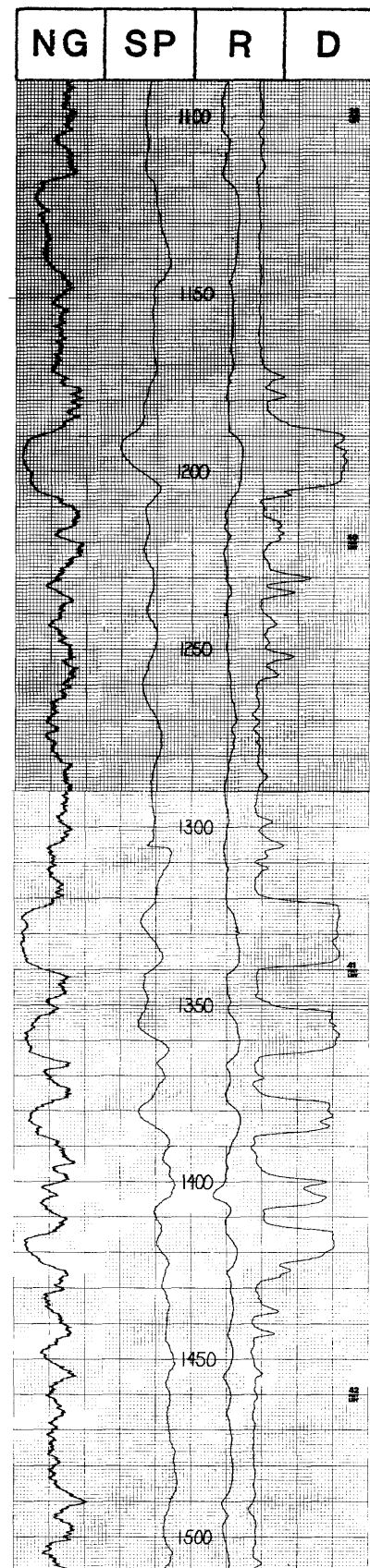
Hole no. H-36-H (continued)



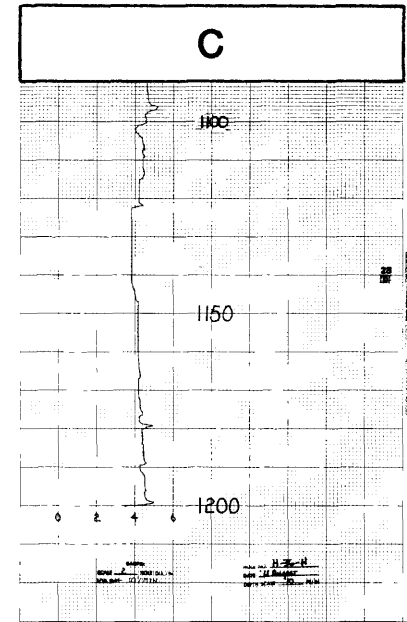
10' $\frac{1''}{10'}$



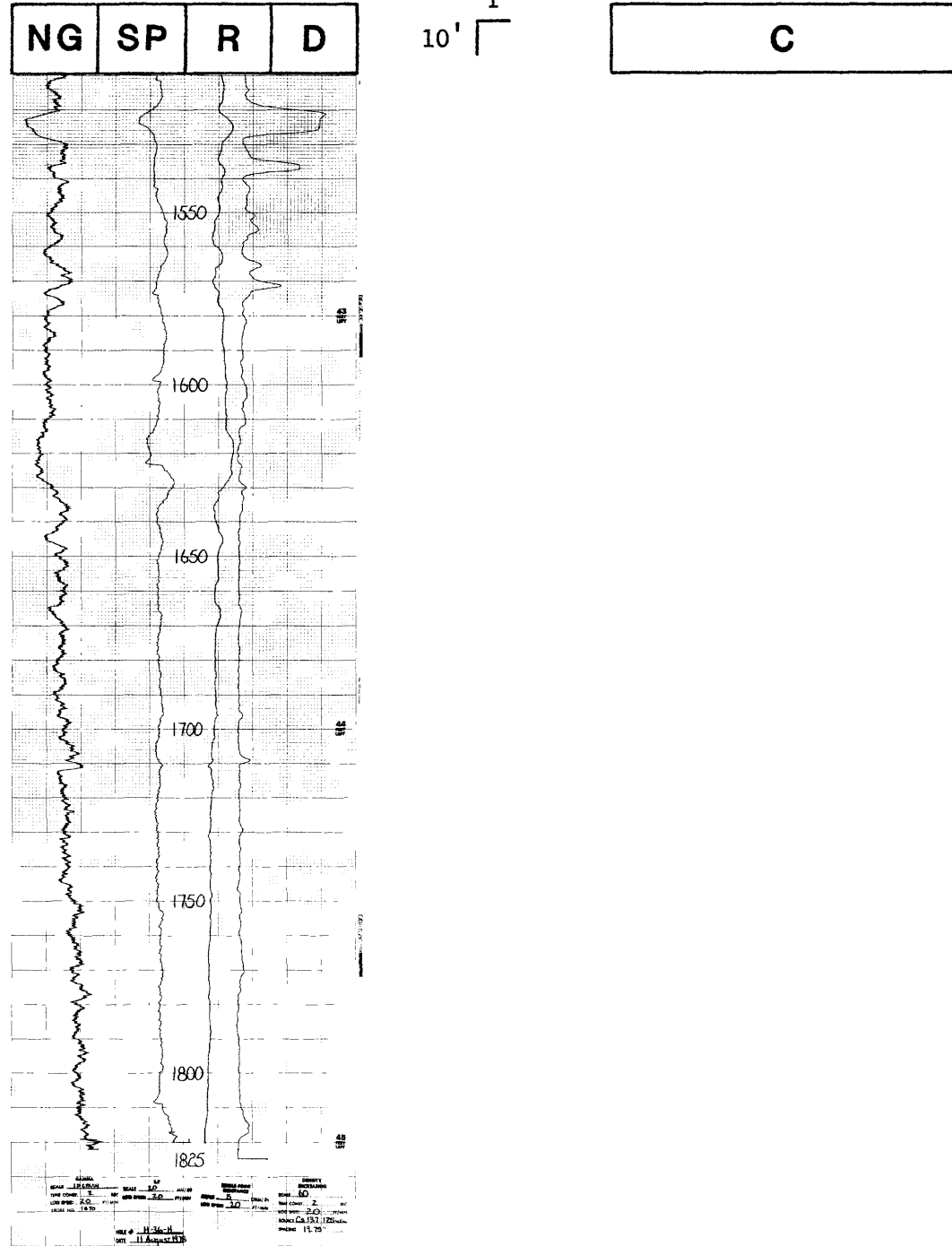
Hole no. H-36-H (continued)



10' $\frac{1''}{\square}$



Hole no. H-36-H (continued)



U.S. GEOLOGICAL SURVEY
GEOPHYSICAL LOG, MOFFAT COUNTY, COLORADO
HAMILTON QUADRANGLE

Hole no. H-38-H Date logged 8-21-80 Ground elevation 7,180'

T. 4 N., R. 91 W., Sec. 13 : 2,400 f n 1, 1,020 f w 1

Drilling medium mud Drilled depth 1,020' Fluid level surface

Logging speed: (1st) 20'/min (2nd) 10'/min Logged depth 1,020'

Natural gamma (NG) Scale 10 cps/in. T.C. 2 sec

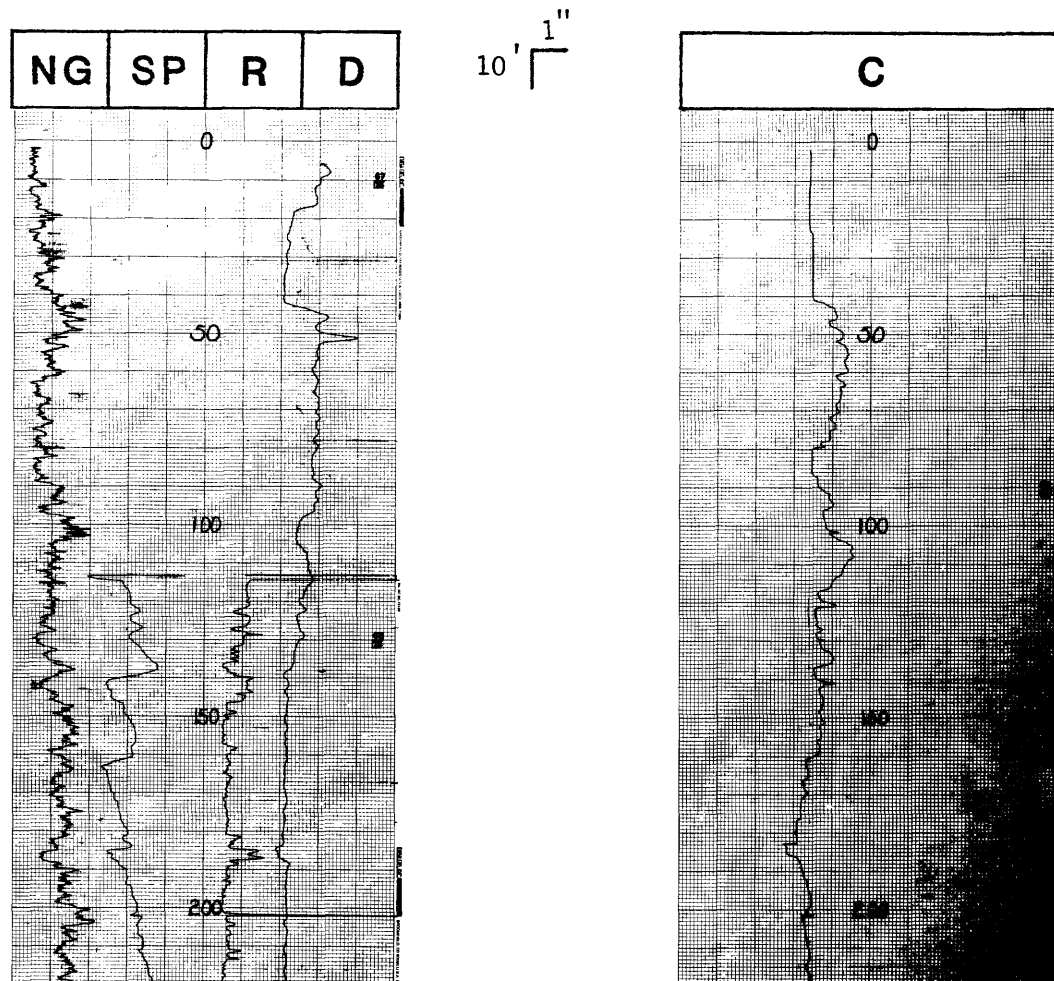
Spontaneous potential (SP) Scale 20 mv/in.

Single point resistance (R) Scale 10 ohms/in.

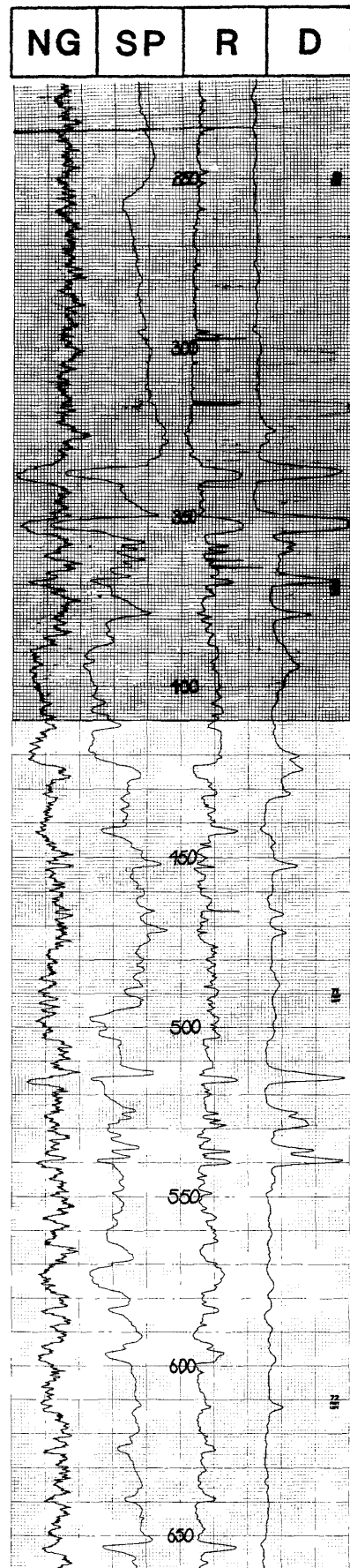
Density (gamma-gamma) (D) Scale 50 cps/in. T.C. 2 sec

Caliper (C) Scale 2 in./in.

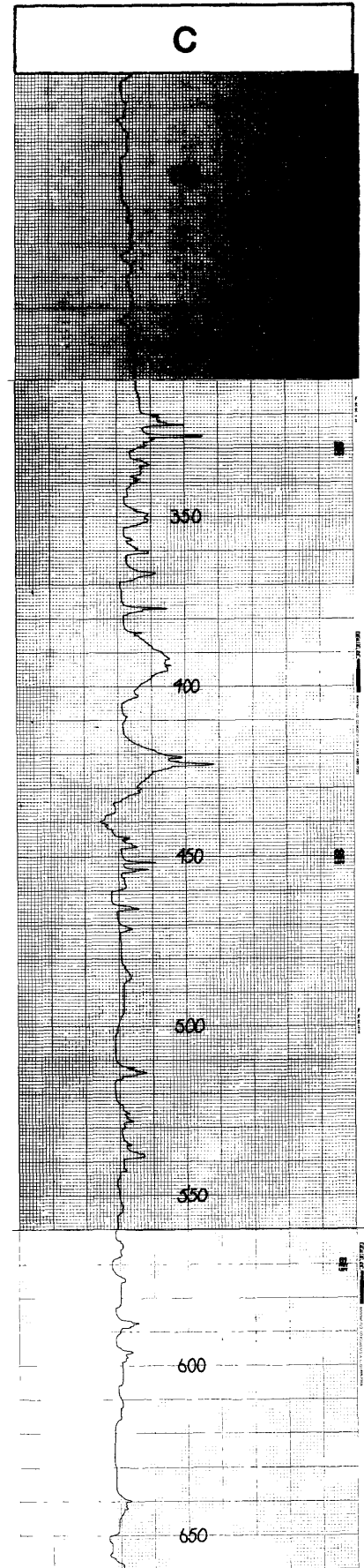
Remarks: Hole cased from 0' to 42'. Extreme kicks in resistance log due to lightning in the distance. Resistance and SP logs were shut off at 104' because of lightning in distance and its effects on the logs and equipment.



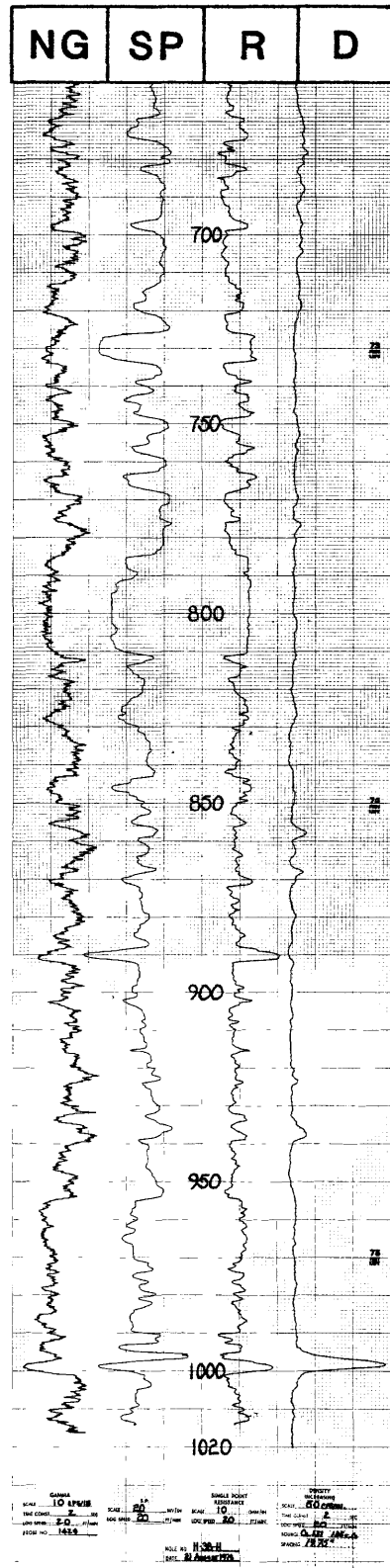
Hole no. H-38-H (continued)



10' $\frac{1}{\text{---}}$ 1"



Hole no. H-38-H (continued)



U.S. GEOLOGICAL SURVEY
GEOPHYSICAL LOG, MOFFAT COUNTY, COLORADO
HAMILTON QUADRANGLE

Hole no. H-39-H Date logged 8-24-78 Ground elevation 7,420'

T. 4 N., R. 91 W., Sec. 13 : 120 f n 1, 2,240 f w 1

Drilling medium foam/mud Drilled depth 1,101' Fluid level 47'

Logging speed: (1st) 20'/min (2nd) 10'/min Logged depth 1,101'

Natural gamma (NG) Scale 10 cps/in. T.C. 2 sec

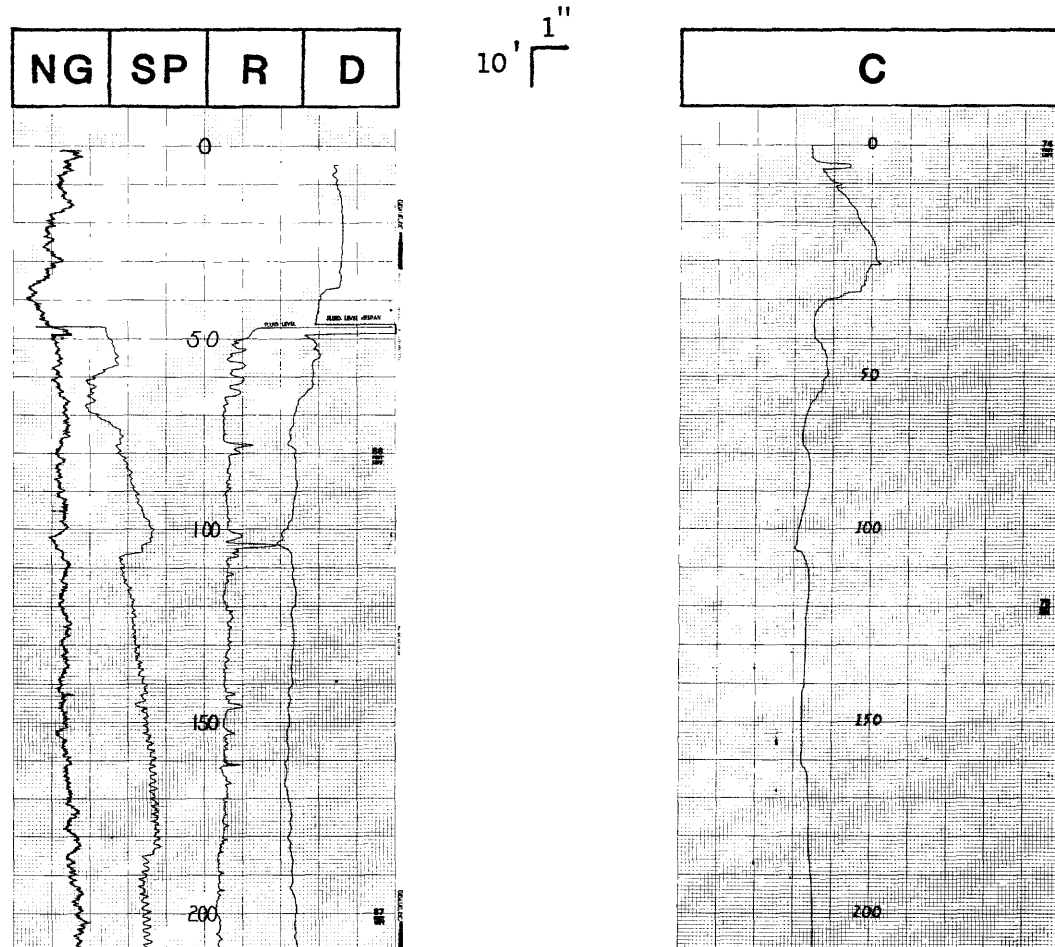
Spontaneous potential (SP) Scale 10 mv/in.

Single point resistance (R) Scale 10 ohms/in.

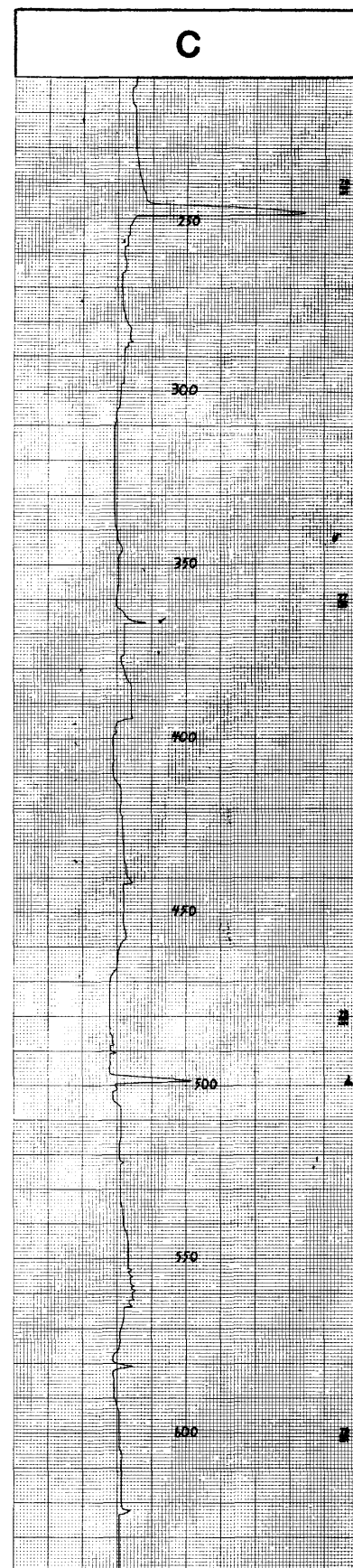
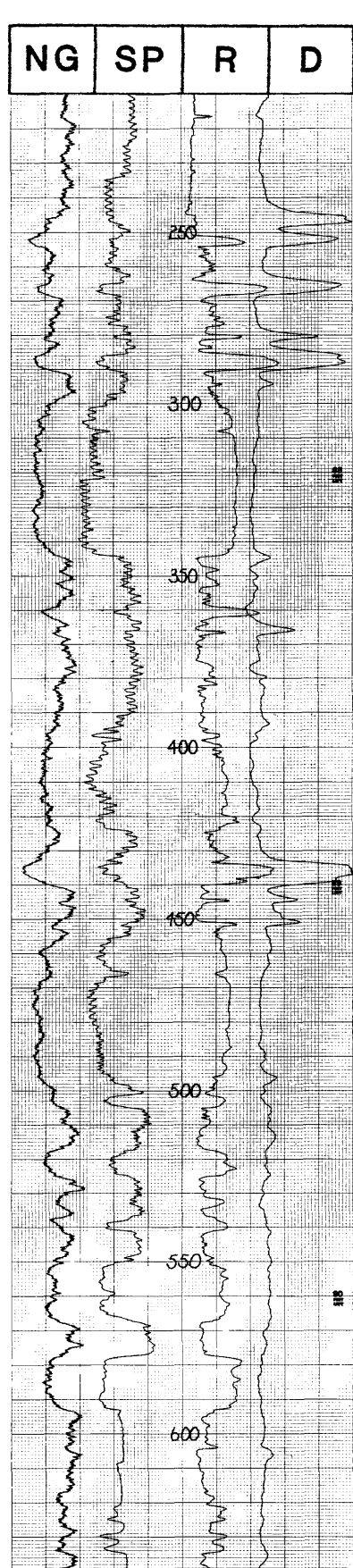
Density (gamma-gamma) (D) Scale 50 cps/in. T.C. 2 sec

Caliper (C) Scale 2 in./in.

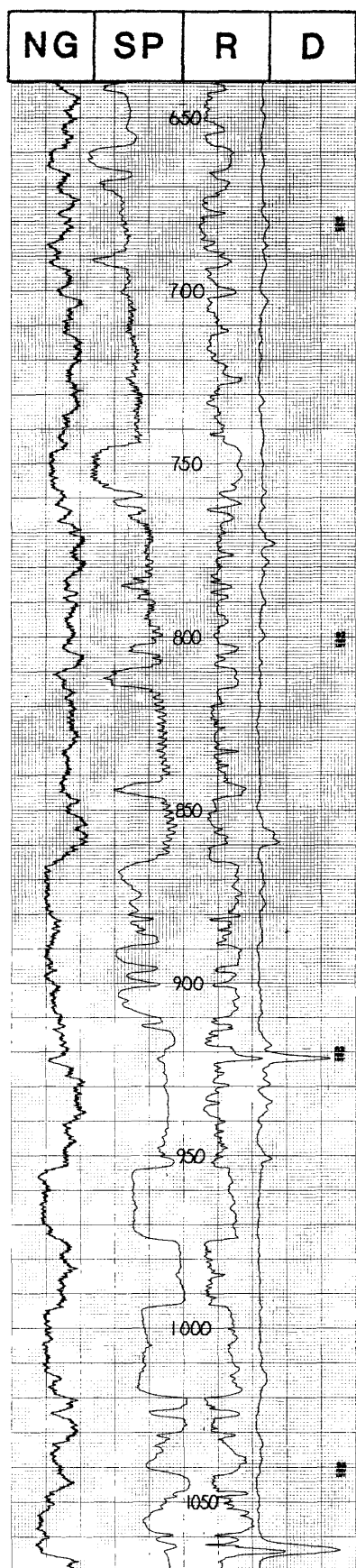
Remarks: Drilled less than 75' from a high voltage transmission line. Relatively low amplitude interference from the transmission line can be seen in the SP log, especially near the top of the hole.



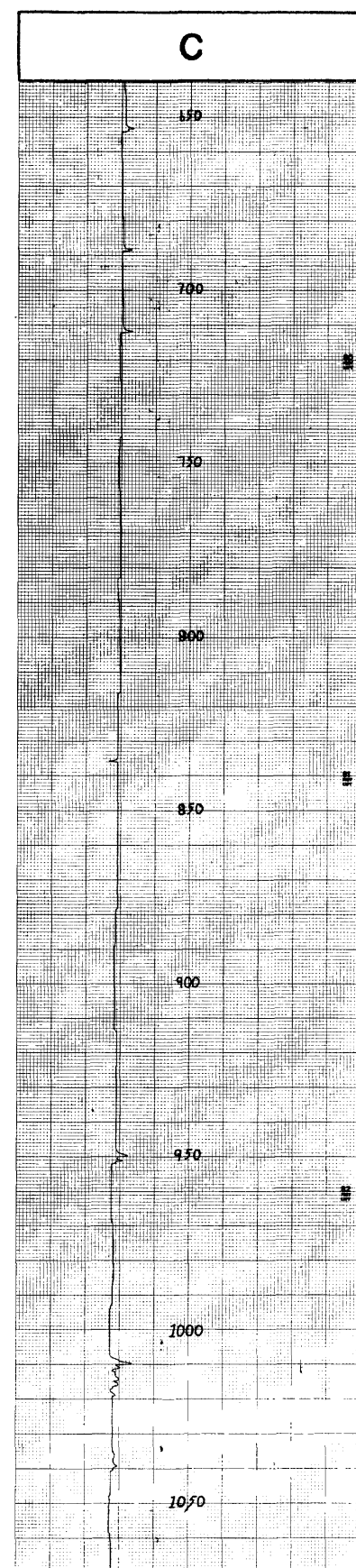
Hole no. H-39-H (continued)



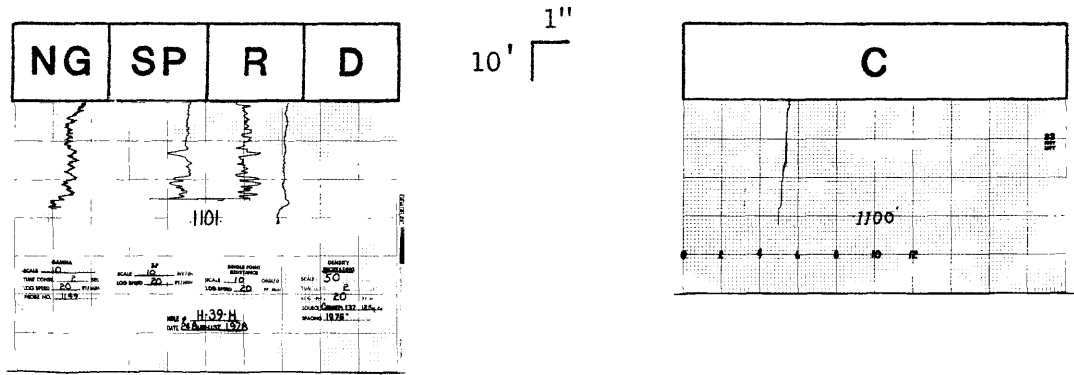
Hole no. H-39-H (continued)



10' $\left| \begin{smallmatrix} 1'' \end{smallmatrix} \right.$



Hole no. H-39-H (continued)



U.S. GEOLOGICAL SURVEY
GEOPHYSICAL LOG, MOFFAT COUNTY, COLORADO
HAMILTON QUADRANGLE

Hole no. H-40-H Date logged 9-8-78 Ground elevation 7,235'

T. 4 N., R. 91 W., Sec. 22: 1,750 f s 1, 680 f w 1

Drilling medium mud Drilled depth 631' Fluid level 30'

Logging speed: (1st) 20'/min (2nd) 10'/min Logged depth 631'

Natural gamma (NG) Scale 10 cps/in. T.C. 2 sec

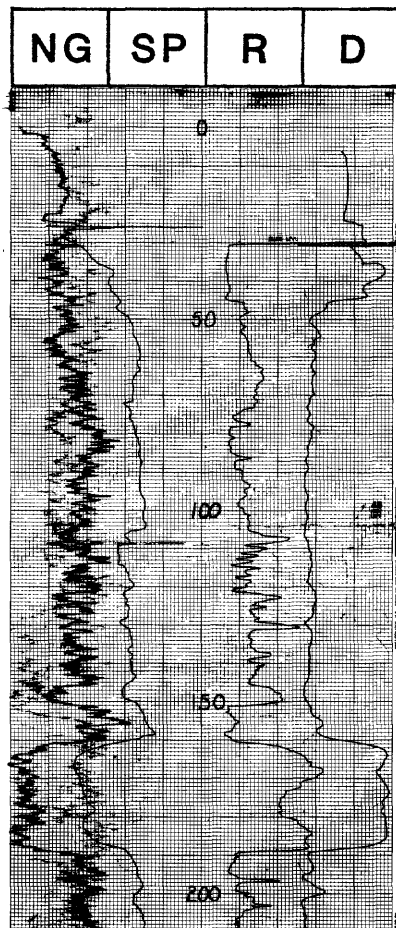
Spontaneous potential (SP) Scale 10 mv/in.

Single point resistance (R) Scale 10 ohms/in.

Density (gamma-gamma) (D) Scale 50 cps/in. T.C. 3 sec

Caliper (C) Scale 2 in./in.

Remarks: Density depth corrected @ 464'. Tight spot at 540' observed during first
run. Did not go below 540' on second run (caliper run). Caliper probe hung in hole
on way out of hole @ 217.4' (top of probe).

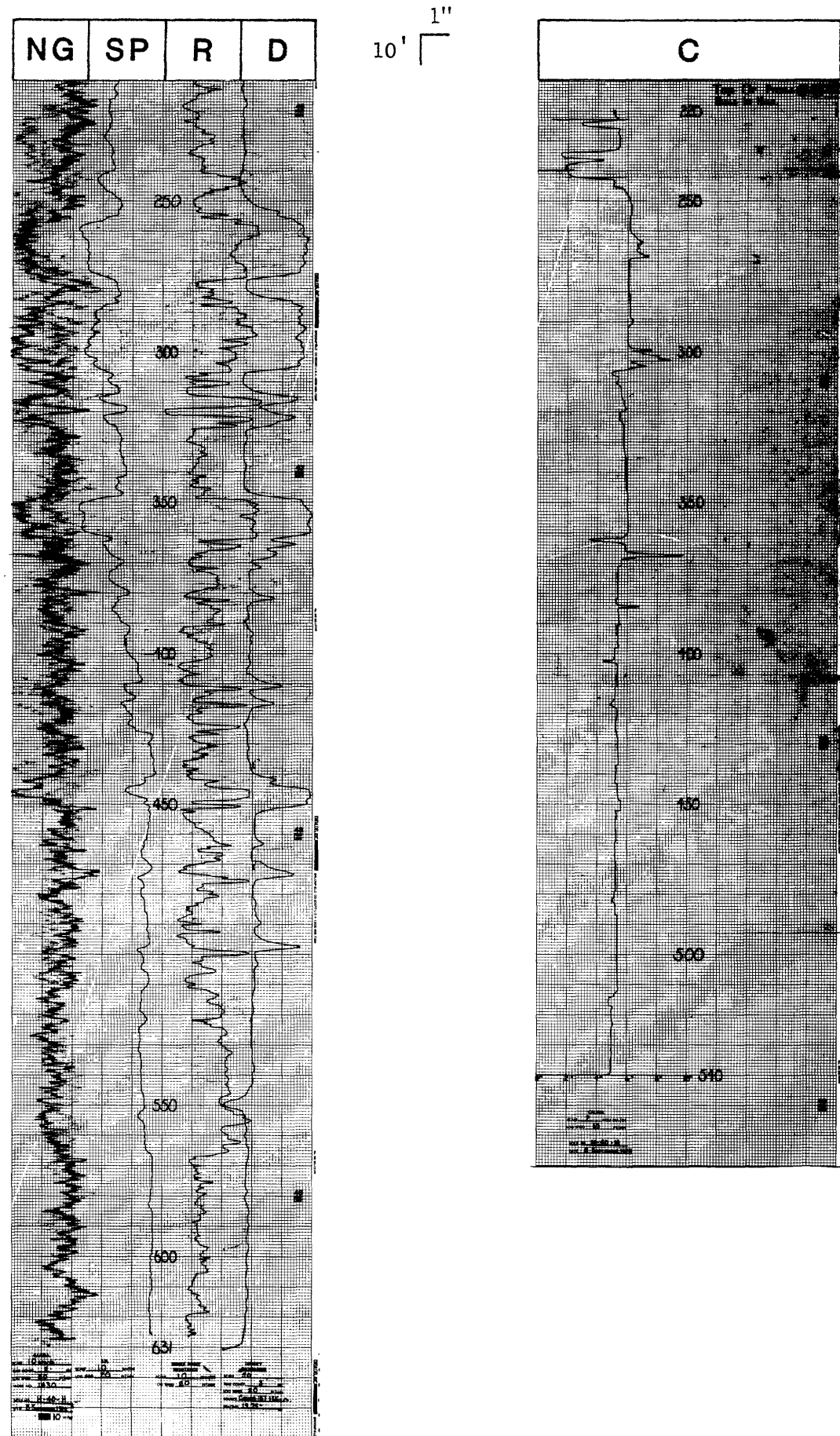


10' $\frac{1''}{\text{in.}}$

C

Caliper log begins on
next page.

Hole no. H-40-H (continued)



U.S. GEOLOGICAL SURVEY
GEOPHYSICAL LOG, MOFFAT COUNTY, COLORADO
PAGODA QUADRANGLE

Hole no. H-41-P Date logged 8-5-78 Ground elevation 8,270'

T. 3 N., R. 90 W., Sec. 3 : 1,250 f s 1, 1,720 f e 1

Drilling medium air/foam Drilled depth 960' Fluid level 470'

Logging speed: (1st) 20'/min (2nd) 10'/min Logged depth 958'

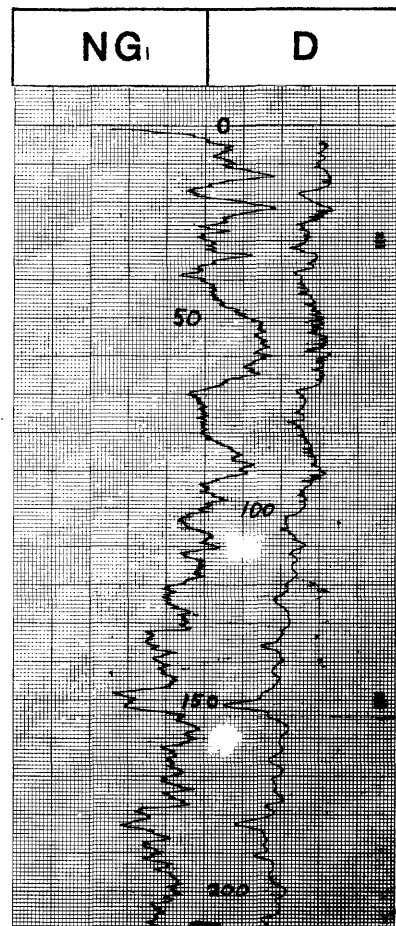
Natural gamma (NG) (1st run) Scale 10 cps/in. T.C. 3 sec

Density (gamma-gamma) (D) Scale 50 cps/in. T.C. 2 sec

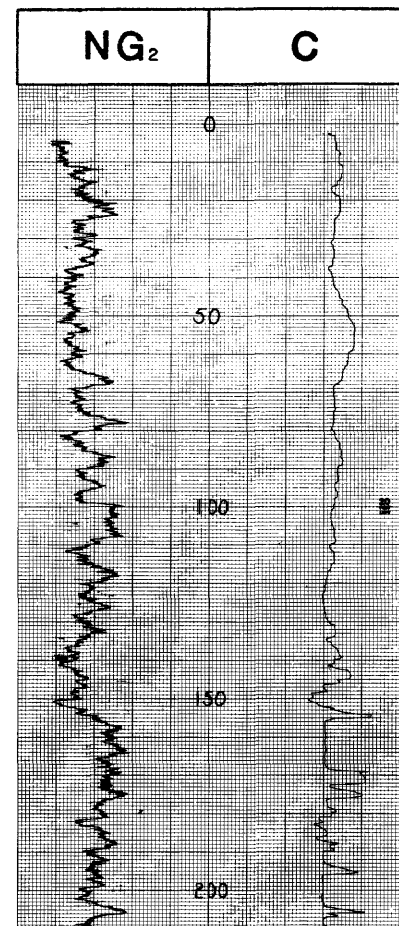
Natural gamma (NG) (2nd run) Scale 10 cps/in. T.C. 3 sec

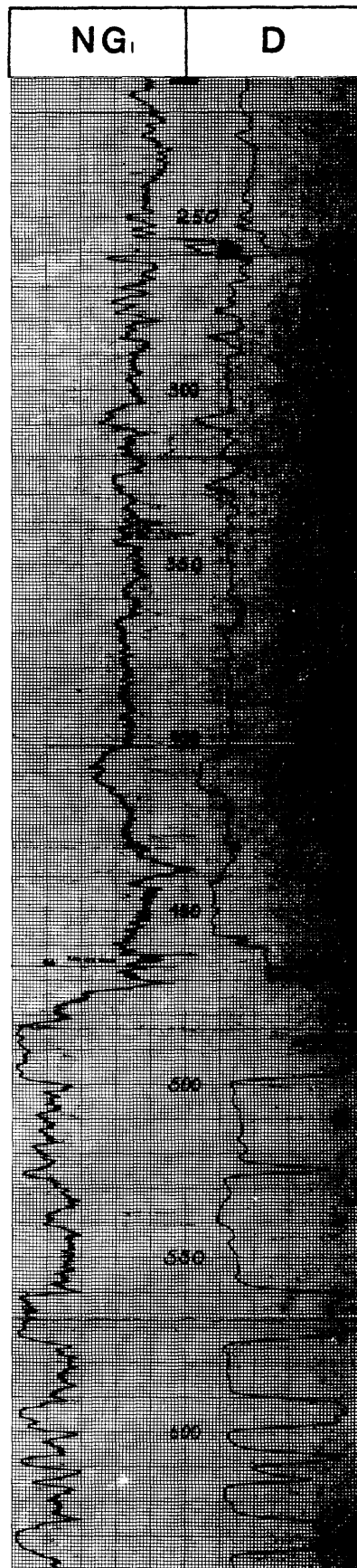
Caliper (C) Scale 2 in./in.

Remarks: Natural gamma log run a second time with the caliper log because the natural gamma and the density logs appear to have been interfering with each other above the water table on the first run. Refer to log H-41A-P for greater detail and more data for interval 140' to 430'.

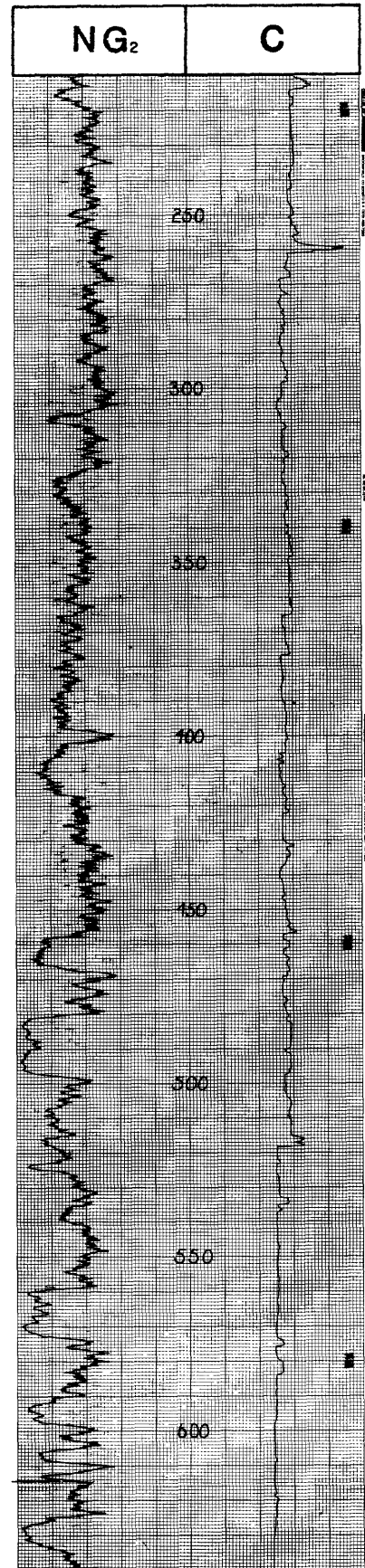


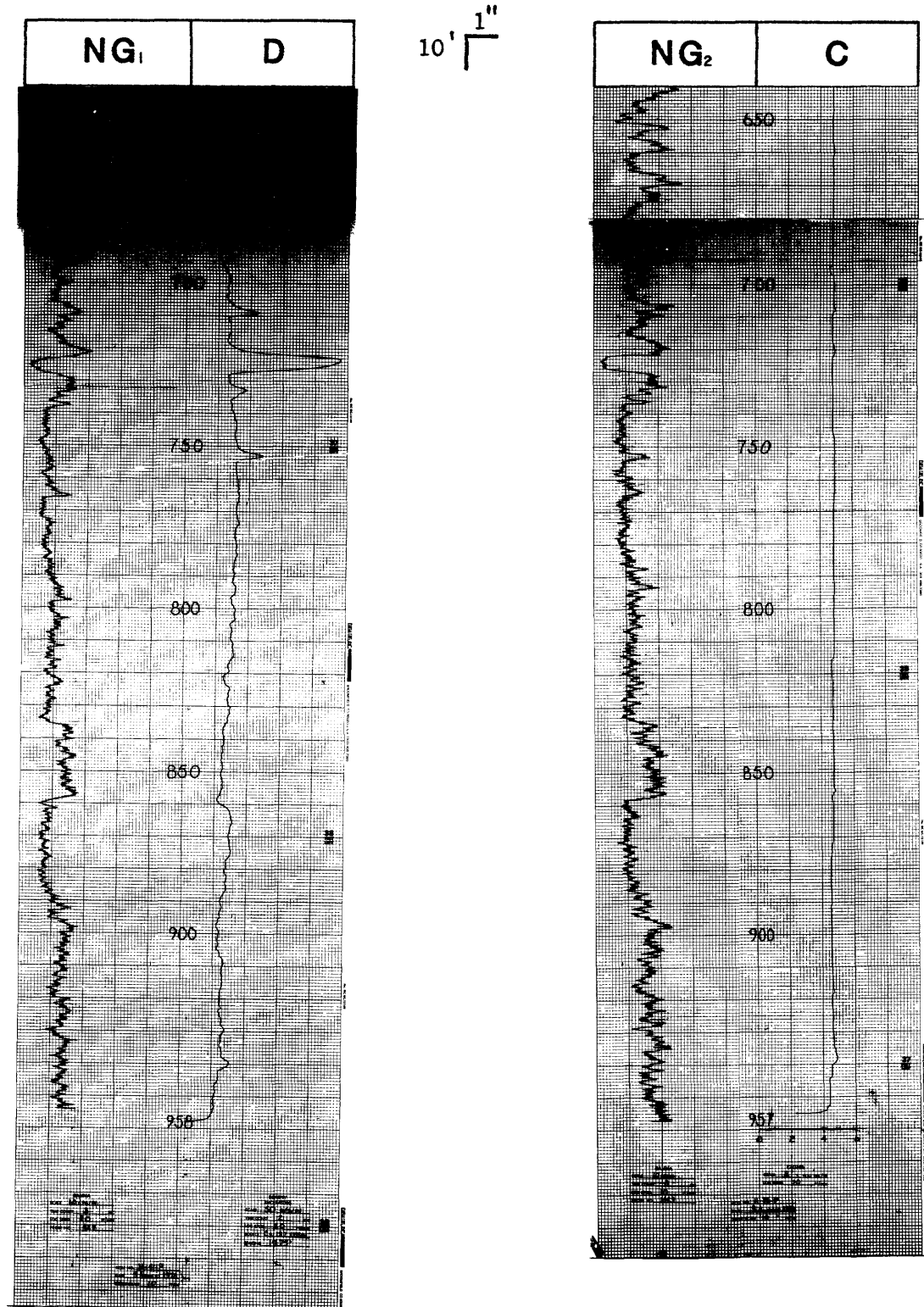
10' $\frac{1''}{1'}$





10' $\frac{1''}{1'}$





U.S. GEOLOGICAL SURVEY
GEOPHYSICAL LOG, MOFFAT COUNTY, COLORADO
PAGODA QUADRANGLE

Hole no. H-41A-P Date logged 9-15-78 Ground elevation 8,275'

T. 3 N., R. 90 W., Sec. 3 : 1,310 f s 1, 1,710 f e 1

Drilling medium mud Drilled depth 430' Fluid level 140'

Logging speed: (1st) 20'/min (2nd) 20'/min Logged depth 430'

Natural gamma (NG) Scale 10 cps/in. T.C. 1 sec

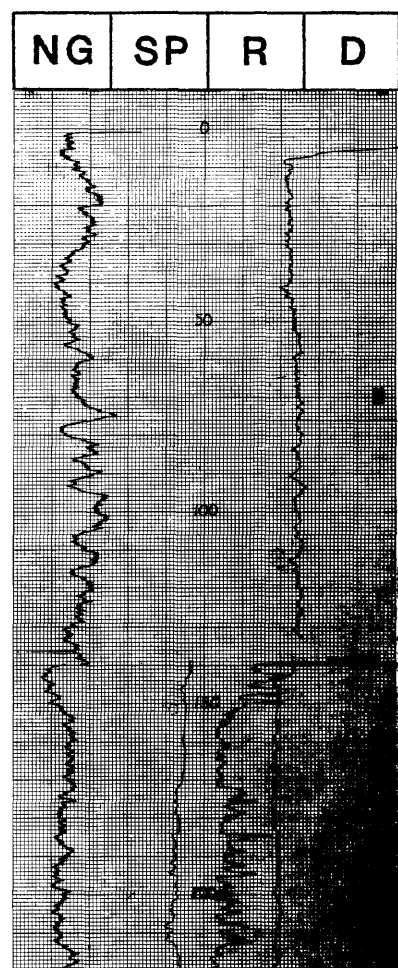
Spontaneous potential (SP) Scale 20 mv/in.

Single point resistance (R) Scale 20 ohms/in.

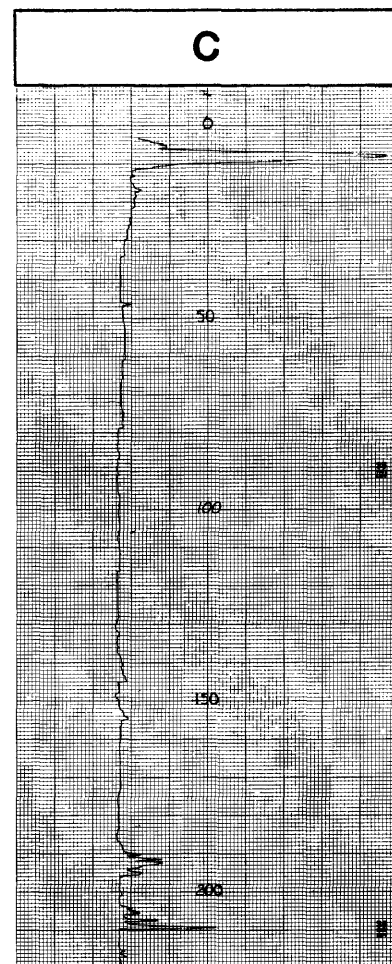
Density (gamma-gamma) (D) Scale 80 cps/in. T.C. 3 sec

Caliper (C) Scale 2 in./in.

Remarks: Hole drilled with heavy mud from the surface. Severe problems encountered
in the effort to retain circulation. Circulation lost seven times, never regained
the last time.



$10' \over 1''$



Hole no. H-41A-P (continued)



10' $\frac{1''}{1''}$

