

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Core Descriptions, Photographs, and Core and X-ray Analyses of
Portions of the Upper Cretaceous Mesaverde Group, Washakie Basin,
Wyoming

by

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This report is preliminary and has not been edited
or reviewed for conformity with U.S. Geological Survey
standards.

Introduction

Eleven cores from the Upper Cretaceous Mesaverde Group in the Washakie basin, Wyoming (fig. 1, table 1), were described, photographed, and sampled at the U.S. Geological Survey core library, Denver, Colorado. Core-analysis data and bulk-sample X-ray data are included to supplement the core descriptions (tables 2, 3).

In the United States the petroleum industry reports all data such as drilling depths, core depth intervals, intervals for which porosity and permeability tests were conducted, bottom hole temperatures, pressure measurements, and fluid or gas flow rates in English units. The author chose to use metric units when describing specific aspects of the cored intervals such as the size of the burrows in bioturbated zones, lamination thicknesses, and lithologic changes within the total described core intervals. Therefore, a mixture of English and metric units will be found within this report.

Conversion factors for English to metric units follow:

$$\begin{aligned} 1 \text{ ft} &= 0.30 \text{ m} \\ 1 \text{ psi} &= 7.03 \times 10^{-2} \text{ kg/cm}^2 \\ 1 \text{ BOPD} &= 159 \text{ liters of oil/day} \\ 1 \text{ MCFD} &= 28.32 \text{ m}^3 \text{ of gas/day} \\ 1 \text{ BWPD} &= 159 \text{ liters of water/day} \end{aligned}$$

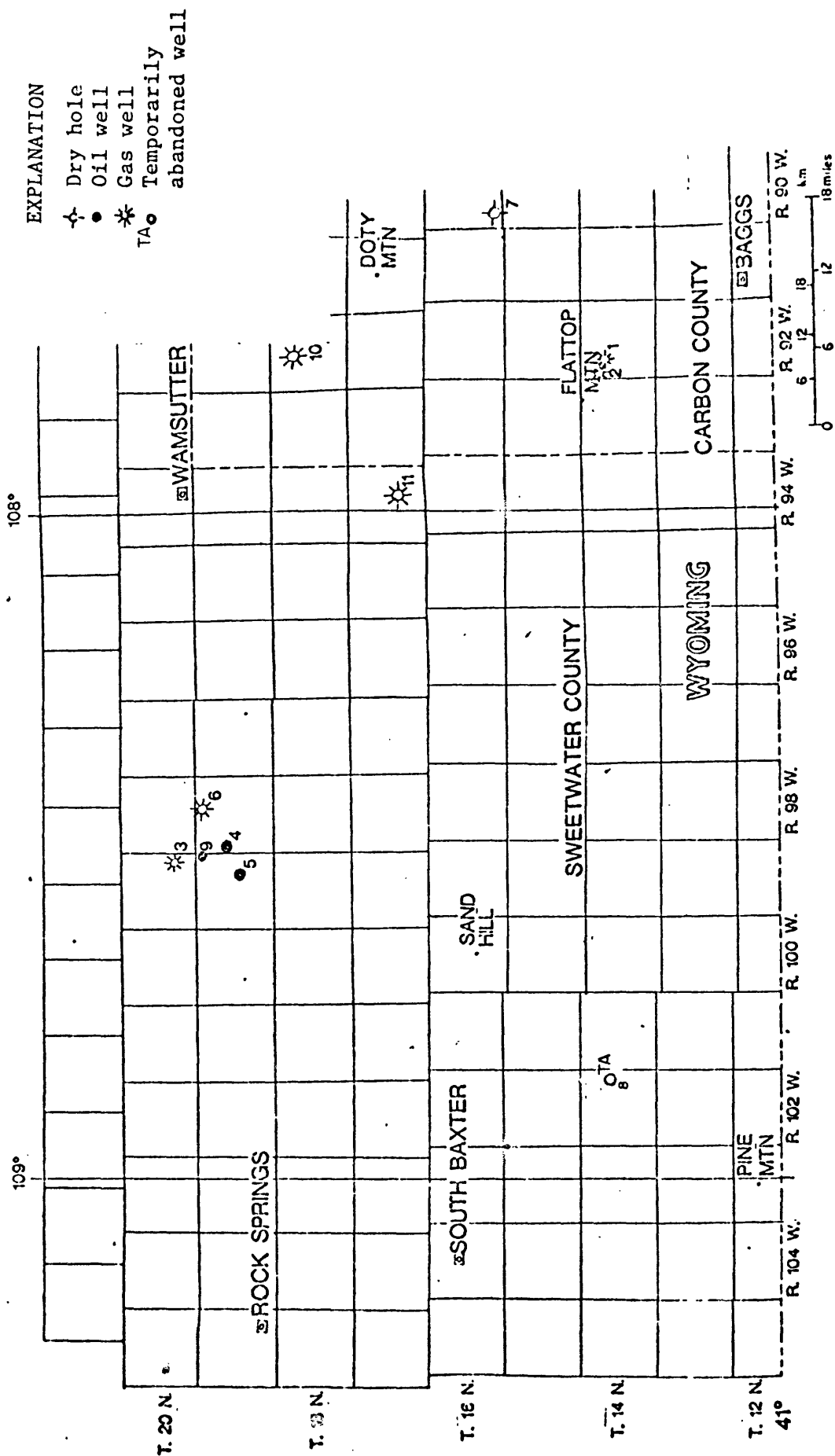


Figure 1.-- Map showing location and reference numbers of drill holes listed in table 1.

Table 1.--List of drill hole locations for described core intervals, and other reference information.

Drill hole reference number ¹	Company name and drill hole location	U.S. Geol. Survey core library reference number	API Well number	Production data	Cored interval ² (in feet)	Core Analysis	Page this repo
1	Colorado Interstate Gas Expl., Inc. SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 8, T. 14 N., R. 92 W. 2-8-14-92 Blue Gap II Unit	A 221	49-007-20206	Gas Gross pay zone 8970-9652 ft IPF 440 MCFD 84 BWPD	9051.5-9298 Mesaverde Group, undivided	Yes	22
2	Colorado Interstate Gas Expl., Inc. SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 7, T. 14 N., R. 92 W. 7-14-92 Blue Gap II Unit	A 222	49-007-20186	Gas Gross pay zone 9126-9602 ft IPF 4800 MCFD	9138-9159 Mesaverde Group, undivided	Yes	26
3	Mesa Petroleum Co. NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 25, T. 20 N., R. 99 W. 1-25 Playa UPRR	A 230	49-037-20653	Gas Gross pay zone 4668-4674 ft IPF 1020 MCFD	4638-4694 Almond Fm of Mesaverde Group	Yes	28
4	Forest Oil Corp. NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 18, T. 19 N., R. 98 W. 9-18-2 Arch Unit	A 394	49-037-05617	Oil Gross pay zone 4884-4899 ft IPF 232 BOPD	4879-4904 Almond Fm of Mesaverde Group	Yes	32
5	Forest Oil Corp. NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 23, T. 19 N., R. 99 W. 20-23-4 Arch Unit	A 395	49-037-05578	Oil Gross pay zone 4493-4518 ft. IPF 1578 BOPD	4497-4547 Almond Fm of Mesaverde Group	Yes	34
6	Forest Oil Corp. SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 3, T. 19 N., R. 98 W. 3-1 UPRR Arch 77	A 415	49-037-05687	Gas Gross pay zone 6054-61 ft 6070-88 ft IPF 1964 MCFD	6020-6069 Almond Fm of Mesaverde Group	Yes	36
7	Amerada Hess Corp. SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 32, T. 16 N., R. 90 W. Deep Creek 2 Unit	A 416	49-007-05071	Dry & abandoned	2407-2453 Mesaverde Group, undivided	No	38
8	Jerry Chambers, Oil Producer C NW $\frac{1}{4}$ sec. 13, T. 14 N., R. 102 W. 1-13 Kemmer Creek Federal	A 483	49-037-20615	Temporarily abandoned	3705-3751 Mesaverde Group, undivided	Yes	41
9	Forest Oil Corp. SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 1, T. 19 N., R. 99 W. 1-8 Arch Unit 70	A 579	49-037-05689	Oil Gross pay zone 4790-4810 ft IPF 20 BOPD 468 BWPD	4790-4815 Almond Fm of Mesaverde Group	Yes	43
10	Michigan Wisconsin Pipeline Co. E $\frac{1}{2}$ SE $\frac{1}{4}$ sec. 9, T. 18 N., R. 92 W. 1-9 Creston	A 716	49-007-20281	Gas Gross pay zone 8591-10195 ft IPF 335 MCFD	8801-10224 Mesaverde Group, undivided	Yes	45
11	Ladd Petroleum Corp. SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 22, T. 17 N., R. 94 W. 1-22-74 Federal	A 846	49-037-20713	Gas Gross pay zone 11465-12058 ft IPF 840 MCFD	10139-10292 Almond Fm of Mesaverde Group	Yes	54

¹Shown in figure 1.

²Core depths not adjusted to log depths.

Table 2.--Core analysis information, drill holes 1 through 11

[*Oil derived from kerogen in shale]

Depth (feet)	Permeability (millidarcys)	Porosity (percent)	Residual saturation (percent pore)	
			Oil	Total water
Ref. No. 1 (A 221) Colorado Interstate Gas Expl., Inc. 2-8-14-92 Blue Gap II Unit SW $\frac{1}{2}$ SW $\frac{1}{4}$ sec. 8, T. 14 N., R. 92 W.				
9,059-60	0.03	3.2	6.3	75.9
9,060-61	0.04	4.6	13.4	80.3
9,061-63	Shale, no analysis			
9,063-64	0.02	1.7	12.6	75.3
9,064-65	0.13	6.8	2.8	61.9
9,065-66	0.03	6.3	3.1	65.0
9,066-67	5.9	5.4	9.2	81.0
9,067-68	0.03	4.6	4.4	91.9
9,068-69	0.01	4.6	4.4	92.1
9,069-69.5	0.01	3.5	34.9	58.1
9,069.5-73	Lost recovery			
9,073-74	0.29	4.4	13.7	82.2
9,074-75	0.01	4.7	14.8	80.2
9,075-76	1.1	5.0	15.8	82.9
9,076-77	0.01	3.0	17.5	76.8
9,077-80	Lost recovery			
9,080-81	0.31	6.2	3.2	83.1
9,081-82	0.02	4.3	4.6	92.8
9,082-83	0.10	7.1	9.6	60.5
9,083-84	0.10	8.5	2.2	62.6
9,084-85	0.03	10.0	1.9	48.1
9,085-86	0.01	6.4	3.1	67.3
9,086-87	0.02	4.9	4.1	89.9
9,087-88	0.03	4.1	4.9	92.3
9,088-89	0.19	3.0	7.0	90.8
9,089-90	13	3.2	6.5	91.1
9,090-91	5.7	2.0	10.5	84.2
9,091-94	Shale, no analysis			
9,094-95	0.01	0.7	29.2	58.4
9,285-86	1.1	1.5	*33.3	53.2
9,292-93	0.08	3.4	*26.5	70.6
9,296-97	0.05	2.5	* 8.8	88.1

Ref. No. 2 (A 222)
Colorado Interstate Gas Expl., Inc.
7-14-92 Blue Gap II Unit
SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 7, T. 14 N., R. 92 W.

9,138-39	0.01	5.8	3.4	82.8
9,139-40	0.01	4.1	4.9	48.7
9,140-41	0.01	3.7	1.4	59.6
9,141-42	0.01	2.5	8.0	87.9
9,144-45	0.01	2.4	8.3	79.3
9,145-46	0.01	2.0	5.0	75.0
9,148-49	0.01	4.2	4.8	83.5
9,152-53	0.01	4.4	20.4	77.4
9,156-57	0.01	2.9	17.2	79.5
9,158-59	0.01	6.7	10.4	88.0

Table 2.--Core analysis information, drill holes 1 through 11--Continued

Depth (feet)	Permeability (millidarcys)	Porosity (percent)	Residual saturation (percent pore)	
			Oil	Total water
Ref. No. 3 (A 230) Mesa Petroleum Company 1-25 Playa UPRR NW ¹ / ₄ NW ¹ / ₄ sec. 25, T. 20 N., R. 99 W.				
4,635-36	50	21.4	0	93.2
4,636-37	63	20.6	0	81.9
4,637-38	24	19.1	Trace	72.3
4,638-38.5	0.13	8.5	Trace	67.7
4,638.5-47	Shale, no analysis			
4,647-48	0.01'	2.0	Trace	66.2
4,648-51	Shale, no analysis			
4,651-52	0.01	10.0	Trace	75.3
4,652-53	0.18	6.2	Trace	75.0
4,653-54	0.01	4.0	Trace	99.1
4,654-55	0.11	6.4	Trace	58.6
4,655-61	Shale, no analysis			
4,661-61.5	0.08	10.9	Trace	71.5
4,661.5-62	Coal, no analysis			
4,662-63	9.50	18.8	Trace	69.6
4,663-64	36	19.1	1.3	58.1
4,664-65	85	19.9	Trace	57.1
4,665-66	2.45	18.2	Trace	63.4
4,666-67	68	19.8	Trace	52.8
4,667-68	7.12	12.3	Trace	48.7
4,668-69	107	19.3	Trace	50.7
4,669-70	78	18.6	Trace	53.8
4,670-71	56	18.9	3.9	67.2
4,671-72	5.32	12.8	7.6	88.4
4,672-73	1.13	9.9	4.9	56.2
4,673-74	1.57	8.9	2.8	45.1
4,674-75	8.20	16.8	Trace	52.9
4,675-80	Shale, no analysis			
4,680-80.5	0.05	12.8	9.2	88.8
4,680.5-81.5	Shale, no analysis			
4,681.5-82	20	19.9	Trace	83.9
4,682-83	20	20.7	Trace	80.7
4,683-84	28	21.0	Trace	72.0
4,684-85	4.36	16.0	0	80.8
4,685-86	11	15.9	Trace	76.8
4,686-87	9.15	16.7	Trace	79.8
4,687-88	14	18.2	Trace	81.9
4,688-89	18	18.6	0	81.3
4,689-90	14	17.8	Trace	76.2
4,690-91	16	17.9	Trace	66.0
4,691-92	0.01	4.5	Trace	90.9
4,692-93	0.15	8.0	Trace	72.0
4,693-94	0.70	13.7	Trace	61.6

Table 2.--Core analysis information, drill holes 1 through 11--Continued

Depth (feet)	Permeability (millidarcys)	Porosity (percent)	Residual saturation (percent pore)	
			Oil	Total water
Ref. No. 4 (A 394) Forest Oil Corp. 9-13-2 Arch Unit NW $\frac{1}{2}$ NW $\frac{1}{4}$ sec. 18, T. 19 N., R. 98 W.				
4,879-80	1.2	9.2	0.0	70.6
4,882-83	15	20.9	13.9	54.5
4,883-84	0.18	6.6	0.0	53.1
4,884-85	0.82	10.7	14.9	38.3
4,885-86	0.11	4.0	0.0	72.5
4,886-87	0.03 ,	2.4	0.0	62.5
4,887-88	42	22.0	14.5	49.5
4,888-89	41	21.3	13.6	50.2
4,889-90	50	21.4	14.0	51.8
4,890-91	112	22.7	14.5	48.8
4,891-92	72	21.9	13.7	47.9
4,892-93	53	20.9	14.4	50.2
4,893-94	115	18.8	14.9	52.1
4,894-95	22	21.8	14.7	51.9
4,895-96	59	22.1	14.5	52.5
4,896-97	179	23.5	13.6	50.6
4,897-98	38	20.7	14.5	53.6
4,898-99	30	18.1	14.9	47.5
4,899-4,900	71	21.6	13.4	50.8
4,900-01	101	24.5	14.3	50.7
4,901-02	87	22.9	14.0	49.7
Ref. No. 5 (A 395) Forest Oil Corp. 20-23-4 Arch Unit NW $\frac{1}{2}$ NE $\frac{1}{4}$ sec. 23, T. 19 N., R. 99 W.				
4,497-98	21	20.7	19.3	41.6
4,498-99	19	21.3	20.6	44.5
4,499-4,500	7.3	18.8	20.2	46.3
4,500-01	15	20.0	20.0	47.5
4,501-02	41	21.5	20.9	41.4
4,502-03	34	23.3	21.4	43.7
4,503-04	33	23.2	21.9	44.8
4,504-05	74	23.3	22.7	39.0
4,505-06	86	23.6	19.9	41.5
4,506-07	10	20.4	21.6	47.1
4,507-08	42	23.0	23.0	38.3
4,508-09	27	22.3	22.9	40.3
4,509-10	47	23.3	21.0	41.6
4,510-11	59	23.1	2.16	40.2
4,511-12	21	22.5	23.5	39.6
4,512-13	22	21.6	22.2	41.2
4,513-14	19	21.4	21.5	44.4
4,514-15	14	19.9	21.6	46.7
4,515-16	41	21.6	17.2	44.1
4,516-17	88	22.4	17.9	48.6
4,517-18	116	25.6	17.6	47.7
4,518-19	135	24.1	17.0	49.3
4,519-20	40	20.5	18.1	49.7
4,524-25	0.21	16.8	15.5	51.8
4,525-26	0.53	12.0	17.5	42.3
4,526-27	0.70	14.7	19.7	45.6
4,527-28	0.53	17.4	16.1	54.0

Table 2.--Core analysis information, drill holes 1 through 11--Continued

Depth (feet)	Permeability (millidarcys)	Porosity (percent)	Residual saturation (percent pore)	
			Oil	Total water
Ref. No. 6 (A 415) Forest Oil Corp. 3-1 UPRR Arch 77 SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 3, T. 19 N., R. 98 W.				
6,029-30	1.9	15.6	4.5	73.8
6,030-31	0.08	14.5	3.5	71.7
6,031-32	-0.08	11.7	6.0	78.5
6,032-33	-0.08	8.1	8.7	81.5
6,033-34	-0.08	8.3	19.3	77.4
6,034-35	0.08	12.3	10.6	74.6
6,035-36	0.16	13.8	44.2	48.5
6,039-40	0.16	17.3	7.5	65.4
6,056-57	2.8	19.3	1.0	45.5
6,057-58	5.2	22.2	2.7	46.0
6,058-59	4.6	21.1	1.9	49.7
6,059-60	1.2	18.5	3.8	50.2
6,060-61	4.2	21.2	2.4	49.1
6,061-62	3.3	18.1	1.1	49.5
6,062-63	12	19.9	2.5	44.7
6,063-64	10	19.0	3.2	44.2
6,064-65	11	20.9	1.9	48.8
6,065-66	41	20.8	5.3	50.0
6,066-67	4.7	22.7	2.6	43.1
6,067-68	0.33	19.4	4.1	46.9

Ref. No. 7 (A 416)

Data not available

Ref. No. 8 (A 483)
Jerry Chambers, Oil Producer
1-13 Kemmer Creek Federal
CNW sec. 13, T. 14 N., R. 102 W.

3,705-06	0.14	11.6	1.7	63.2
3,706-07	1.1	11.4	1.7	64.9
3,707-08	0.67	9.2	5.4	76.3
3,708-09	0.67	9.9	5.0	76.3
3,709-10	2.0	10.8	4.6	69.7
3,710-11	0.52	9.6	1.0	61.5
3,711-12	0.76	12.4	7.0	49.7
3,712-13	0.20	10.2	1.9	67.8
3,713-14	8.4	11.0	0.9	67.4
3,714-15	63	9.1	3.7	76.4
3,715-16	9.1	7.8	9.1	77.9
3,716-17	0.04	7.1	4.9	83.0
3,718-19	0.27	8.1	6.2	74.9
3,721-22	1.6	6.2	11.7	83.3
3,724-25	0.69	8.2	6.1	75.9
3,729-30	0.44	8.1	6.2	84.1
3,734-35	2.8	7.4	6.8	81.8
3,742-43	0.38	6.0	8.6	82.6
3,745-46	0.71	7.0	7.1	74.3
3,750-51	29	6.5	7.9	82.3

Table 2.--Core analysis information, drill holes 1 through 11--Continued

Depth (feet)	Permeability (millidarcys)	Porosity (percent)	Residual saturation (percent pore)	
			Oil	Total water
Ref. No. 9 (A 579) Forest Oil Corp. 1-8 Arch Unit 70 SE $\frac{1}{2}$ NE $\frac{1}{4}$ sec. 1, T. 19 N., R. 99 W.				
4,794-95	3.1	17.9	16.8	55.9
4,795-96	16	20.6	15.5	48.5
4,796-97	8.5	18.6	19.4	45.2
4,797-98	24	20.8	18.8	50.5
4,798-99	5.2	17.6	18.8	47.1
4,799-4,800	11.3	21.2	19.3	48.1
4,800-01	22	19.1	18.9	49.8
4,801-02	17	20.0	19.0	50.0
4,802-03	20	21.0	18.6	48.6
4,803-04	7.8	11.5	15.7	29.5
4,804-05	9.3	19.6	19.4	49.4
4,805-06	21	21.2	21.7	46.2
4,806-07	44	18.8	17.0	46.8
4,807-08	27	23.9	27.7	39.0
4,808-09	4.1	17.7	15.2	50.9
4,809-10	75	23.7	23.2	43.9
4,810-11	7.0	20.5	19.5	50.8
4,811-12	102	23.1	21.7	44.1
Ref. No. 10 (A 716) Michigan Wisconsin Pipeline Company 1-9 Creston E $\frac{1}{2}$ SE $\frac{1}{4}$ sec. 9, T. 18 N., R. 92 W.				
8,801-02	0.03	12.5	5.2	31.5
8,802-03	0.60	13.5	4.2	31.9
8,803-04	0.28	13.4	3.5	39.3
8,804-05	0.10	12.6	3.7	37.3
8,805-06	0.19	13.3	4.9	30.6
8,825-26	0.01	4.8	18.3	56.9
8,826-27	0.02	5.7	15.2	50.5
8,827-28	0.01	4.3	20.5	54.8
8,842-43	0.18	13.4	1.4	35.1
8,843-44	0.15	13.9	1.4	45.0
8,844-45	0.29	12.7	0.7	43.3
8,845-46	0.25	12.9	0.7	42.4
8,846-47	0.04	13.3	1.4	38.8
8,847-48	0.45	14.1	1.3	48.3
8,848-49	0.52	15.4	1.2	38.9
8,849-50	0.11	12.3	0.8	46.5
8,850-51	0.09	12.3	0.8	48.3
8,851-52	0.06	13.5	0.0	32.1
8,852-53	0.17	13.6	0.0	40.3
8,853-54	0.13	13.7	0.0	37.6
8,854-55	0.30	13.2	1.4	39.8
8,855-56	0.29	14.6	0.6	37.3
8,856-57	0.40	12.3	0.8	38.5
8,857-58	6.0	8.9	5.8	58.2
8,858-59	0.03	7.9	1.2	73.3
8,859-60	0.42	6.3	11.0	62.8
8,860-61	0.33	7.3	28.3	51.1
8,864-65	0.02	5.4	9.2	66.2
8,865-66	0.05	5.8	3.4	74.7
8,866-67	0.02	7.2	2.7	43.2
8,868-69	0.37	3.5	14.7	52.8
8,881-82	0.12	4.7	14.5	58.2

Table 2.--Core analysis information, drill holes 1 through 11--Continued

Depth (feet)	Permeability (millidarcys)	Porosity (percent)	Residual saturation (percent pore)	
			Oil	Total water
Ref. No. 10 (A 716) Michigan Wisconsin Pipeline Company 1-9 Creston E½SE¼ sec. 9, T. 18 N., R. 92 W. --Continued				
8,882-83	0.07	4.9	9.9	55.7
8,883-84	0.35	4.4	11.3	67.7
8,884-85	0.44	10.8	0.9	33.7
8,885-86	0.08	11.2	4.2	33.2
8,895-96	0.09	6.2	7.8	62.7
8,896-97	0.39	5.6	3.5	74.3
8,897-98	0.09	4.5	2.2	62.4
8,898-99	0.04	4.4	4.6	69.0
8,899-8,900	0.94	4.4	16.2	65.0
10,185-86	0.07	6.0	11.4	26.1
10,186-87	0.01	10.4	6.4	29.1
10,187-88	0.60	10.8	1.8	28.8
10,188-89	0.22	10.5	1.8	25.6
10,189-90	0.20	11.7	1.6	24.1
10,190-91	0.14	12.2	5.3	33.6
10,191-92	0.09	12.2	5.4	30.6
10,192-93	0.04	10.3	8.5	28.3
10,193-94	0.34	10.1	1.9	26.1
10,194-95	0.26	10.7	4.5	27.2
10,213-14	0.14	3.8	19.4	77.5
10,214-15	0.02	3.5	20.9	71.6
10,215-16	0.09	4.0	18.0	77.0
10,218-19	0.01	2.1	5.1	81.8
10,221-22	0.02	3.8	13.5	80.9
10,223-24	0.02	4.9	16.5	66.1
Ref. No. 11 (A 846) Ladd Petroleum Corp. 1-22-74 Federal SE½SE¼ sec. 22, T. 17 N., R. 94 W.				
10,139-40	0.01	2.1	5.0	90.3
10,140-41	0.01	2.4	8.8	87.7
10,141-42	0.01	3.2	6.9	89.7
10,143-44	0.01	3.1	10.6	79.2
10,144-45	0.07	4.5	11.2	49.3
10,145-46	0.01	3.7	15.8	63.4
10,146-47	0.01	5.9	5.4	31.3
10,147-48	0.01	3.8	15.8	73.5
10,148-49	0.01	3.7	15.9	74.2
10,149-50	0.30	3.5	11.0	81.3
10,162-63	0.01	0.6	17.3	60.2
10,163-64	0.01	0.7	29.6	59.2
10,164-65	0.02	3.4	11.8	80.5
10,182-83	0.01	3.2	19.3	70.8
10,183-84	0.01	4.5	15.3	70.2
10,184-85	0.11	5.0	17.9	39.8
10,185-86	0.01	4.7	25.2	50.3
10,186-87	0.01	3.9	25.2	60.6
10,187-88	0.01	3.4	21.2	66.7
10,188-89	0.01	5.3	18.7	56.1
10,189-90	0.15	4.5	21.9	61.3
10,201-02	0.01	3.1	6.5	90.4
10,202-03	0.01	3.2	0.0	82.5

Table 2.--Core analysis information, drill holes 1 through 11--Continued

Depth (feet)	Permeability (millidarcys)	Porosity (percent)	Residual saturation (percent pore)	
			Oil	Total water
Ref. No. 11 (A 846)				
Ladd Petroleum Corp.				
1-22-74 Federal				
SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 22,, T. 17 N., R. 94 W. --Continued				
10,203-04	0.01	3.6	5.6	89.7
10,204-05	0.01	4.3	2.3	78.8
10,205-06	0.01	4.4	4.5	89.8
10,206-07	0.01	3.7	5.3	85.6
10,207-08	0.01	3.5	5.8	92.1
10,208-09	0.01	4.2	4.9	92.4
10,209-10	0.01	3.9	2.6	92.3
10,210-11	0.08	4.2	4.9	92.8
10,211-12	0.01	4.3	4.7	90.2
10,212-13	0.01	3.4	6.1	91.1
10,213-14	0.01	4.4	8.9	88.6
10,214-15	0.01	3.4	5.9	88.2
10,226-27	0.01	2.9	25.1	71.6
10,227-28	0.01	4.7	16.8	33.6
10,228-29	0.01	4.5	17.5	39.4
10,229-30	0.01	3.1	22.5	70.8
10,233-34	0.01	3.4	11.6	85.5
10,234-35	0.01	3.2	12.3	84.4
10,236-37	0.01	3.0	13.3	84.0
10,237-38	0.01	2.6	7.9	87.1
10,248-49	0.01	1.9	5.6	90.2
10,249-50	0.01	2.4	8.8	88.2
10,252-53	0.01	3.9	16.2	80.8
10,253-54	0.01	4.7	4.2	71.4
10,254-55	0.01	4.0	5.0	75.4
10,255-56	0.01	2.5	4.2	91.9
10,259-60	0.70	5.0	6.9	81.1
10,260-61	0.24	4.6	11.1	80.0
10,261-62	0.15	4.4	11.8	80.2
10,262-63	5.8	4.2	14.7	78.2
10,263-64	0.06	3.8	13.5	81.0
10,264-65	1.5	4.7	11.2	80.5
10,270-71	0.07	4.5	11.3	72.2
10,271-72	0.01	3.6	9.5	78.0
10,272-73	0.18	1.3	40.9	49.0
10,273-74	0.11	3.4	15.1	78.6
10,274-75	0.11	4.0	13.1	83.8
10,288-89	0.42	4.1	22.4	69.6
10,289-90	0.60	4.5	22.4	76.0
10,290-91	0.01	4.3	12.5	80.0
10,291-92	0.18	3.8	13.3	79.8
10,292-93	0.08	4.0	12.5	75.1

Table 3.--Bulk X-ray mineral assemblage, common minerals

[Pm - minor constituent within mineral group; PM - major constituent within mineral group; P - mineral present approximately equal amounts; D - dominant rock constituents; leaders (---) indicate mineral not present.]

Sample footage	Feldspars			Carbonates		Clays			Mixed-layer clays
	Quartz	Albite	Orthoclase	Calcite	Dolomite	Illite	Kaolinite	Montmorillonite	
Ref. Well No. 1 (A 221) Colorado Interstate Gas Expl., Inc. 2-8-14-92 Blue Gap II Unit SW $\frac{1}{4}$ SW $\frac{1}{4}$, sec. 8, T. 14 N., R. 92 W.									
9,064	DPM	Pm	Pm?	Pm	PM	Pm	---	---	Pm?
9,084	DPM	Pm	---	Pm	PM	Pm	---	---	Pm?
9,289	DPM	Pm	---	---	PM	Pm	PM	---	Pm
Ref. Well No. 2 (A 222) Colorado Interstate Gas Expl., Inc. 7-14-92 Blue Gap II Unit SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 7, T. 14 N., R. 92 W.									
9,138	DPM	DPM	DPM	Pm	PM	PM	Pm	Pm	Pm
9,142	DPM	PM	---	Pm	PM	PM	---	---	Pm
Ref. Well No. 3 (A 230) Mesa Petroleum 1-25 Playa UPRR NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 25, T. 20 N., R. 99 W									
4,643	DPM	Pm	PM	Pm	PM	Pm	PM	---	Pm
4,651	DPM	Pm	PM	PM	---	Pm	PM	Pm	Pm
4,666	DPM	Pm	PM	DPM	DPM	Pm	PM	Pm	-
4,672	DPM	Pm	PM	Pm	DPM	Pm	PM	Pm	Pm
4,686	DPM	--	PM	Pm	PM	Pm	PM	Pm	Pm?
4,691	DPM	--	PM	PM	Pm	Pm	PM	Pm	Pm
Ref. Well No. 4 (A 394) Forest Oil Corp. 9-18-2 Arch Unit NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 18, T. 19 N., R. 98 W.									
4,882	DPM	Pm	DPM	Pm	DPM	Pm	PM	---	---
4,894	DPM	Pm	PM	--	Dm	Pm	PM	---	---
4,903	DPM	Pm	PM	Pm	PM	PM	Pm	Pm	Pm
Ref. Well No. 5 (A 395) Forest Oil Corp. 20-23-4 Arch Unit NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 23, T. 19 N., R. 99 W.									
4,497	DPM	Pm	PM	Pm	DPM	Pm	DPM	---	Pm?
4,510	DPM	PM	Pm	Pm	DM	Pm	PM	Pm	Pm
4,518-19	DPM	PM	Pm	Pm?	PM?	Pm	PM	---	---
4,529	DPM	Pm	PM	Pm	PM	Pm	PM	---	---
4,536	DPM	Pm	PM	Pm	PM	PM	Pm	---	Pm
Ref. Well No. 6 (A 415) Forest Oil Corp. 3-1 UPRR Arch Unit 77 SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 18, T. 19 N., R. 98 W.									
6,042	DPM	PM	Pm	PM	Pm	PM	Pm?	Pm?	Pm?
6,055	PM	---	---	DPM	---	Pm	PM	---	Pm?
6,062	DPM	DPM	DPM	Pm	PM	Pm	PM	Pm?	Pm
6,068	DPM	Pm	DPM	---	---	Pm	PM	Pm?	Pm

Table 3.--Bulk X-ray mineral assemblage, common minerals--Continued

Sample footage	Feldspars			Carbonates		Clays			Mixed-layer clays
	Quartz	Albite	Orthoclase	Calcite	Dolomite	Illite	Kaolinite	Montmorillonite	
Ref. Well No. 7 (A 416) Amerada Hess Corp. Deep Creek 2 Unit SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 32, T. 16 N., R. 90 W.									
2,408	DPM	DPM	Pm	Pm	PM	PM	Pm	---	Pm
2,415	DPM	PM	Pm	Pm	DPM	Pm	PM	---	Pm?
2,428-30	DPM	P	P	---	---	PM	Pm	---	Pm?
2,432	DPM	PM	Pm	Pm?	DPM	P	P	Pm?	Pm
2,447-48	DPM	DPM	Pm	Pm	PM	Pm	PM	Pm?	---
2,452	DPM	Pm	PM	Pm	PM	Pm	PM	---	Pm?
Ref. Well No. 8 (A 483) Jerry Chambers, Oil Producer 1-13 Kemmerer Creek Federal CNW $\frac{1}{4}$ sec. 13, T. 14 N., R. 102 W.									
3,707-08	DPM	PM	---	Pm?	PM	PM	Pm	---	Pm
3,724	DPM	PM	Pm	Pm	PM	PM	Pm	---	Pm?
Ref. Well No. 9 (A 579) Forest Oil Corp. 1-8 Arch Unit 70 SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 1, T. 19 N., R. 99 W.									
4,794	DPM	PM	Pm	PM	Pm	Pm	PM	---	Pm?
4,799	DPM	Pm	PM	Pm	PM	Pm	PM	---	Pm?
4,808	DPM	Pm	PM	P	P	Pm	PM	---	---
Ref. Well No. 10 (A 716) Michigan Wisconsin Pipeline Co. 1-9 Creston E $\frac{1}{2}$ SE $\frac{1}{4}$ sec. 9, T. 18 N., R. 92 W.									
8,805	DPM	---	Pm?	---	---	PM	Pm	Pm?	---
8,815	DPM	---	---	---	---	Pm	Pm	Pm?	Pm
8,854	DPM	---	---	---	PM	PM	Pm	Pm?	Pm?
8,836	DPM	---	---	---	---	P	P	Pm?	Pm
10,189	DPM	Pm?	---	---	PM	P	P	---	Pm
10,204	DPM	PM	---	---	PM	Pm	PM	Pm?	Pm
10,222	DPM	PM	---	Pm?	PM	PM	Pm	---	Pm?
Ref. Well No. 11 (A 846) Ladd Petroleum Corp. 1-22 Federal SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 22, T. 17N., R. 94 W.									
10,145	DPM	PM	---	---	DPM	PM	---	---	Pm?
10,167	DPM	PM	---	DPM	Pm	PM	---	---	Pm?
10,185	DPM	PM	---	---	PM	PM	---	---	Pm?
10,194	DPM	PM	Pm	---	PM	PM	---	---	Pm
10,204	DPM	PM	---	Pm	PM	PM	---	---	Pm?
10,207	DPM	PM	Pm	Pm	DPM	PM	---	---	Pm?
10,214	DPM	PM	---	Pm	PM	PM	---	---	Pm
10,228	DPM	PM	---	---	PM	PM	---	---	Pm
10,254	DPM	PM	Pm?	---	PM	PM	---	---	Pm
10,272	DPM	PM	---	---	DPM	PM	Pm?	---	Pm?
10,280	DPM	Pm	---	Pm?	PM	PM	Pm	---	Pm

The author would like to thank the companies listed in table 1 for allowing core analysis data to be released. Samples were prepared by J. R. Peterson, U.S. Geological Survey.

This report is part of a study being conducted by the U.S. Geological Survey in cooperation with the U.S. Department of Energy, to evaluate resources of natural gas trapped in low-permeability reservoirs in the Rocky Mountain region.

General lithology

Mesaverde Group

The described core intervals of the Upper Cretaceous Mesaverde Group consist of very fine to fine-grained, light-gray to gray (N5-N7) sandstone and siltstone, mudstone, black calcareous and carbonaceous shale, and thin coal stringers.

Most of the sandstone and siltstones described have a "salt and pepper" appearance resulting from the presence of dark organic-rich material and dark chert grains. The sandstone and siltstones are homogeneous to thinly laminated, and disruption of laminae is due to high-energy and/or bioturbation. Small-scale rippling and/or scour-fill sedimentary structures are visible and are usually highlighted by organic-rich laminae (fig. 2).

Black shale is frequently interbedded with the sandstones and siltstones, organic-rich mudstones, and coals. These shales are dense to brittle, silty, and at times calcareous and coaly.

Coal intervals vary considerably in thickness, ranging from less than 1 cm to greater than 1 m. The coals and black shales tend to alternate frequently in the described core intervals.

LADD PETROLEUM CORP.

1-22 FEDERAL

SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 22, T. 17 N., R. 94 W.
SWEETWATER COUNTY, WYO.

10261-10261.7'



Figure 2 -- Siltstone with small-scale
sedimentary structures.
(10261 ft)

Abundant shell material occurs in a number of the cores, specifically wells numbered 3, 4, 6, and 9. This shell material is in a matrix of silty mudstone to shale for wells numbered 4, 6, and 9. In well number 3, a thin, 2- to 5-cm shell bed occurs within a thin coal stringer.

Many of the sandstone, siltstone, and shale intervals are bioturbated, and at times this bioturbation gives the core a mottled appearance. Horizontal, vertical, and inclined burrows show the disruptive nature of burrowing organisms. In some of the core areas that are inferred to be burrowed are as large as 2 by 3 cm, and in other core the burrowing is quite dense and a single horizontal burrow could be less than 0.1 cm in diameter (figs. 3, 4).

Environments of deposition

The environments of deposition for the described core intervals can be interpreted from a combination of three factors: (1) the different lithologies present, (2) the sedimentary structures present, and (3) the degree and type of bioturbation (trace fossils). C. W. Spencer (written commun., 1977) has interpreted environments of deposition for the Western Interior Cretaceous marine and coastal deposits using the above three factors.

The environments of deposition for the described intervals range from submarine shoreface-shoreface toe to offshore transition, and possibly include a barrier to lagoonal environment in a landward direction. No specific environments of deposition will be shown on the core descriptions at this time. After more cores have been described and subsurface cross sections completed to help demonstrate the geometry of the various lithologies of the Mesaverde Group, specific environments of deposition will be applied to the described cores.

LADD PETROLEUM CORP.
1-22 FEDERAL
SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 22, T. 17 N., R. 94 W.
SWEETWATER COUNTY, WYO.
10,290'

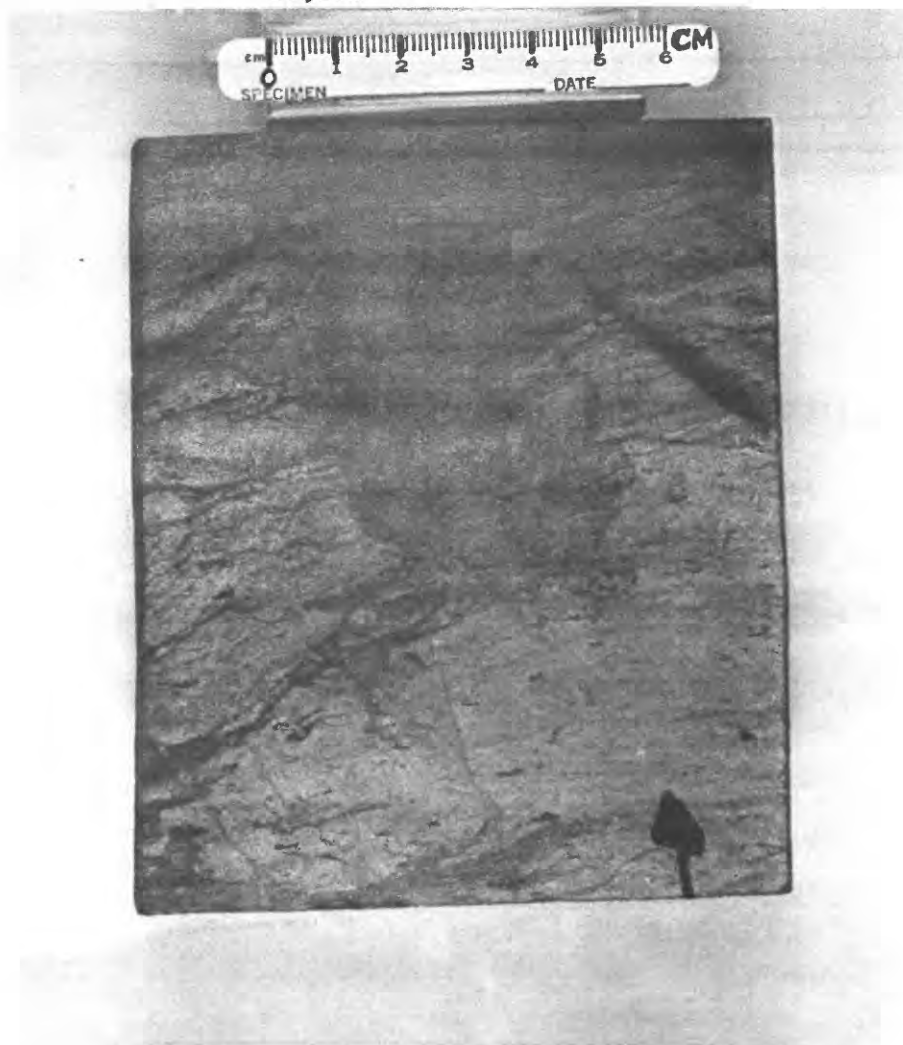


Figure 3 -- Very fine grained sandstone with
area of bioturbation (center of photograph).
Arrow points to homogenous area which
could also be bioturbated.
(10290 ft)

AMERADA HESS CORP.
DEEP CREEK 2 UNIT
SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 32, T. 16 N., R. 90 W.
CARBON COUNTY, WYO.
2414'

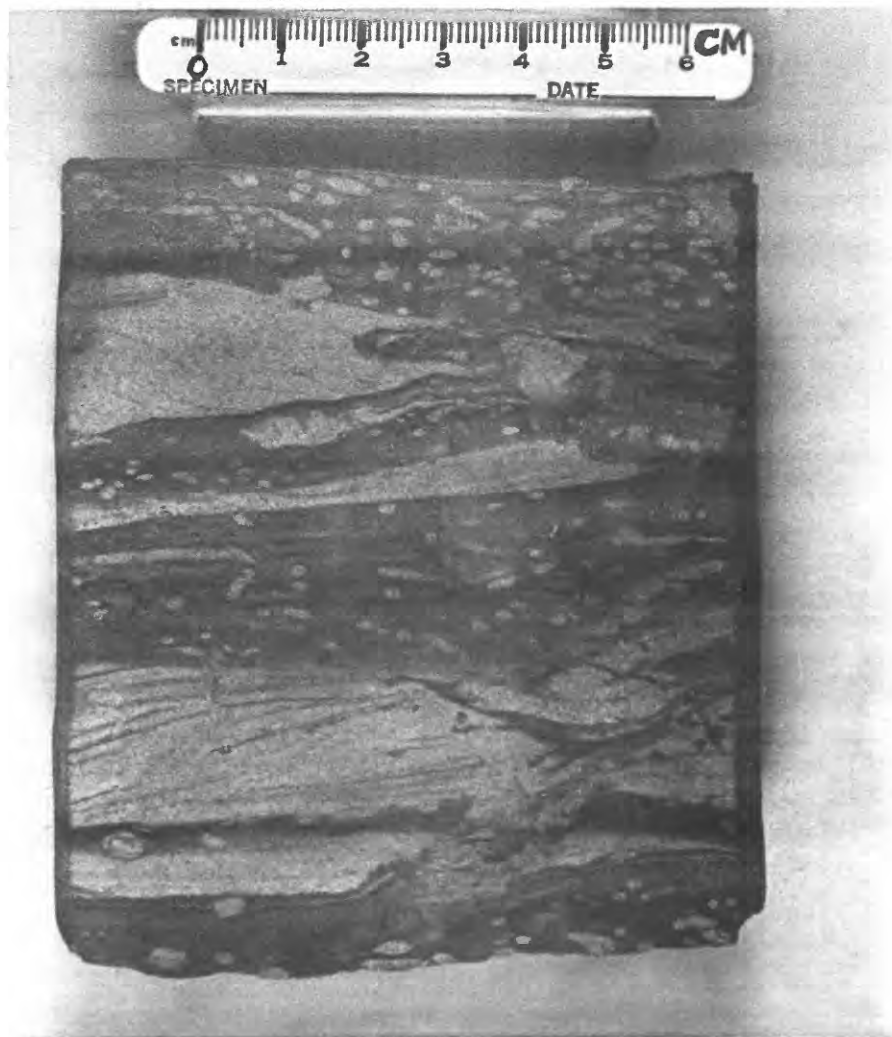


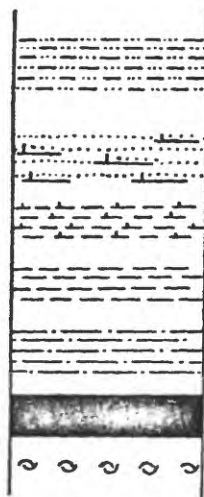
Figure 4 -- Vertical, horizontal, and inclined burrows (Chondrites) in organic-rich shale. Burrows filled with very fine grained sandstone. (2414 ft)

Core descriptions and photographs

The core descriptions and core photographs for the eleven described cores follow in numerical order by drill-hole reference number and core library reference number (table 1). The core descriptions include much of the reference material, as shown in table 1, and the core photographs are referenced by the U.S. Geol. Survey core-library reference number shown in the middle of each photograph. The core box in each photograph is one meter in length, and footages are marked on the core for reference purposes. An explanation is given for the range of estimated visual porosity for the core, the symbols used to describe the major lithologies present, the observed bedding characteristics, and the sedimentary structures. A list is also given to explain the abbreviations used in the core descriptions. Major lithologic rock types are abbreviated and capitalized; within the general description, lower case abbreviations are used when referring to lithologies. Color symbols (N5-N7) are from The Geological Society of America Rock Color Chart.

Estimated visual porosity
(percent)

None	0-1
Poor	1-10
Good	10-20
Excellent	>20



Symbols used to represent rock type

Sandstone or siltstone interbedded with shale

Sandstone or siltstone, calcareous

Shale, calcareous

Shale, noncalcareous

Mudstone

Coal

Shell fragments

Combinations of the general rock types shown above are used in the core descriptions.

Symbols used to represent type of bioturbation



Nondescript horizontal tracks, trails, and burrows



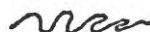
Nondescript vertical burrows



Nondescript inclined burrows



Burrow (mottled or churned sediment)



Contorted bedding, generally due to bioturbation

Sorting of grain size

W - well sorted

M - moderately sorted

P - Poorly sorted

Color

Abbreviation of lithologies

SS - sandstone

SLTSS - siltstone

SH - shale

LS - limestone

gy - grey

blk - black

brn - brown

grn - green

Type of fracture

VF - vertical fracture

HF - horizontal fracture

Type of porosity

VUG - vuggy porosity

FRAC - fracture porosity

IG - intergranular porosity

Type of laminations

ell - even parallel

wll - wavy parallel

dell - discontinuous even parallel

dwll - discontinuous wavy parallel

dwnll - discontinuous wavy nonparallel

t1 - thinly laminated

h - homogeneous (no distinct laminations)

Type of ripple



general

Graded bedding



normal (becoming finer upward)



reverse (coarsening upward)

General abbreviations used in core descriptions

k - permeability

∅ - porosity

subang - subangular

subrd - subrounded

appear - appearance

frag - fragments

sl - slightly

fg - fine grained

sdv - sandy

v - very

calc - calcareous

vert - vertical

hori - horizontal

inclin - inclined

lamin - laminated

tr - trace

lt - light

alt - alternating

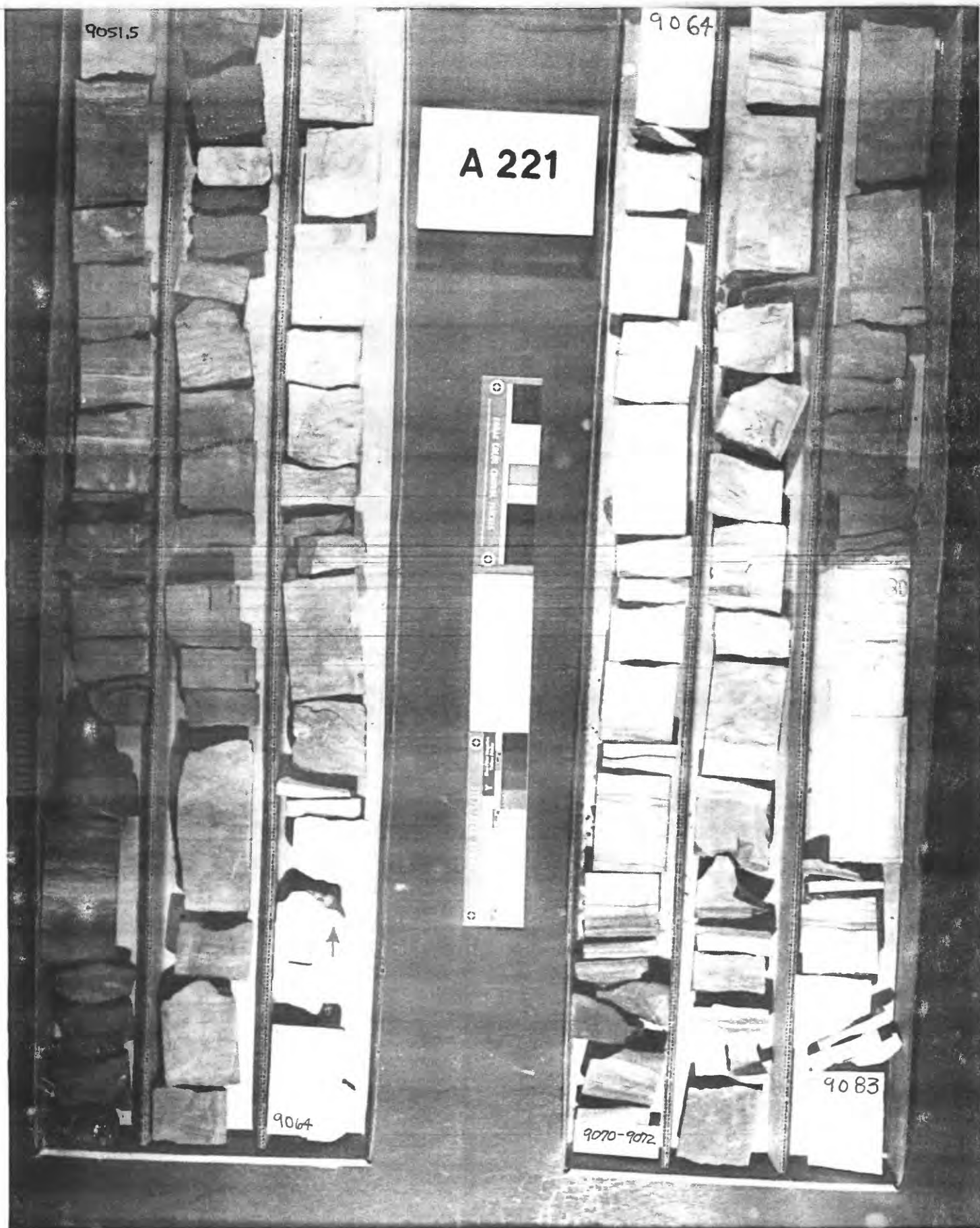
anhy - anhydrite

pyr - pyrite or pyritic

COLORADO INTERSTATE GAS EXPL., INC. 2-8-14-92 Blue Gap II Unit
 LOCATION SW SW Sec 8 T. 14 N. R. 92 W.
 STATE Wyoming COUNTY Carbon
 U.S.G.S. CORE LIBRARY NUMBER A 221 5/5 API WELL NUMBER 49-007-20206

DEPTH AND FOOTAGE	FRAC- TURES (Type and Size)	POROSITY TYPES	Visual Porosity	Rock Type	Color	Grain Size	Bedding (as observed)	Sedimentary Structures	Biologic Constituents	Sorting	Roundness	Percent Fracture	Accessory Minerals or Fracture	Description
9051.5				BEGIN CORE	b1		dull							SH, dense, sl calc, interbedded with 18cm coals vert-hori burrows, contorted bedding? COAL
9060					gy		dull							hori burrows
9070					b1		dull							SLTSS, tr hori burrows, organic lamin rootlets, vert burrows?
9080				MISSING	gy		dull							MUDSTONE, silty, tr hori burrows, coaly sh-coal 9cm
9090					b1		dull							MISSING CORE
9090					gy		dull							SH, vert-hori burrows, disrupted lamin, contorted bedding? w pure gy-grn clay 516/1 bioturbation?
9090					gy		dull							SS, vert burrows, rootlets?, calc
9090					b1		dull							SH, hori burrows, rippled lamin, calc
9090					b1		dull							v shaly coal coaly sh SH, rippled, burrows, v calc, rootlets?
9285				MISSING CORE										MISSING CORE
9290					b1		dull							SH, dense, calc
9298				MISSING CORE										dark and light sh lamin alt. FOOTAGE POORLY MARKED SH, dense, v calc, mottled?

Drill hole reference
 number 1



9083

A 221

9285

9291-9295

9296-9297



9299

A 221



COLORADO INTERSTATE GAS EXPL., INC.
LOCATION SE 1/4 Sec. 1

STATE.....Wyoming

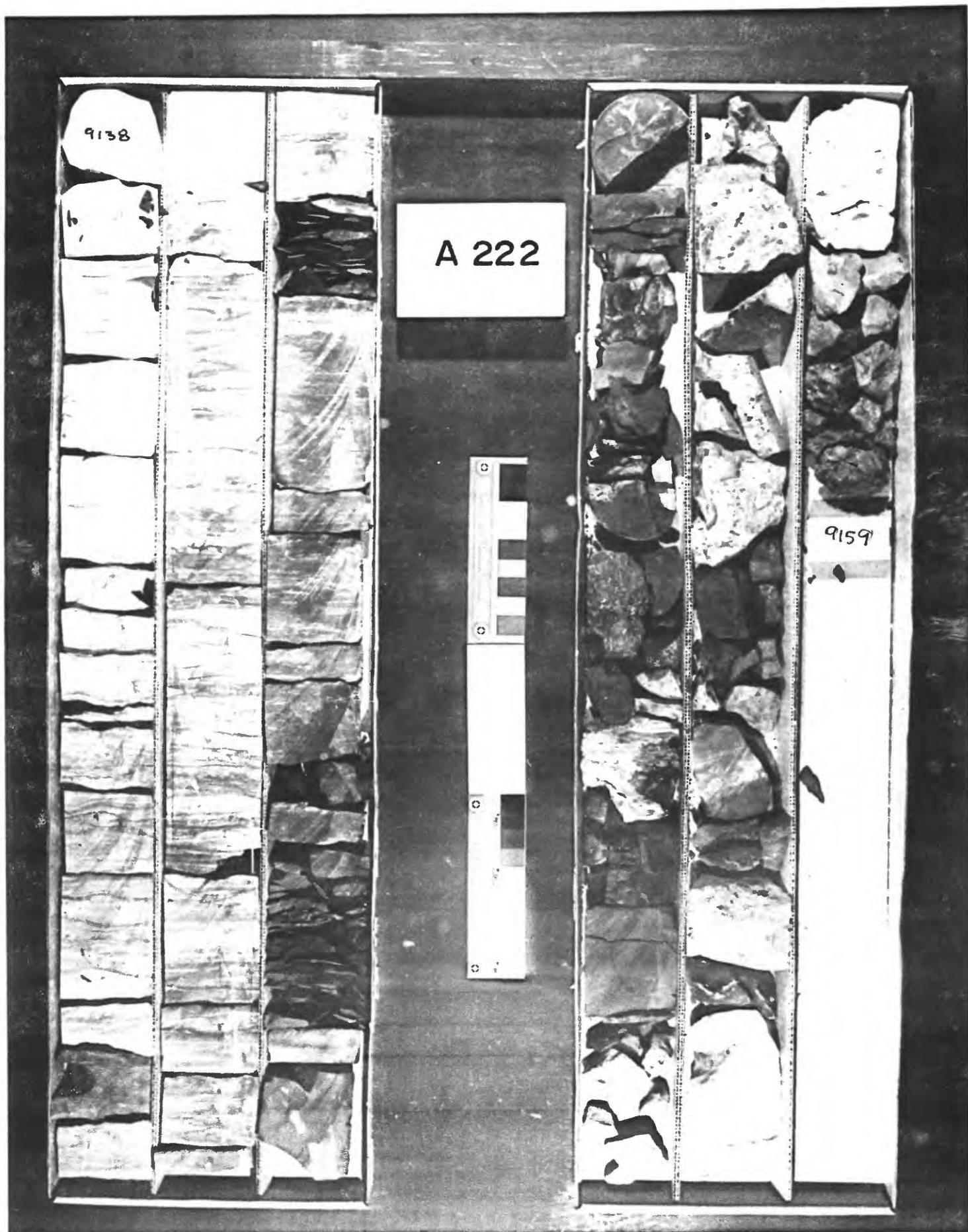
COUNTY.....Carbon

U.S.G.S. CORE LIBRARY NUMBER A 222 2/2

API WELL NUMBER 49-007-20186

DEPTH AND FORMATION TOPS	SHOWS FRACTURES (Type and %)	POROSITY TYPES	Visual Porosity Estimate	Rock Type	Color	Dominant Grain Size	Bedding (as observed)	Sedimentary Structures	Biologic Constituents	Sorting	Roundedness	Percent Framework	Accessory Minerals or Fragments	Description
9138				BEGIN CORE								M Subang- Subid 95		SS, calc, salt-pepper appear, slav. calc. cement.
9140		LG			gy		h+ A	4-5 wavy						MUDSTONE v calc, vsilty vert? hori. burrows rippled, scour fill? possibly v muddy silty interval becomes very calc, muddy-is?
9150					gy		h+ A							SH, brittle MUDSTONF-SH, dense lt gy sh lamin
9159		W (75) W (65)		END CORE	blk		h+ A	4-5 wavy			W Subang 40			SH, dense SH, very coaly MUDSTONE, calc, rippled?, tr hori- vert burrows, healed fracture silty interval in Mudstone

Drill hole reference
number 2



LOCATION NW NW MESA PETROLEUM CO.]-25 Playa UPRR Sec. 25 T. 20N R. 99W
 STATE Wyoming COUNTY Sweetwater
 U.S.G.S. CORE LIBRARY NUMBER A.230 5/5 API WELL NUMBER 49-037-20653

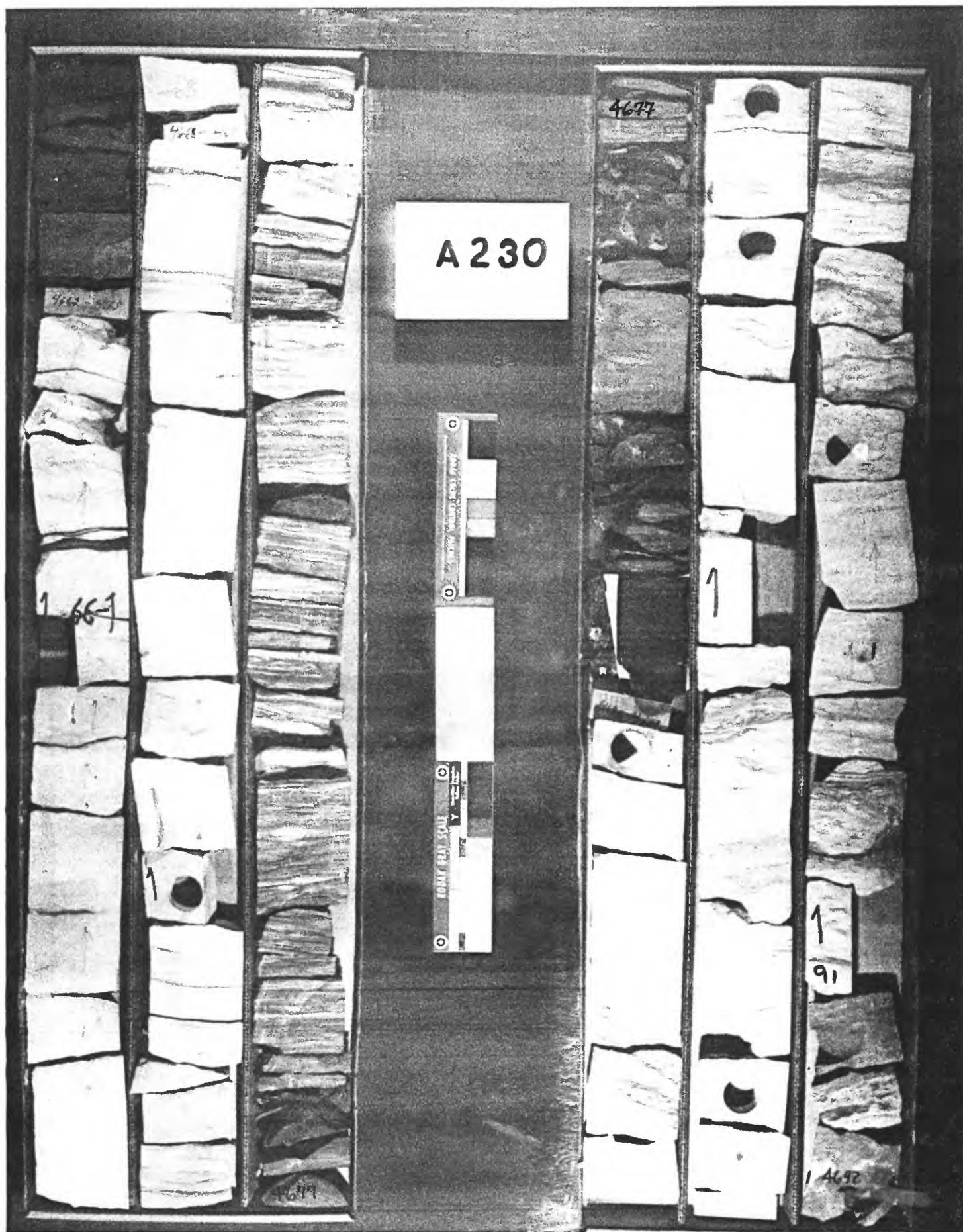
DEPTH AND FORMATION TOPS	SHALES FRACTURES (Type, range)	POROSITY TYPES	Visual Porosity Estimate	Core	ROCK TYPE	COLOR	CLAY DOMINANT	GRAIN SIZE	BEDDING (as observed)	SEDIMENTARY STRUCTURES	BIOLOGIC CONSTITUENTS	SORTING	ROUGHNESS	PERCENT FRAMEWORK	ACCESSORY MINERALS OR FRAGMENTS	DESCRIPTION
4638		IG			BEGIN CORE	gy bl					Shell frag	W	Subang Subrid			SS, shaly, shell frag, mottled, highly bioturbated, anhy.
4640						gy bl										SH, dense, anhy?-ss lamin, v pyr
4650						gy bl										SH-SS, ss lamin, mottled, hori burrows, vert burrows, bioturbation decreasing
4660						gy bl			15°			W				SS, calc, rippled organ lamin SH, dense, brittle hori burrows, sl mottled calc to heavy for burrows SS, dense, burrowed, ripple, rootlets?
4670						gy bl					Shell frag	W				SH, dense, frags alt with y calc SH, lamin, shell hori zone COALS, v. coaly, sh., small ss, rip-u?
4680					MISSING CORE	gy bl										MISSING CORE SS, salt-pepper, appear organic mat'l, good k, calc-clay cement
4690						gy bl										organic rich layers have vert-hori burrows, 4-6cm ripple-scour fill zone, v sdy, vert-hori-inclined burrows SH, dense COAL, shaly coal, shell frags
4695					MISSING CORE	gy bl					Shell frag					MISSING CORE SS, contorted lamin, salt-clay cement, vert-hori burrows, clay cross bedding, scour fill areas? 25-30% organic mat'l
4695					END CORE	gy bl			0-10° dill							SH, interbedded with v f ss, mottled, vert-hori-inclined burrows

Drill hole reference
number 3

4638

A 230







FOREST OIL CORP. 9-18-2 Arch Unit

LOCATION NW1/4 Sec. 18 T. 19 N. R. 98 W.
 STATE Wyoming COUNTY Sweetwater
 U.S.G.S. CORE LIBRARY NUMBER A 394 2/2 API WELL NUMBER 49-037-05617

DEPTH AND FORMATION TOPS	SPERM FRACTURES (Type of)	POROSITY TYPES	EST VISUAL POROSITY ESTIMATE	ROCK TYPE	COLOR	CLAY DOMINANT	SHD GRAIN SIZE	BEDDING (as observed)	SEDIMENTARY STRUCTURES	BIOLOGIC CONSTITUENTS	SORTING	ROUNDNESS	PERCENT FRAMEWORK	ACCESSORY MINERALS OR FRAGMENTS	DESCRIPTION
4879				BEGIN CORE											
4880	TC				gy			5-10°	sh. frags	sh. frags	M		55?		SS, v limy-to a v sdy limestone, (oyster frags?) shell frag. 20cm zone.
	VP (S)							5-10°					80		SS, v calc, salt-pepper appear, vert fracturing, calc-clay cement open fractures, rippling sh. lamin
4890	VP (S)							5-10°			P		90		sh. lamin more abundant, rippled, coaly sh
4900	TC				b1			5-10°	sh. frags	sh. frags	M		90		SH, dense few shell frags (oyster frags?)
4905				END CORE	b1			2-5°							shell frags
					b1			15°							SH, dense
															END CORE

Drill hole reference
 number 4

4879

A 394

4899

82

4899

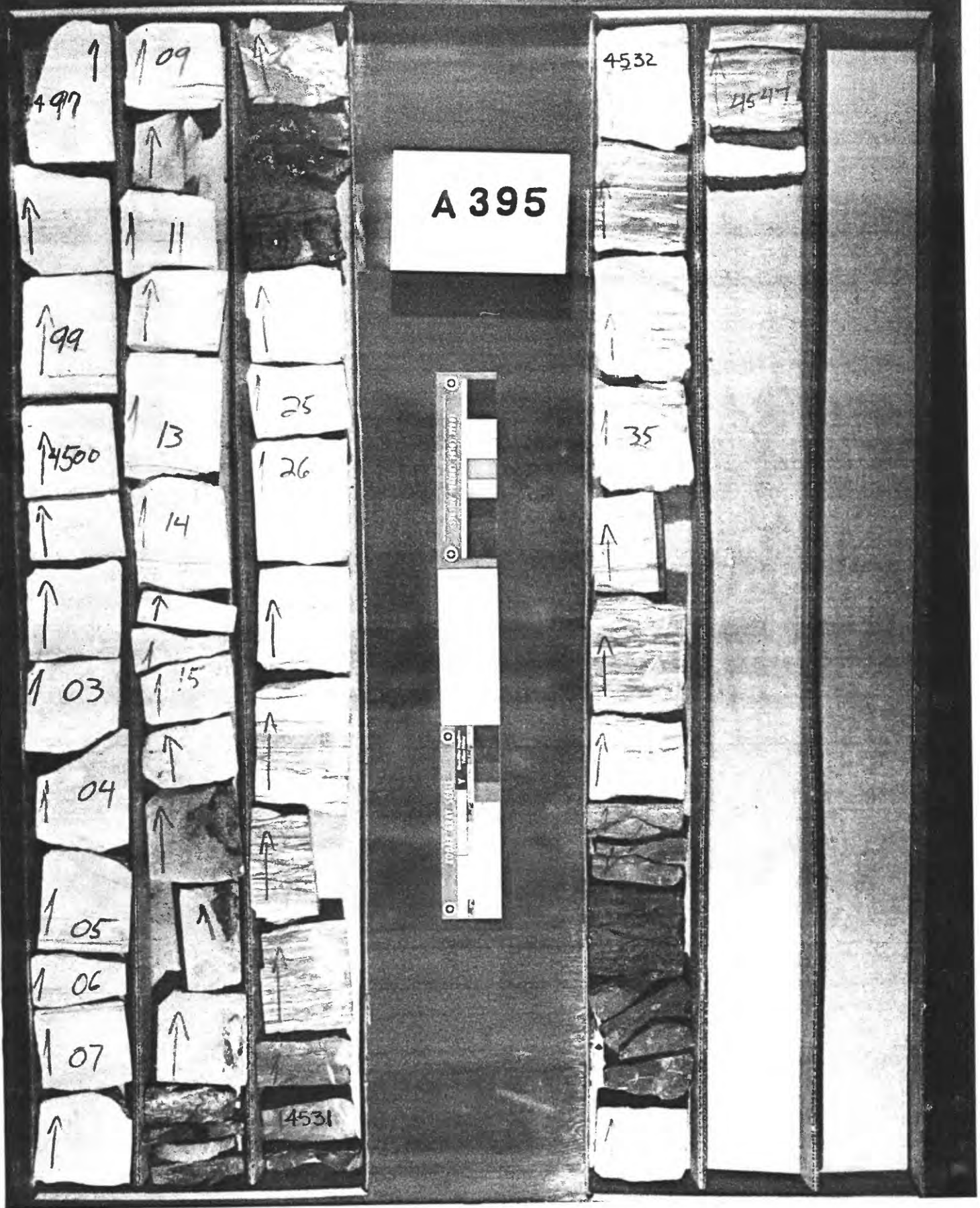
4904



FOREST OIL CORP. 20-23-4 Arch Unit
 LOCATION NW 1/4 Sec. 23 T. 19 N. R. 99 W.
 STATE Wyoming COUNTY Sweetwater
 U.S.G.S. CORE LIBRARY NUMBER A 395 2/2 API WELL NUMBER 49-037-05578

DEPTH AND FORMATION TOPS	SHIMS	FRACTURES (Type & #)	PEROSITY TYPES	Visual Porosity Estimate	Core	Rock Type	COLOR	Clay Mud Dominant	Grain Size	Bedding (as observed)	Sedimentary Structures	Biologic Constituents	Sorting	Roundness	Percent Framework	Accessory Minerals or Fragments	DESCRIPTION
4497	IC	VT				BEGIN CORE	Ny						M		90		SS, calc, salt-pepper appear, friable hint of hori lamin, good k, clay-calc cement
4500							Ny			5-8			W				SS appears to be breaking along v coaly-organic rich lamin
4510							Ny			10-8					95		Scour fill, tr hori burrows
4520							Ny			10-8							rippled sh lamin
4530							Ny			25			N-W				hori burrows?
4540							Ny			5							tr mica, fg ss lamin, graded bedding?
4547							Ny										Footage poorly marked, MISSING CORE: 4519-4523?
							Ny										SS, calc, highly bioturbated, vert-hori burrows, calc-clay cement burrowing decreasing, scour fill to ripples appear
							Ny										BLSS, v. shaly, scour fill-rippled
							Ny										SH, silty, vert-hori burrows, alt
							Ny										SS, v calc, vert-hori burrows, sh lamin
							Ny										SH, silty, vert-hori burrows
							Ny										SS, calc, vert-hori burrows, sh lamin
							Ny										Core poorly marked below 4535ft
							Ny										SH, dense
							Ny										Coal
							Ny										SS, calc, vert-hori burrows, ripples
							Ny										SH, silty, sh-sless lamin alt, vert-hori burrows
							Ny										END
							Ny										CORE

Drill hole reference
 number 5



A 395



FOREST OIL CORP. 3-1 Arch Unit 77
 LOCATION SW 24 NE 3 Sec. 3 T. 19 N. R. 98 W.
 STATE Wyoming COUNTY Sweetwater
 U.S.G.S. CORE LIBRARY NUMBER A 415-2/2 API WELL NUMBER 49-037-05687

DEPTH AND FORMATION TOPS	FRAC. (1/2 in. or less)	POSS. TYPES	VISUAL POROSITY ESTIMATE	ROCK TYPE	COLOR	CLAY DOMINANT	SH. GRAIN SIZE	BEDDING (as observed)	SEDIMENTARY STRUCTURES	BIOLOGIC CONSTITUENTS	SORTING	ROUNDNESS	PERCENT FRAMEWORK	ACCESSORY MINERALS OR FRAGMENTS	DESCRIPTION
6020				BEGIN CORE	bl			h dull							Core Footage Poorly Marked For Complete Core Interval
6030					bl			h dull							Coal, grading into sh, dense
6040					bl			h dull							sl, v calc, alt with lamin of lt
6050					bl			h dull							sh, calc sh
6060					bl			h dull							sh, v silty, fr. v. fg. ss, calc, few hori -vert burrows
6070				END CORE	bl			h dull							MUDSTONE to SH
					bl			h dull							SS, silty, calc, poor ksg, v shaly,
					bl			h dull							SS, calc, silty
					bl			h dull							MUDSTONE, ls calc, sl silty
					bl			h dull							SS, v shaly, v silty, sl calc, few hori -vert burrows, rip up clasts?
					bl			h dull							MUDSTONE, sl calc, silty
					bl			h dull							MUDSTONE, v calc, mottled sl silty, grades into noncalc sh
					bl			h dull							SH, dense
					bl			h dull							MUDSTONE, calc, large shell frags
					bl			h dull							MISSING CORE
					bl			h dull							SS, clay-calc cement, poor k
					bl			h dull							sh lamin, Fe staining

Drill hole reference number 6

A 415

47

-6056-

1

-6060-

-62-

-63-

-64-

-65-

6071

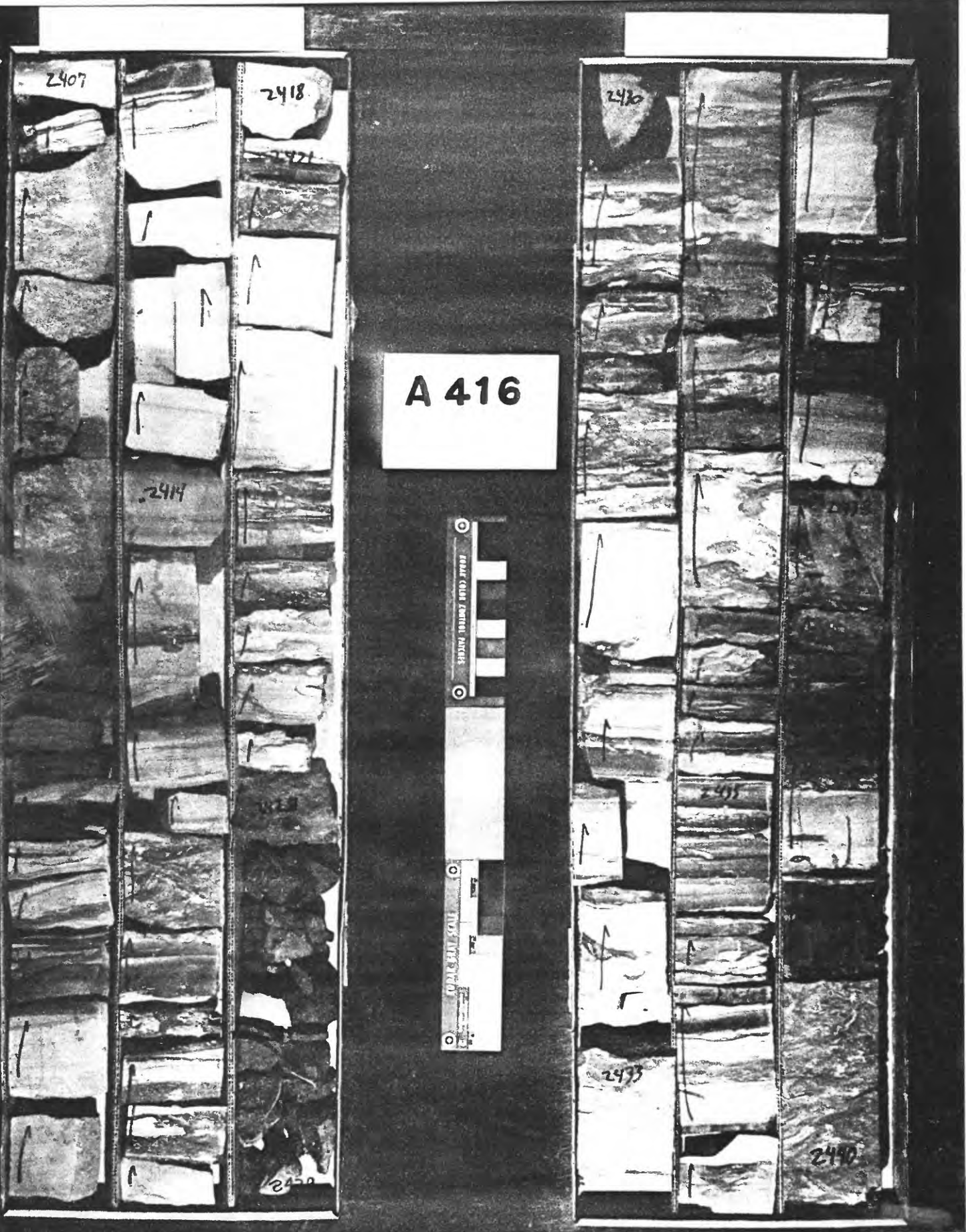
6055



LOCATION AMERADA HESS CORP. Deep Creek 2 Unit
 STATE Wyoming COUNTY Carbon
 U.S.G.S. CORE LIBRARY NUMBER A 416 3/3 API WELL NUMBER 49-007-05071

DEPTH AND FORMATION TOPS	SCALES	FRACTURES (Type, etc.)	POROSITY TYPES	VISUAL POROSITY ESTIMATE	ROCK TYPE	COLOR	CLASTIC GRAIN	GRAIN SIZE	BEDDING (as observed)	SEDIMENTARY STRUCTURES	BIOLOGIC CONSTITUENTS	SORTING	ROUNDNESS	PERCENT FRAGMENT	ACCESSORY MINERALS OR FRAGMENTS	DESCRIPTION
2407					BEGIN CORE	N5-N7 gy blk				vert		W	Subd	70		SS, interbedded with blk shale few vert-hori burrows, mottled
2410						N5-N7 gy blk				vert		W	Subd	25		SH, silty, friable to dense mudstone, silty, large vert burrow
2420					MISSING CORE	N5-N7 gy blk				vert		M-W	Subd	50		SS, interbedded with shale, vert hori burrows, calc-clay cement, trace pyrite
2430						5G 2/1 gy blk				vert		M	Subd	85		SS-SH, interbedded, approx 50/50 heavy bioturbation in shale vert-hori burrows MISSING CORE (2418-2424) Footage poorly marked: 2421-2428ft MUDSTONE, silty SH, dense, green coloration
2440						5Y 6/1 gy blk				vert		M	Subd	70		SLTSS-SS, calc, hori-vert burrows, heavy bioturbation SH, interbedded with silty mudstone
2450						5Y 6/1 gy blk				vert		W	Subd	95		SH, dense, alt. with lamin. x. fg. to fg SS, heavy bioturbation of organic rich lamin, vert-hori burrows SS, massive, sl calc, clay-calc cement, poor k.
2453					END CORE					vert		M	Subd			SS, sl calc, massive, cross-bedded

Drill hole reference
 number 7



2407

2418

2420

A 416

2414

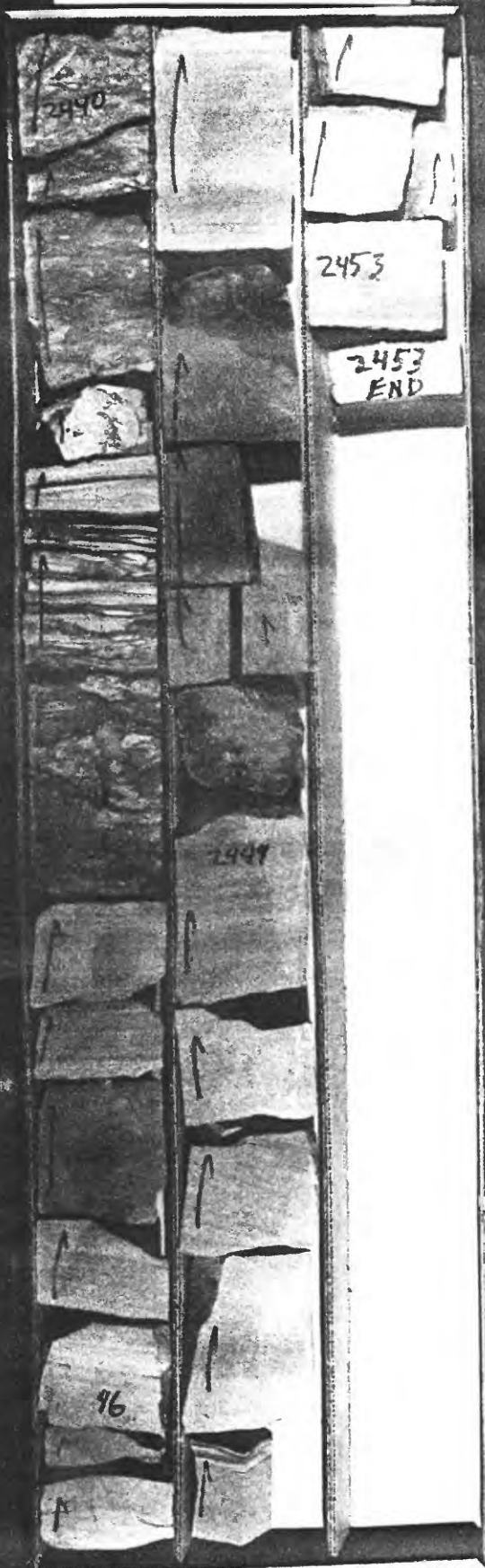
ROSE CLAY CENTER PATCHES

INCHES

2433

2440

2422



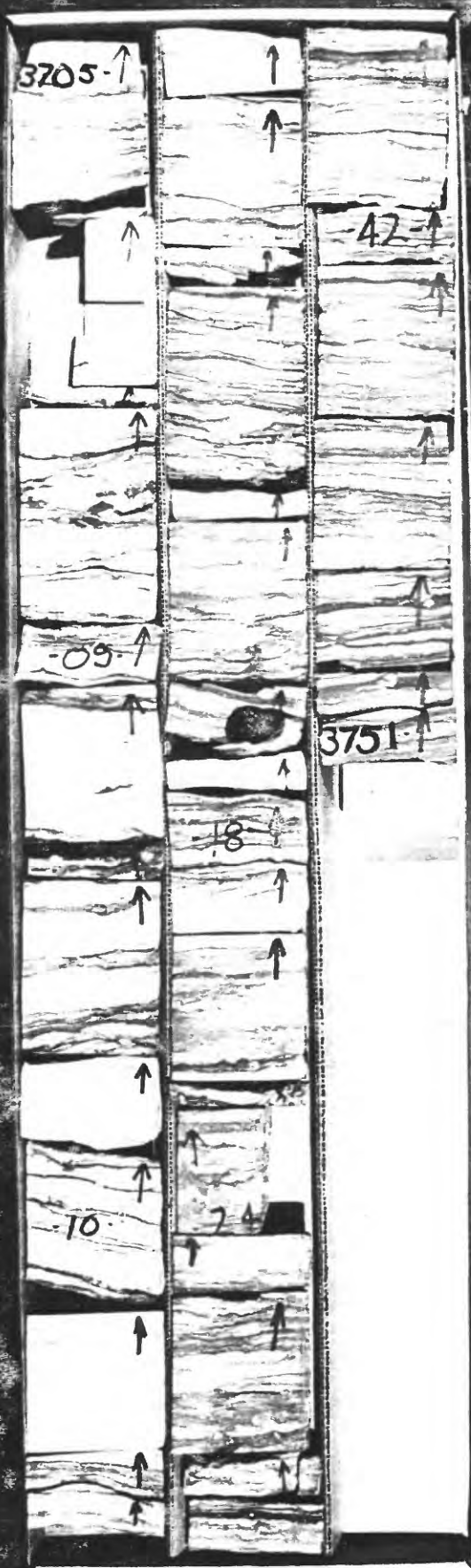
A 416



Jerry Chambers, Oil Producer 1-13 Kemmer Creek Federal
 LOCATION C. NW Sec. 13 T. 14 N. R. 102 W.
 STATE Wyoming COUNTY Sweetwater
 U.S.G.S. CORE LIBRARY NUMBER A 483 1/1 API WELL NUMBER 49-037-20615

DEPTH AND FORMATION TOPS	SHOWS FRACTURES (types, etc.)	POROSITY TYPES	Visual Porosity (None, Poor, Good)	Rock Type	COLOR	Clay Dominant (Silt, Fines, Mixed, Coarse, etc.)	Grain Size (as observed)	Bedding (as observed)	Sedimentary Structures	Biologic Constituents	Sorting	Roundness	Percent Framework	Accessory Minerals or Fragments	Description
3700															
3705				BEGIN CORE	MY						N	Subang-Chert Subrd	90		FOOTAGE POORLY MARKED ON CORE
3710					N5-N7			5-10°			M	Subrd	65		SS, sl calc, salt and pepper from organic mat'l., sh lamin, highly burrowed, clay-silica cement, homo to disrupted lamin due to bioturbation, indication of 5-10° dip of lamin, vert-hori-
3720					N7			H			M		65		inclined burrows, poor k, . More sh below 3715 ft, approx. 50% Sh, 50% SS,
3730															Mainly hori -inclined burrows burrows concentrate in sh lamin
3740													65		
3750				END CORE							M				END CORE
3751															

Drill hole reference number 8



A 483



LOCATION SFANEZ Sec. 1 T. 19 N. R. 99 W.
STATE Wyoming COUNTY Sweetwater
U.S.G.S. CORE LIBRARY NUMBER A 579 2/2 API WELL NUMBER 49-037-05689

DEPTH AND FORMATION TOPS	DEPTH	ROCK TYPE	COLOR	CLAS. DOMINANT	GRAIN	FRASD	CLAS. SIZE	BEDDING (as observed)	SEDIMENTARY STRUCTURES	BIOLOGIC CONSTITUENTS	SORTING	ROUNDNESS	PERCENT FRAMEWORK	ACCESSORY MINERALS OR FRAGMENTS	DESCRIPTION
4790		BEGIN CORE	N5	gy				6	bed	Shell frag	M	Subid	85		SS, v calc, fair k, bioturbation
4800			N5	gy				nd	bed		W	Subid	30		SS, v calc, shell frags
4810			N5	gy				nd	bed		M	Subid	70		SS, v calc, shell frags
4815		END CORE	gy	blk				nd	bed		W	Subid	90		SS, calc, tr shell frags, tr bioturbation, sh lamin sl coaly, calc-clay cement
								nd	bed						hori burrows, rippling of sh lamin more homo ss, sl calc, clay cement poor k
								nd	bed						homo ss due to high energy
								nd	bed						tr gy chert
								nd	bed		M	Subid	90		SS, sh lamin, tr hori burrows, tr chert
								nd	bed		W	Subid	95		COAL
								nd	bed						SLTSS to MUDSTONE, sh lamin, calc, hori burrows
								nd	bed						END CORE

Drill hole reference
number 9



MICHIGAN WISCONSIN PIPELINE CO. 1-9 Creston

LOCATION E/2 SE Sec. 9 T. 18N R. 32W
 STATE Michigan COUNTY Carbon
 U.S.G.S. CORE LIBRARY NUMBER A 716 12/12 API WELL NUMBER 49-007-20281-00

DEPTH AND FORMATION TOPS	SHOWS FRACTURES (Type, angle)	POROSITY TYPES	EST. VISUAL POROSITY	EST. FAVOR ESTIMATE	COLE	ROCK TYPE	N6-N7	COLOR	CLAY DOMINANT	GRAIN	MASS SIZE	BEDDING (as observed)	SEDIMENTARY STRUCTURES	BIOLOGIC CONSTITUENTS	SORTING	ROUNDNESS	PERCENT FRAMEWORK	ACCESSORY MINERALS OR FRAGMENTS	DESCRIPTION	
8800						BEGIN CORE														
8801		IG										dwll	8		M	Subang-Subrd	90			SS, organic lamip, salt-pepper appear, clay-silica cement, poor k
8810												dwll								Sh, coaly, dense, 4 inch coal slightly silty
8820																				Mottled, bioturbation?
8830																				Mottled, bioturbation? MUDSTONE, hori burrows? mottled, organic lamin contorted? slightly silty
						MISSING														MISSING
						CORE														CORE
8840												dwll	8		M	Subang-Subrd	95			SS, v sl calc, salt-pepper appear 5% organic mat, clay-silica cement
												dwll	Slump?							Vert. burrows, or rootlets?
8850												5-10								Core appear to split along organic partings
												dwll								tr calc cement

Drill hole reference number 10

1 of 3

LOCATION _____ Sec. _____ T. _____ R. _____
 STATE _____ COUNTY _____
 U.S.G.S. CORE LIBRARY NUMBER _____ API WELL NUMBER _____

DEPTH AND FORMATION TOPS	SHOWS FRACTURES (if any)	POROSITY TYPES	EST. VISUAL POROSITY	ROCK TYPE	COLOR	CLAY MINERAL DOMINANT	GRAIN SIZE	BEDDING (as observed)	SEDIMENTARY STRUCTURES	BIOLOGIC CONSTITUENTS	SORTING	ROUNDNESS	PERCENT FRAMEWORK	ACCESSORY MINERALS OR FRACMENTS	DESCRIPTION
8860					N6-N7	gy		15° 20° 25° 30° 35° 40° 45° 50° 55° 60° 65° 70° 75° 80° 85° 90° 95° 100°	W Subang	95					SS, v sl calc, salt-pepper appear, sh lamin increasing such that interval shaly ss, horiz burrows in organic rich lamin, disrupted lamin
8870					N6	blk		15° 20° 25° 30° 35° 40° 45° 50° 55° 60° 65° 70° 75° 80° 85° 90° 95° 100°	W Subang	95					ss alt with silty sh
8880					N6	blk		15° 20° 25° 30° 35° 40° 45° 50° 55° 60° 65° 70° 75° 80° 85° 90° 95° 100°	W Subang	95					SH, dense, lamin of v fg ss gives mottled appear to lamin, few horiz burrows
8890					N6	blk		15° 20° 25° 30° 35° 40° 45° 50° 55° 60° 65° 70° 75° 80° 85° 90° 95° 100°	W Subang	95					SH, v silty to shaly ss, v fg ss filling burrows, clay-silica cement, few horiz burrows
8900					N6	blk		15° 20° 25° 30° 35° 40° 45° 50° 55° 60° 65° 70° 75° 80° 85° 90° 95° 100°	W Subang	95					SS, vert-horiz burrows, clay-silica cement, v sl calc, mottled
10174					N6	blk		15° 20° 25° 30° 35° 40° 45° 50° 55° 60° 65° 70° 75° 80° 85° 90° 95° 100°	W Subang	95					MISSING CORE
10184					N6	blk		15° 20° 25° 30° 35° 40° 45° 50° 55° 60° 65° 70° 75° 80° 85° 90° 95° 100°	W Subang	95					SH, dense, v coaly and silty, SLTSS to v shaly SS, mottled
10190					N6	blk		15° 20° 25° 30° 35° 40° 45° 50° 55° 60° 65° 70° 75° 80° 85° 90° 95° 100°	W Subang	95					SS, calc-silica cement, rootlets, vert burrows, salt-pepper appear
10190					N6	blk		15° 20° 25° 30° 35° 40° 45° 50° 55° 60° 65° 70° 75° 80° 85° 90° 95° 100°	W Subang	95					SLTSS to v silty SH, dense, mottled, horiz burrows, clay-silica cement
10190					N6	blk		15° 20° 25° 30° 35° 40° 45° 50° 55° 60° 65° 70° 75° 80° 85° 90° 95° 100°	W Subang	95					SS, calc, bioturbated

Drill hole reference
number 10

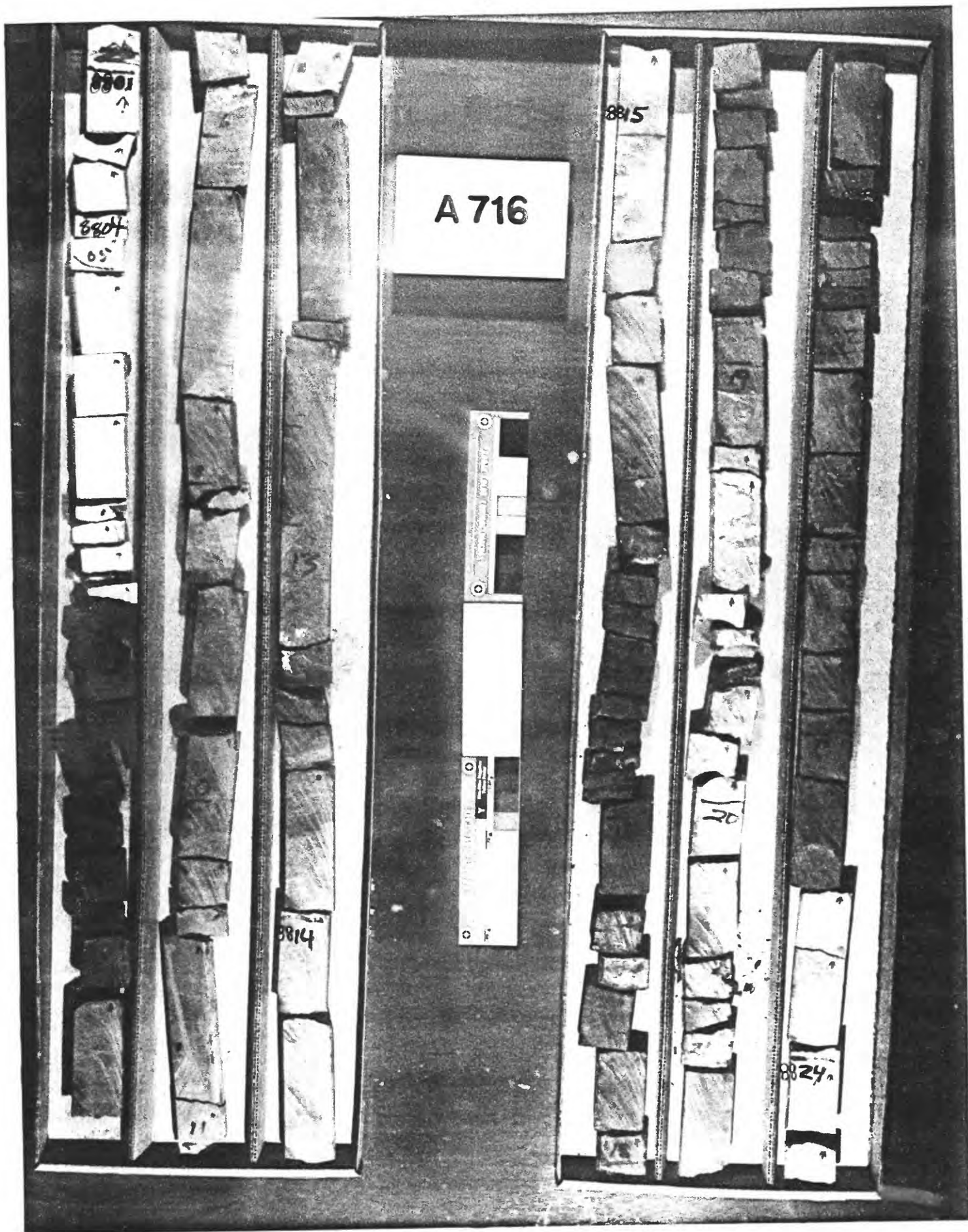
2 of 3

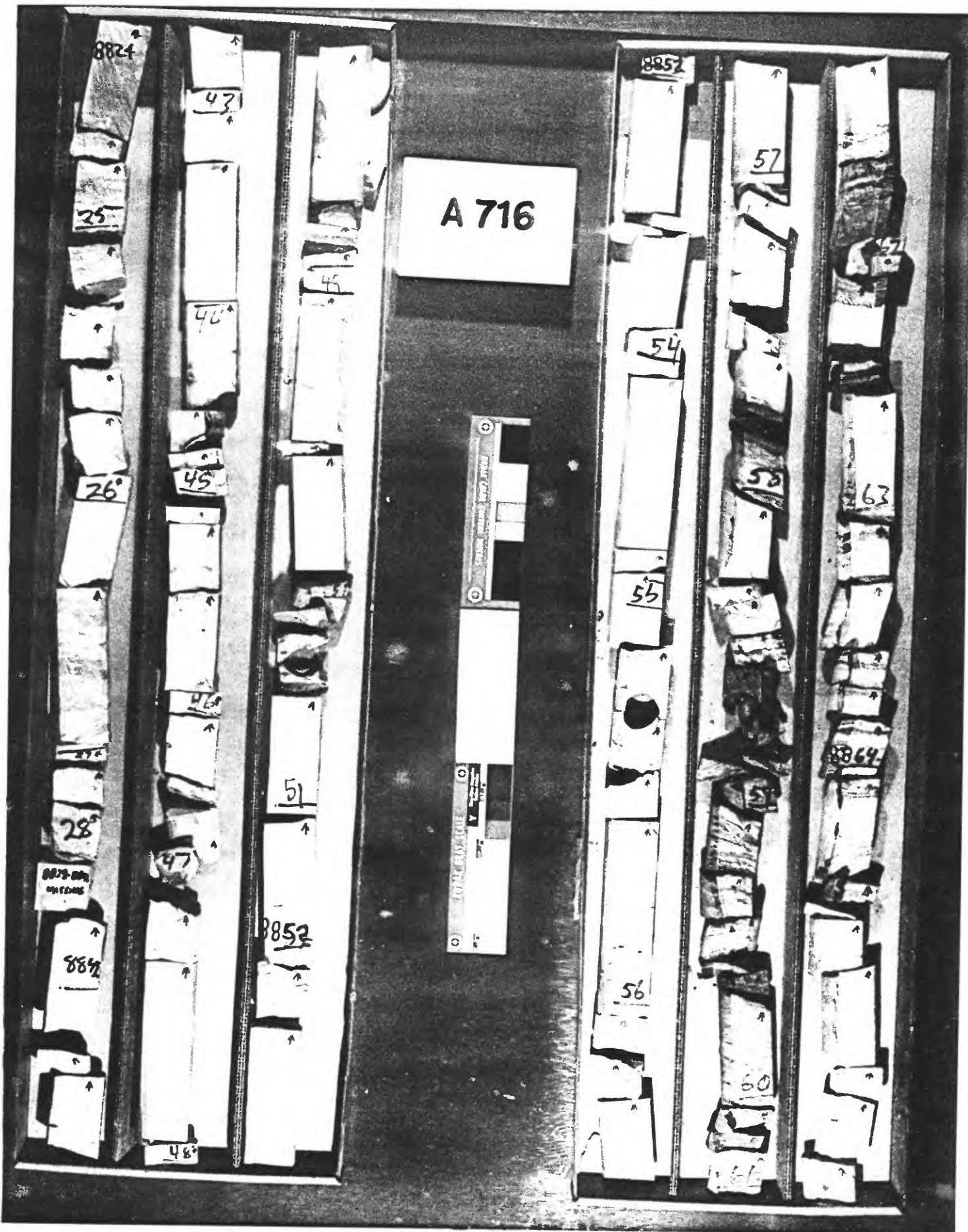
LOCATION _____ Sec. _____ T. _____ R. _____
 STATE _____ COUNTY _____
 U.S.G.S. CORE LIBRARY NUMBER _____ API WELL NUMBER _____

DEPTH AND FORMATION TOPS	SHOWS FRACTURES (Type, no.)	POSSIBILITY TYPES	VISUAL ESTIMATE Good Poor None	ROCK TYPE	COLOR	CLAY DOMINANT Silt V. sand V. mud	GRAIN SIZE V. med V. fine V. s.d.	BEDDING (as observed)	SEDIMENTARY STRUCTURES	BIOLOGIC CONSTITUENTS	SORTING	ROUNDNESS	PERCENT FRAMEWORK	ACCESSORY MINERALS OR FRAGMENTS	DESCRIPTION
10200															
10210															SS, shaly, calc, silty SS alt with SH or v silty SH
10220															SH, dense, v coaly SH, v silty SH, mottled, hori burrows, few vert burrows?, clay-silica cement
10225															SH, v silty SS, sl calc SH, v silty SS, clay-silica cement
				END CORE											

3 of 3

Drill hole reference
number 10





A 716

8877

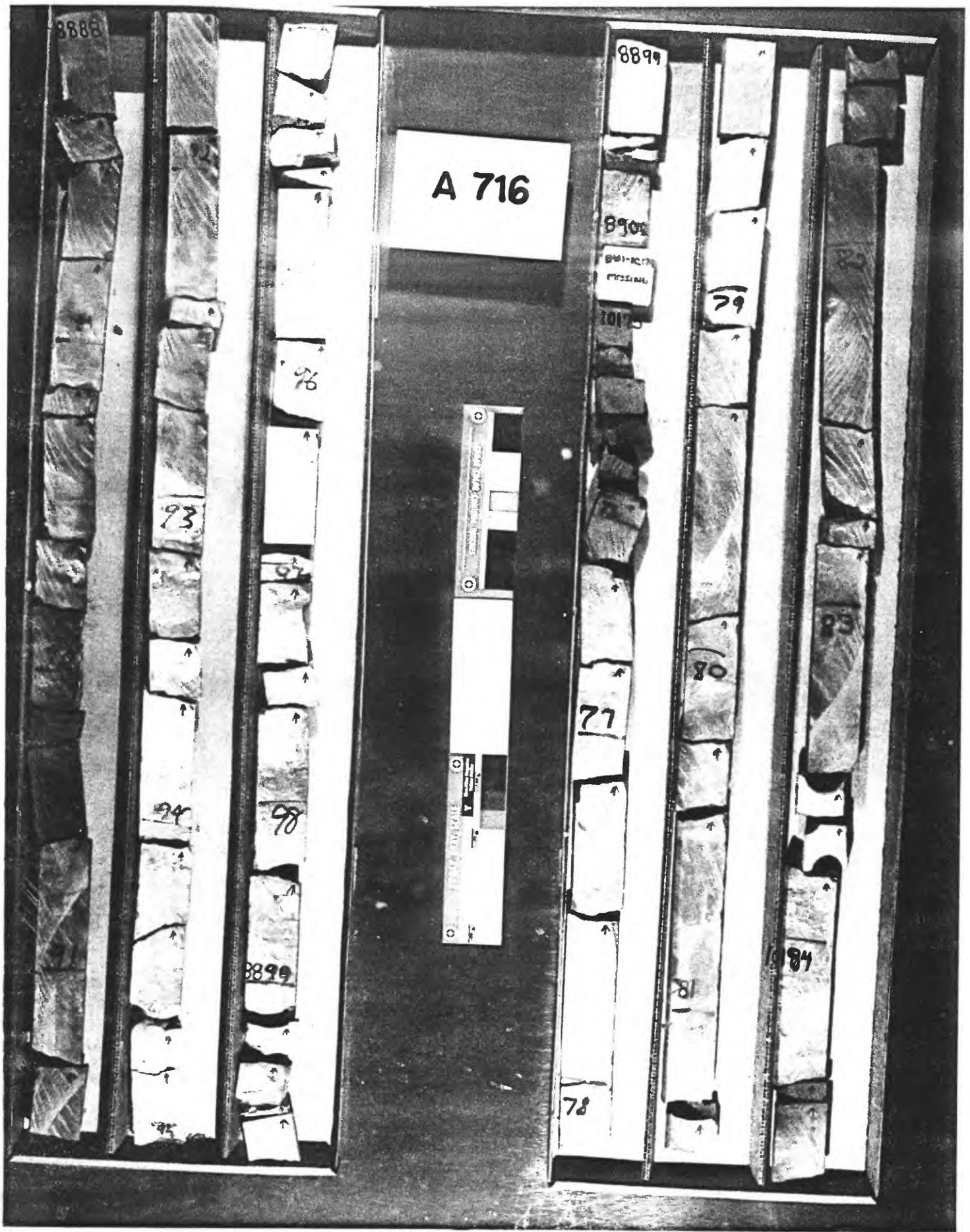
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A 716

10200

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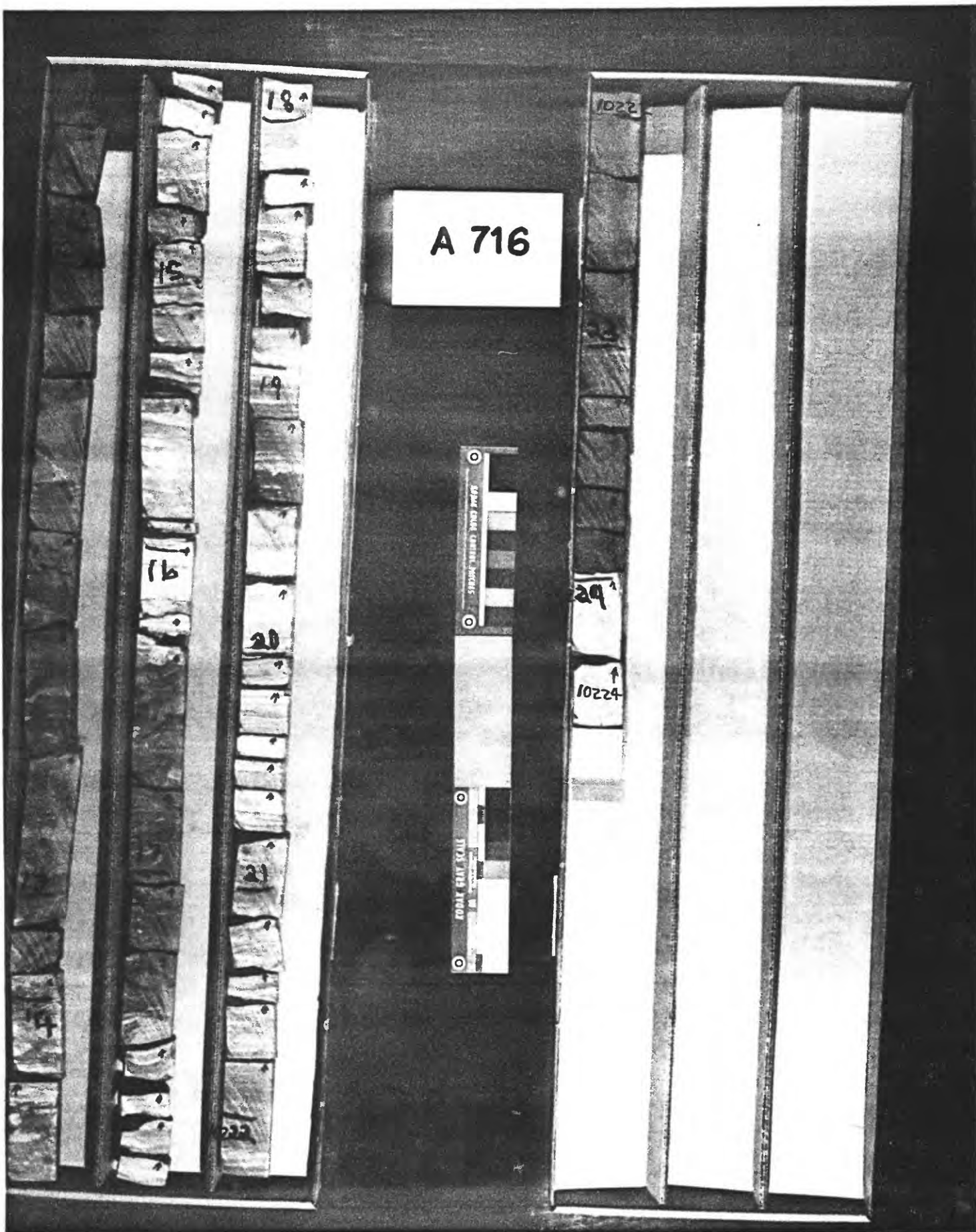
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100



LADD PETROLEUM CORP. 1-22-74 Federal
 LOCATION SP₁ SP₂ Sec. 22 T. 17 N. R. 94 W.
 STATE Wyoming COUNTY Sweetwater
 U.S.G.S. CORE LIBRARY NUMBER A 846 12/12 API WELL NUMBER 49-037-20713-00

[illegible]

1 of 3

Drill hole reference
number 11

LOCATION _____ Sec. _____ T. _____ R. _____
 STATE _____ COUNTY _____
 U.S.G.S. CORE LIBRARY NUMBER _____ API WELL NUMBER _____

DEPTH AND FORMATION TOPS	SNOWS	FRACTURES (Type, no.)	POROSITY TYPES	VISUAL POROSITY ESTIMATE	ROCK TYPE	COLOR	DOMINANT GRAIN SIZE	BEDDING (as observed)	SEDIMENTARY STRUCTURES	BIOLOGIC CONSTITUENTS	SORTING	ROUNDNESS	PERCENT FRAMEWORK	ACCESSORY MINERALS OR FRAGMENTS	DESCRIPTION
10210		VF	H	None		gy		ll	rrr x		W	Subang Subrd	85		SS, v calc, salt-pepper appear. vert-hori -inclined burrows, homo due to bioturbation, rootlets? poor k, clay-calc cement, clay-alt? sh lamin (Core breaking along organic rich sh zones)
10220		VF	H	None		bl		ll	rrr x		W	Subang Subrd	85		sh lamin, rippling, contorted bedding due to bioturbation? or loading? scour fill? SH, dense, alt with v fg to silty mudstone, hori burrows play 2cm 5Y6/1
10230		VF	H	None		gy		ll	rrr x		W	Subang Subrd	85		Coal small 5 cm ss, v fg, calc SH, dense, v coaly SH, dense, mottled due to bioturbation SS, calc, vert-hori -inclined burrows, disrupted lamin due to bioturbation, poor k SH, dense, sl coaly, mottled
10240		VF	H	None		bl		ll	rrr x		W	Subang Subrd	90		SS, silty, calc, sh lamin, vert-hori - inclined burrows, SH, dense, alt with v fg ss, hori burrows, sl calc SS, sl calc, bioturbation, contorted bedding
10250		VF	H	None		gy		ll	rrr x		W	Subang Subrd	90		scour fill-rippling, vert-hori - inclined burrows SS, calc, clay-calc cement, sh lamin sl coaly SH, dense, coaly SH, dense, alt with mudstone to v fg ss SS, sl calc, vert-hori -inclined burrows, salt-pepper, poor k, rootlets?, silica-clay cement Interval massive due to bioturbation

Drill hole reference
number 11

2 of 3

LOCATION.....Sec.....T.....R.....
 STATE.....COUNTY.....
 U.S.G.S. CORE LIBRARY NUMBER.....API WELL NUMBER.....

DEPTH AND FORMATION TOPS	SHOALS	FRACTURES (typ. ang.)	POSSIBILITY TYPES	VISUAL POROSITY ESTIMATE	ROCK TYPE	COLOR	CLAY DOMINANT	GRAIN SIZE	BEDDING (as observed)	SEDIMENTARY STRUCTURES	BIOLOGIC CONSTITUENTS	SORTING	ROUNDNESS	PERCENT FRAMEWORK	ACCESSORY MINERALS OR FRAGMENTS	DESCRIPTION	W
10260	IG	IG	Good	None	IG	bl gy	Clay	Med Sd	Med Sd	Med Sd		Subang-Subang	8-90			SS, sl calc, tr vert-hori burrows, scour fill-rippling of sh lamin SH, dense, alt with v fg ss	
10270	IG	IG	Good	None	IG	bl gy	Clay	Med Sd	Med Sd	Med Sd		W	85			Sl, dense, alt with v fg ss to silty mudstone	
10280	IG	IG	Good	None	IG	bl gy	Clay	Med Sd	Med Sd	Med Sd		W	75			SS, sl calc, v bioturbated, vert-hori-inclined burrows, poor k some burrows fill with clay 516/1 SLTSS to silty MUDSTONE, pyr MUDSTONE, silty, bioturbated, pyr SH, dense, mottled, sl silty	
10290	IG	IG	Good	None	IG	bl gy	Clay	Med Sd	Med Sd	Med Sd		W	75			SS, sl calc, bioturbated, clay-silica cement, coaly sh lamin	
10292	IG	IG	Good	None	IG	bl gy	Clay	Med Sd	Med Sd	Med Sd		W	75			SS, alt with sh lamin, highly bioturbated, vert-hori-inclined burrows, poor k	
					END CORE											END CORE	

3 of 3

Drill hole reference number 11

