CORE ANALYSIS REPORT

FOR

AMERADA PETROLEUM CORPORATION

EAVES NO. A-1 WELL

KNOWLES FIELD

LEA COUNTY, NEW MEXICO

CORE

GENERAL OFFICES
120 BROADWAY NEW YORK

AMERADA PETROLEUM CORPORATION

BEACON BUILDING
P. O. BOX 2040
TULSA 2, OKLA.

June 16, 1950

Case # 204

Mr. R. R. Spurrier, Secretary
Oil Conservation Commission
Santa Fe, New Mexico

Dear Mr. Spurrier:

Enclosed herewith we are sending you a copy of a core analysis report on our Eaves "A" No. 1 in the Knowles Field. Analysis of the core was delayed because of a fire in their Midland Laboratory. After receiving it, I wanted to inspect the core and compare it with the analysis before forwarding it.

I am not too pleased with this report in several respects. Some of the core description under "Visual Examination" is quite misleading. A number of the cores are described as being fractured; however, after examining all the cores, I could see only a few places where even small fractures existed. From the strictly geological interpretation, there are a number of lines in the core which could well be called fractures but showed no evidence of porosity or even oil stain. Certainly the cores do not show fracturing as we commonly think of a fractured reservoir rock.

A number of the cores are marked "slightly vuggy" and only a few as "vuggy". To the upper part of the core, in the majority of cases, the term "slightly vuggy" is appropriate. In the lower 20 feet or so, I believe the descriptions "vuggy" and "very vuggy" could be used. For a clear conception of the cores, some pictures in U.S.G.S. Water Supply Paper No. 639, particularly Plates 11, 13, and 15, following Page 68, could be considered as cross-sections of cores from Eaves "A" No. 1. While these photographs are considerably enlarged, they should be considered as actual size for representing the cores. As yet, we have no check on the permeabilities reported, although I must confess I am suspicious of them on several of the more "vuggy" samples. Although the report does not specifically state, the cores were analyzed by the so-called "big-chunk method", in which the complete section of the core was analyzed.

We trust you will find this core analysis report of interest and value in considering the large area that can be efficiently and effectively drained by one well.

Very truly yours,

C. V. Millikan

CVM:jm
Enclosure

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

May 23, 1950

Amerada Petroleum Corporation
McClintic Building
Midland, Texas

Attention: Mr. Blackwood

Subject: Special Core Analysis
Eaves No. A-1 Well
Knowles Field
Lea County, New Mexico

Gentlemen:

Reported herein are revised estimates of recoverable oil based on a solution gas-oil ratio of 165 cubic feet per barrel and a formation volume factor of 1.15

The unit recoverable oil by solution gas drive is 33 barrels per acre-foot and the increase due to an effective water drive is 104 barrels per acre-foot.

Very truly yours,

CORE LABORATORIES, INC.

T. L. Kennerly

T. L. Kennerly

TLK:mrm

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS
May 19, 1950

Amerada Petroleum Corporation
McClintic Building
Midland, Texas

Attention: Mr. Blackwood

Subject: Special Core Analysis
Eaves No. A-1 Well
Knowles Field
Lea County, New Mexico

Gentlemen:

The Eaves No. A-1 well was cored using diamond coring equipment and water base mud. The cores were logged, sampled and quick-frozen at the well site by a representative of Core Laboratories, Inc. and transported to the Midland laboratory for analysis.

The Woodford shale was cored between 12,455 and 12,470 feet and the Devonian formation was cored between 12,470 and 12,580 feet. The Devonian formation was analyzed by special methods to determine the effects of vugs and fractures upon the physical characteristics of the cores. Permeability tests were not made on the samples in the interval, 12,473 to 12,485 feet, as the cores were not of correct shape to fit the permeameter. However, plug permeability tests were made over this interval to determine matrix permeability. The intervals, 12,470 to 12,473 and 12,485 to 12,490 feet, were not analyzed as the formation was not considered to be productive.

The results of these analyses are presented in tabular and graphical form on the enclosed pages along with estimates of recoverable oil by gas and water drive mechanisms of recovery.

We trust these data will be of value to you in the proper evaluation and development of this reservoir.

Very truly yours,

CORE LABORATORIES, INC.

R. S. Byrum, Jr.
District Engineer

RSB:jr

SAMPLE NUMBER	DEPTH: FEET	POROSITY: PER CENT	SATURATION: % BULK VOL. OIL	SATURATION: % BULK VOL. WATER	SATURATION: % PORE OIL	SATURATION: % PORE WATER	PERMEABILITY TO AIR MAXIMUM	PERMEABILITY TO AIR 90°	VISUAL EXAMINATION
30	12513.0-14.0	1.81	Trace	1.52	Trace	84.0	5.2	0.9	Sl. porous dol. lime
31	14.0-15.3	1.94	Trace	1.54	Trace	79.4	<0.1	<0.1	Dense, styl. dol. lime
32	15.3-16.8	2.01	Trace	0.84	Trace	41.8	0.2	0.2	Sl. porous dol. lime
33	16.8-18.1	2.73	0.72	0.54	26.3	19.8	0.2	0.2	Sl. porous dol. lime
34	18.1-19.2	2.13	Trace	1.35	Trace	63.5	<0.1	<0.1	Sl. porous dol. lime
35	19.2-20.0	1.81	Trace	0.73	Trace	40.3	4.1	0.2	Sl. porous dol. lime
36	20.0-21.0	1.20	0.00	0.86	0.0	71.7	0.8	0.1	Dense, sl. fract. dol. lime
37	21.0-23.0	2.74	0.00	2.37	0.0	86.6	0.1	0.1	Dense, sl. porous dol. lime
38	23.0-23.7	1.87	Trace	1.48	Trace	79.1	<0.1	<0.1	Sl. porous dol. lime
39	23.7-25.0	1.34	Trace	0.51	Trace	38.0	0.2	0.1	Dense, dol. lime
40	25.0-26.1	0.70	Trace	0.70	Trace	100.0	<0.1	<0.1	Dense, dol. lime
41	26.1-27.0	2.24	Trace	2.24	Trace	100.0	<0.1	<0.1	Dense, dol. lime
42	27.0-28.7	1.25	Trace	1.25	Trace	100.0	<0.1	<0.1	Dense, dol. lime
43	28.7-30.2	4.24	Trace	4.24	Trace	100.0	8.0	0.9	Porous dol. lime
44	30.2-31.2	9.73	2.49	1.90	25.5	19.6	2.5	0.7	Porous dol. lime
45	31.2-32.2	5.67	1.31	3.20	23.1	56.5	85	*	Porous dol. lime
46	32.2-33.2	7.02	1.03	1.67	14.7	23.8	*	*	Porous dol. lime
47	33.2-35.0	8.42	1.97	2.37	23.4	28.2	7.4	4.1	Porous dol. lime
48	35.0-36.0	10.64	2.03	5.06	19.1	47.6	80	72	Porous dol. lime
49	36.0-37.0	3.26	Trace	2.41	Trace	74.0	25	4.8	Porous dol. lime
50	37.0-37.8	6.51	1.57	2.77	24.2	42.6	14	14	Sl. vuggy, sl. fract., porous dol. lime
51	37.8-38.7	4.88	1.52	1.06	31.2	21.8	5.2	3.1	Sl. porous dol. lime
52	38.7-39.8	3.73	0.45	1.62	12.1	43.6	0.2	0.1	Sl. porous dol. lime
53	39.8-40.8	2.72	0.56	2.16	20.6	79.5	0.5	0.4	Dense dol. lime
54	40.8-42.0	5.22	0.82	1.70	15.7	32.7	56	5.7	Sl. porous dol. lime
55	42.0-43.3	6.39	0.57	4.51	9.0	70.8	453	47	Sl. vuggy, sl. porous dol. lime
56	43.3-44.9	5.71	0.61	3.09	10.7	54.1	106	*	Sl. porous, sl. vuggy dol. lime
57	44.9-45.7	7.19	1.34	3.40	18.7	47.4	*	*	Sl. porous, sl. vuggy dol. lime
58	45.7-47.3	7.76	1.51	2.70	19.4	34.8	67	61	Sl. porous, sl. vuggy dol. lime
59	47.3-48.2	4.59	0.73	2.66	15.9	58.0	18	11	Sl. porous, sl. vuggy dol. lime
60	48.2-49.2	5.79	0.60	4.19	10.3	72.4	540	360	Sl. porous, sl. vuggy dol. lime
61	49.2-50.3	5.29	0.31	3.18	5.9	60.2	106	31	Sl. porous, sl. vuggy dol. lime

SAMPLE NUMBER	DEPTH: FEET	POROSITY: PER CENT	SATURATION: % BULK VOL. OIL	SATURATION: % BULK VOL. WATER	SATURATION: % PORE OIL	SATURATION: % PORE WATER	PERMEABILITY TO AIR MAXIMUM	PERMEABILITY TO AIR 90°	VISUAL EXAMINATION
62	12550.3-51.2	3.73	0.12	3.29	3.2	88.1	64	53	Sl. porous, sl. vuggy dol. lime
63	51.2-52.1	9.11	1.70	3.73	18.7	40.9	73	18	Vuggy, fract. dol. lime
64	52.1-53.2	8.83	0.46	4.50	5.2	51.0	84	76	Sl. vuggy, sl. fract. dol. lime
65	53.2-54.3	7.95	0.40	4.17	5.0	52.5	141	26	Porous, vuggy dol. lime
66	54.3-55.7	5.99	0.24	2.02	4.0	34.0	76	*	Sl. vuggy, anhy. dol. lime
67	55.7-56.7	8.96	0.33	6.13	3.7	68.3	1260	475	Sl. vuggy, anhy. dol. lime
68	56.7-57.7	4.89	Trace	3.10	Trace	63.5	1.3	0.7	Sl. vuggy, anhy. dol. lime
69	57.7-59.0	8.67	0.70	4.76	8.1	55.1	400	106	Vuggy dol. lime
70	59.0-60.2	5.82	0.20	3.04	3.4	52.2	908	142	Vuggy dol. lime
71	60.2-61.5	2.79	Trace	2.55	Trace	91.7	19	4.9	Sl. fract, sl. vuggy dol. lime
72	61.5-62.8	6.19	0.69	4.92	11.1	79.7	27	13	Sl. fract, sl. vuggy dol. lime
73	62.8-64.2	5.27	1.05	2.92	19.8	55.3	21	14	Sl. fract, sl. vuggy dol. lime
74	64.2-65.5	4.92	1.18	3.34	24.0	67.9	3.1	0.4	Sl. fract, sl. vuggy dol. lime
75	65.5-66.9	4.64	0.41	3.43	8.8	74.0	4.5	2.9	Sl. fract, sl. vuggy dol. lime
76	66.9-68.3	5.98	1.22	3.92	20.4	65.6	0.7	0.4	Sl. vuggy, sl. porous dol. lime
77	68.3-69.3	4.83	0.56	3.53	10.8	73.2	19	3.9	Sl. vuggy, sl. porous dol. lime
78	69.3-70.3	4.17	0.10	3.37	2.4	81.0	119	39	Sl. vuggy, sl. porous dol. lime
79	70.3-71.5	8.51	1.41	4.36	16.6	51.3	*	*	Vuggy dol. lime
80	71.5-72.8	7.92	1.62	2.90	20.5	36.8	182	44	Vuggy dol. lime
81	72.8-74.3	10.34	2.27	4.26	21.9	41.2	22	12	Vuggy dol. lime
82	74.3-75.5	5.36	0.45	2.92	8.4	54.5	55	50	Sl. fract. dol. lime
83	75.5-76.7	3.86	0.38	3.26	9.9	84.5	1.9	<0.1	Sl. fract. dol. lime
84	76.7-77.5	7.33	1.32	3.83	18.0	52.2	2.8	0.6	Sl. fract. dol. lime
85	77.5-78.8	13.74	1.31	4.66	9.6	34.0	136	114	Sl. fract, porous dol. lime
86	78.8-80.0	7.44	0.58	3.25	7.8	43.7	8250	490	Sl. fract, porous dol. lime

* Unsuitable for analysis

FORM F-11A

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS

File MI-264 S
Well EAVES NO. A-1

CORE SUMMARY AND CALCULATED RECOVERABLE OIL

CORE SUMMARY

FORMATION NAME	DEVONIAN				
DEPTH, FEET	12,474.0-12,580.0	106'			
% CORE RECOVERY	100	62'			
FEET OF PERMEABLE, PRODUCTIVE FORMATION RECOVERED	62.4				
AVERAGE PERMEABILITY MILLIDARCYS	MAX: 299 90°: 55				
CAPACITY—AVERAGE PERMEABILITY X FEET PRODUCTIVE FORMATION	MAX: 18,658 90°: 3432				
AVERAGE POROSITY, PERCENT	5.95				
AVERAGE RESIDUAL OIL SATURATION, % PORE SPACE	15.2				
GRAVITY OF OIL, °A.P.I.					
AVERAGE TOTAL WATER SATURATION, % PORE SPACE	48.3				
AVERAGE CALCULATED CONNATE WATER SATURATION, % PORE SPACE	48.3				
SOLUTION GAS-OIL RATIO, CUBIC FEET PER BARREL (1)	1200				
FORMATION VOLUME FACTOR—VOLUME THAT ONE BARREL OF STOCK TANK OIL OCCUPIES IN RESERVOIR (1)	1.74				

CALCULATED RECOVERABLE OIL

Prediction dependent upon complete isolation of each division. Structural position of well, total permeable thickness of oil zone and drainage area of well should be considered.

BY NATURAL OR GAS EXPANSION, BBLS. PER ACRE FOOT (2)	22				
INCREASE DUE TO WATER DRIVE, BBLS. PER ACRE FOOT	45				
TOTAL AFTER COMPLETE WATER DRIVE, BBLS. PER ACRE FOOT (3)	67				

CORE LABORATORIES, INC.

R. S. Byrum

R. S. Byrum

NOTE:

(*) REFER TO ATTACHED LETTER.

(1) REDUCTION IN PRESSURE FROM estimated SATURATION PRESSURE TO ATMOSPHERIC PRESSURE.

(2) AFTER REDUCTION FROM ORIGINAL RESERVOIR PRESSURE TO ZERO POUNDS PER SQUARE INCH.

(3) RESERVOIR PRESSURE MAINTAINED BY WATER DRIVE AT OR ABOVE estimated ORIGINAL SATURATION PRESSURE.

(4) NO ESTIMATE FOR GAS PHASE RESERVOIRS.