CORE ANALYSIS REPORT
FOR
PHILLIPS PETROLEUM COMPANY

HOSPAH C-1 WELL

BISTI FIELD

SAN JUAN COUNTY, NEW MEXICO

LOCATION: SEC. 36-T23N-R13W

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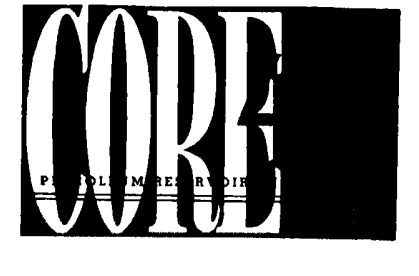


APR 13 1967

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

April 1, 1957

REPLY TO
706 PATTERSON BLDG.
DENVER, COLORADO

Phillips Petroleum Company
301 Korber Building
Albuquerque, New Mexico

Attention: Mr. W. M. Freeman

Subject: Core Analysis
Hospah C-1 Well
Bisti Field
San Juan County, New Mexico
Location: Sec 36-T23N-R13W

Gentlemen:

Diamond coring equipment and water base mud were used to core the interval from 4865 to 4915 feet in the Hospah C-1. Engineers of Core Laboratories, Inc. selected and quick-froze samples of recovered formation, and transported these samples to the Farmington laboratory for analysis. The results are presented in this report. A description of the core analysis procedure used is presented on page one of the report.

Gallup sand from 4880 to 4882 feet is characterized by very low permeability and porosity, and will make no significant contribution to the productivity of the well. Comparatively high water saturations are present in this zone, and it should be excluded from the completion interval.

Gallup sand from 4882 to 4901 feet is characterized at most points by permeability, porosity, and residual liquid saturations usually associated with oil productive Gallup formation. At a few points in this zone, denoted by asterisks in the probable production column of the Completion Coregraph, the liquid saturations are comparatively unfavorable, and it is possible that water production will be obtained from these points, along with any oil produced. Since formation at these points is of questionable value, data therefrom have been omitted from consideration in computing the average core

analysis values and the recovery estimates presented later in the report.

In the zone from 4882 to 4901 feet, there are present 16 feet of formation interpreted to be oil productive. These 16 feet of formation have an arithmetic average permeability of 1.6 millidarcys and a total observed productive capacity of but 26 millidarcy-feet, entirely inadequate to support satisfactory rates of oil production unless favorable response is obtained to treatment. The average porosity is 14.3 per cent, and the observed values in those portions of the zone interpreted to be oil productive range from a minimum of 9.5 to a maximum of 17.4 per cent. The empirically calculated connate water saturation of these 16 feet of formation averages 33 per cent of pore space.

Estimates of recoverable oil have been calculated for the Gallup sand between 4882 and 4901 feet using the observed core analysis data from the 16 feet of formation interpreted to be oil productive, together with estimated reservoir fluid characteristics considered applicable. The calculated maximum solution gas drive recovery is 137 barrels per acre-foot, assuming that production could be continued until reservoir pressure declined to zero psig. In view of the very low productive capacity and of the anticipated comparatively rapid decline in production rates, the actual solution gas drive recovery to abandonment time probably would be in the range of 50 to 60 barrels per acre-foot. A water drive recovery estimate has not been computed since the characteristics of the formation would indicate that this mechanism would be of little importance in the production of oil.

Formation from 4901 to 4908 feet has favorable residual oil saturations, but the total water saturations are noticeably higher. This zone may be in the transitional stage from oil to water productive and should be excluded from the completion attempt.

From 4908 to 4915 feet, the Gallup sand is interpreted to be water productive.

Thank you for the opportunity to be of service to you.

Very truly yours,

Core Laboratories, Inc.

J. D. Harris,
District Manager

JDH:TLK:ea

CORE LABORATORIES, INC
Petroleum Reservoir Engineering
DALLAS, TEXAS

File RP-3-436 FC
Well Hospah C-1

Conventional Core Analysis Procedure

(A) Portion No. 1 (about 15 cc.), for gas bulk

1. Bulk volume of weighed fresh sample is determined by mercury displacement.

2. Mercury is injected at 750 PSI. Amount injected is taken as gas content of the wet sample.

(B) Portion No. 2 (125 gms.), for liquid contents

1. Oil is removed by retorting, and recorded to the nearest 0.1 cc. A correction is applied to take care of holdup and other small losses.

2. Water is also removed by retorting, as above. Calibration consists of taking reading at appropriate time, as determined from plateau on distillation curve, so that free rather than combined water is measured.

3. Porosity is obtained by the summation of gas, oil and water contents expressed as per cent volume of the rock.

(C) Portion No. 3 (shaped sample, about 8 cc.), for permeability

1. The shaped sample is partially extracted in boiling carbon tetrachloride, and dried in oven at 110° C.

2. Permeability is determined by flowing air through the sample and correcting for the Klinkenberg effect.

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

CORE SUMMARY AND CALCULATED RECOVERABLE OIL

FORMATION NAME AND DEPTH INTERVAL: Gallup 4882.0 - 4901.0

FEET OF CORE RECOVERED FROM ABOVE INTERVAL	19.0	AVERAGE TOTAL WATER SATURATION: PER CENT OF PORE SPACE		33.8
FEET OF CORE INCLUDED IN AVERAGES	16.0	AVERAGE CONNATE WATER SATURATION: PER CENT OF PORE SPACE	(c)	33
AVERAGE PERMEABILITY: MILLIDARCYS	1.6	OIL GRAVITY: °API	(e)	39
PRODUCTIVE CAPACITY: MILLIDARCY-FEET	26	ORIGINAL SOLUTION GAS-OIL RATIO: CUBIC FEET PER BARREL	(e)	380
AVERAGE POROSITY: PER CENT	14.3	ORIGINAL FORMATION VOLUME FACTOR: BARRELS SATURATED OIL PER BARREL STOCK-TANK OIL	(e)	1.25
AVERAGE RESIDUAL OIL SATURATION: PER CENT OF PORE SPACE	27.6	CALCULATED ORIGINAL STOCK-TANK OIL IN PLACE: BARRELS PER ACRE-FOOT		594

Calculated maximum solution gas drive recovery is (*) barrels per acre-foot, assuming production could be continued until reservoir pressure declined to zero psig. Calculated maximum water drive recovery is (*) barrels per acre-foot, assuming full maintenance of original reservoir pressure, 100% areal and vertical coverage, and continuation of production to 100% water cut. *(Please refer to footnotes for further discussion of recovery estimates.)*

FORMATION NAME AND DEPTH INTERVAL:

FEET OF CORE RECOVERED FROM ABOVE INTERVAL		AVERAGE TOTAL WATER SATURATION: PER CENT OF PORE SPACE	
FEET OF CORE INCLUDED IN AVERAGES		AVERAGE CONNATE WATER SATURATION: PER CENT OF PORE SPACE	
AVERAGE PERMEABILITY: MILLIDARCYS		OIL GRAVITY: °API	
PRODUCTIVE CAPACITY: MILLIDARCY-FEET		ORIGINAL SOLUTION GAS-OIL RATIO: CUBIC FEET PER BARREL	
AVERAGE POROSITY: PER CENT		ORIGINAL FORMATION VOLUME FACTOR: BARRELS SATURATED OIL PER BARREL STOCK-TANK OIL	
AVERAGE RESIDUAL OIL SATURATION: PER CENT OF PORE SPACE		CALCULATED ORIGINAL STOCK-TANK OIL IN PLACE: BARRELS PER ACRE-FOOT	

Calculated maximum solution gas drive recovery is barrels per acre-foot, assuming production could be continued until reservoir pressure declined to zero psig. Calculated maximum water drive recovery is barrels per acre-foot, assuming full maintenance of original reservoir pressure, 100% areal and vertical coverage, and continuation of production to 100% water cut. *(Please refer to footnotes for further discussion of recovery estimates.)*

(c) Calculated (e) Estimated (m) Measured (*) Refer to attached letter.

These recovery estimates represent theoretical maximum values for solution gas and water drive. They assume that production is started at original reservoir pressure; i.e., no account is taken of production to date or of prior drainage to other areas. The effects of factors tending to reduce actual ultimate recovery, such as economic limits on oil production rates, gas-oil ratios, or water-oil ratios, have not been taken into account. Neither have factors been considered which may result in actual recovery intermediate between solution gas and complete water drive recoveries, such as gas cap expansion, gravity drainage, or partial water drive. Detailed predictions of ultimate oil recovery to specific abandonment conditions may be made in an engineering study in which consideration is given to overall reservoir characteristics and economic factors.

Distribution of Final Reports

4 Copies	Phillips Petroleum Company 301 Korber Building Albuquerque, New Mexico Attention: Mr. W. M. Freeman
2 Copies	Phillips Petroleum Company 655 West Broadway Farmington, New Mexico Attention: Mr. J. A. Byrd
9 Copies	El Paso Natural Gas Company Box 997 Farmington, New Mexico Attention: Mr. W. R. Speer
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1 Copy	Phillips Petroleum Company Bartlesville, Oklahoma Attention: Mr. R. O. Dunbar

CORE LABORATORIES, INC. *Petroleum Reservoir Engineering*

COMPANY	PHILLIPS PETROLEUM COMPANY	DATE ON	3/24/57	FILE NO.	RP-3-436 FC
WELL	HOSPAH C-1	DATE OFF	3/25/57	ENGRS.	WJC, JW, BA
FIELD	BISTI	FORMATION	GALLUP	ELEV.	6190' DF
COUNTY	SAN JUAN STATE NEW MEX.	DRLG. FLD.	WATER BASE MUD	CORES	DIAMOND
LOCATION	SW NE 60'FNL, 1890' FWL SEC 36-23N-13W	REMARKS	SAMPLED BY CLI ENGINEER.		

SAND LIMESTONE CONGLOMERATE CHERT

SHALE DOLOMITE

TABULAR DATA and INTERPRETATION

SAMPLE NUMBER	DEPTH FEET	PERM MD.	POROSITY %	RESIDUAL SATURATION % PORE SPACE OIL	RESIDUAL SATURATION % PORE SPACE TOTAL WATER		PROD
1	4880-81	0.36	3.7	27.1	67.6		(*)
2	81-82	0.43	6.1	19.7	41.0		(*)
3	82-83	1.00	12.0	29.2	35.0		OIL
4	83-84	1.00	11.3	39.8	42.5		OIL
5	84-85	0.80	14.6	20.6	35.6		OIL
6	85-86	0.80	9.9	19.2	19.2		OIL
7	86-87	0.80	15.0	27.4	38.0		OIL
8	87-88	1.00	15.6	27.6	25.6		OIL
9	88-89	1.30	14.7	27.9	32.6		OIL
10	89-90	2.40	14.6	28.0	28.0		OIL
11	90-91	2.80	15.2	30.2	23.7		OIL
12	91-92	6.00	7.2	22.2	50.0		(*)
13	92-93	2.20	13.6	14.7	47.1		OIL
14	93-94	0.54	11.2	18.7	56.1		(*)
15	94-95	4.10	16.4	25.0	42.6		OIL
16	95-96	2.20	15.8	20.9	34.8		OIL
17	96-97	2.10	17.3	29.5	31.8		OIL
18	97-98	1.80	17.4	33.9	32.2		OIL
19	98-99	0.67	12.4	12.1	55.6		(*)
20	99-00	0.62	16.2	32.1	36.4		OIL
21	4900-01	0.60	9.5	35.8	35.8		OIL
22	01-02	0.67	13.7	29.9	41.6		(*)
23	02-03	0.69	15.1	32.4	42.3		(*)
24	03-04	0.47	12.8	32.1	44.6		(*)
25	04-05	0.32	12.0	25.8	51.7		(*)
26	05-06	0.37	12.6	36.5	42.9		(*)
27	06-07	0.26	12.4	28.2	54.0		(*)
28	07-08	0.23	12.0	29.2	55.9		(*)
29	08-09	0.25	7.3	13.7	83.6		(*)
30	09-10	0.21	9.5	7.4	84.4		(*)
31	10-11	0.15	8.9	2.3	89.9		(*)
32	11-12	0.21	8.3	2.4	89.2		(*)
33	12-13	0.17	8.2	2.4	90.4		(*)
34	13-14	0.16	7.6	2.6	85.6		(*)
35	4914-15	0.16	9.1	2.2	81.4		(*)

(*) - REFER TO ATTACHED LETTER FOR CLARIFICATION OF INTERPRETATION.

COMPLETION COREGRAPH