

CORE LABORATORIES, INC.

Petroleum Reservoir Engineering

DALLAS 1, TEXAS

November 19, 1957



REPLY TO
706 PATTERSON BLDG.
DENVER, COLORADO

Rock Island Refining Corporation
717 Colorado Building
Denver 2, Colorado

Subject: Core Analysis
Brotzman No. 1 Well
East Atwood Field
Logan County, Colorado

Gentlemen:

Diamond coring equipment and water base mud were used to core the interval 4415 to 4440 feet in the Brotzman No. 1. An engineer of Core Laboratories, Inc. selected and preserved samples of recovered formation as directed by representatives of Rock Island Refining Corporation and transported these samples to the Sterling laboratory for analysis. The results are presented in this report.

"D" sand analyzed from 4427.5 to 4430.0 feet is characterized by unfavorable residual fluid saturation and is considered to be predominantly water productive.

From 4430 to 4431 feet, formation analyzed exhibits low porosity and an absence of measurable permeability. It is considered possible that this one foot interval may be an effective barrier separating the water productive formation above from the possible oil productive formation below.

"D" sand from 4431 to 4439 feet exhibits residual fluid saturations which are considered to be indicative of possible oil production. The measured total water saturations in this interval are quite high but it is considered possible that these high water saturations may be at least partially due to extreme flushing by the drilling fluid filtrate in this highly permeable zone. It is considered highly possible, however, that these saturations

Rock Island Refining Corporation
Brotzman No. 1 Well

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may indicate that substantial volumes of water will accompany any oil produced from the horizon. In view of the possible water production to be obtained from this zone, estimates of recoverable oil have not been presented; however, a complete summary of average core analysis data is presented on page one.

Formation analyzed from 4439 to 4440 feet exhibits an absence of residual oil saturation and high total water saturation and is considered to be predominantly water productive. Any completion attempt in this interval should be confined to formation above 4439 feet.

Thank you for the opportunity to be of service.

Very truly yours,

Core Laboratories, Inc.

 (R)

J. D. Harris,
District Manager

JDH:JDJ:ds

8 cc. - Addressee

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

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 Well Brotzman No. 1

CORE SUMMARY AND CALCULATED RECOVERABLE OIL

FORMATION NAME AND DEPTH INTERVAL: "D" Sand 4431.0-4439.0

FEET OF CORE RECOVERED FROM ABOVE INTERVAL	8.0	AVERAGE TOTAL WATER SATURATION: PER CENT OF PORE SPACE	56.0
FEET OF CORE INCLUDED IN AVERAGES	8.0	AVERAGE CONNATE WATER SATURATION: PER CENT OF PORE SPACE	(c) 53
AVERAGE PERMEABILITY: MILLIDARCYS	495	OIL GRAVITY: °API	
PRODUCTIVE CAPACITY: MILLIDARCY-Feet	3960	ORIGINAL SOLUTION GAS-OIL RATIO: CUBIC FEET PER BARREL	
AVERAGE POROSITY: PER CENT	18.3	ORIGINAL FORMATION VOLUME FACTOR: BARRELS SATURATED OIL PER BARREL STOCK-TANK OIL	
AVERAGE RESIDUAL OIL SATURATION: PER CENT OF PORE SPACE	13.4	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.)*

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.

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CORE LABORATORIES, INC.



Petroleum Reservoir Engineering

COMPANY **ROCK ISLAND REFINING CORPORATION** DATE ON **11/14/57** FILE NO. **RP-2-1776 PC**
WELL **BROTZMAN NO. 1** DATE OFF **11/15/57** ENGRS. **LAH, WEH**
FIELD **EAST ATWOOD** FORMATION **'D' SAND** ELEV. **3992' KB**
COUNTY **LOGAN** STATE **COLORADO** DRLG. FLD. **WATER BASE MUD** CORES **DIAMOND**
LOCATION **SE SE SE SEC 23-7N-53W** REMARKS **SAMPLED BY CLI ENGINEER**



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TABULAR DATA and INTERPRETATION

COMPLETION COREGRAPH

PERMEABILITY
MILLIDARCY

800 600 400 200 0

POROSITY X---X
PERCENT

40 30 20 10 0

TOTAL WATER
PERCENT PORE SPACE

80 60 40 20 0

OIL SATURATION X---X
PERCENT PORE SPACE

0 20 40 60 80

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

SAMPLE NUMBER	DEPTH FEET	PERM MD	POROSITY %	RESIDUAL SATURATION % PORE SPACE		VERTICAL PERMEA- BILITY	PROD.
				OIL	TOTAL WATER		
1	4427.5-28	110	15.9	0.0	56.0	107	WATER
2	28-29	153	15.6	0.0	32.1	118	WATER
3	29-30	107	10.6	1.9	50.0	1.8	WATER
4	30-31	0.0	9.7	2.1	61.8	0.0	
5	31-32	346	14.3	6.3	37.8	322	(*)
6	32-32.5	194	14.1	13.5	46.1	174	(*)
7	32.5-33	381	16.4	17.7	65.3	346	(*)
8	33-34	451	20.7	13.5	52.3	381	(*)
9	34-35	278	19.6	14.8	58.3	224	(*)
10	35-36	387	19.1	14.6	60.7	328	(*)
11	36-37	977	19.6	16.3	67.3	724	(*)
12	37-38	840	17.6	15.4	63.6	752	(*)
13	38-39	293	20.2	10.9	52.0	230	(*)
14	4439-40	43	17.3	0.0	90.2	23	WATER

