

CORE ANALYSIS RESULTS

SHELL OIL COMPANY

MUDGE NO. 303

BASIN DAKOTA FIELD

SAN JUAN COUNTY, NEW MEXICO



CORE LABORATORIES, INC.

Petroleum Reservoir Engineering

DALLAS, TEXAS

Company SHELL OIL COMPANY Formation DAKOTA Page 2 of 3
 Well MUDGE NO. 303 Cores DIAMOND L" File RP-3-2759
 Field BASIN DAKOTA Drilling Fluid WATER BASE MUD Date Report 3-3-76
 County SAN JUAN State NEW MEXICO Elevation 6420' KB Analysts RG
 Location NW NE SEC. 16-T25N-R11W Remarks _____

CORE ANALYSIS RESULTS

(Figures in parentheses refer to footnote remarks)

SAMPLE NUMBER	DEPTH FEET	PERMEABILITY MILLIDARCYS		POROSITY PERCENT	RESIDUAL SATURATION		GRAIN DENSITY	REMARKS
		HORIZONTAL	VERTICAL		OIL % VOLUME	TOTAL WATER % PORE		
		(K _A)						
26	5829-30	0.9		14.7	0.0	46.9		Sd Gy VFG Silty Clay
27	30-31	0.4		16.1	0.0	45.9		Sd Gy VFG Silty Sl/Shy Clay
28	31-32	2.3		15.9	0.0	46.5		Sd Gy VFG Silty Sl/Shy Clay
29	32-33	0.4		15.2	0.0	50.7		Sd Gy VFG Silty Sl/Shy Clay
30	33-34	0.3	0.1	14.8	0.0	48.6	2.64	Sd Gy VFG Silty Sl/Shy Clay
31	34-35	0.1		9.6	0.0	66.7		Sd Gy VFG Silty Sl/Shy Clay
32	35-36	0.3		14.0	0.0	48.5		Sd Gy VFG Silty Sl/Shy Clay
33	36-37	0.2		11.7	0.0	45.2		Sd Gy VFG Silty Clay
34	37-38	0.4	0.2	14.2	0.0	47.9	2.64	Sd Gy VFG Silty Clay
35	38-39	0.1		11.7	0.0	51.2		VF Sd Gy VFG Silty Clay
36	39-40	<0.1		7.3	0.0	65.7		VF Sd Gy VFG Silty Shy Clay
37	40-41	<0.1		2.9	3.4	72.5		Silt Drk Gy VFG V/Shy Clay
38	41-42	0.3		11.6	0.0	37.1		Sd Gy VFG Silty Clay
39	42-43	0.4	0.2	15.1	0.0	45.0	2.64	Sd Gy VFG Silty Sl/Shy Clay
40	43-44	0.4		11.7	0.9	42.7		VF Sd Gy VFG Silty Clay
41	44-45	2.1		11.0	0.0	43.6		VF Sd Gy VFG Silty Sl/Shy Clay
42	45-46	0.4		11.5	0.0	43.5		VF Sd Gy VFG Silty Clay
43	46-47	0.5		13.4	0.0	53.0		Sd Gy VFG Silty Sl/Shy Clay
44	47-48	0.1		11.6	0.0	46.5		Sd Gy VFG Silty Sl/Shy Clay
45	48-49	0.3	0.2	11.9	0.0	47.0	2.64	VF Sd Gy VFG Silty Sl/Shy Clay
46	49-50	0.4		12.2	0.0	43.4		VF Sd Gy VFG Silty Clay
47	50-51	0.3		13.8	0.7	44.9		Sd Gy VFG Silty Clay
48	51-52	0.2		10.5	0.0	37.1		VF Sd Gy VFG Silty Clay
49	52-53	0.1		11.3	0.0	50.3		Sd Gy VFG Silty Sl/Shy Clay
50	53-54	0.4	0.3	12.5	0.0	46.4	2.64	Sd Gy VFG Silty Clay
51	54-55	0.1		9.9	0.0	35.4		Sd Gy VFG Silty Clay
52	55-56	0.1		11.1	0.0	45.0		Sd Gy VFG Silty Sl/Shy Clay
53	56-57	<0.1		6.4	1.6	53.1		VF Sd Gy VFG Silty Clay
54	57-58	<0.1		2.7	3.7	62.9		Silt Drk Gy VFG Shy Clay
55	58-59	<0.1		2.2	4.6	59.1		Silt Drk Gy VFG Shy Clay
56	59-60	<0.1		1.9	0.0	57.8		Silt Drk Gy VFG Shy Clay
57	60-61	<0.1	<0.1	8.6	1.2	40.7	2.64	VF Sd Gy VFG Silty Clay
58	61-62	<0.1		8.6	0.0	44.1		VF Sd Gy VFG Silty Clay
59	62-63	0.1		11.4	0.0	54.3		VF Sd Gy VFG Silty Sl/Shy Clay
60	63-64	0.1		7.8	0.0	59.0		Sd Gy VFG Silty Sl/Shy Clay

VF=Vertical Fracture

NOTE:

(*) REFER TO ATTACHED LETTER.

(1) INCOMPLETE CORE RECOVERY—INTERPRETATION RESERVED.

(2) OFF LOCATION ANALYSES—NO INTERPRETATION OF RESULTS.

These analyses, opinions or interpretations are based on observations and materials supplied by the client to whom, and for whose exclusive and confidential use, this report is made. The interpretations or opinions expressed represent the best judgment of Core Laboratories, Inc. (all errors and omissions excepted); but Core Laboratories, Inc., and its officers and employees, assume no responsibility and make no warranty or representations, as to the productivity, proper operation, or profitability of any oil, gas or other mineral well or sand in connection with which such report is used or relied upon.

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Petroleum Reservoir Engineering

DALLAS, TEXAS

Company SHELL OIL COMPANY Formation DAKOTA Page 1 of 3
 Well MUDGE NO. 303 Cores DIAMOND 4" File RP-3-2759
 Field Basin DAKOTA Drilling Fluid WATER BASE MUD Date Report 3-3-76
 County SAN JUAN State NEW MEXICO Elevation 6420' KB Analysts RG
 Location NW NE SEC. 16-T25N-R11W Remarks _____

CORE ANALYSIS RESULTS

(Figures in parentheses refer to footnote remarks)

SAMPLE NUMBER	DEPTH FEET	PERMEABILITY MILLIDARCY		POROSITY PERCENT	RESIDUAL SATURATION		GRAIN DENSITY	REMARKS
		HORIZONTAL	VERTICAL		OIL % VOLUME	TOTAL WATER % PORE		
		(K _A)						
1	5781-82	<0.1		3.5	0.0	88.5		Silt Drk Gy VFG V/Shy Clay
2	82-83	<0.1		3.1	0.0	90.3		Silt Drk Gy VFG V/Shy Clay
3	83-84	<0.1		3.3	0.0	88.0		Silt Drk Gy VFG V/Shy Clay
4	84-85	0.1		5.2	26.9	59.6		Silt Drk Gy VFG V/Shy Clay
5	85-86	0.1	<0.1	5.3	9.4	66.0	2.67	Silt Drk Gy VFG V/Shy Clay
6	86-87	<0.1		4.3	4.7	76.7		Silt Drk Gy VFG V/Shy Clay
7	87-88	<0.1		3.1	6.4	80.6		Silt Drk Gy VFG V/Shy Clay
8	88-89	0.1		7.3	37.0	45.2		Silt Gy VFG Shy Clay
9	89-90	0.1	<0.1	8.7	42.5	35.7	2.64	Silt Gy VFG Shy Clay
10	90-91	<0.1		6.5	21.5	33.8		VF Silt Gy VFG Sl/Shy Clay
11	91-92	<0.1		3.7	32.5	27.1		VF Silt Drk Gy VFG V/Shy Clay
12	5794-95	<0.1		2.8	3.6	82.2		Silt Drk Gy VFG V/Shy Clay
13	95-96	<0.1	<0.1	3.8	5.3	76.3	2.66	Silt Drk Gy VFG V/Shy Clay
14	96-97	<0.1		2.4	0.0	87.5		Silt Drk Gy VFG V/Shy Clay
15	5806-07	<0.1		4.2	0.0	85.8		Silt Drk Gy VFG V/Shy Clay
16	07-08	<0.1		3.0	0.0	90.0		Silt Drk Gy VFG V/Shy Clay
17	5815-16	<0.1	<0.1	3.7	19.0	64.8	2.63	Silt Drk Gy VFG V/Shy Clay
18	16-17	<0.1		3.7	13.5	70.3		Silt Drk Gy VFG V/Shy Clay
19	5822-23	<0.1		7.5	2.7	76.0		Sd Drk Gy VFG V/Silty V/Shy Clay
20	23-24	<0.1	<0.1	6.4	0.0	56.1	2.63	Sd Gy VFG Silty Clay
21	24-25	<0.1		8.0	2.5	75.0		Sd Gy VFG Silty Shy Clay
22	25-26	0.1		8.2	0.0	41.5		Sd Gy VFG Silty Clay
23	26-27	0.1		8.3	0.0	42.2		Sd Gy VFG Silty Clay
24	27-28	0.4		13.4	0.0	46.3		Sd Gy VFG Silty Clay
25	28-29	0.5	0.3	15.1	0.0	49.0	2.64	Sd Gy VFG Silty Clay

VF=Vertical Fracture

NOTE:

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CORE LABORATORIES, INC.

Petroleum Reservoir Engineering

DALLAS, TEXAS

Company SHELL OIL COMPANY Formation DAKOTA Page 3 of 3
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 Location NW NE SEC. 16-T25N-R11W Remarks _____

CORE ANALYSIS RESULTS

(Figures in parentheses refer to footnote remarks)

SAMPLE NUMBER	DEPTH FEET	PERMEABILITY MILLIDARCYS		POROSITY PERCENT	RESIDUAL SATURATION		GRAIN DENSITY	REMARKS
		HORIZONTAL	VERTICAL		OIL % VOLUME	TOTAL WATER % PORE		

(K_A)

61	5864-65	0.1		11.1	0.0	39.6		Sd Gy VFG Silty Clay
62	65-66	0.2	0.2	13.4	0.0	44.8	2.64	Sd Gy VFG Silty Clay
63	66-67	0.1		10.9	0.0	36.7		Sd Gy VFG Silty Clay

NOTE:

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COMPANY SHELL OIL COMPANY FIELD BASIN DAKOTA FILE RP-3-2759
WELL MUDGE NO. 303 COUNTY SAN JUAN DATE 3-3-76
LOCATION NW NE SEC. 16-T25N-R11W STATE NEW MEXICO ELEV. 6420' KB

CORE-GAMMA CORRELATION

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VERTICAL SCALE: 5" = 100'

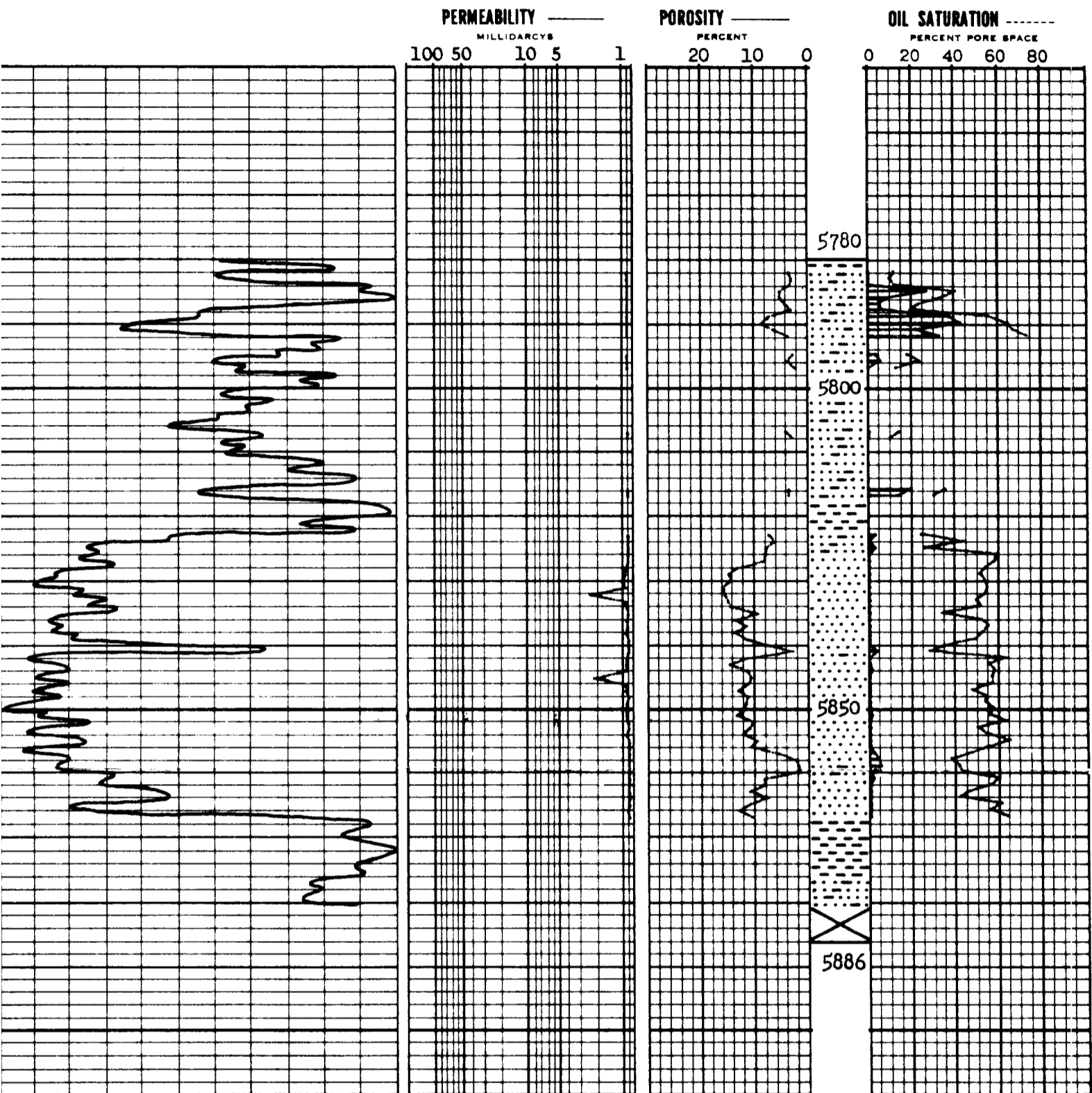
CORE-GAMMA SURFACE LOG

(PATENT APPLIED FOR)

GAMMA RAY
RADIATION INCREASE →

COREGRAPH

TOTAL WATER ———
PERCENT TOTAL WATER
80 60 40 20 0



CL 529

CORE SUMMARY AND CALCULATED RECOVERABLE OIL

FORMATION NAME AND DEPTH INTERVAL: Dakota - 5825.0-5867.0 Feet

FEET OF CORE RECOVERED FROM ABOVE INTERVAL	42	AVERAGE TOTAL WATER SATURATION: PER CENT OF PORE SPACE	46.2
FEET OF CORE INCLUDED IN AVERAGES	34	AVERAGE CONNATE WATER SATURATION: PER CENT OF PORE SPACE	
AVERAGE PERMEABILITY: MILLIDARCYs	Hor. 0.4 Vert. 0.2	OIL GRAVITY: γ_{API}	
PRODUCTIVE CAPACITY: MILLIDARCY-Feet	Hor. 13.2 Vert. 1.6	ORIGINAL SOLUTION GAS-OIL RATIO: CUBIC FEET PER BARREL	
AVERAGE POROSITY: PER CENT	12.3	ORIGINAL FORMATION VOLUME FACTOR: BARRELS SATURATED OIL PER BARREL STOCK-TANK OIL	
AVERAGE RESIDUAL OIL SATURATION: PER CENT OF PORE SPACE	0	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.

INTERPRETATION OF DATA

5781.0-5825.0 Feet - Interval interpreted as non-productive due to low permeability and porosity.
5825.0-5867.0 Feet - Believed to be gas productive.

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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