CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS 1, TEXAS

October 25, 1957

Kansas-Nebraska Natural Gas Company, Inc.
300 North St. Joseph
Hastings, Nebraska

Attention: Mr. S. D. Ford, Jr.

Subject: Core Analysis
Excelsior Oil Corporation
Fiebig No. 4 Well
East Atwood Field
Logan County, Colorado

Gentlemen:

Diamond coring equipment and water base mud were used to core the interval from 4376 to 4407 feet in the Fiebig No. 4. Engineers of Core Laboratories, Inc. selected and quick-froze samples of recovered formation, and transported these samples to the Sterling laboratory for analysis. The results are presented in this report.

"D" sand from 4399 to 4400 feet has low permeability, and is probably nonproductive for all practical purposes in the reservoir. The fluid saturations in this foot of "D" sand are quite unfavorable, and any fluid produced from the zone would be water.

One foot of "D" sand from 4400 to 4401 feet has residual liquid saturations usually associated with oil production. However, the permeability is comparatively low, and this unfavorable factor, in conjunction with lack of productive thickness, indicates the zone to be of no commercial significance.

One foot of impermeable "D" sand underlies this oil productive foot, and the impermeable barrier is in turn underlain by two feet of "D" sand from 4402 to 4404 feet which appear to be water productive.

Immediately below the two feet of possible water sand from 4402 to 4404
feet, the "D" sand contains numerous shale laminations which may serve
as an effective vertical barrier between the possible water sand and a
zone from 4404 to 4407 feet which appears to have oil productive possibili-
ties. The three-foot potential oil zone has an arithmetic average perme-
ability of 381 millidarcys and a total observed productive capacity of 1143
millidarcy-feet, probably adequate to support satisfactory rates of oil
production without treatment. It is suggested that every effort be made
to avoid treating the zone in view of the fact that apparent water sand is
present just above the oil zone and separated from it only by thin shale
breaks. The average porosity in the oil zone is 19.5 per cent, and the
empirically calculated connate water saturation is 44 per cent of pore
space.

Estimates of recoverable oil have been calculated for the "D" sand be-
tween 4404 and 4407 feet using the observed core analysis data in con-
junction with estimated reservoir fluid characteristics considered appli-
cable. These estimates are presented on page one of the report, and
are subject to the conditions set forth in the body of and in the footnotes
to the summary page.

We sincerely appreciate this opportunity to be of service to you, and
trust that this report will prove useful in making a preliminary evalua-
tion of the "D" sand analyzed from this well.

Very truly yours,

Core Laboratories, Inc.

J. D. Harris,
District Manager

JDH:TLK:sw

Form F-11B

CORE LABORATORIES, INC.

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DALLAS, TEXAS

CORE SUMMARY AND CALCULATED RECOVERABLE OIL

FORMATION NAME AND DEPTH INTERVAL: "D" Sand 4404.0-4407.0

FEET OF CORE RECOVERED FROM ABOVE INTERVAL	3.0	AVERAGE TOTAL WATER SATURATION: PER CENT OF PORE SPACE	48.9
FEET OF CORE INCLUDED IN AVERAGES	3.0	AVERAGE CONNATE WATER SATURATION: PER CENT OF PORE SPACE (c)	44
AVERAGE PERMEABILITY: MILLIDARCYS	381	OIL GRAVITY: °API (e)	40
PRODUCTIVE CAPACITY: MILLIDARCY-FEET	1143	ORIGINAL SOLUTION GAS-OIL RATIO: CUBIC FEET PER BARREL (e)	440
AVERAGE POROSITY: PER CENT	19.5	ORIGINAL FORMATION VOLUME FACTOR: BARRELS SATURATED OIL PER BARREL STOCK-TANK OIL (e)	1.30
AVERAGE RESIDUAL OIL SATURATION: PER CENT OF PORE SPACE	14.9	CALCULATED ORIGINAL STOCK-TANK OIL IN PLACE: BARRELS PER ACRE-FOOT	652

Calculated maximum solution gas drive recovery is 179 barrels per acre-foot, assuming production could be continued until reservoir pressure declined to zero psig. Calculated maximum water drive recovery is 427 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.

CORE LAB

CORE LABORATORIES, INC.   *Petroleum Reservoir Engineering*

COMPANY **EXCELSIOR OIL CORPORATION**	DATE ON **10/20/57**	FILE NO. **RP-2-1757 FC**
WELL **FIEBIG NO. 4**	DATE OFF **10/22/57**	ENGRS. **LAH**
FIELD **EAST ATWOOD**	FORMATION **"D" SAND**	ELEV. **3974' GL**
COUNTY **LOGAN** STATE **COLORADO**	DRLG. FLD. **WATER BASE MUD**	CORES **DIAMOND**
LOCATION **W/2 SE NW SEC 25-7N-53W**	REMARKS **SAMPLED BY CLI ENGINEER**	

SAND   LIMESTONE   CONGLOMERATE   CHERT
SHALE   DOLOMITE   VERTICAL FRACTURES

These analyses, opinions or interpretations are based on observations and material 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 profitableness of any oil, gas or other mineral well or sand in connection with which such report is used or relied upon.

COMPLETION COREGRAPH

PERMEABILITY — MILLIDARCYS — 400 300 200 100 0
TOTAL WATER — PERCENT PORE SPACE — 80 60 40 20 0

TABULAR DATA and INTERPRETATION

POROSITY X---X — PERCENT — 40 30 20 10 0
OIL SATURATION X---X — PERCENT PORE SPACE — 0 20 40 60 80

SAMPLE NUMBER	DEPTH FEET	PERM. MD.	POROSITY %	RESIDUAL SATURATION % PORE SPACE OIL	RESIDUAL SATURATION % PORE SPACE TOTAL WATER	VERTICAL PERMEABILITY	PROD
1	4399-00	4.3	9.0	0.0	95.8	0.0	(*)
2	4400-01	50	14.7	17.0	33.4	38	(*)
3	01-02	0.0	10.9	0.0	78.8	0.0	
4	02-03	28	14.9	0.0	76.5	1.8	WATER
5	03-04	71	18.9	0.0	76.8	59	WATER
6	04-05	322	17.8	15.8	52.2	0.0	OIL*
7	05-06	528	21.9	14.6	44.3	469	OIL*
8	4406-07	293	18.9	14.3	50.3	239	OIL*

(*) REFER TO ATTACHED LETTER FOR
CLARIFICATION OF INTERPRETATION

Coregraph depth markers: 4376, 4380, 4385, 4390, 4395, 4400, 4405, 4407