

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

Reservoir Fluid Study
for
TEXAS OIL AND GAS CORPORATION

Evans "E" No. 1 Well
Wildcat
Greeley County, Kansas

T. 16 N. 36. 43W SEC. 11

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS 75207

May 9, 1979

RESERVOIR FLUID DIVISION

Texas Oil and Gas Corporation
1800 Lincoln Center Building
Denver, Colorado 80264

Attention: Mr. John Regan

Subject: Reservoir Fluid Study
Evans "E" No. 1 Well
Greeley County, Kansas
Our File Number: RFL 79264

Gentlemen:

On April 16, 1979, a representative of Core Laboratories, Inc. was present at the well site to collect duplicate subsurface samples for use in a reservoir fluid study. Presented in this report are the results of the fluid study that was performed as requested by Texas Oil and Gas Corporation.

In the early morning of April 16, 1979, the static subsurface pressure was measured to be 1012 psig at the producing depth of 5151 feet and the shut-in casing pressure was 820 psig. Prior to collecting the samples, about 12 barrels of fluid was swabbed from the well causing the well to begin to flow and the tubing pressure dropped to about 400 psig. The well was then shut-in for one hour and the casing pressure had built up to about 780 psig. Duplicate subsurface samples were then collected at a depth of 5100 feet and these samples were used in the performance of this study.

Upon receiving the samples in our laboratory, the bubble point pressures of the two samples were determined to be about 830 psig at the laboratory temperature of 70°F. A large sample of the reservoir fluid was then charged to a high pressure visual cell and expanded to the reservoir temperature of 149°F. The bubble point pressure of the reservoir fluid was then determined to be 857 psig at the reservoir temperature of 149°F. Pressure-volume relations, differential vaporization, viscosity data, compositional analysis and a single-stage flash separation test were then performed on samples of this fluid. The data from these tests were then used to extrapolate and obtain data on a fluid sample that would have been saturated at the original reservoir pressure of 1068 psig as requested by Texas Oil and Gas Corporation.

Texas Oil and Gas Corporation
Evans "E" No. 1 Well

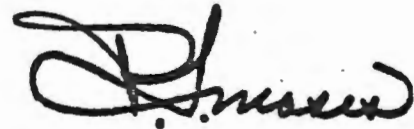
Page Two

The combined results of the measured and extrapolated data are presented in this report.

It has been our pleasure to perform this study for Texas Oil and Gas Corporation. Should you have any questions regarding the data, please do not hesitate to contact us.

Very truly yours,

Core Laboratories, Inc.

A handwritten signature in dark ink, appearing to read "P. L. Moses", with a stylized, flowing script.

P. L. Moses, Manager
Reservoir Fluid Analysis

PLM:HLS:dr
7 cc. - Addressee

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

Page 1 of 10

File RFL 79264

Company Texas Oil and Gas Corporation Date Sampled April 16, 1979
Well Evans "E" No. 1 County Greeley
Field Wildcat State Kansas

FORMATION CHARACTERISTICS

Formation Name Morrow
Date First Well Completed March 10, 1979
Original Reservoir Pressure 1068 PSIG @ 5151 Ft.
Original Produced Gas-Oil Ratio 6000-8000 SCF/Bbl
Production Rate 75 Bbl/Day
Separator Pressure and Temperature 75 PSIG, 60 °F.
Oil Gravity at 60° F. °API
Datum Ft. Subsea
Original Gas Cap

WELL CHARACTERISTICS

Elevation Ft.
Total Depth Ft.
Producing Interval 5140-5161 Ft.
Tubing Size and Depth 2-7/8 In. to 5169 Ft.
Productivity Index Bbl/D/PSI @ Bbl/Day
Last Reservoir Pressure 1012 PSIG @ 5151 Ft.
Date April 16, 1979
Reservoir Temperature 149 °F. @ 5151 Ft.
Status of Well Shut in
Pressure Gauge
Normal Production Rate Bbl/Day
Gas-Oil Ratio SCF/Bbl
Separator Pressure and Temperature 75 PSIG, atmos. °F.
Base Pressure PSIA
Well Making Water No % Cut.

SAMPLING CONDITIONS

Sampled at 5100 Ft.
Status of Well Shut in
Gas-Oil Ratio SCF/Bbl
Separator Pressure and Temperature PSIG, °F.
Tubing Pressure PSIG
Casing Pressure 800-820 PSIG
Sampled by C.W.
Type Sampler Wofford

REMARKS:

CORE LABORATORIES, INC
Petroleum Reservoir Engineering
DALLAS, TEXAS

Page 2 of 10

File RFL 79264

Company Texas Oil and Gas Corporation Formation Morrow
Well Evans "E" No. 1 County Greeley
Field Wildcat State Kansas

HYDROCARBON ANALYSIS OF Subsurface Fluid* SAMPLE

COMPONENT	MOL PERCENT	WEIGHT PERCENT	DENSITY @ 60° F. GRAMS PER CUBIC CENTIMETER	° API @ 60° F.	MOLECULAR WEIGHT
Hydrogen Sulfide	Nil	Nil			
Carbon Dioxide	0.48	0.13			
Nitrogen	3.82	0.64			
Methane	6.63	0.63			
Ethane	2.48	0.44			
Propane	4.18	1.10			
iso-Butane	1.30	0.45			
n-Butane	4.31	1.49			
iso-Pentane	1.85	0.79			
n-Pentane	2.96	1.27			
Hexanes	6.20	3.16			
Heptanes plus	65.79	89.90	0.8453	35.7	230
	100.00	100.00			

* Bubble point pressure = 857 psig at 149°F.

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

Page 3 of 10

File RFL 79264

Well Evans "E" No. 1

VOLUMETRIC DATA OF Reservoir Fluid **SAMPLE** (Extrapolated)

1. Saturation pressure (bubble-point pressure) 1068 PSIG @ 149 °F.
2. Specific volume at saturation pressure: ft ³/lb 0.02072 @ 149 °F.
3. Thermal expansion of saturated oil @ 5000 PSI = $\frac{V @ 149 \text{ °F}}{V @ 70 \text{ °F}} = \underline{1.03871^*}$
4. Compressibility of saturated oil @ reservoir temperature: Vol/Vol/PSI:

From	<u>5000</u>	PSI to	<u>4000</u>	PSI =	<u>6.44×10^{-6}</u>
From	<u>4000</u>	PSI to	<u>3000</u>	PSI =	<u>6.70×10^{-6}</u>
From	<u>3000</u>	PSI to	<u>2000</u>	PSI =	<u>7.15×10^{-6}</u>
From	<u>2000</u>	PSI to	<u>1068</u>	PSI =	<u>7.94×10^{-6}</u>

* Measured on original subsurface sample saturated at 857 psig and 149°F.

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

Page 4 of 10

File RFL 79264

Well Evans "E" No. 1

Pressure-Volume Relations at 149 °F. (Extrapolated)

<u>Pressure</u> <u>PSIG</u>	<u>Relative</u> <u>Volume (1)</u>	<u>Y</u> <u>Function (2)</u>
5000	0.9726	
4500	0.9757	
4000	0.9789	
3500	0.9821	
3000	0.9855	
2500	0.9890	
2000	0.9926	
1500	0.9964	
1200	0.9989	
1100	0.9998	
1068	1.0000	
1050	1.0026	
1025	1.0064	
960	1.0173	6.403
857	1.0385	6.284
750	1.0684	6.077
650	1.1076	5.842
550	1.1661	5.520
450	1.2596	5.120
350	1.4249	4.630
250	1.7566	4.080
150	2.6034	3.470
100	3.6722	3.150

(1) Relative Volume: V/V_{sat} is barrels at indicated pressure per barrel at saturation pressure.

(2) Y Function =
$$\frac{(P_{sat}-P)}{(P_{abs})(V/V_{sat}-1)}$$

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 accepted); 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.

CORE LABORATORIES, INC.

Petroleum Reservoir Engineering

DALLAS, TEXAS

Page 5 of 10File RFL 79264Well Evans "E" No. 1Differential Vaporization at 149 °F. (Extrapolated)

<u>Pressure PSIG</u>	<u>Solution Gas/Oil Ratio(1)</u>	<u>Relative Oil Volume(2)</u>	<u>Relative Total Volume(3)</u>	<u>Oil Density gm/cc</u>	<u>Deviation Factor Z</u>	<u>Gas Formation Volume Factor(4)</u>	<u>Incremental Gas Gravity</u>
1068	150	1.116	1.116	0.7730			
960	145	1.114	1.131	0.7732	0.971	0.01709	0.922
857	139	1.112	1.153	0.7734	0.970	0.01909	0.916
700	129	1.109	1.203	0.7737	0.970	0.02328	0.905
550	117	1.106	1.289	0.7740	0.971	0.02949	0.896
400	104	1.102	1.446	0.7744	0.974	0.04027	0.880
250	88	1.098	1.817	0.7748	0.980	0.06345	0.887
102	61	1.085	3.417	0.7787	0.990	0.14518	1.022
0	0	1.044		0.7887			1.591
	@ 60°F. = 1.000						

Gravity of residual oil = 40.2°API @ 60° F.

- (1) Cubic feet of gas at 14.65 psia and 60°F. per barrel of residual oil at 60°F.
- (2) Barrels of oil at indicated pressure and temperature per barrel of residual oil at 60°F.
- (3) Barrels of oil plus liberated gas at indicated pressure and temperature per barrel of residual oil at 60°F.
- (4) Cubic feet of gas at indicated pressure and temperature per cubic foot at 14.65 psia and 60°F.

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 profitability of any oil, gas or other mineral well or sand in connection with which such report is used or relied upon.

Page 6 of 10

File RFL 79264

Well Evans "E" No. 1

Viscosity Data at 149 °F. (Extrapolated)

<u>Pressure</u> <u>PSIG</u>	<u>Oil Viscosity</u> <u>Centipoise</u>	<u>Calculated</u> <u>Gas Viscosity</u> <u>Centipoise</u>	<u>Oil/Gas</u> <u>Viscosity</u> <u>Ratio</u>
5000	2.19		
4000	2.03		
3000	1.87		
2000	1.72		
1400	1.63		
1068	1.58		
960	1.59	0.0129	123.26
857	1.60	0.0127	125.98
700	1.61	0.0124	129.84
550	1.63	0.0121	134.71
400	1.66	0.0118	140.68
250	1.70	0.0115	147.83
102	1.78	0.0108	164.81
0	2.23	0.0089	250.56

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

Page 7 of 10

File RFL 79264

Well Evans "E" No. 1

SEPARATOR TESTS OF Reservoir Fluid SAMPLE (Extrapolated)

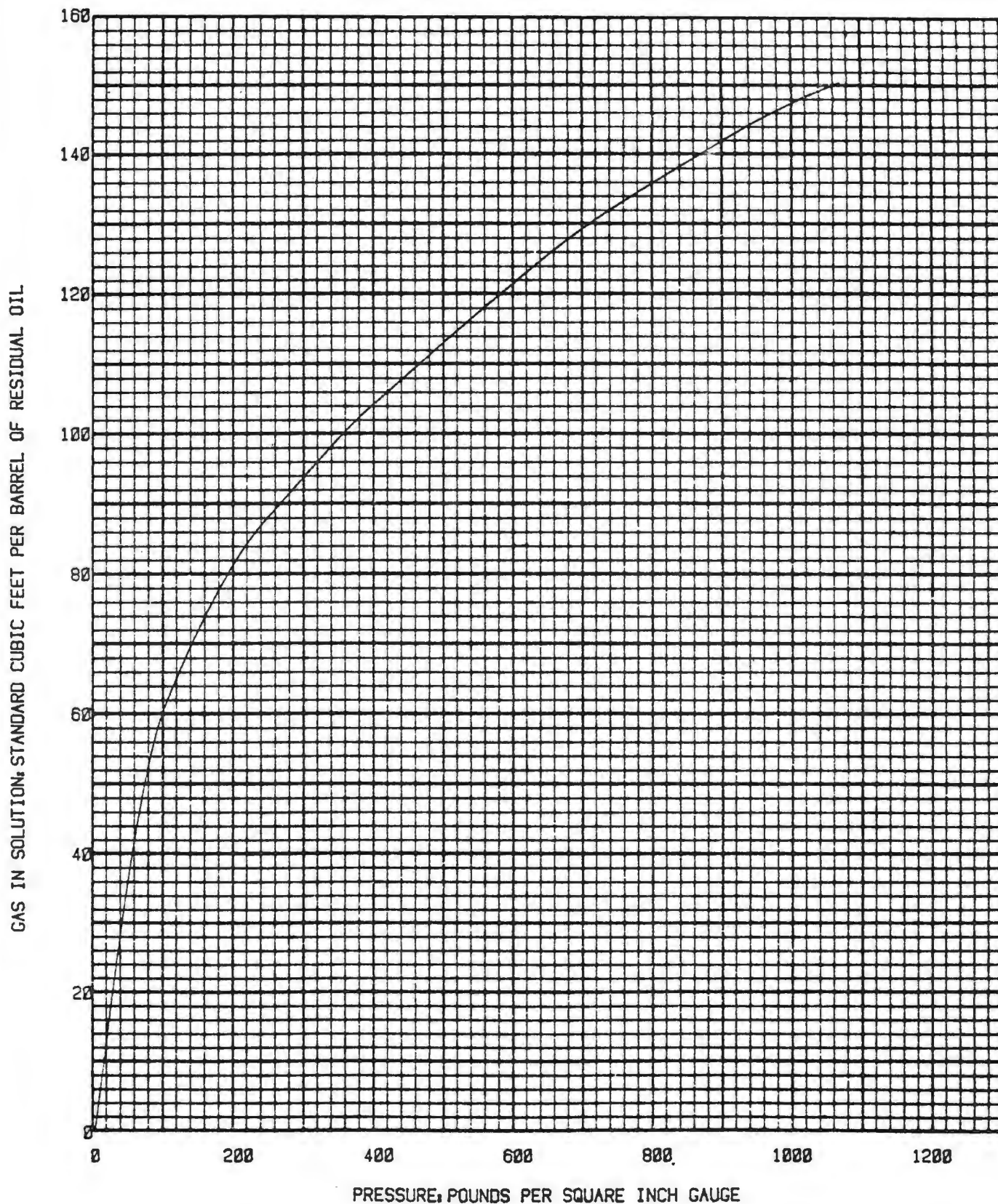
SEPARATOR PRESSURE. PSI GAUGE	SEPARATOR TEMPERATURE. ° F.	GAS/OIL RATIO (1)	GAS/OIL RATIO (2)	STOCK TANK GRAVITY. ° API @ 60° F.	FORMATION VOLUME FACTOR (3)	SEPARATOR VOLUME FACTOR (4)	SPECIFIC GRAVITY OF FLASHED GAS
75 to 0	71 72	83 35	85 35	 41.3	 1.101	1.024 1.006	0.857 1.243

- (1) Gas/Oil Ratio in cubic feet of gas @ 60° F. and 14.65 PSI absolute per barrel of oil @ indicated pressure and temperature.
- (2) Gas/Oil Ratio in cubic feet of gas @ 60° F. and 14.65 PSI absolute per barrel of stock tank oil @ 60° F.
- (3) Formation Volume Factor is barrels of saturated oil @ 1068 PSI gauge and 149° F. per barrel of stock tank oil @ 60° F.
- (4) Separator Volume Factor is barrels of oil @ indicated pressure and temperature per barrel of stock tank oil @ 60° F.

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 profitability of any oil, gas or other mineral well or sand in connection with which such report is used or relied upon.

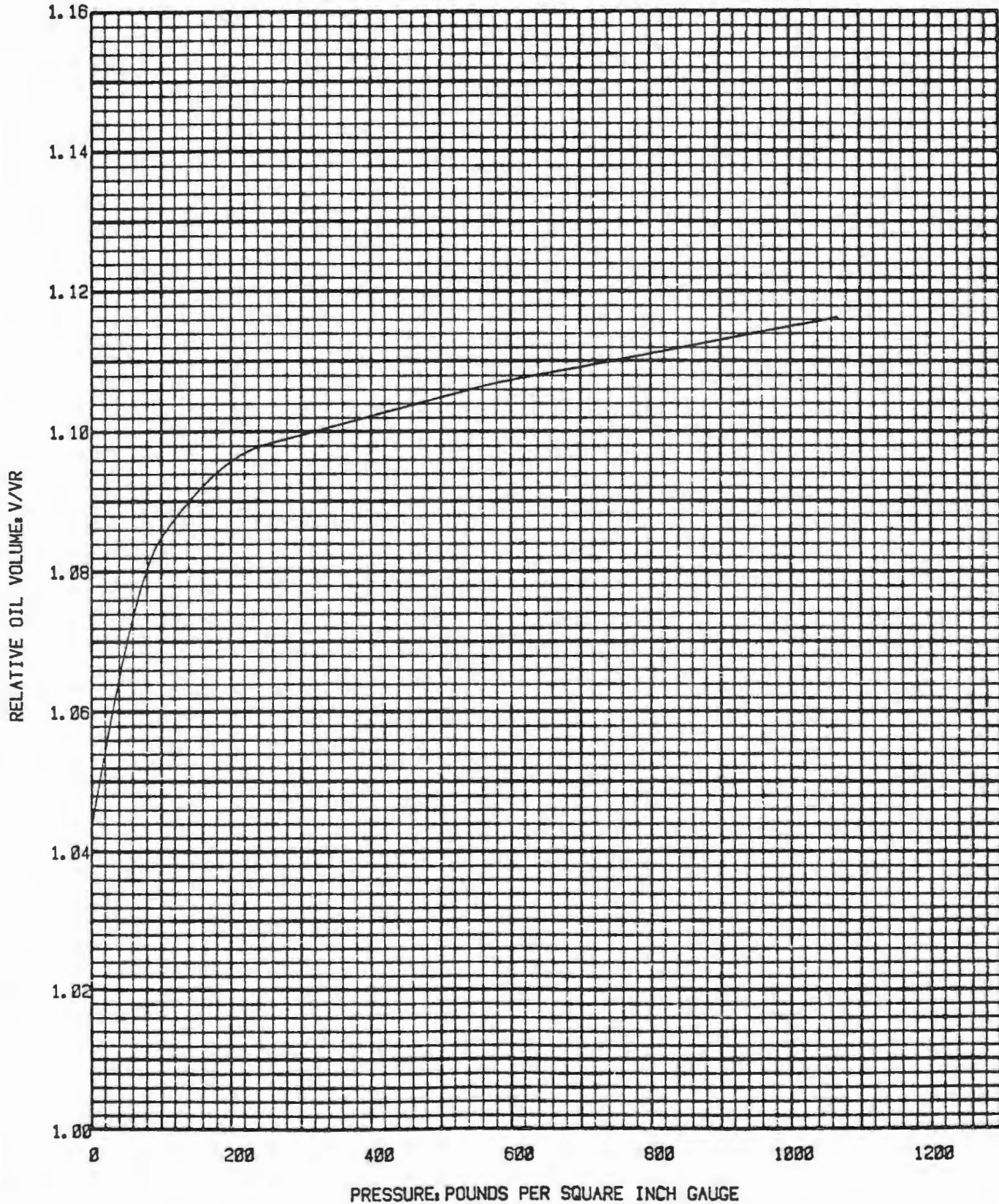
DIFFERENTIAL VAPORIZATION OF RESERVOIR FLUID AT 149 °F.

Company	TEXAS OIL AND GAS CORPORATION	Formation	MORROW
Well	EVANS E NO. 1	County	GREELEY
Field	WILDCAT	State	KANSAS



DIFFERENTIAL VAPORIZATION OF RESERVOIR FLUID AT 149 °F.

Company	TEXAS OIL AND GAS CORPORATION	Formation	MORROW
Well	EVANS E NO. 1	County	GREELEY
Field	WILDCAT	State	KANSAS



VISCOSITY OF RESERVOIR FLUID AT 149 °F.

Company	TEXAS OIL AND GAS CORPORATION	Formation	MORROW
Well	EVANS E NO. 1	County	GREELEY
Field	WILDCAT	State	KANSAS

