RECOVERABLE OIL RESERVES

LEA BONE SPRINGS POOL

Basic Data

Porosity	=	3.34% (Core Analysis #2 & #4)
Net Pay	=	16 feet (6 well average)
Water Saturation	=	30% (estimated)
Recovery Factor	=	25% (estimated)
Formation Volume Factor	=	1.50 (estimated)

Volumetric Calculations

$$\frac{7758 \text{ Bbl/acre-ft.} \times \text{Porosity} \times (1\text{-Water Saturation}) \times \text{Net Pay} \times \text{Recovery Factor}}{\text{Formation Volume Factor}}$$

$$\frac{(7758)(1)(16)(0.0334)(.70)(.25)}{1.50} = 483 \text{ bbl/acre}$$

NMOCC Case No. 2119
Ohio Exhibit No. 5
Date 12-13-61

COMPARATIVE ECONOMICS FOR DEVELOPMENT OF LEA BONE SPRINGS POOL

40-ACRE SPACING VS. 80-ACRE SPACING

Proposed Participating Area		2280 Acres
Wells Required with 40-Acre Spacing		57 Wells
Wells Required with 80-Acre Spacing		29 Wells
Investment @ $225,000 per Well		
For 40-Acre Spacing (57 Wells)		$12,825,000
For 80-Acre Spacing (29 Wells)		$ 6,525,000
Investment for Dual Completion @ $25,000 per Well		
For 40-Acre Spacing (57 Wells)		$ 1,425,000
For 80-Acre Spacing (29 Wells)		$ 725,000
Ultimate Reserves		
Oil		1,101,000 bbls.
Gas @ 2000 cu. ft. per bbl.		2,202,000 MCF
W.I. Net Operating Income per Gross Bbl. of Oil Produced Including Income from Gas Produced with Oil		
Value		
Bbl. of oil		$2.81
2000 cu. ft. of gas		0.20
Total Gross Value		$3.01
Costs		
Severance & Ad valorem Taxes	$0.21	
Royalty	0.38	
Lifting Costs	0.24	
		$0.83
Net Operating Income per Gross Bbl.		$2.18
W.I. Total Net Operating Income		
1,101,000 bbls. x $2.18/bbl.		$2,400,000
Net Loss for 40-Acre Spacing		$10,425,000
Net Loss per Well	$182,895	
Net Loss for 80-Acre Spacing		$4,125,000
Net Loss per Well	$142,241	
Net Profit for Dual Completion for 40-Acre		$975,000
Net Profit per Well	$17,105	
Profit to Investment Ratio		0.68 to 1
Net Profit for Dual Completion for 80-Acre		$1,675,000
Net Profit per Well	$57,759	
Profit to Investment Ratio		2.31 to 1

NMOCC Case No. 2119
Ohio Exhibit No. 6
Date 12-13-61

LEA DEVONIAN POOL

SHUT-IN BOTTOM HOLE PRESSURES

POOL DATUM -10,744'

DATE	WELL NO. 1 SI Time (Hours)	WELL NO. 1 BHP (psi)	WELL NO. 2 SI Time (Hours)	WELL NO. 2 BHP (psi)	WELL NO. 4 SI Time (Hours)	WELL NO. 4 BHP (psi)	WELL NO. 5 SI Time (Hours)	WELL NO. 5 BHP (psi)	WELL NO. 6 SI Time (Hours)	WELL NO. 6 BHP (psi)	WELL NO. 9 SI Time (Hours)	WELL NO. 9 BHP (psi)
7-15-60	161	6046										
8-15-60	65	6054										
10-13-60	23	6057										
4-13-61			28	6089								
4-26-61					36	6091						
4-27-61	37	6065	36	6073								
5- 1-61	133	6072	71	6065								
5-12-61					456	6087						
5-23-61	648	6028			672	6096						
8-21-61							26	6016				
10-2-61	264	6069	53	6082	53	6085						
10-6-61	363	6058										
12-6-61							24	5963	93	6065		
2-13-62	24	6036	27	6044			24	6046	29	6065		
5- 2-62	46	6036	48	6044	47	6033	53	6033	27	6060		
7-11-62											22	6014
8- 2-62	23	6025	24	6038	26	6041	28	6005	26	6033	29	6038
11-7-62	24	6019	28	6024	27	6031	27	5997	25	6024	28	6015

NMOCC Case No. 2118 & 2459

Marathon Exhibit No. 5

Date 12-19-62

COMPARATIVE ECONOMICS FOR DEVELOPMENT OF LEA DEVONIAN POOL

40-ACRE SPACING VS. 80-ACRE SPACING VS. 160-ACRE SPACING

Proposed Participating Area		2280 Acres
Wells Required with 40-Acre Spacing		57 Wells
Wells Required with 80-Acre Spacing		29 Wells
Wells Required with 160-Acre Spacing		15 Wells
Investment @ $510,000 per Well		
For 40-Acre Spacing (57 Wells)		$29,070,000
For 80-Acre Spacing (29 Wells)		$14,790,000
For 160-Acre Spacing (15 Wells)		$ 7,650,000
Ultimate Reserves		
Oil		15,180,240 bbls.
Gas @ 300 cu. ft. per bbl.		4,554,072 MCF
W.I. Net Operating Income Per Gross Bbl. of Oil Produced Including Income From Gas Produced With Oil		
Value		
Bbl. of oil		$2.81
300 cu. ft. of gas		.06
Total Gross Value		$2.87
Costs		
Severance & Ad valorem Taxes	$0.20	
Royalty	0.36	
Lifting Costs	0.25	
		$0.81
Net Operating Income Per Gross Bbl.		$2.06
W.I. Total Net Operating Income		
15,180,240 x $2.06/bbl.		$31,271,294
Net Profit for 40-Acre Spacing		$ 2,201,294
Net Profit per Well	$38,619	
Profit to Investment Ratio		0.08 to 1
Net Profit for 80-Acre Spacing		$16,481,294
Net Profit per Well	$568,320	
Profit to Investment Ratio		1.11 to 1
Net Profit for 160-Acre Spacing		$23,621,294
Net Profit per Well	$1,574,753	
Profit to Investment Ratio		3.09 to 1

NMOCC Case No. 2118 & 2459
Ohio Exhibit No. 10
Date 12-13-61

The Ohio Oil Co.

P. O. BOX 3128
HOUSTON 1, TEXAS

October 21, 1960

Re: Lea-Devonian Pool in Section 12,
Township 20 South, Range 34 East,
N.M.P.M., Lea County, New Mexico

New Mexico Oil Conservation Commission
P O. Box 871
Santa Fe, New Mexico

Attention: Mr. A. L. Porter, Jr.
Secretary-Director

Gentlemen:

The Ohio Oil Company hereby applies for pool rules to be applicable to the Lea-Devonian Pool in Lea County, New Mexico, and also applies for extension of the pool to include all acreage reasonably shown to be productive from the reservoir at the time of the hearing. The only well now completed in the reservoir is Lea Unit Federal Well No. 1 located in the NW/4 SW/4 of Section 12, Township 20 South, Range 34 East, N.M.P.M. The Ohio Oil Company is operator of that well under the Agreement for the Development and Operation of the Lea Unit Area, which Agreement was heretofore approved by the New Mexico Oil Conservation Commission Order No. R-1540, dated November 30, 1959, in Case No. 1823.

The Ohio requests and recommends temporary pool rules be adopted requiring 80-acre proration units and an 80-acre spacing pattern; each proration unit to consist of any two contiguous governmental quarter-quarter sections, with the well located in the approximate center of either the NW/4 or the SE/4 of a governmental quarter section.

It is further recommended by The Ohio that the pool rules permit a tolerance of 150 feet in the location of any well where necessary because of surface obstructions, such tolerance to be approved upon application of the interested owners, but without notice or hearing.

The Ohio further requests that the oil allowable for wells in the field be fixed by applying the 80-acre proportional factor as provided for in Statewide Rule 505 as amended, provided that if any non standard proration unit is approved the allowable for the well on such unit shall be increased or decreased in the proportion that the number of surface acres included in such unit bears to 80 acres.

The proposed rules are necessary to prevent waste and to protect correlative rights, will encourage the development of the pool on a regular pattern, and will aid in preventing the drilling of unnecessary wells. The Ohio therefore requests that this application be set for hearing before the Commission or one of the

Examiners at the earliest possible date and that notice be given as required by the applicable laws and regulations.

To effectively and fairly accomplish the purposes of the requested rules, and pursuant to Statewide Rule 1202, The Ohio requests that the rules proposed by this application be made applicable to any and all wells commenced within one mile of the SW/4 of Section 12, Township 20 South, Range 34 East, from and after the date this application is filed with the Commission, and further requests that no location be approved after said date for any well projected to or completed in said formation within one mile of the SW/4 of said Section 12. As the basis for such action pending hearing The Ohio refers to the evidence and data in the records of the Commission regarding the above identified well and the Lea Unit Area.

A list of the interested parties now known to applicant is attached.

Very truly yours,

THE OHIO OIL COMPANY

By J. Terrell Couch
J. O. Terrell Couch

TC:MK

List of Interested Parties known to Applicant
re: Foregoing Application for Pool Rules and
Determination of Pool Limits, Section 12,
in Township 20 South, Range 34 East, N.M.P.M.
Lea County, New Mexico

W. G. Ross and wife, Vee K. Ross
P. O. Box 1094
Midland, Texas

Jake L. Hamon
5th Floor Vaughn Building
1712 Commerce Street
Dallas 1, Texas

Edwin B. Cox
2100 Adolphus Tower
Dallas, Texas

The Pure Oil Company
P. O. Box 239
Houston 1, Texas

Gulf Oil Corporation
P. O. Box 669
Roswell, New Mexico

Sinclair Oil & Gas Company
P. O. Box 1470
Midland, Texas

Drilling & Exploration Co., Inc.
Box 35366, Airlawn Station
Dallas 35, Texas

Mr. John Anderson
Regional Oil and Gas Supervisor
United States Geological Survey
P. O. Box 6721
Roswell, New Mexico

Mr. Murray E. Morgan
Commissioner of Public Lands
Santa Fe, New Mexico

Mr. and Mrs. W. H. Milner
609 S. Lea
Roswell, New Mexico

Martha Featherstone
236 Petroleum Building
Roswell, New Mexico

Harvey E Roelofs
Trustee for Olen F. Featherstone, II
c/o Olen F. Featherstone
236 Petroleum Building
Roswell, New Mexico

Edith M. Kasper and husband, Paul Kasper
P. O. Box 1094
Midland, Texas

Dorothy E. Cox McCormick and husband,
Don G. McCormick
c/o Reese, McCormick, Lusk & Paine
3 Bujac Building
112 North Canyon
Carlsbad, New Mexico

L. N. Hapgood and wife, Mary C. Hapgood
P. O. Box 966
Casper, Wyoming

E. F. Howe and wife, Frances E. Howe
c/o New Mexico Bank & Trust
Hobbs, New Mexico

Thomas Joseph Sheehan and wife,
Louise Sheehan
112 West Fairview Boulevard
Inglewood, California

R. R. Herrell
Oil & Gas Properties
P. O. Box 1656
Midland, Texas

Western Oil Fields, Inc.
P. O. Box 1139
Denver, Colorado

Ernest A. Ha son
P. O Box 852
Roswell, New Mexico

E. B. Todhunter
P. O. Box 852
Roswell, New Mexico

United States Smelting Mining & Refining Co.
P O. Box 1877
Midland, Texas

Texaco, Inc.
P. O. Box 1720
Fort Worth, Texas

Pan American Petroleum Corporation
P. O. Box 68
Hobbs, New Mexico

Herbert Aid Estate
c/o J. T. Sivley
212 Booker Building
Artesia, New Mexico

BEFORE THE OIL CONSERVATION COMMISSION

STATE OF NEW MEXICO

IN THE MATTER OF THE APPLICATION OF THE OHIO OIL COMPANY FOR POOL RULES IN THE LEA DEVONIAN POOL IN SECTION 12, TOWNSHIP 20 SOUTH, RANGE 34 EAST, N.M.P.M., LEA COUNTY, NEW MEXICO.

No. 2115

ENTRY OF APPEARANCE

The undersigned, Atwood & Malone, of Roswell, New Mexico, a firm of attorneys, all of whose members are duly licensed to practice law in the State of New Mexico, hereby enters its appearance in the above styled and numbered cause as co-counsel with W. Hume Everett, Esquire, and J. O. Terrell Couch, Esquire, of Houston, Texas, for the Ohio Oil Company, Petitioner.

Dated at Roswell, New Mexico, this 24th day of October, 1960.

ATWOOD & MALONE

By Paul L. Malone

P. O. Box 867
Roswell, New Mexico

11-4-60

LEA DEVONIAN POOL

PERTINENT DATA

1. Location of Field:

   Approximately 14 miles west-southwest of Monument, New Mexico, Section 12, T-20-S, R-34-E, Lea County

2. Completion Data Lea Unit Well No. 1:

a.	Formation	Devonian
b.	Total Depth	14,735
c.	Top of Devonian	14,285 (-10,611)
d.	Top of Devonian Pay	14,349 (-10,675)
e.	Completion Data	7-8-60
f.	Perforated Interval	14,347-375 14,393-489
g.	Treatment	500 gal MA 4,000 gal Acid
h.	Initial Potential Test	
	(1) Potential (BOPD)	516
	(2) Choke Size (in.)	8/64
	(3) GOR (CF/B)	321
	(4) Casing Pressure (psig)	pkr.
	(5) Tubing Pressure (psig)	1570

3. Reservoir Fluid Characteristics:

a.	Saturation Pressure (bubble point)	567 psi @ 202°F
b.	Formation Volume Factor @ Original Pressure	1.185
c.	Solution Gas Oil Ratio (CF/B)	318
d.	Oil Viscosity @ Original Pressure (cp)	0.310
e.	Oil Gravity (°API @ 60°F)	58.2

4. Reservoir Characteristics:

a.	Porosity (%)	4.7
b.	Permeability (md)	9.6 and greater
c.	Water Saturation (%)	30.0 est.
d.	New Pay (ft.)	98
e.	Reservoir Temperature (°F)	202
f.	Original Reservoir Pressure (psig)	6046 @ -10,744
g.	Probable Reservoir Mechanism	Water Drive

NMOCC Case No. 2118

Ohio Exhibit No. 2

Date

RECOVERABLE OIL RESERVES

LEA DEVONIAN POOL

Basic Data

Net Pay	= 98 feet	(Neutron Log)
Porosity	= 4.7%	(Neutron Log)
Water Saturation	= 30%	(estimated)
Formation Volume Factor	= 1.185	(fluid analysis)
Recovery Factor	= 50%	(estimated)

Volumetric Calculation

$$\frac{7758 \text{ Bbl/acre-foot} \times \text{Porosity} \times (1\text{-Water Saturation}) \times \text{Net Pay} \times \text{Recovery Factor}}{\text{Formation Volume Factor}}$$

$$\frac{(7758)(0.047)(0.70)(98)(0.50)}{1.185} = 10{,}554 \text{ bbls/acre}$$

NMOCC Case No. 2118

Ohio Exhibit No. 4

Date _____

$ 100,000

COMPARATIVE ECONOMICS FOR DEVELOPMENT OF LEA DEVONIAN POOL

40-ACRE SPACING VS. 80-ACRE SPACING

Minimum Area Expected to be Productive		800 Acres
Wells Required with 40 Acre Spacing		20 Wells
Wells Required with 80 Acre Spacing		10 Wells
Investment @ $471,000 per Well		
For 40 Acre Spacing (20 Wells)		$ 9,420,000
For 80 Acre Spacing (10 Wells)		$ 4,710,000
Ultimate Reserves		
Oil		8,443,200 bbls.
Gas @ 300 cu. ft. per bbl.		2,532,960 MCF
W.I. Net Operating Income Per Gross Bbl. of Oil Produced Including Income From Gas Produced with Oil		
Value		
Bbl. of oil		$2.77
300 cu. ft. of gas		.06
Total Gross Value		$2.83
Costs		
Severance & Advalorem Taxes	$0.20	
Royalty	0.35	
Lifting Costs	0.25	
		$0.80
Net Operating Income per gross bbl.		$2.03
W.I. Total Net Operating Income		
8,443,200 x $2.03/bbl.		$17,139,696
Net Profit for 40-Acre Spacing		$ 7,719,696
Net Profit per Well	$385,985	
Profit to Investment Ratio		0.82 to 1
Net Profit for 80-Acre Spacing		$12,429,696
Net Profit per Well	$1,242,970	
Profit to Investment Ratio		2.64 to 1

This Exhibit looks only at Single completion while subj. well is actually dualled

386,000 × 20 = $7,720,000

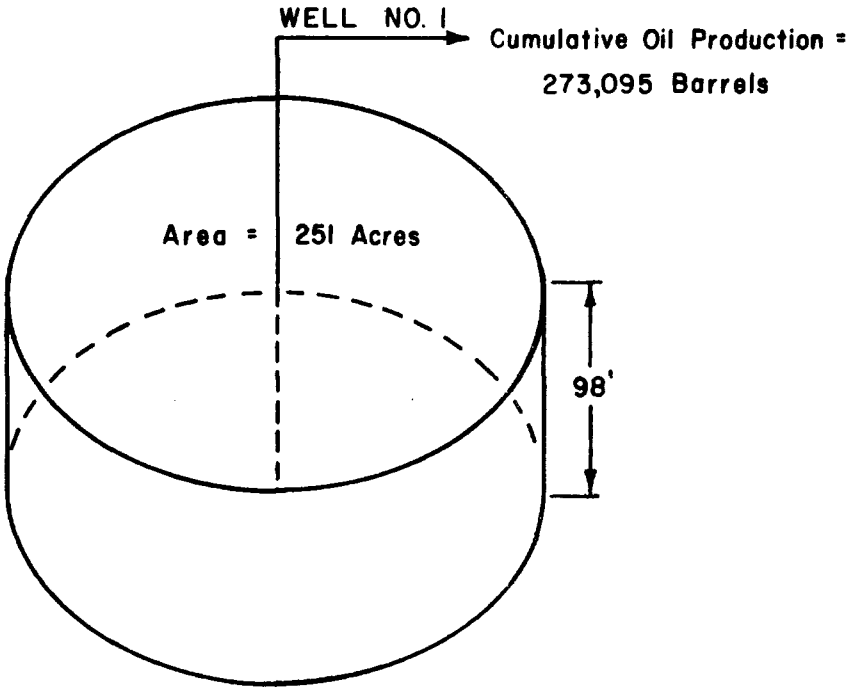
1,243,000 × 10 = $12,430,000

NMOCC Case No. 2118

Ohio Exhibit No. 5

Date _____

PRESSURE DECLINE CALCULATED FOR LEA UNIT NO. 1
FROM
JULY, 1960 TO NOVEMBER, 1962
BASED ON MAXIMUM RADIAL DRAINAGE OF 251 ACRES



$$\text{Pressure Decline} = \frac{N_p}{c_e N} \times \frac{B_o}{B_{oi}}$$

$$\text{Pressure Decline} = \frac{273{,}095}{(23.2 \times 10^{-6})(5.04 \times 10^{6})} \times \frac{1.241}{1.185}$$

$$\text{Pressure Decline} = \frac{338{,}911}{139}$$

$$\text{Pressure Decline} = 2438 \text{ psi}$$

Measured Pressure Decline from July, 1960
to November, 1962 = 27 psi

NMOCC Case No. 2148 & 2459
Marathon Exhibit No. 6
Date 12-19-62

The Material Balance for an oil reservoir producing when the reservoir pressure is above the bubble point pressure of the reservoir fluid is given by the following equation:

$$NB_{oi}\, c_e \Delta p = N_p B_o - W_e + B_w W_p$$

where:

N = original oil in place

N_p = cumulative oil production

B_o = oil formation volume factor

W_e = cumulative water influx

B_w = water formation volume factor

W_p = cumulative water production

Δp = reservoir pressure decline

B_{oi} = initial oil formation volume factor

c_e = effective fluid compressibility

$$c_e = \frac{S_o c_o + S_w c_w + c_f}{S_o}$$

S_o = oil saturation

c_o = oil compressibility

S_w = water saturation

c_o = water compressibility

c_f = formation or rock compressibility

For a volumetric reservoir $W_e = 0$ and $W_p = 0$ and the above equation reduces to:

$$NB_{oi}\, c_e \Delta p = N_p B_o$$

The reservoir pressure decline at any time is thus given by the following expression:

$$\Delta p = \frac{N_p}{c_e N} \times \frac{B_o}{B_{oi}}$$

Basic Data for Lea Unit No. 1:

Porosity (ϕ)	= 5.49%
Water Saturation (S_w)	= 43%
Net Pay (h)	= 98 feet
Area (A)	= 251 acres
Initial Formation Volume Factor (B_{oi})	= 1.185
Oil Compressibility (c_o)	= 9.99×10^{-6} vol/vol/psi
Water Compressibility (c_w)	= 3.00×10^{-6} vol/vol/psi
Rock Compressibility (c_f)	= 6.25×10^{-6} vol/vol/psi

Original Oil in Place in 251 Acres Surrounding Lea Unit No. 1

$$N = \frac{7758\ Ah\ \phi\ (1 - S_w)}{B_{oi}}$$

$$N = \frac{(7758)(251)(98)(0.0549)(0.57)}{1.185}$$

$$N = 5{,}040{,}000 \text{ bbls. of stock tank oil}$$

Effective Fluid Compressibility

$$c_e = \frac{S_o c_o + S_w c_w + c_f}{S_o}$$

$$c_e = \frac{[(0.57)(9.99) + (0.43)(3.0) + (6.25)]\ 10^{-6}}{(0.57)}$$

$$c_e = 23.2 \times 10^{-6} \text{ vol/vol/psi}$$

LEA DEVONIAN POOL

WELL COST DATA

	DRILLING COST $	COMPLETION COST $	DRILLING AND COMPLETION COST $	SURFACE EQUIPMENT COST $	GRAND TOTAL $
Well No. 1	396,096	261,315	657,411	39,740	697,151
Well No. 2	354,201	187,371	541,572	22,840	564,412
Well No. 4	366,761	148,545	515,306	5,981	521,287
Well No. 5	368,523	190,931	559,454	5,948	565,403
Well No. 6	305,286	185,667	490,953	12,113	503,066
TOTAL	1,790,867	973,829	2,764,696	86,622	2,851,319
Average Per Well	358,173	194,766	552,939	17,324	570,264
Average Per Well Excluding #1	348,693	178,129	526,821	11,721	538,542

Estimated Cost to Dual	25,000
Estimated Cost Per Devonian Well	$ 501,821
Number of Devonian Wells to Date	7
Approximate Total Devonian Well Costs to Date	$3,512,747

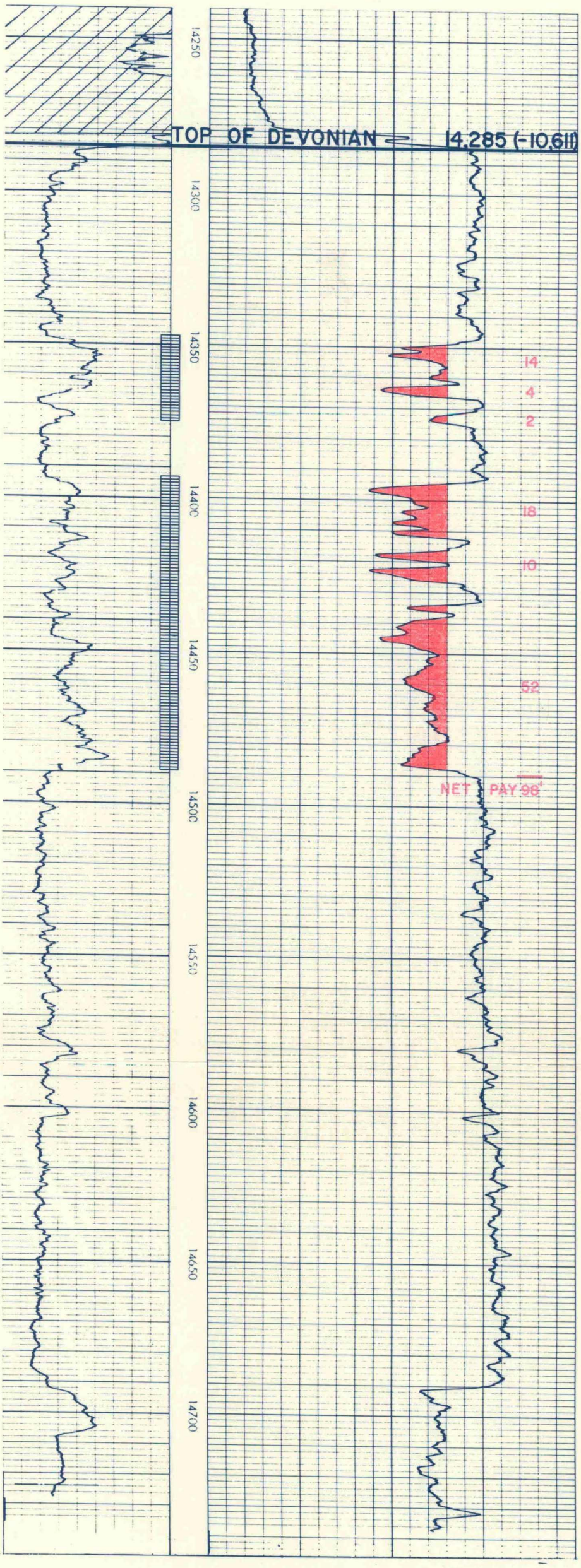
NMOCC Case No. 2118 & 2454
Marathon Exhibit No. 7
Date 12-19-62

OHIO OIL COMPANY
LEA UNIT FEDERAL WELL NO. 1

ELEV. 3674

NW/4 SW/4 SEC. 12, T-20-S, R-34-E

RADIOACTIVITY LOG OF DEVONIAN SECTION



BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO
Ohio EXHIBIT No. 3
CASE 2118
11-16-60

NMOCC CASE NO. 2118
OHIO EXHIBIT NO. 3
DATE.