Case No.

697

Application, Transcript,
Small Exhibits, Etc.

Petroleum Production Engineering Co.

Reservoir and Engineering Analyses

P. O. BOX 4111
TULSA, OKLAHOMA

June 6, 1953

FILE NO.
LO-860

Lowry Oil Company
616 East Central Avenue
Albuquerque, New Mexico

Attention: Mr. A. F. Holland

Subject: Gas-Oil Relative Permeability
Determinations for
Lowry Oil Company
Federal 23-49-129 Well
Tocito Sandstone Reservoir
Pettigrew Tocito Field
Rio Arriba County, New Mexico

Gentlemen:

You will find enclosed a report presenting the results of gas-oil relative permeability determinations made on four samples of cores from the Tocito Sandstone Reservoir in the Federal 23-49-129 Well, Pettigrew Tocito Field, Rio Arriba County, New Mexico. All of the samples used in the tests were drilled samples of approximately 1½" in diameter and 2" in length.

The core samples were subjected to gas-oil relative permeability measurements using dynamic displacement of oil by gas. Simultaneous flow of oil and gas through the cores in the presence of irreducible minimum interstitial water, using methods to eliminate or minimize capillary end effects, permitted the acquisition of the data reported herein.

In saturating the samples prior to making the relative permeability measurements, the irreducible minimum interstitial water saturation was effected by the capillary pressure technique using as a displacing medium a portion of the same oil later used in the relative permeability determinations.

As used herein, K_g may be defined as the equilibrium permeability to gas at the particular gas phase saturation indicated, measured during the simultaneous flow of both oil and gas in the presence of irreducible minimum interstitial water. Likewise K_o may be defined as the equilibrium permeability to oil at the particular gas phase saturation indicated, measured during the simultaneous flow of both oil and gas in the presence of irreducible minimum interstitial water.

The gas-oil relative permeability for a given gas phase saturation, as represented by the symbol K_g/K_o, is the quotient of the above defined values of K_g and K_o as determined at that particular gas phase saturation.

The relative permeability to gas for a given gas phase saturation, as represented by the symbol K_{rg}, is the ratio of the above defined K_g at that particular gas saturation to the K_g at 100% gas saturation.

The relative permeability to oil for a given gas phase saturation, as represented by the symbol K_{ro}, is the ratio of the above defined K_o at that particular gas saturation to the K_o with irreducible minimum interstitial water present and with zero gas phase saturation.

Figures 1 through 4, pages 8 through 11, show the graphical presentations of K_{rg} and K_{ro} versus the gas phase saturation.

Figures 5 through 8, pages 12 through 15, show the graphical presentations of the K_g/K_o values versus the gas phase saturation.

It will be noted that the relative permeability curves shown on the graphs do not necessarily pass through all of the points determined from actual permeability measurements. It is believed, however, that the experimentally determined values are accurate as measured. The reason the plotted values do not fall on a smooth curve is believed to be a result of irregularities in the pore size distribution combined with the tortuosity of the permeability channels within the particular core sample tested. The smooth curves shown are believed to more accurately represent the relative permeability performance characteristics that would be applicable to the reservoir as a result of a tendency for the different saturation distributions in the individual permeability channels to exert an equalizing influence on one another in the reservoir as a whole. It is emphasized, however, that the shape of the curves is a matter of interpretation.

We hope that these data will prove valuable in your effort to determine the optimum recovery technique to be applied to this reservoir.

Yours very truly,

Harold S. Deyo

HSDeyo:gad
Enclosures

Petroleum Production Laboratories, Inc.

TELEPHONE Victor-0871

Dallas, Texas

ADDRESS ALL CORRESPONDENCE TO P. O. BOX 2026

ADDRESS ALL SHIPMENTS TO 407 SOUTH HASKELL

June 5, 1953

File No. LO-860

Petroleum Production Engineering Co.
P. O. Box 4111
Tulsa, Oklahoma

Gentlemen:

Transmitted herewith are the tabular data and curves showing the results of the laboratory determinations of the gas-oil relative permeability and related information obtained in accordance with your instructions for the four samples of cores submitted from the Federal 23-49-129 Well, Tocito Sandstone Reservoir, Pettigrew Tocito Field.

Respectfully yours,

Tom Halliburton

Enclosures

INDEX

Petroleum Production Laboratories, Inc.

DALLAS, TEXAS File No. LO-860

POROSITY, IRREDUCIBLE MINIMUM INTERSTITIAL WATER SATURATION, AND SINGLE PHASE PERMEABILITY MEASUREMENTS

Core Sample Number	Depth (Ft.)	Specific Permeability To Air (md.)	Specific Permeability To Oil (md.)	Specific Permeability To Formation Water (md.)	Porosity (%)	Irreducible Minimum Interstitial Water % Pore Space
1	6597.2-98.0	3.65	2.55	1.64	11.8	13.6
2	6589.2-89.8	11.3	8.72	7.01	11.4	17.1
3	6593.1-93.7	145	125	113	17.4	22.4
4	6590.2-90.7	436	418	380	19.5	17.1

Table I

EFFECT OF THE PRESENCE OF IRREDUCIBLE MINIMUM INTERSTITIAL WATER

ON THE PERMEABILITY TO OIL AT 100% LIQUID SATURATION

Core Sample Number	Permeability to Oil (md.) 100% Oil Saturation	Oil Plus Interstitial Water
1	2.55	1.63
2	8.72	6.04
3	125	110
4	418	377

Table II

GAS PHASE SATURATION SATURATION VS. THE CORRESPONDING RELATIVE PERMEABILITY DETERMINATIONS AND GAS AND OIL PERMEABILITY MEASUREMENTS MADE WITH BOTH PHASES FLOWING IN THE PRESENCE OF IRREDUCIBLE MINIMUM INTERSTITIAL WATER

Core Sample Number	Gas Phase % Pore Space	K_g (md.)	K_o (md.)	K_{rg} (Relative To 100% Gas Saturation)	K_{ro} (Relative to Oil Permeability With Interstitial Water Present)	K_g/K_o
1	6.4	0.0318	1.04	0.0087	0.638	0.030
	11.0	0.0365	0.700	0.0100	0.429	0.0521
	12.7	0.0402	0.535	0.0110	0.328	0.0751
	16.9	0.0493	0.307	0.0135	0.188	0.161
	25.9	0.0971	0.134	0.0266	0.082	0.725
2	9.2	0.0061	2.22	0.00054	0.366	0.0027
	12.5	0.0146	1.50	0.00128	0.248	0.0097
	17.2	0.0355	0.707	0.00314	0.117	0.0502
	20.6	0.595	0.403	0.0527	0.0667	1.48
	23.3	1.32	0.242	0.117	0.0401	5.45
3	10.1	0.497	34.1	0.0034	0.310	0.0146
	13.8	1.32	26.3	0.0091	0.239	0.0502
	18.5	3.42	12.1	0.0236	0.110	0.283
	23.4	5.24	7.48	0.0361	0.0680	0.701
	26.9	8.90	4.75	0.0614	0.0432	1.87
	31.8	18.7	2.67	0.129	0.0243	7.00
	36.2	29.7	1.56	0.205	0.0142	19.0
4	10.9	0.947	102	0.0022	0.271	0.0093
	13.4	4.52	84.5	0.0104	0.224	0.0535
	16.7	6.10	53.8	0.0140	0.143	0.113
	20.7	11.3	37.1	0.0259	0.0984	0.305
	24.1	24.1	25.7	0.0553	0.0682	0.938
	28.8	32.9	13.3	0.0755	0.0353	2.47
	33.5	43.5	8.72	0.0998	0.0231	4.99

Petroleum Production Laboratories

Laboratory and Reservoir Engineering Analysis

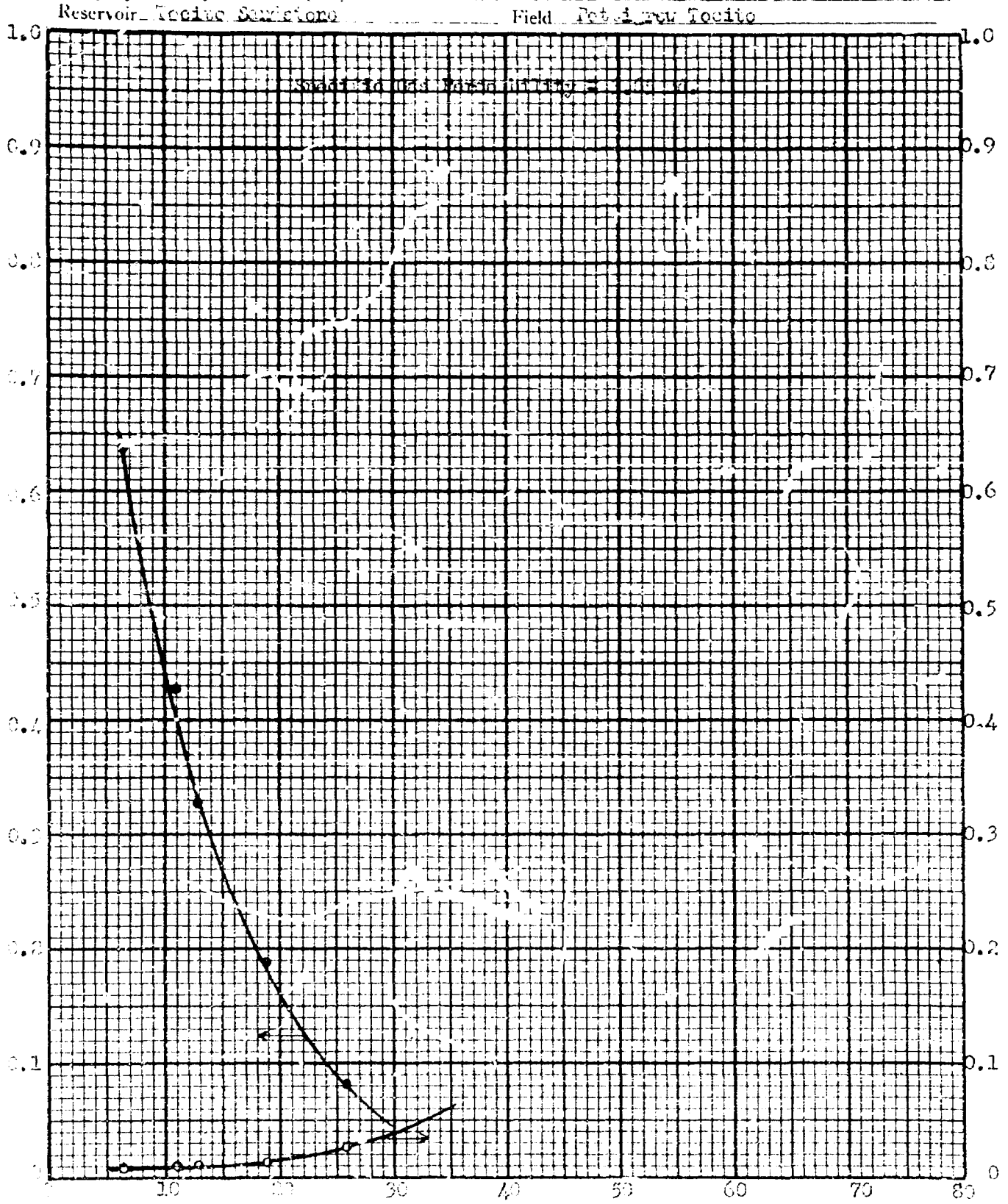
Dallas, Texas File No. LO-860

RELATIVE PERMEABILITY RELATIONSHIP

CORE SAMPLE NO. 1

Company Lowry Oil Company Well Federal 23-[illegible]-1-[illegible]

Reservoir Tocito Sandstone Field Petrified Tocito



GAS PHASE: PERCENT OF PORE SPACE

Figure 1

Petroleum Production Laboratories

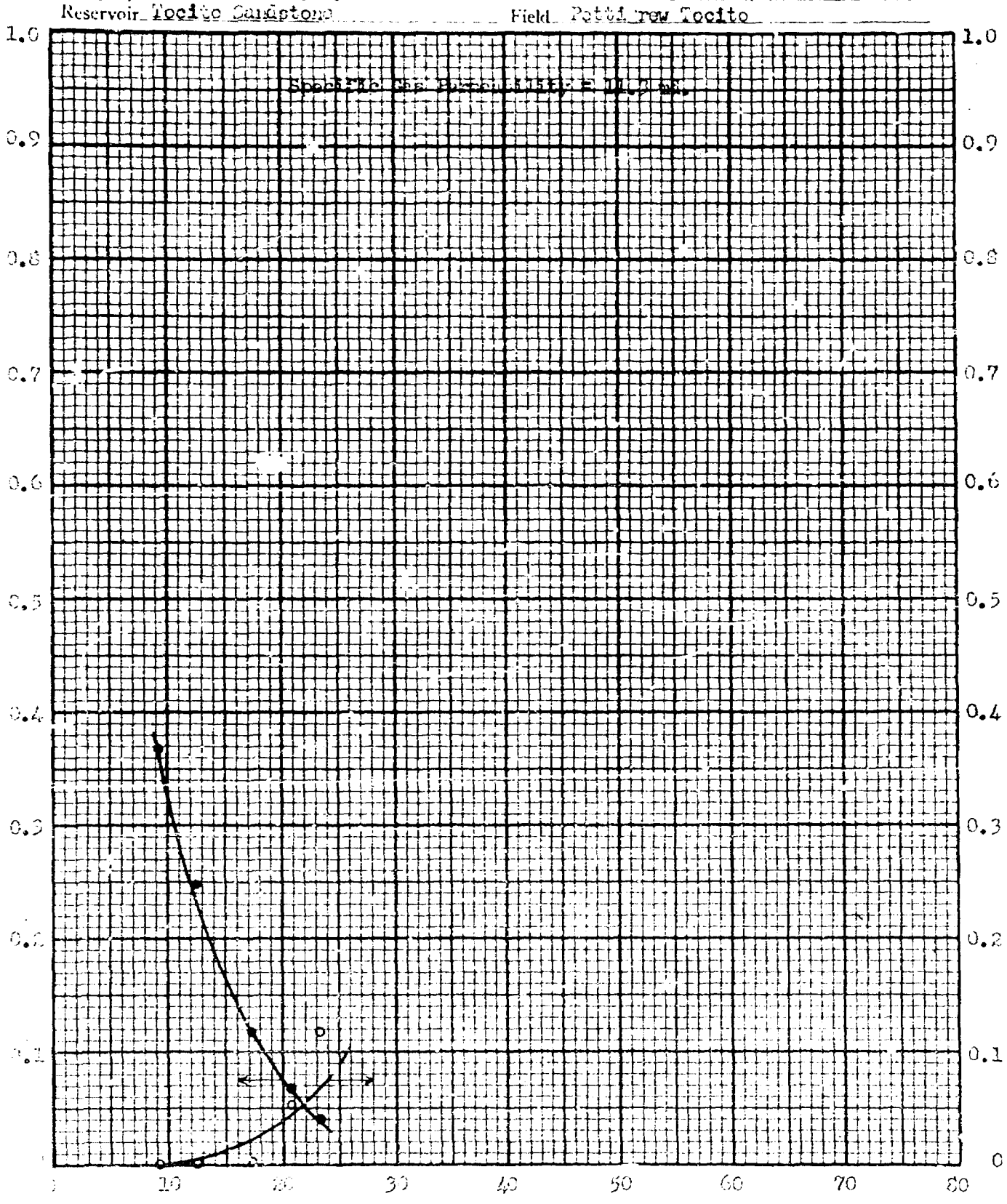
Laboratory and Reservoir Engineering Analysis

Dallas, Texas File No. LO-800

RELATIVE PERMEABILITY RELATIONSHIP
CORE SAMPLE NO. 2

Company Lowry Oil Company Well Federal 23-29-12D

Reservoir Tocito Sandstone Field Petrified Tocito



Petroleum Production Laboratories

Laboratory and Reservoir Engineering Analysis

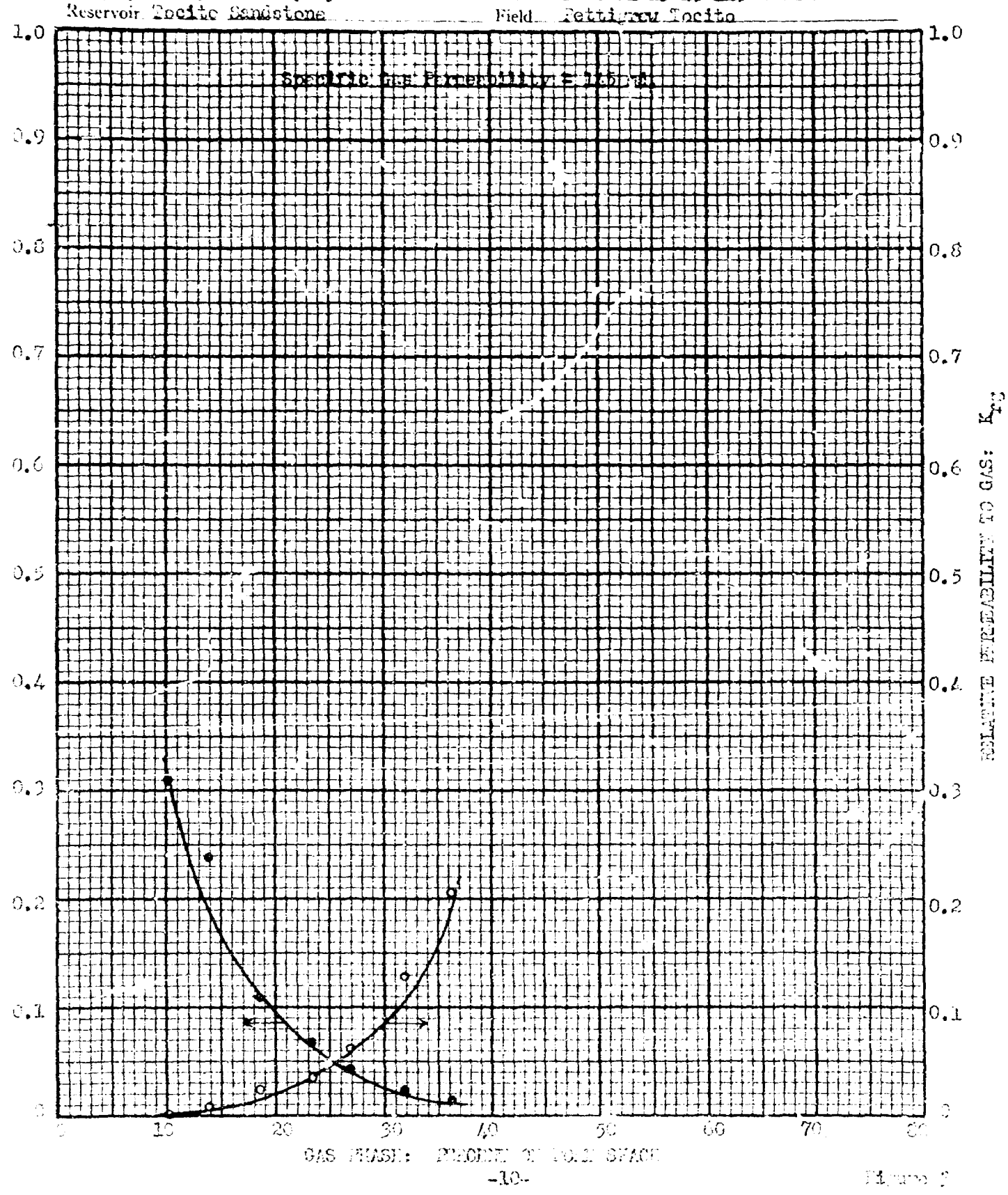
Dallas, Texas

File No. LO-860

RELATIVE PERMEABILITY RELATIONSHIP
CORE SAMPLE NO. 3

Company Lowry Oil Company Well Federal 23-49-12S

Reservoir Tocito Sandstone Field Pettigrew Tocito



Petroleum Production Laboratories

Laboratory and Reservoir Engineering Analysis

Dallas, Texas File No. LO-860

RELATIVE PERMEABILITY RELATIONSHIP

CORE SAMPLE NO. 4

Company Lowry Oil Company Well [illegible] 23-42-129

Reservoir Tocito Sandstone Field [illegible] Tocito

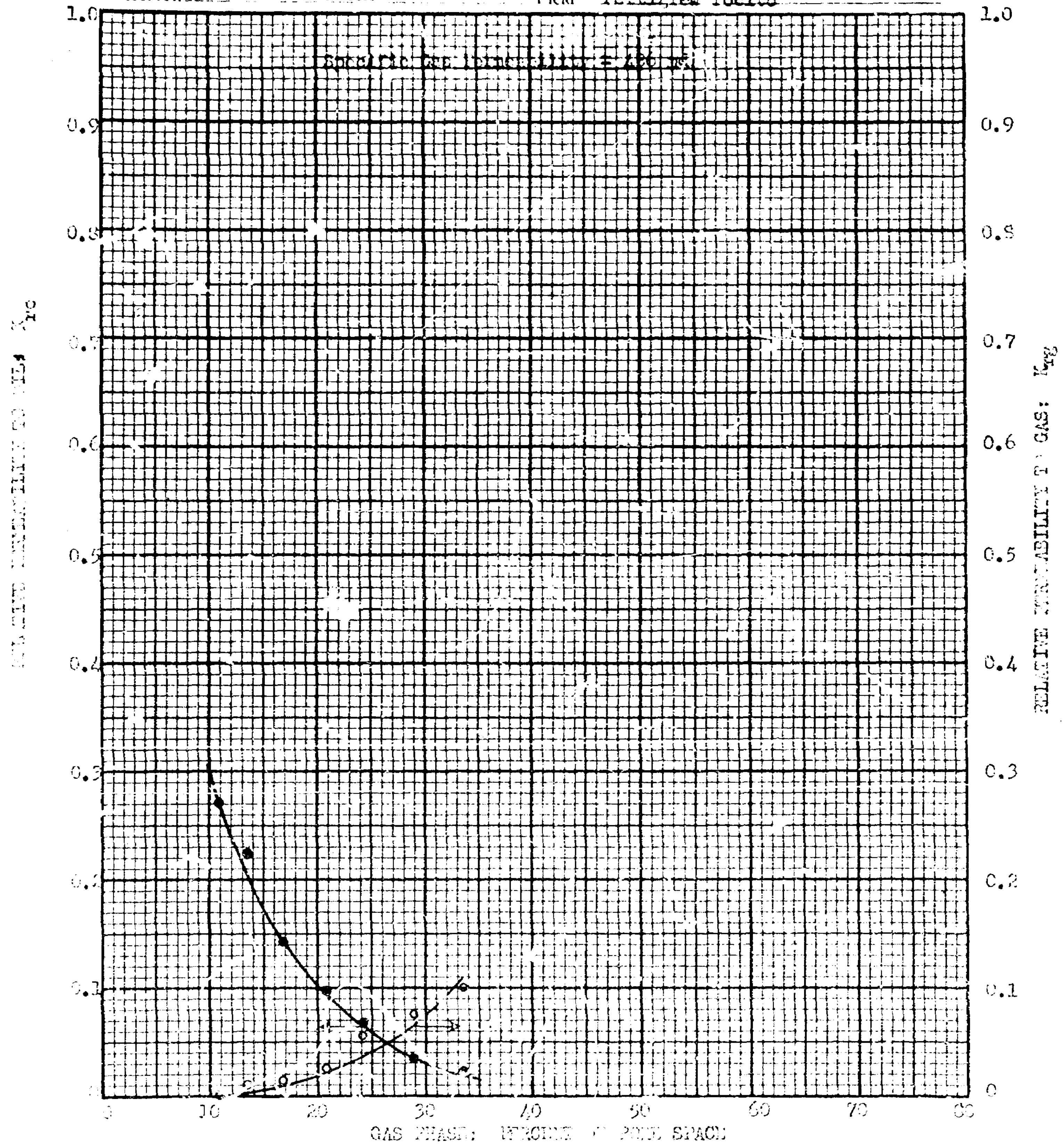


Figure 4

Petroleum Production Laboratories, Inc.

Laboratory and Reservoir Engineering Analysis

Dallas, Texas

File No. LO-860

RELATIVE PERMEABILITY RELATIONSHIP
CORE SAMPLE NO. 1

Company Lowry Oil Company
Reservoir Tocito Sandstone

Well Federal 23-49-129
Field Pettigrew Tocito

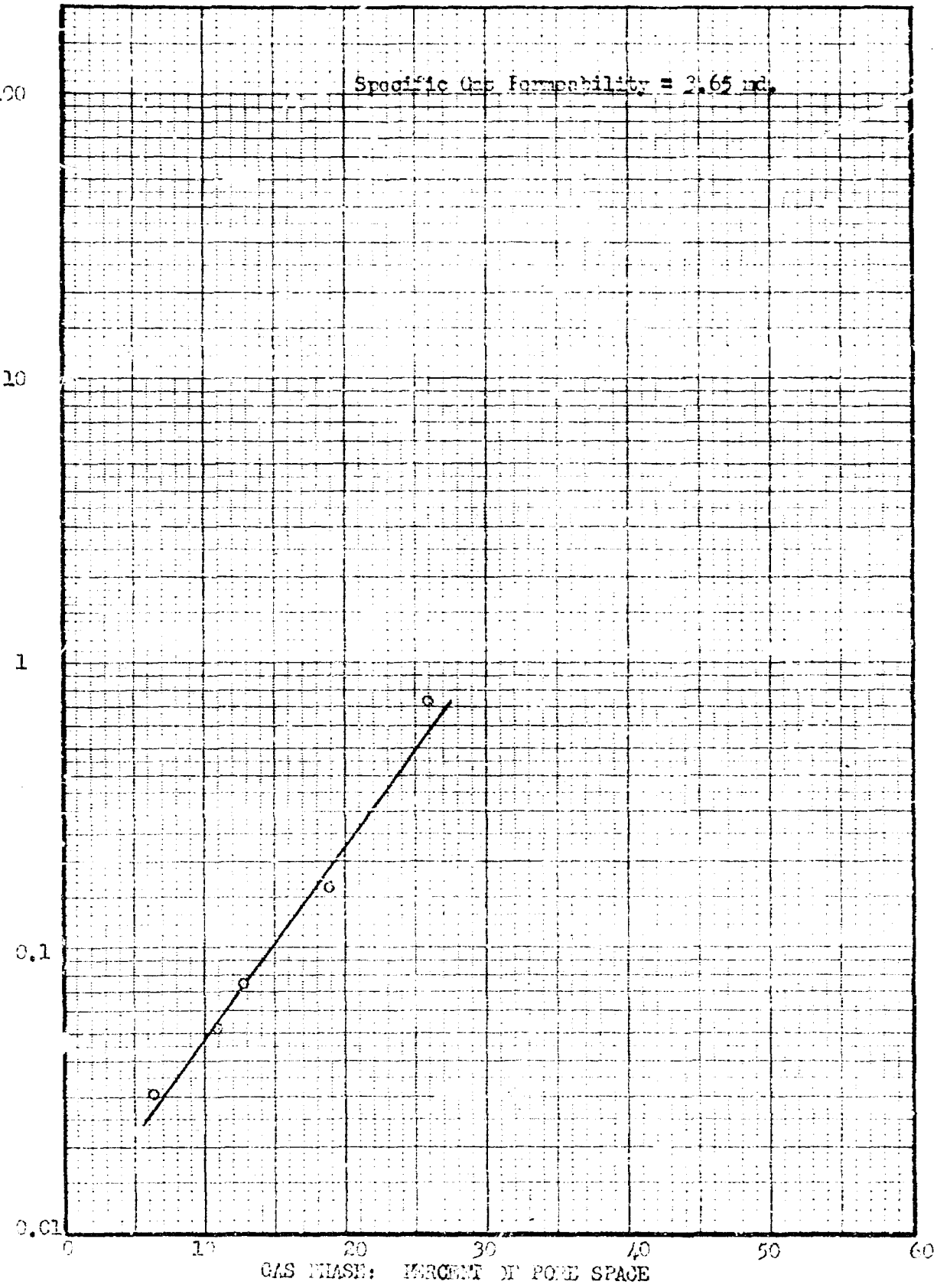


FIGURE 5

Petroleum Production Laboratories, Inc.

Laboratory and Reservoir Engineering Analyses

Dallas, Texas File No. LA-860

RELATIVE PERMEABILITY RELATIONSHIP
CORE SAMPLE NO. 2

Company Loury Oil Company Well Federal 23-49-12?
Reservoir Tocito Sandstone Field Pettigrew Tocito

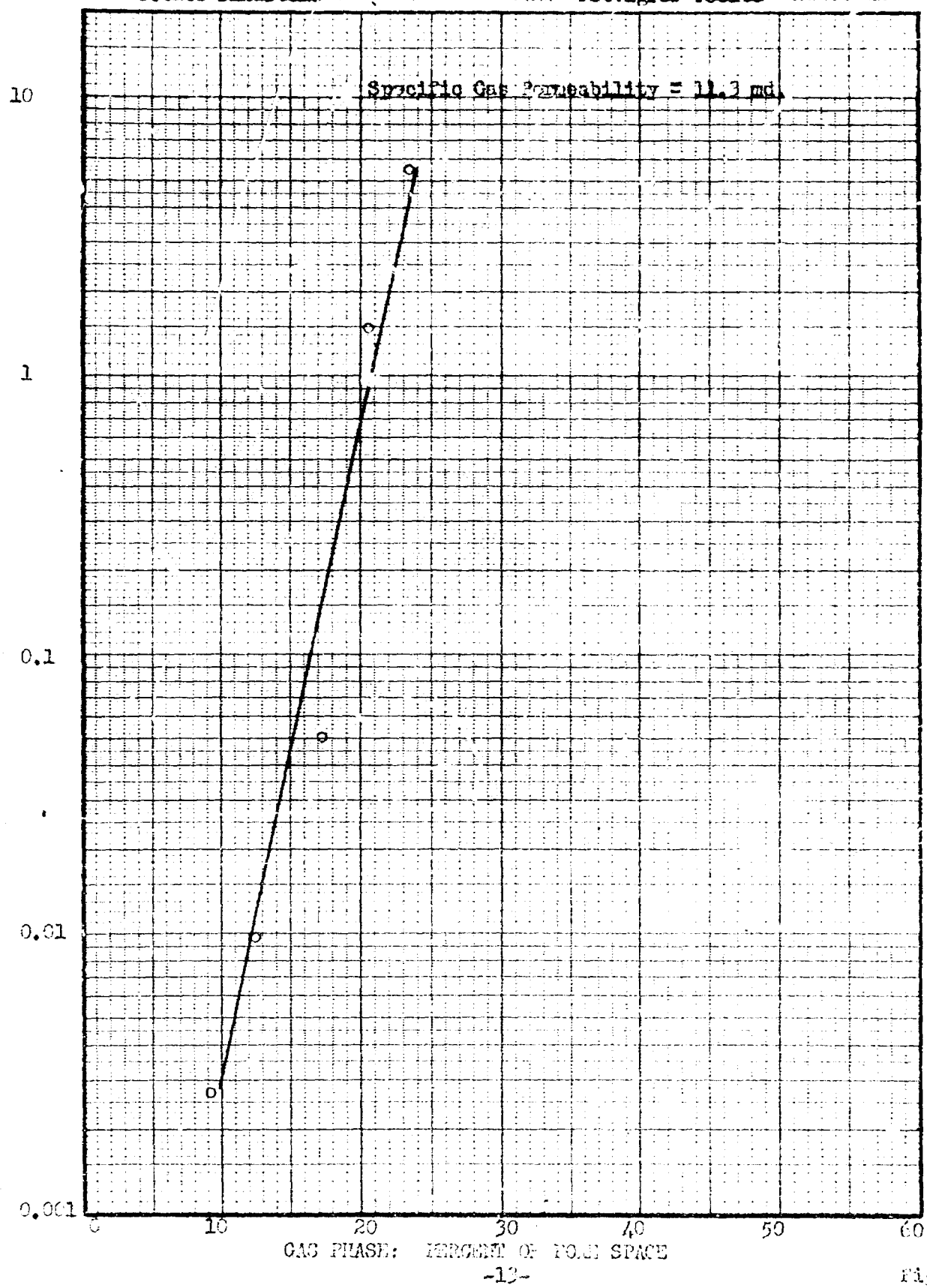


Figure 6

Petroleum Production Laboratories, Inc.

Laboratory and Research Engineering Analyses

Dallas, Texas

File No. LO-860

RELATIVE PERMEABILITY RELATIONSHIP
CORE SAMPLE NO. 3

Company Lowry Oil Company Well Federal 23-49-139
Reservoir Tocito Sandstone Field Pettigrew Tocito

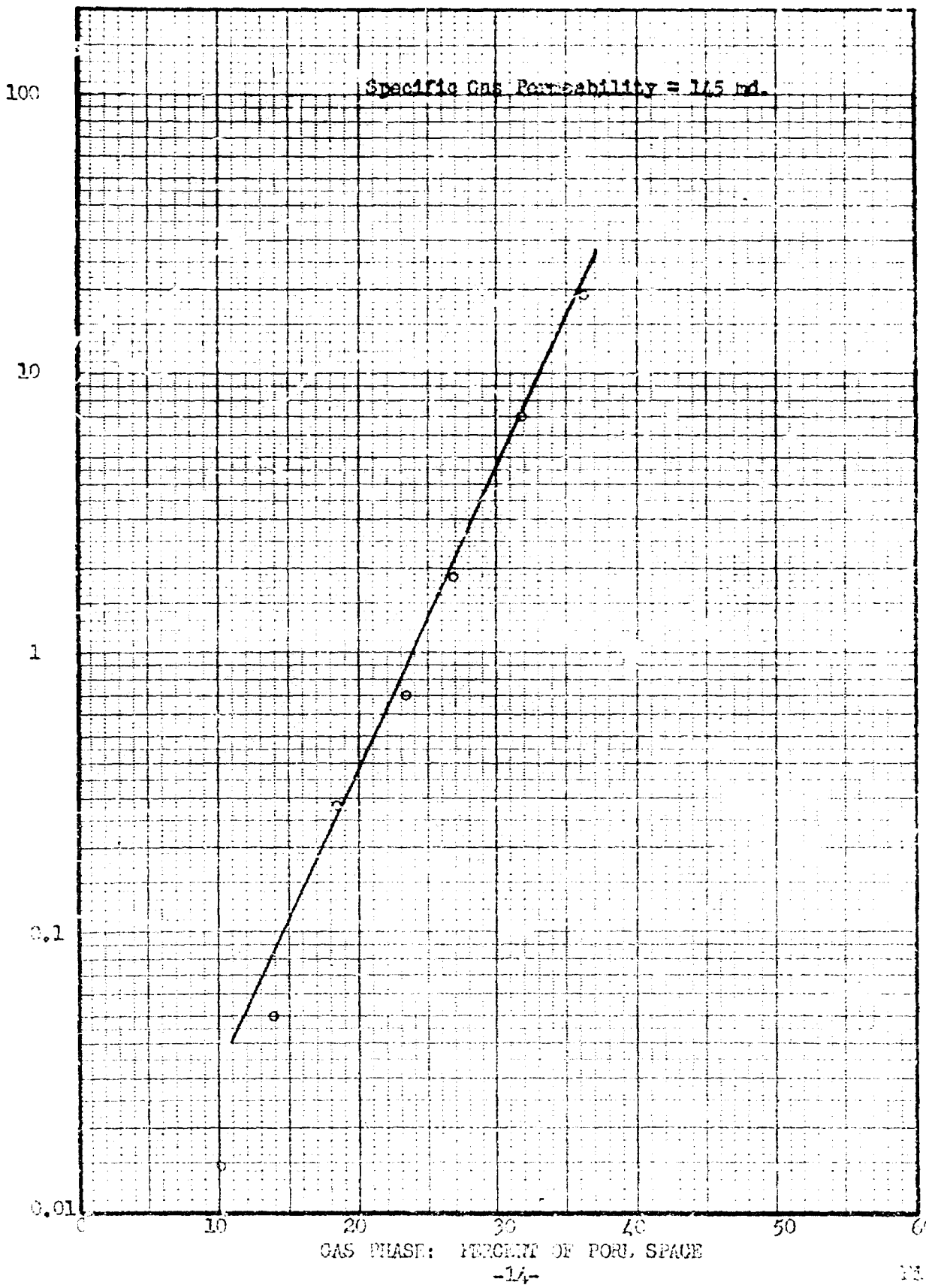
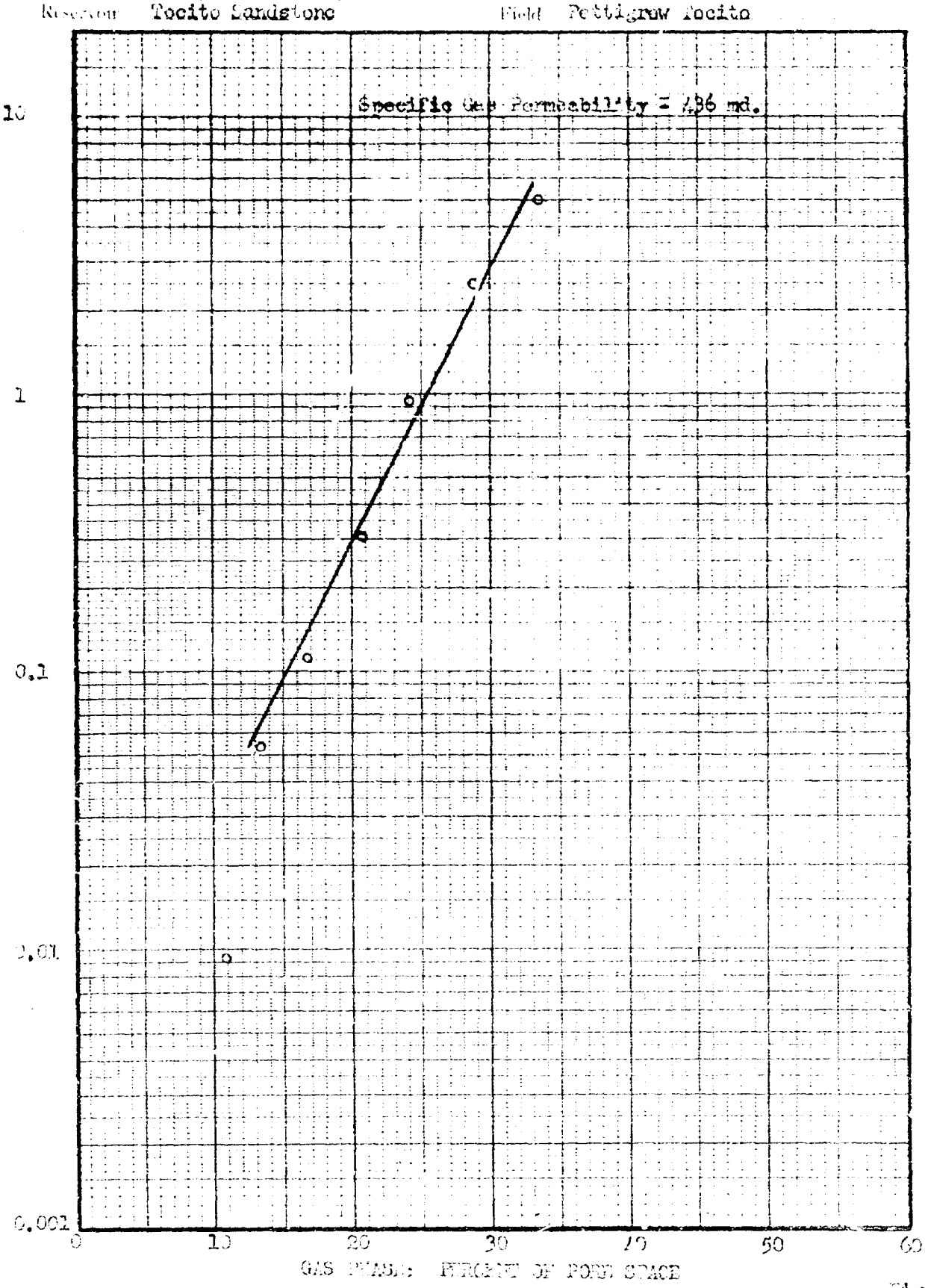


Figure 7

RELATIVE PERMEABILITY RELATIONSHIP
CORE SAMPLE NO. 4

Company Lowry Oil Company Well Federal 22-43-129
Reservoir Tocito Sandstone Field Petitgraw Tocito



Case 697

SOUTH BLANCO TOCITO POOL

LOWRY OPERATED WELLS GAS-OIL RATIO TESTS JULY 1953 THRU APRIL 1954

WELL NO.	DATE	GAS-OIL RATIC	ACCUMULATIVE OIL PRODUCTION
T-85	7-1-53	1256:1	298
	7-29-53	2199:1	788
	8-17-53	2241:1	1068
	10-31-53	1563:1	1993
	1-29-54	1383:1	3283
	2-23-54	2316:1	3629
	3-20-54	1802:1	4032
	4-20-54	1176:1	4468
T-109	7-14-53	1830:1	31,490
	7-27-53	2608:1	32,453
	8-12-53	2280:1	33,197
	10-28-53	1370:1	38,253
	11-28-53	1379:1	40,550
	12- 4-53	682:1	41,016
	2-14-54	630:1	45,958
	2-21-54	694:1	46,463
	3-16-54	725:1	48,187
	4-24-54	652:1	50,628
T-125	10-28-53	1076:1	968
	1- -54	1644:1	11,096
	2-20-54	1256:1	14,890
	3- -54	1741:1	17,461
	4-17-54	2525:1	21.586
	4- -54	2533:1	21.616
T-127	7-4-53	883:1	11,879
	8-20-53	988:1	19,225
	10-2-53	870:1	26,541
	12-4-53	789:1	36,552
	1-30-54	912:1	42,427
	2-19-54	738:1	44,636
	3- -54	898:1	47,237
	4-11-54	1087:1	50,357
	4- -54	1025:1	51,450
T-129	7-6-53	1173:1	31,098
	8-19-53	1129:1	38,110
	10-29-53	880:1	50,024
	12-1-53	681:1	54,925
	12-2-53	733:1	55,111
	1-29-54	841:1	61,093
	2-16-54	910:1	63,177
	3- -54	897:1	65,845
	4-17-54	949:1	69,995
	4- -54	966:1	70,048

BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO
EXHIBIT No. 2
CASE 697

GAS-OIL RATIO TESTS

WELL NO.	DATE	GAS-OIL RATIO	ACCUMULATIVE OIL PRODUCTION
T-132	7-13-53	1573:1	76,373
	7-29-53	1622:1	77,973
	8-11-53	1548:1	78,934
	10--53	855:1	85,066
	10-28-53	1653:1	85,868
	11--53	1375:1	88,353
	12-4-53	1306:1	91,340
	12--53	1177:1	92,047
	1----54	696:1	95,294
	4-13-54	628:1	105,541
T-134	7-13-53	3412:1	6,012
	7-26-53	4879:1	6,151
T-157	7-15-53	1644:1	102,293
	7-28-53	1503:1	104,295
	7-31-53	1768:1	104,806
	8-11-53	1339:1	106,150
	10-31-53	1441:1	119,822
	11-27-53	886:1	123,269
	12--4-53	739:1	124,358
	2- 8-54	910:1	130,876
	2-26-54	834:1	132,657
	3-16-54	864:1	135,008
	4-24-54	922:1	140,569
T-177	7--6-53	4483:1	19,306
	7-29-53	4577:1	23,125
	8-19-53	4128:1	26,009
	10-31-53	4313:1	33,466
	11-30-53	7252:1	35,319
	1-31-54	7712:1	37,077
	2-18-54	9683:1	37,694
T-179	7-8-53	1271:1	194,460
	8-8-53	1133:1	199,026
	10--53	1415:1	210,370
	10-29-53	1898:1	211,863
	11--53	1304:1	214,670
	12--53	1138:1	218,372
	1--54	1423:1	221,594
	2--54	1248:1	224,616
	3--54	1459:1	227,872
	4-15-54	1865:1	231,622
	4--54	1845:1	232,167

GAS-OIL RATIO TESTS

WELL NO.	DATE	GAS-OIL RATIO	ACCUMULATIVE OIL PRODUCTION
T- 182	7-5-53	5326:1	70,874
	7-21-53	5615:1	72,463
	8-15-53	5105:1	74,575
	11-30-53	3061:1	76,747
	1-4-54	3512:1	78,499
	1-5-54	3593:1	78,609
	1-6-54	3344:1	78,731
	2-14-54 to 3-1-54	3780:1	80,872
	2-16-54	3756:1	80,978
	2-26-54	3635:1	81,080
	3-7-54	[illegible]:1	81,307
	3-54	3755:1	81,541
	3-17-54	3750:1	81,665
	3-27-54	3628:1	82,011
	4-10-54	3642:1	82,310
	4-54	3541:1	82,456
T-207	7-6-53	2027:1	69,427
	7-21-53	2399:1	71,962
	8-13-53	2898:1	75,158
	8-25-53	2613:1	77,199
	8-26-53	2288:1	77,710
	8-27-53	2112:1	77,880
	8-28-53	2271:1	78,050
	8-31-53	2108:1	78,366
	10-53	2390:1	85,941
	10-30-53	2311:1	88,135
	12-1-53	2283:1	91,791
	1-29-54	1690:1	97,306
	2-19-54	1546:1	99,430
	2-14-54 to 3-1-54	1602:1	99,589
	3-54	1782:1	102,312
	4-54	1603:1	106,626

Page 2 - Bottomhole Pressure Tests - Datum - South Blanco Tocito Pool

WELL NO.	DATE	HOURS SHUT IN	BOTTOMHOLE PRESSURE
T-177	8-3-53	81	2041 p.s.i.
	10-7-53	199	2004 p.s.i.
	1-12-54	185	1992 p.s.i.
	4-1-54	50 days	1986 p.s.i.
T-179	8-3-53	95	1969 p.s.i.
	10-19-53	116	1963 p.s.i.
	1-12-54	147	1947 p.s.i.
	4-1-54	123	1940 p.s.i.
T-182	8-3-53	89	1934 p.s.i.
	10-7-53	48 days	1922 p.s.i.
	1-12-54	136	1930 p.s.i.
	4-1-54	114	1925 p.s.i.
T-207	8-3-53	77	1903 p.s.i.
	10-7-53	171	1906 p.s.i.
	1-12-54	151	1899 p.s.i.
	4-1-54	135	1907 p.s.i.

Page 607

BOTTOMHOLE PRESSURE TESTS

Datum -100 ft.

South Blanco Tocito Pool

Rio Arriba County, N. M.

Lowry et al Operating Account

WELL NO.	DATE	HOURS SHUT IN	BOTTOMHOLE PRESSURE
T-85	8-4-53	142	1885 p.s.i.
	10-7-53	219	1892 p.s.i.
	1-13-54	191	1872 p.s.i.
	4-2-54	196	1864 p.s.i.
T-109	8-3-53	103	1826 p.s.i.
	10-5-53	152	1828 p.s.i.
	1-12-54	146	1796 p.s.i.
	4-2-54	160	1811 p.s.i.
T-123	2-3-54	70 days	2056 p.s.i.
	4-2-54	123 days	2049 p.s.i.
T-125	10-19-53	240	2108 p.s.i.
	1-12-54	131	2053 p.s.i.
	4-2-54	145	2025 p.s.i.
T-127	8-4-53	112	2091 p.s.i.
	10-5-53	76	2070 p.s.i.
	1-13-54	166	2025 p.s.i.
	4-2-54	136	2021 p.s.i.
T-129	8-4-53	111	2020 p.s.i.
	10-7-53	168	1989 p.s.i.
	1-13-54	166	1975 p.s.i.
	4-2-54	140	1981 p.s.i.
T-132	8-3-53	90	1928 p.s.i.
	10-5-53	137	1912 p.s.i.
	1-11-54	132	1893 p.s.i.
	4-2-54	146	1888 p.s.i.
T-134	8-3-53	116	1782 p.s.i.
T-157	8-4-53	82	1885 p.s.i.
	10-5-53	144	1883 p.s.i.
	1-11-54	141	1904 p.s.i.
	4-1-54	128	1905 p.s.i.

SOUTH BLANCO TOCITO POOL - RIO ARRIBA COUNTY, N.M.

PRODUCTION DATA

LOWRY OPERATED PROPERTIES

Month & Year	Monthly Oil Production, Barrels	Monthly Gas Production, M.C.F.	Gas-Oil Ratio Cu.Ft./Bbl.	Daily Average Oil Production, Barrels	Daily Average Gas Production, M.C.F.	Cumulative Oil Production, Barrels	Cumulative Gas Production, M.C.F.
1953							
JULY	39,490	87,591	2218	1274	2825	643,806	1,054,805
AUGUST	35,224	71,287	2024	1136	2300	679,030	1,126,092
SEPTEMBER	33,285	62,733	1885	1110	2091	712,315	1,188,825
OCTOBER	35,254	49,392	1401	1137	1593	747,569	1,238,217
NOVEMBER	33,543	52,514	1566	1118	1750	781,112	1,290,731
DECEMBER	27,897	37,836	1358	900	1222	809,009	1,328,617
1954							
JANUARY	26,696	38,809	1454	861	1252	835,705	1,367,426
FEBRUARY	25,032	29,209	1167	894	1043	860,737	1,396,634
MARCH	29,516	35,567	1205	952	1147	890,253	1,432,201
APRIL	35,564	49,154	1354	1185	1605	925,817	1,480,355

OIL CONSERVATION COMMISSION
EXHIBIT NO. 6
CASE

Case 697

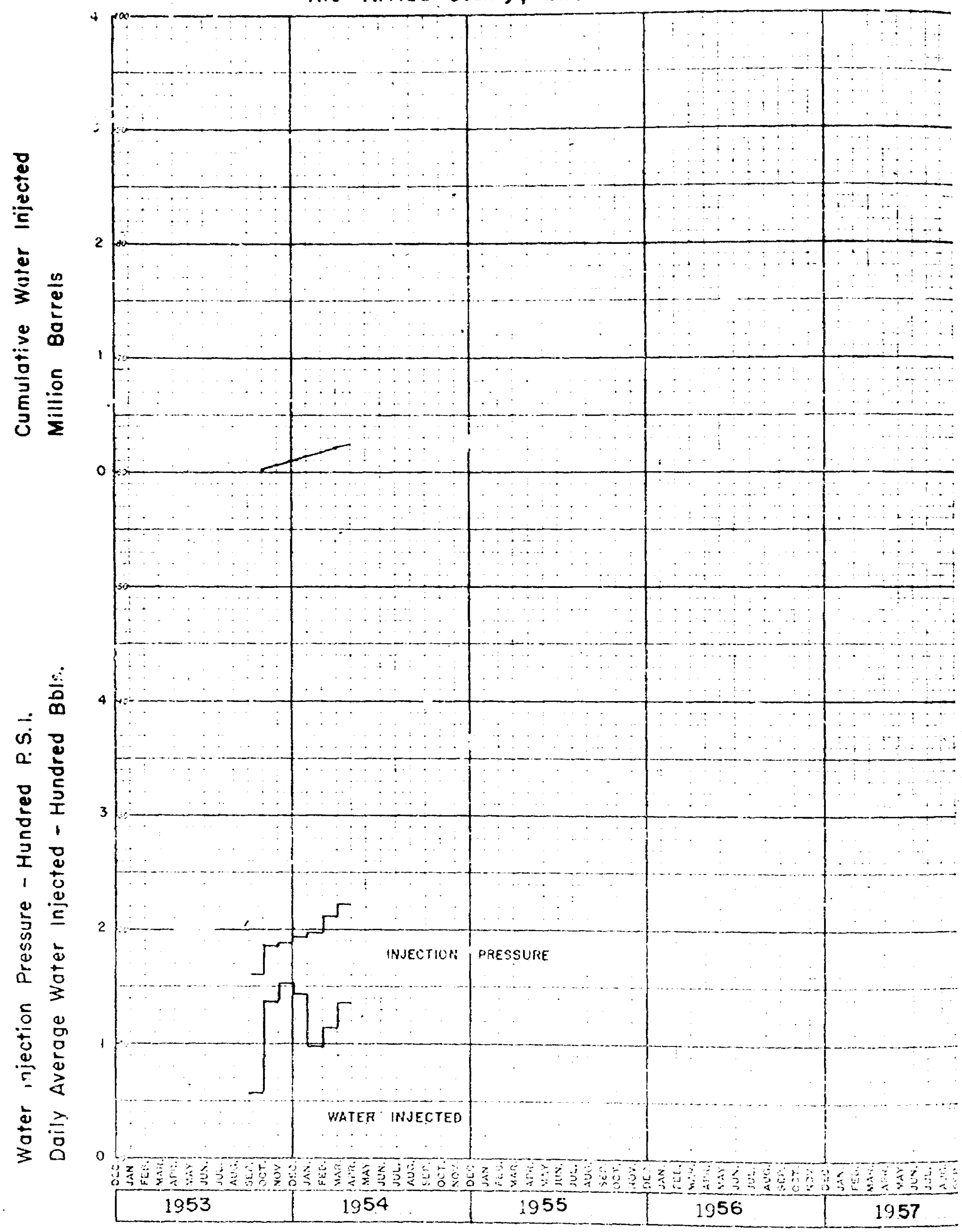
SOUTH BLANCO TOCITO POOL

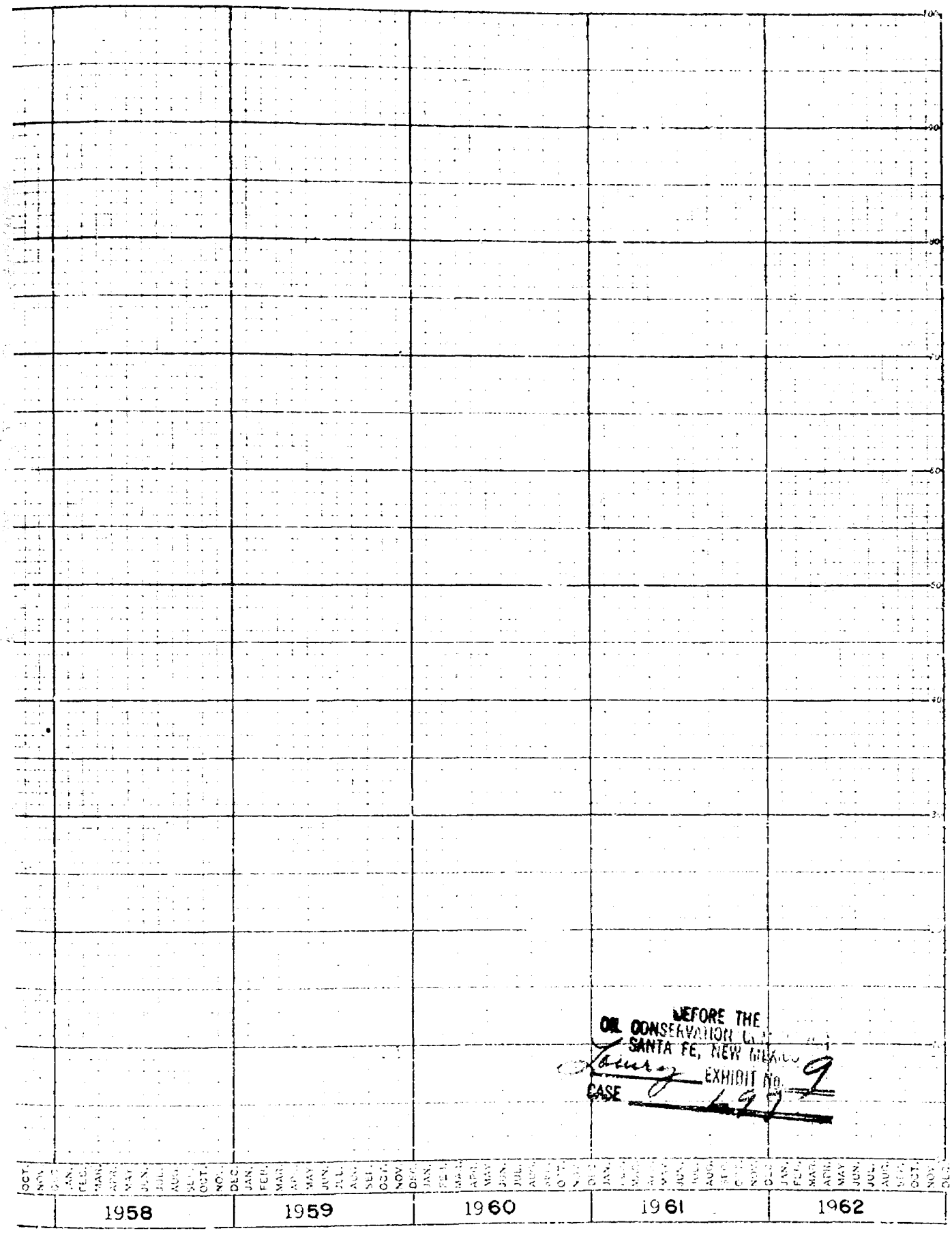
LOWRY ET AL OPERATING ACCOUNT

WATER INJECTED-WELL NO. T-134

	WATER INJECTED BBLS. MONTHLY AVERAGE	WATER INJECTED BBLS. DAILY AVERAGE	AVERAGE INJECTION PRESSURE, p.s.i.	CUMULATIVE WATER INJECTION BARRELS
October, 1953	14,511	468		14,511
November, 1953	41,607	1387	1875	56,118
December, 1953	46,794	1509	1890	102,912
January, 1954	44,129	1424	1950	147,041
February, 1954	27,887	996	1980	174,928
March, 1954	35,521	1146	2112	210,449
April, 1954	40,965	1366	2220	251,414
April 1 to April 15	19,607	1401	2220	271,021

WATER INJECTION WELL - LOWRY T-134
SOUTH BLANCO TOCITO POOL
Rio Arriba County, N.M.





BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO
EXHIBIT No. 9
CASE 1997

SOUTH BLANCO TOCITO POOL

PRODUCTION DATA — LOWRY WELLS

PILOT PRESSURE MAINTENANCE AREA

YEAR, 1953	OIL PRODUCTION, BBLS.		GAS PRODUCTION, MCF		GAS-OIL
	MONTHLY	DAILY AVERAGE	MONTHLY	DAILY AVERAGE	RATIO
January	20,294	655	41,539	1340	2047
February	21,900	782	45,384	1621	2072
March	20,965	676	41,616	1342	1985
April	16,832	561	35,515	1184	2110
May	19,967	644	43,985	1419	2203
June	17,914	597	41,962	1399	2342
July	18,402	594	45,627	1472	2479
August	15,963	515	35,598	1148	2230
September	14,694	490	[illegible],094	970	1980
October	14,791	477	23,426	756	1584
November	15,044	501	25,350	845	1685
December	13,347	431	18,659	602	1398
YEAR, 1954					
January	12,580	406	17,206	555	1368
February	12,779	456	13,836	494	1083
March	14,323	462	16,366	528	1143
April	16,106	537	17,433	581	1082

BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO
EXHIBIT No. 10
CASE 827

Case 697

SOUTH BLANCO TOCITO POOL

ANALYSIS OF BOTTOMHOLE PRESSURE DATA

LOWRY OPERATED WELLS

	BEFORE PRESSURE MAINTENANCE			AFTER PRESSURE MAINTENANCE		
WELL NO.	BBLS.OIL PRODUCED	PRESSURE DROP,p.s.i.	BBLS./ p.s.i.DROP	BBLS.OIL PRODUCED	PRESSURE DROP,p.s.i.	BBLS./ p.s.i.DROP
T-109	35,086	-275	128	12,162	-17	715
T-132	78,412	-226	347	20,281	-24	845
T-157	114,029	-240	475	22,550	+22	No drop
T-182	74,469	-186	400	6,836	+ 3	No drop
T-207	83,036	-205	405	21,035	+ 1	No drop
T- 85	759	+ 7	Nc drop	2,560	-28	91
T-125	---	---	---	19,153	-83	231
T-127	25,940	- 38	683	22,367	-49	456
T-129	45,202	-122	370	22,316	- 8	2789
T-134	4,111	-122	34	---	---	---
T-177	30,594	- 87	352	6,633	-18	369
T-179	205,569	-234	878	20,227	-23	879

BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO
Lowry EXHIBIT No. 11
CASE 697

Lowry Oil Company
P. O. Box 8008
Albuquerque, New Mexico

June 3, 1954

New Mexico Oil Conservation Commission
Santa Fe, New Mexico

Attention: Mr. R. R. Spurrier

Dear Mr. Spurrier:

On May 19, 1954 the New Mexico Oil Conservation Commission heard Case Number 697 relating to Lowry et al Operating Account's request to enlarge its pressure maintenance program and provide for a central tank battery oil system. At this hearing, by testimony, I stated that two Federal leases were now productive of oil for our properties and that the royalty interest and overriding royalty interests were identical for these leases.

Mr. A. L. Cogin, representing W. C. Smith, one of the overriding royalty owners, stated that the overriding royalty interests were not identical for the two leases involved. Although I had checked Division Orders on these properties prior to the hearing, and was certain, according to our records, that the royalties were identical, I did not advance arguments to Mr. Cogin's statement.

During this present week, I have again checked with Malco Refineries, Incorporated in regard to the royalty interests of the leases involved, and their Division Orders and Abstracts reveal the following royalty and overriding royalty interests for Lowry et al Operating Account, Federal Leases New Mexico 03551 and SF 079035-A.

	ROYALTY	
FEDERAL GOVERNMENT		.125000 of 8/8
NAME	OVERRIDING ROYALTY AND WORKING INTEREST	PERCENTAGE OF 7/8
Doris Elaine Mims		.0009524
Dacresa Corp.		.0161142
Brookhaven Oil Corp.		.0124571
Robert Mims		.0009524
P. T. Bee		.0003810
S. B. Petree		.0003810
W. C. Smith		.0003810
J. W. Bartlett		.0003810
Frank A. Schultz		.0003810
R. L. Crockett		.0019048
Working Interest		.9657141

The royalty and overriding royalty interest on the subject leases are identical according to available records.

Yours very truly,

LOWRY ET AL OPERATING ACCOUNT

A. F. Holland

AFH:mhw

cc: J. W. Kellahin

BROOKHAVEN OIL COMPANY
FIRST NATIONAL BANK BUILDING
(MAIL) P. O. BOX 644
Albuquerque, New Mexico
PHONE 7-8853 TELETYPE AQ-96

June 11, 1954.

New Mexico Oil Conservation Commission
State Capitol
Santa Fe, New Mexico

Att: Mr. R. R. Spurrier, Secretary

Dear Sirs:

Referring to Case 697 and to the undersigned's statement sent you under cover of June 1st, we are in receipt today of copy of letter dated June 9th from Mr. Kellahin, Attorney for Lowry et al Operating Account, to the New Mexico Oil Conservation Commission, wherein he requests withdrawal from consideration the utilization of well T-123 for water injection purposes, giving as reason the lack of full cooperation on the part of Johnston Oil and Gas Company, owners of offsetting leases.

It is our understanding from said letter, that Lowry et al Operating Account continues to seek approval to plug back well D-83 (located in the NW/4 SE/4 of Section 5-26N-6W), from the Dakota formation where it is now producing commercially, to the Tocito formation, and without producing it or even attempting to produce it from said Tocito formation, to inject water into said formation.

Please be advised that the undersigned companies own all the lease rights below the Pictured Cliffs formation under the NW/4 Section 5-26N-6W, offsetting to the northwest well D-83, and that there has been no attempt for agreement nor is there presently any understanding between Lowry et al Operating Account and the undersigned with reference to water injection in well D-83; and, without such an agreement or the unitization of the NW/4 of Section 5 with the other three-fourths of this section, it would not be feasible for Lowry to inject water into the Tocito formation in well D-83, this being the same reasoning as is acknowledged with reference to the Johnston properties and well T-123. As a matter of fact, injection of water in well D-83 without unitization of Section 5 would be highly damaging to the lease rights owned by the undersigned in the NW/4 of said section. Please refer to our statement of June 1, 1954, page 4, second paragraph under "Comment".

Very truly yours,

BROOKHAVEN OIL COMPANY
DAGRESA CORPORATION

Thos. B. Scott, Jr.
President

TBS:ms
CC: Gov. Edwin L. Mechem, Chairman
Mr. E. S. Walker, Member
Lowry et al Operating Account
Mr. Jason W. Kellahin
Mr. Jack M. Campbell

Lowry Oil Company

MAIN OFFICE OCC P. O. Box 8008

Albuquerque, New Mexico

NOV 5 PM 1 November 3, 1954

Mr. W. B. Macey
New Mexico Oil Conservation Commission
Santa Fe, New Mexico

Dear Mr. Macey:

This will acknowledge receipt of New Mexico Oil Conservation Commission Order No. R-532 dated October 4, 1954, granting the application of Lowry et al Operating Account to extend its pressure maintenance program for the South Blanco Tocito Pool, Rio Arriba County, New Mexico.

In behalf of Lowry Oil Company I wish to express appreciation for the granting of this order which I believe will permit a greater ultimate oil recovery from the South Blanco Tocito Pool. The continuing co-operation by yourself and members of your staff in the many problems relating to this field is greatly appreciated.

Yours very truly,

LOWRY OIL COMPANY

A. F. Holland

AFH/leh

BEFORE THE

OIL CONSERVATION COMMISSION

STATE OF NEW MEXICO

Santa Fe, New Mexico

* * * * *

TRANSCRIPT OF PROCEEDINGS

CASE NO. 697

Regular Hearing

BEFORE THE
OIL CONSERVATION COMMISSION
STATE OF NEW MEXICO
Santa Fe, New Mexico
May 19, 1954

IN THE MATTER OF:

Application of Lowry et al Operating Account for the approval and extension of its pilot pressure maintenance program in the South Blanco-Tocito Pool, and for permission to gauge oil at a common tank battery. Case No. 697

BEFORE THE FULL COMMISSION

TRANSCRIPT OF PROCEEDINGS

MR. SPURRIER: The meeting will come to order. The next Case on the docket is 697.

MR. KELLAHIN: Jason Kellahin representing Lowry Oil Company, the Lowry et al Operating Account applicant in this Case. In the interest of saving time and in order that the Commission might have a complete picture of the entire history of this field, we ask that the Commission take notice of the extensive geological and engineering information which has heretofore been offered by Lowry in connection with Cases 537 which is concerned with 80 acre spacing. 555 which approved a pilot pressure maintenance program and 607 oil proration case coupled with that/we will offer information today to supplement the geological and engineering information offered in those previous cases and will bring the record down to date and with the testimony and exhibits offered in those previous cases, the Commission will have a complete and full picture of the entire history of this pool to guide them in drafting an order in this Case.

This Case is an application for an extension of the pilot pressure maintenance program which was approved by the Commission in Case No. 555, Order No. R-349. We would like to call Mr. Art. Holland as a witness.

A. F. H O L L A N D

a witness, having been first duly sworn, testified as follows:

DIRECT EXAMINATION

By: MR. KELLAHIN:

Q State your name please? A My name A. F. Holland.

Q By whom are you employed?

A I am employed by the Lowry Oil Company.

Q In what capacity?

A As a petroleum engineer for that company.

Q Is the Lowry Oil Company, the operator for the Lowry et al Account? A That is correct.

Q Have you testified before this Commission before as an expert engineer? A Yes, sir, I have.

Q Have your qualifications been accepted by the Commission?

A They have been accepted.

MR. KELLAHIN: We submit that the witness is qualified.

MR. SPURRIER: He is.

Q Mr. Holland, the Commission has before it at this time an application for an extension of the pilot pressure maintenance program in the South Blanco-Tocito Pool, which was heretofore approved in Case 555 by Order No. R-349, are you familiar with the pilot pressure maintenance program now in effect?

A I am familiar with that program.

Q Have you drafted the plans for the extension?

A I have helped work out the extension program,yes, sir.

Q I hand you what has been marked as Exhibit No. 1 and ask you to state to the Commission what that shows?

A Exhibit No. 1 is a plat of the South Blanco-Tocito Pool. The area colored in yellow on the plat represents the acreage operated by Lowry. The plat includes all of the producing wells in the field which are operated both by Lowry and by the Johnson Oil and Gas Company. On the plat are shown in addition to the producing wells the proposed expansion program of the pressure maintenance project. The wells proposed by Lowry to be converted to water injection wells are their well T-123 and their well D-83, T-123 is located in Section 7, Township 26 North, Range 6 West and well D-83 is located in Section 5, Township 26, North, Range 6 West. Both wells in Rio Arriba County. In addition is shown the present well being used for water injection purposes and that is well T-13¼ located in Section 10 of the same township and range as before.

Q Has another well been approved by this Commission as a proposed water injection well?

A The application for the pilot program requested approval of two wells. T-13¼ which is presently being used and P-109 which has never been converted to water injection purposes. The reason for requesting two wells was to be able to use the two wells instead of the one, if it became necessary. So far, it has not.

Q Now, I noticed on examining the Exhibit No. 1 that a well not on Lowry property has beencircled in red, is it proposed to use that as a water injection?

A This is the Johnson Oil Company Rincon unit No. 11, Lowry

has been attempting to work out a cooperative water injection program with the Johnson Oil and Gas Company. We thought we had those arrangements complete, however, we do not have final approval on it and therefore are requesting only approval of our portion of the program.

Q Mr. Holland, I hand you what has been marked as Exhibit No. 2 and ask you to state what that is designed to reflect?

A Exhibit No. 2 is a summary of the gas-oil ratio tests conducted for the Lowry wells of the South Blanco-Tocito Pool. These tests are presented commencing with July 1st, 1953 in order to show tests before and after institution of the pressure maintenance project.

Q This Exhibit coupled with the Exhibits in the previous cases mentioned at the outset of this hearing, does that complete the record on those tests for the life of the field?

A It does, it includes all of the tests which have been performed. The tests are more numerous than are required by the South Blanco-Tocito Pool rules. The reason for taking so many tests was to follow the progress of the program. I would like to call the Commission's attention to some of the wells that are offsetting the water injection well. The first well, I would like to point out is well T-157. This well had a producing gas-oil ratio before commencing the pressure maintenance program as high as 1768 cubic feet per barrel. At the present time, after six months of approximately water injections, the well has a ratio of 522 cubic feet per barrel.

The next well I would like to point out is well T-109, that well before water injection had gas-oil ratio as high as 2280 cubic

feet per barrel. The latest test on that well showed a gas-oil ratio of 652 cubic feet per barrel. The next well, I would like to point out is well T-132, this well had ratios as high as 1653 cubic feet per barrel prior to water injections and at the present time it has a producing ratio of 628 cubic feet per barrel. One thing I haven't mentioned is that water injection commenced during October, October 7, 1953. Those three wells have shown the biggest drop in producing gas-oil ratio. Other wells have been effected, T-128 has been affected, T-207 has been affected.

Q I hand you what has been marked as Exhibit No. 3 and ask you to state what that shows, Mr. Holland?

A Exhibit No. 3 is a bottom hole pressure test record of tests taken since July the 1st, 1953, it shows that tests have been performed at intervals of each three months and shows for the wells in the pilot water flood area that pressure drops have been nil, have gained pressure or have been materially arrested, during the last three months, survey that was taken during April, 1954.

Q You are referring now to Exhibit No. 5?

A The data is on Exhibit No. 5. Exhibit No. 3 will reflect that during the period, January , 1954 to April, 1954 that well T-109 gained 15 pounds, well T-157 gained 1 pound, well T-207 gained 8 pounds. T-132 had a decrease of 5 pounds, and well T-182 also had a decrease of 5 pounds. Before pressure maintenance operations were commenced, pressure drops ranged from as high as 20 pounds between surveys to as much as in excess of 50.

Q Have you prepared any isobaric maps reflecting the results of your bottom hole pressure tests, Mr. Holland?

A Isobaric maps have been prepared and are submitted for the last two pressure surveys.

Q That is Exhibit No. 4?

A Exhibit No. 4 would be the pressure survey conducted during January, 1954.

Q Exhibit No. 5, what does it reflect?

A Exhibit 5 would reflect the bottom hole pressure tests taken during April, 1954.

Q Calling your attention to Exhibit No. 6, Mr. Holland, would you discuss that?

A Exhibit No. 6 represents production data from all of the Lowry operated wells in the South Blanco-Tocito Pool since July, 1953.

Q Supplementing this Exhibit No. 6 with the information that is heretofore been presented to the Commission, does it give a complete production history of the South Blanco-Tocito operation by Lowry?

A It does, it supplements part of the information that has been presented in order to review data before and since the institution of the project.

Q Have you any further comments on Exhibit No. 6?

A Only that I would like to point out the gas-oil ratio for all of the wells that there has been a substantial decrease in those ratios since the project was commenced.

Q That reflects the same information substantially as Exhibit No. 2 on gas-oil ratios, does it not?

A It is a field wide figure instead of the individual well figures.

Q Now, I hand you Exhibit No. 7 and ask you to state what that

is?

A Exhibit No. 7 is a graphical repetition of data contained in the other Exhibits. It shows graphically oil production rates, gas-oil ratio, gas production, reservoir pressure performance, number of producing wells and accumulative production for Lowry operated wells.

Q Does that Exhibit show that gas-oil ratio has been reduced?

A It does, it shows that gas-oil ratios in excess of 2200 cubic feet per barrel were obtained before pressure maintenance and at the present time, the producing gas-oil ratio is 1354 cubic feet per barrel.

Q Does it also reflect that pressures have been stabilized to some --

A (Interrupting) It does, it shows that there has been material decrease in the bottom hole pressure decline between surveys.

Q Now, I hand you Exhibit No. 8 and ask you to state what that is, Mr. Holland?

A Exhibit No. 8 is a record of the water injected into the water injection well T-134 through April 15, 1954, 271,021 barrels had been injected.

Q Is that the total injection of water under the present program?

A That represents every barrel of water that has been injected.

Q Now, I hand you the Exhibit No. 9, Mr. Holland, and ask you to state what that shows?

A Exhibit No. 9 is a graphical representation of the water injected and it just shows the results in graphical form.

Q I now hand you Exhibit No. 10, Mr. Holland, and ask you to discuss that Exhibit.

A This Exhibit represents production information for the five wells that encircle the pilot pressure maintenance area. It is a total of the production from these five wells T-109, D-83[illegible], T-157, T-182, and T-207. These five wells were selected because they have shown the most marked influence from the pressure maintenance program. That, naturally is true because they are the wells nearest the injection well. It shows that during the month of September, 1953, that the producing gas-oil ratio of those five wells was 1980 cubic feet per barrel. Water injection was commenced during October 1953 and the producing gas-oil ratio of those five wells during April, 1954 was 1082 cubic feet per barrel. There has been a decrease in the producing gas-oil ratio from the experimental area of roughly 900 cubic feet per barrel.

Q I hand you what has been marked as Lowry's Exhibit No. 11 and ask you to state what that shows?

A Exhibit No. 11 is an analysis of the bottom hole pressure information prior to water injection and after water injection. The wells in the experimental pressure maintenance area are separated from the remaining Lowry operated wells and appear at the top of the Exhibit. It shows that prior to pressure maintenance for the five wells in the pressure maintenance area that the oil produced per barrel per pound drop for the individual wells varied from 128 to 475. After the program was placed in operation and through the period, October, 1953 through April, 1954, three of the wells had no drops, two of the wells had produced from 715 to 845 barrels per

pound bottom hole pressure drop. It reflects that all five wells are being effected and we believe that this evidence coupled with the gas-oil ratio information indicates that the water is being dispersed throughout the formation to best achieve an increase in ultimate oil recovery.

MR. KELLAHIN: At this time, we would like to offer in evidence Lowry's Exhibits 1 through 11, inclusive.

MR. SPURRIER: Is there objections? Without objections they will be admitted.

Q Mr. Holland, in your opinion, will the proposed expansion of the water injection program as a pressure maintenance project result in a beneficial effect on the South Blanco-Tocito Pool?

A We believe it will. The reason for the expansion is so that a greater area will be affected. We hope to maintain reservoir pressure and possibly restore some pressure in order to increase the ultimate oil recovery from the pool. That is the reason that we are asking for the extension.

Q In your opinion, will correlative rights be protected by the program proposed by Lowry?

A I believe they will. As I mentioned at the start of the hearing, we haven't completed arrangements with Johnson Oil and Gas Company but that program was arranged so that they would maintain or it was recommended to them that they maintain their reservoir voidage, by that I mean restore their approximate reservoir voidage to the reservoir and Lowry would essentially do the same. In that manner, we proposed to protect correlative rights.

Q In youropinion, should the program be taken off the pilot status and made a permament water pressure maintenance and water

inj ection program?

A We believe it is successful. We have injected 271,000 barrels of water and have produced no water except during the past few days. One of the wells, T-157 has shown a slight percentage of water. We have had a casing leak with that well before. We had trouble, we are not certain whether the water is coming from the injection well or the packer which we set in the well is leaking.

Q In the event the Commission approves this application, is Lowry willing to supply the Commission with any data required in order that they may keep track of your progress and the results thereof?

A Well, we have been furnishing monthly production and water injection values and any other information and we will furnish what ever they request.

MR. KELLAHIN: That is all.

MR. SPURRIER: Anyone have a question of the witness?

MR. CAMPBELL: Yes, I have.

MR. KELLAHIN: We have some matters here. Included in the application is a request for the installation of central tank battery for the metering of oil. Mr. Holland, what is proposed in connection with the setting of the central tank battery?

A The plans that we hope to place in effect are to locate all separators, we plan to set a separator and fluid meter and a gas meter for each individual well and we plan to locate those at the central point. We will measure the fluid from each well and then we would like to request permission to produce this well into a common tank battery.

Q How many basic leases would be involved in that?

A At the present time, there are two leases and our records indicate that the royalty and ownership both regular and overriding are the same.

Q The royalty ownership is it Federal?

A These are Federal leases.

Q Have you checked this proposal with the U.S.G.S.?

A I have. We have presented the plan to the U.S.G.S. and we do have an approval from them to do it.

Q And have you presented the pressure maintenance pressure program to the U.S.G.S.?

A We have, it was presented to them that we had the cooperation of the Johnson Oil and Gas Company. We thought we had and we will still continue to try to work out a cooperative program with them. They have approved it on that basis.

Q If Lowry is allowed to set a central tank battery, will they be in a position to account for all the production in accordance with their lease contracts?

A Yes, that is right. Records will be maintained on the individual leases.

MR. KELLAHIN: That is all.

MR. CAMPBELL: If the Commission please, I would like to enter an appearance here and ask a few questions of Mr. Holland about the proposed extension of this plan. I would like to enter an appearance on behalf of Brookhaven and Dacresa Corporation who as I understand, own two and a half percent overriding royalty on most ofthe production from this Dacresa overriding interest on this pool.

Questions by MR. CAMPBELL:

Q I assume your application, I have not seen it, I assume it asks the Commission to take this program out of the pilot stage and put it on a permament basis?

A We would like to expand the program and add additional injection wells.

Q Do you feel that the experience you have gained on only one water injection well in this area is enough to satisfy you fully with regard to the program?

A We think so, yes.

Q Do you intend to continue water injection in this T-134, the well you are now using?

A We plan to continue using that well plus the other wells that we are requesting approval here today.

Q You no longer intend to use the T-109 as a water injection well or do you intend to use that also?

A We will probably want to use that well. At such time that water encroachment invades that area and the well is no longer of any use for oil production.

Q Now, I notice that two wells that you proposed to use for water injection, T-123 and D-83 are both shown on your plat as gas wells. Would you explain the method by which you intend to use gas wells as water injection wells in this area?

A D-83 is a well producing from the Tocito formation. What we would propose to do is plug that well back to the Tocito zone perforate and inject water into the Tocito zone and use the well so long as it is necessary, then when the well is no longer needed for water injection purposes to again complete in the Tocito and

deplete the Dakota formation.

Q What is the status of T-123?

A T-123 is shown as a gas well. It is a well in the gas cap of the South Blanco-Tocito Pool.

Q How do you intend to use that as a water injection well? What, mechanically, do you intend to do to protect the gas cap gas there?

A We intend to inject water into the Tocito zone just as the well is presently completed. It is perforated in the Tocito zone.

Q It isn't necessary, in your opinion, to shut off the gas cap gas from that water injection?

A Well, the zone is about roughly ten feet and I don't know of any way that we could do otherwise than we have recommended.

Q You do not feel, I assume, that you will cause any damage to the gas cap or the reservoir as a whole by using a gas cap well in that manner for water injection?

A We don't think so. We don't intend to abandon that gas cap gas. We think that possibly it is of considerable magnitude and value. We at some date will probably propose to produce that gas cap gas.

Q You don't think it requires any protection?

A Well, I don't know just what you have in mind.

Q I am not sure either, but what I am getting at is, isn't it a rather unorthodox procedure to use as a water injection well a well which is essentially a gas well?

A This field has low relief somewhere in the approximate value of 80 feet per mile. The reason we are recommending this program is that we want to prevent all oil migration into the gas cap. To

get the best results from our program and we, by that we will attempt to keep our wells flowing as well as possible, we need to maintain or restore bottom hole pressure. We have been concerned in so doing with migrating oil into the gas cap. For that reason and in view of the fact that there is not much relief for the pool, we would like to ask the approval of the program to inject water into those wells.

Q Would you mind explaining to me what the reason is that you can't use some of these oil wells that are lower on structure for your water injection program rather than taking the well of the type T-123 there higher on the structure and injecting the water there?

A Well, we would like to get the water dispersed for one reason to different areas of the field. We can use the wells low and will propose doing it at such time that they are of no value for oil production. Well, in fact, that is what our program is now. We are injecting water in one of the lower wells.

Q Isn't it customary in the water injection programs to inject the water at the lower points on structure to force oil up structure? Isn't that customary procedure?

A I think generally, most projects are worked that way.

Q All I am trying to get at, I am not trying to attack your program necessarily, I am trying to find out why you want to use the wells higher on structure, wells that are now gas wells instead of using the oil wells that are on the flank?

A The reasons are those I have given you.

Q I didn't understand what they were. Is it the water dispersal?

A Water dispersal is one, attempt to prevent migration of oil

into the gas cap is another reason which is, it is not an important reason but was a way of working out a cooperative arrangement with the Johnson Oil and Gas Company, that is another reason.

Q They would prefer you to use these wells at these points, is that it? They would rather you would use these than some of the others?

A I frankly don't know. We have talked to the Johnson people about this program and had proceeded along the lines that they would join in this cooperative arrangement.

MR. CAMPBELL: I think that is all.

MR. SPURRIER: Anyone else?

By: MR. KELLAHIN:

Q In the event that Johnson did join the program, the use of that well would be more beneficial to them, would it not?

A Well, the well is presently shut in, both of those wells are shut in there. Presently no income is being derived from those wells.

MR. KELLAHIN: That is all.

MR. COGIN: A. L. Cogin, Dallas, representing W. C. Smith, one of the overriding royalties under some tracts of land covered by the Lowry leases.

Questions by MR. COGIN:

Q I don't think that the royalty ownership, the overriding royalty ownership will be the same all through your acreage there and in the setting of this common tank by the use of your separator and gauging the fluid to the separator and then lift it to the common tank, do you think that you can adequately protect the interest of the party where the ownership is different?

A I think so. We will measure the fluid from each well. Now, that will represent both oil and water and we will take periodic tests on those wells and I think the answer is to your question, is yes.

Q I doubt it.

MR. COGIN: That is all.

MR. SPURRIER: Why do you doubt it?

MR. COGIN: It seems to me they have to catch the oil and measure it before it goes into the central tank.

MR. SPURRIER: That is what they said they were going to do. They said they were going to meter from each one of the wells.

MR. KELLAHIN: What they propose to do is to meter the fluid from each well and take periodic tests as to the water ratio. What it boils down to is whether they are a good operator and whether they are not a good operator. I think they have demonstrated here that they have been a good operator in the past.

MR. SPURRIER: Anyone else?

MR. KELLAHIN: We would also like to ask that as these wells are abandoned by water encroachment that they be allowed to go to water injection wells without any necessity for further hearing before the Commission.

MR. SPURRIER: Anyone else? If not, the witness may be excused.

(Witness excused.)

MR. CAMPBELL: If the Commission please, I would like to make a request to ask the applicant if it would be agreeable. The companies which I represent have not had an opportunity to analyze the effects of the proposed extension insofar as these new injection

wells are concerned. Without intending to necessarily delay the extension of the program, if it is feasible and proper they would like to have some time to check that situation with reference to those particular wells. Perhaps it will be entirely agreeable, I do not know if it is, the Commission and the applicant could be advised. If it isn't they would like the opportunity to put some evidence on in this Case.

MR. KELLAHIN: The only difficulty with your position, the longer this program is delayed, the harder it is going to be to catch up with the drop in pressure. While we have no idea of foreclosing, Mr. Campbell's companies from entering an appearance, in fact Mr. Scott talked to me and asked if it would be all right to submit a written statement. I told him we would have no objection to that. We would want some indication of how long your--are you, in effect, asking for a continuance of this Case?

MR. CAMPBELL: Not necessarily. The position that he is in, that prior to the time that the testimony was offered, he didn't have the basis for the use of these particular wells for water injection as I have indicated. I think he would like an opportunity to look at the transcript and put on testimony in the event, he feels that it would be damaging to his interest in there. How long it would take to get the transcript, I don't know. I could try to give him the information and present it here. I can't give it to him like an engineer does.

MR. KELLAHIN: If Mr. Scott would come to Lowry's office, we would be glad to give him the information that is available even the testimony that has been presented.

MR. CAMPBELL: If the Commission would stay that, Mr. Scott or these companies should have a period of time, I don't think he should have necessarily until next month.

MR. SPURRIER: How many days?

MR. CAMPBELL: Two weeks, it maybe entirely satisfactory. I think he is entitled to a chance to look this over.

MR. KELLAHIN: If Mr. Scott will come to Lowry's office in Albuquerque, they will be glad to discuss the matter with him and show him everything they have. That offer was made to him prior to the calling of this hearing. We feel like he had the opportunity at least.

MR. CAMPBELL: Suppose we leave it he has two weeks to file a written statement. If no written statement is filed, the matter is agreeable to him.

MR. SPURRIER: We will expect that by June 2nd, that is two weeks.

MR. KELLAHIN: We have no objection to that.

MR. SPURRIER: Anything further? We will take the Case under advisement according to stipulation until June 2nd and move on to Case 698.

STATE OF NEW MEXICO)
: ss.
COUNTY OF BERNALILLO)

I, ADA DEARNLEY, Court Reporter, do hereby certify that the foregoing and attached transcript of proceedings before the New Mexico Oil Conservation Commission at Santa Fe, New Mexico, is a true and correct record to the best of my knowledge, skill and ability.

IN WITNESS WHEREOF I have affixed my hand and notarial seal this 28th day of May, 1954.

Ada Dearnley
Notary Public, Court Reporter

My Commission Expires:

June 19, 1955

Lowry Oil Company

P. O. Box 8008

Albuquerque, New Mexico

July 23, 1954

Oil Conservation Commission
Box 871
Santa Fe, New Mexico

Attention: Mr. Dusty Rhoades

Dear Dusty.

Attached in accordance with your request are the following:

1. Report of Gas-Oil Relative Permeability Determinations for the Lowry et al Operating Account Well T-129 of the South Blanco Tocito Pool.

2. Replotting of the Relative Permeability Data presented in Item 1 above.

We appreciated your complete study of our pressure maintenance enlargement proposals and the full investigation you made relating to the impracticality of gas injection for this pool.

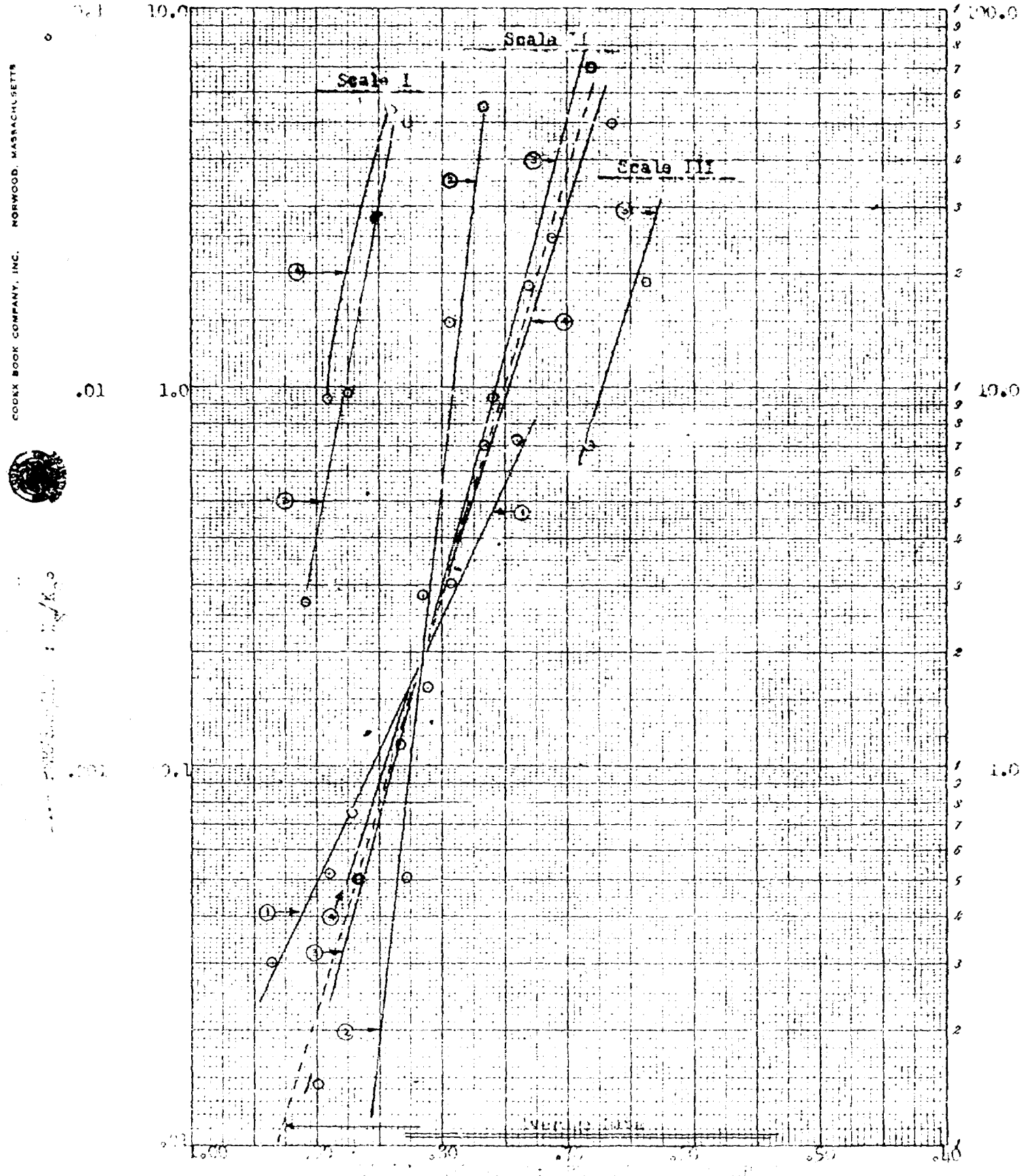
If there is any additional information you need, we will gladly supply it.

Yours very truly,

LOWRY OIL COMPANY

A. F. Holland

AFH:mhw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COOKX BOOK COMPANY, INC. NORWOOD, MASSACHUSETTS

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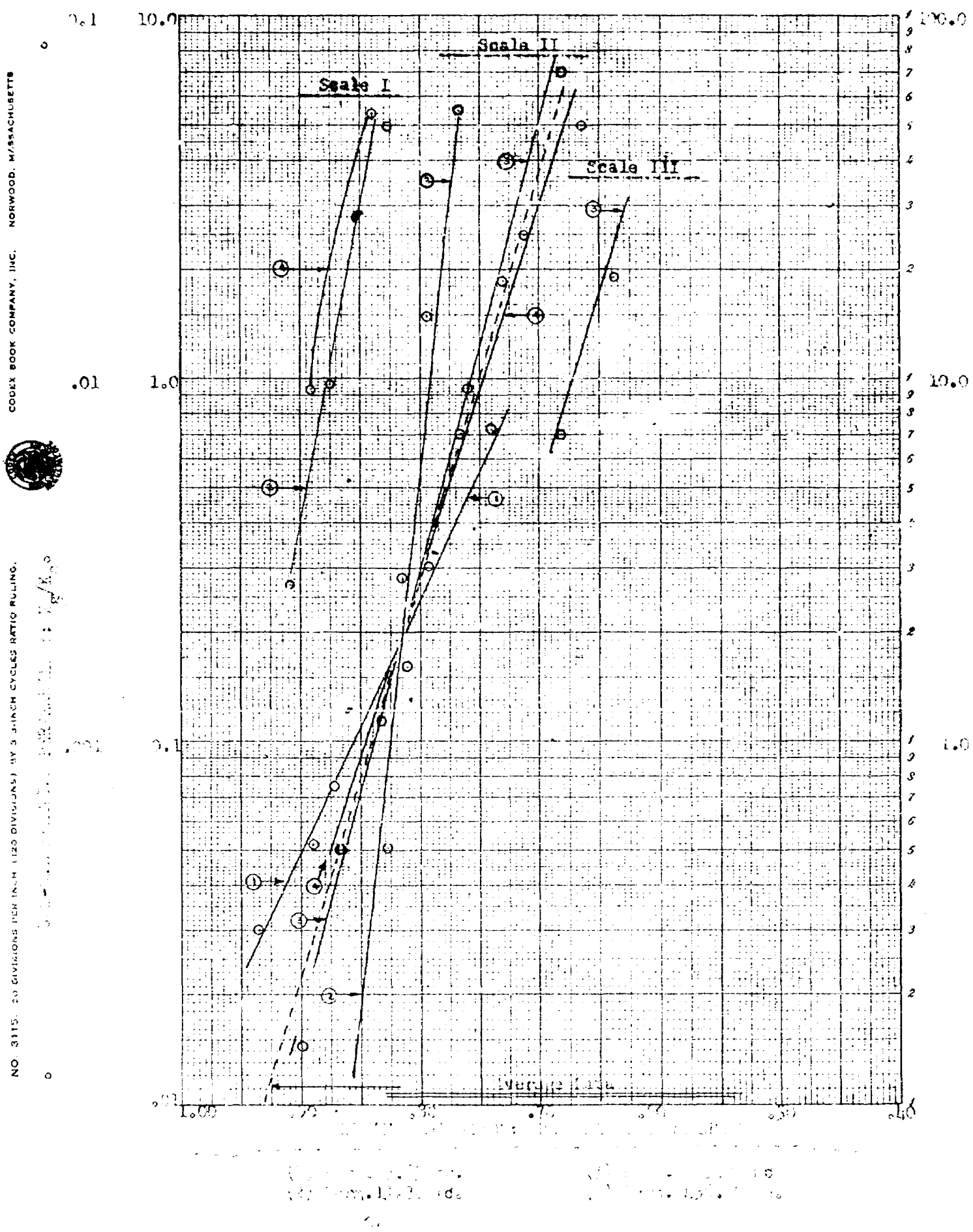
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CODEX BOOK COMPANY, INC. NORWOOD, MASSACHUSETTS
NO 3115 20 DIVISIONS PER INCH (120 DIVISIONS) BY 3 INCH CYCLES RATIO RULING.

OIL CONSERVATION COMMISSION
P. O. BOX 871
SANTA FE, NEW MEXICO

October 26, 1954

Mr. Thomas B. Scott, jr.
Brookhaven Oil Company
P. O. Box 644
ALBUQUERQUE, NEW MEXICO

Dear Sir:

We enclose copy of Order R-532 issued by the New Mexico Oil Conservation Commission in Case 697.

Very truly yours,

W. B. Macey
Secretary-Director

WBM:mr

cc: Mr. Jack Campbell, Attorney
J. P. White Building
Roswell, N M

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE HEARING CALLED BY THE OIL CONSERVATION COMMISSION OF THE STATE OF NEW MEXICO FOR THE PURPOSE OF CONSIDERING:

CASE NO. 697
ORDER NO. R-532

THE APPLICATION OF LOWRY ET AL OPERATING ACCOUNT FOR THE APPROVAL OF AN EXTENSION OF ITS PILOT PRESSURE MAINTENANCE PROGRAM IN THE SOUTH BLANCO-TOCITO POOL, RIO ARRIBA COUNTY, NEW MEXICO, AND PERMISSION TO GAUGE OIL AT A COMMON TANK BATTERY

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 o'clock a.m. on July 21, 1954, on the amended petition of Lowry et al Operating Account, before the Oil Conservation Commission of New Mexico, hereinafter referred to as the "Commission".

NOW, on this 7th day of October, 1954, the Commission, a quorum being present, having considered the testimony and exhibits offered therein, and the record pertaining to geological and engineering information received in Commission Cases Nos. 537, 555, and 607, received in this case, and testimony and evidence presented at the hearing in this cause on the original petition, on date May 19, 1954, and being fully advised in the premises,

FINDS:

(1) That due notice having been given as required by law, the Commission has jurisdiction of this cause and the subject matter thereof.

(2) That petitioner has operated a pilot pressure maintenance program in the South Blanco-Tocito Pool, Sra Juan County, New Mexico, under authority of Commission Order No. R-349, and has made regular reports as required by said order.

(3) That evidence introduced at the hearing on May 19, 1954, shows that the pilot pressure maintenance program has been successful in maintaining pressures in the South Blanco-Tocito Pool, will result in a greater ultimate recovery of oil, with reduced waste of gas, and will protect and utilize reservoir energy to the best advantage.

(4) That for successful operation of the pressure maintenance project, said project should be expanded by the addition of injection wells, as hereinafter provided, and water injection should be increased.

(5) That by its amended petition applicant seeks approval for the use of its well, T-85, located in SW/4 Section 4, Township 26 North, Range 6 West, NMPM, and that in all other respects the petition herein is the same as that originally filed.

(6) That, in order to facilitate operations and reduce economic losses, petitioner should be permitted to meter or gauge oil production from its leases in the South Blanco-Tocito Pool into a central tank battery, and such procedure will affect two basic leases of common royalty ownership, and that the rights of royalty owners and owners of overriding royalties will not be impaired, but rather will be fully protected.

(7) That extension of the pressure maintenance program and metering or gauging of oil into a central tank battery by petitioner is in the interests of conservation, will prevent waste, result in an increased ultimate recovery of oil, and that correlative rights will be protected.

IT IS THEREFORE ORDERED:

(1) That the application of Lowry et al Operating Account for permission to extend its pressure maintenance program in the South Blanco-Tocito Pool be, and the same hereby is approved.

(2) That petitioner be authorized to utilize its well T-85, SW/4 Section 4, Township 26 North, Range 6 West, NMPM, as an injection well, as an addition to the authority heretofore granted in Commission Order No. R-349, water to be injected to enter the Tocito sands, producing formation of the South Blanco-Tocito Pool, Rio Arriba County, New Mexico.

(3) That in the event proration of oil is instituted in the South Blanco-Tocito Pool, suitable provision shall be made for the transfer of allowables from injection wells to other producing wells.

(4) That petitioner, as operator, shall submit monthly reports to the Commission showing the monthly oil production, monthly water production, the amount of water injected into each well bore, and such other information as the Commission may from time to time require for the purpose of keeping fully informed as to the progress of operations under the terms of this order.

(5) That petitioner may, as abandonment of producing wells is necessitated by water encroachment, utilize such wells as additional water injection wells upon submitting proper notice to the Commission Secretary and Director, and thereafter reporting operations affecting such wells as hereinabove provided; provided, however, notice of such proposed utilization shall also be given to all parties at interest, and in the event a protest is filed with the Commission within 20 days after the date such notice is served, the Commission may, in its discretion, set the matter for hearing.

IT IS FURTHER ORDERED:

(1) That the application of Lowry et al Operating Account for permission to gauge or meter oil production from Federal Lease NM-03551 and Federal Lease SF-079035-A in a common or central tank battery be, and the same hereby is approved, subject to like approval being obtained from the U. S. Geological Survey; provided, however,

(a) That Petitioner make suitable provision for the metering of oil production to the end that proper accounting can be made to all persons having an interest in such production;

(b) That tests be made at regular intervals of not less than once each month to determine water content of oil produced, for the purposes of accounting for oil production under the method of accounting set up by petitioner as operator.

DONE at Santa Fe, New Mexico, on the day and year hereinabove designated.

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

E. L. Mechem

EDWIN L. MECHEM, Chairman

E. S. Walker

E. S. WALKER, Member

W. B. Macey

W. B. MACEY, Member and Secretary

SEAL

For
Case 697
file

BROOKHAVEN OIL COMPANY
FIRST NATIONAL BANK BUILDING
(MAIL) P. O. BOX 644
Albuquerque, New Mexico
PHONE 7-8853 TELETYPE AQ-96

MAIN OFFICE OCC
1954 JUL 23 AM 9:41

July 23, 1954.

Mr. William G. Macey
New Mexico Oil Conservation Commission
State Capitol
Santa Fe, New Mexico

SUBJECT: OCC Case 697

Dear Mr. Macey:

Attached is correspondence between Mr. Tim G. Lowry and myself relative to unitizing the NW/4 of Section 5-26N-6W, owned by us in Lowry's water flooding program. This is the Lowry letter that Mr. Kellahin was unable to produce at the hearing on last Wednesday and it is the only letter I have ever received from Mr. Lowry relative to the subject.

I believe you will see that Mr. Lowry, after making his original telephone suggestion as explained in the first paragraph of my letter to him of June 18th, was not too much in earnest and merely wanted me to get a well drilled in the NW/4 of Section 5 for his benefit. From the map you will see that Lowry has to eventually drill some oil wells in the S/2 of Section 5 because of an offset obligation for the requirements of development.

Very truly yours,

BROOKHAVEN OIL COMPANY
DACRESA CORPORATION

Thos. B. Scott, Jr.
President

TBS:ms

Enc. - Copy of letter 6/18/54 to Mr. Lowry
Copy of letter 6/21/54 from Mr. Lowry

_C O P Y_

June 16, 1954

Mr. Timothy C. Lowry
Eckert, Petersen & Lowry
135 South La Salle St.
Chicago 3, Illinois

Dear Tim:

I have been thinking over our telephone conversation the other day wherein you requested that the undersigned companies consider giving up their lease rights below the Pictured Cliffs in the NW/4 of Section 5, Township 26 North, Range 6 West, for an overriding royalty on all of Lowry's leases which these companies originally sold to Roswell and including this NW/4 of Section 5.

This problem I have approached from a producing acreage and a reserve basis, which I will attempt to describe.

1. Presently the NW/4 of Section 5 is about 1/28th of the present and future possibilities in the Tocito. Therefore an override in the whole should be based on 1/29th, or approximately a 3.5% override on the producing and prospective Tocito area.

2. Inasmuch as we would be willing to gamble with you on future possibilities on the whole area you have under lease, not only the Tocito, I might be able to persuade the directors and stockholders of the undersigned companies to transfer to you all of our lease rights under the NW/4 of Section 5 blow the Pictured Cliffs formation for a 2½% overriding royalty on all of your holdings as mentioned above. This would include the attached list of leases and their descriptions.

3. As to the SE/4 of Section 15 and SW/4 of Section 13, all of the lease rights today are subject to the Mead Contract. Unless Mead drills a Dakota test on each of these by September 19, 1956 and offsets any wells that you might drill, the lease rights below the Pictured Cliffs must be relinquished by Mead to us. From this you will see that I can not negotiate on these two quarter sections at the present time and possibly you may never want them anyway.

With kindest regards, I remain,

Very truly yours,

BROOKHAVEN OIL COMPANY
DACRESA CORPORATION

Thos. H. Scott, Jr.
President

THS:ms

C O P Y

ECKERT, PETERSON & LOWRY
135 South La Salle Street
Chicago 3, Illinois

June 21, 1954.

Mr. Thomas F. Scott, Jr., President
Brookhaven Oil Company
First National Bank Building
Albuquerque, New Mexico

Dear Tom:

I'm afraid I do not entirely comprehend the suggestion in your letter of June 18th.

Is it that you propose that we now assign to you an additional ORR of 2-1/2% on some 13,700 acres, of which about 2500 are proven producing Tocito, in return for an assignment of lease rights below the Pictured Cliff on your 160 acres which is neither producing nor proven?

If so, I don't think we can get together, and suggest that if you can get someone to drill a test well on your 160, that we then unitize on a basis of acre feet of pay for the water injection program if your test proves production, which we believe is quite uncertain.

I would appreciate it if you would discuss this preliminarily with Red Hunt.

Very truly yours,

TGL/H

(Sgd.) Tim G. Lowry

cc: A. A. Hunt

NEW MEXICO OIL CONSERVATION COMMISSION

SANTA FE, NEW MEXICO

IN THE MATTER OF THE APPLICATION OF LOWRY, ET AL OPERATING ACCOUNT FOR THE APPROVAL OF AN EXTENSION OF ITS PILOT PRESSURE MAINTENANCE PROGRAM IN THE SOUTH BLANCO-TOCITO POOL, RIO ARRIBA COUNTY, NEW MEXICO, AND PERMISSION TO GUAGE OIL AT A COMMON TANK BATTERY.

Case 697

PETITION

TO THE OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO

Comes the undersigned, Lowry et al Operating Account, with offices at 142 Munroe NE, Albuquerque, New Mexico, and petitions the Commission for an order approving the extension of its pilot pressure maintenance program in the South Blanco-Tocito Pool, Rio Arriba County, New Mexico, by the addition of wells to be utilized for water injection purposes and authority to increase the amount of water to be injected; and for an order to permit guaging of oil at a common tank battery; and in support thereof Petitioner would show:

1. That the Commission has heretofore approved pressure maintenance in the South Blanco Tocito Pool, Rio Arriba County, New Mexico, by its order No. R-349, and that upon approval of this petition, this pressure maintenance program will be extended, and will be in the interests of conservation.

2. That geological information has heretofore been presented to the Commission in Case No. 537 and Case No. 555, which information Petitioner respectfully requests the Commission to take notice of in connection with this petition; and that further information will be offered in connection with this petition.

3. That the guaging of oil at a common tank battery will be in the interests of efficient management of the pressure maintenance program, and that the rights of all persons interested

including royalty owners, will be protected.

WHEREFORE Petitioner requests the Commission, after notice and hearing as required by law and the Rules and Regulations of the Commission, to enter its order approving extension of the pressure maintenance program heretofore approved by Commission order No. R-349, and to approve the guaging of oil at a common tank battery, together with such other provisions as in the judgment of the Commission may be deemed fit and proper.

Respectfully submitted,

LOWRY et al OPERATING ACCOUNT

By Jason W. Kellahin
Attorney for Petitioner

Jason W. Kellahin
P. O. Box 361
Santa Fe, New Mexico

NEW MEXICO OIL CONSERVATION COMMISSION

SANTA FE, NEW MEXICO

IN THE MATTER OF THE APPLICATION OF LOWRY, ET AL OPERATING ACCOUNT FOR THE APPROVAL OF AN EXTENSION OF ITS PILOT PRESSURE MAINTENANCE PROGRAM IN THE SOUTH BLANCO-TOCITO POOL, RIO ARRIBA COUNTY, NEW MEXICO, AND PERMISSION TO GUAGE OIL AT A COMMON TANK BATTERY.

Case No. 697

AMENDED PETITION

TO THE OIL CONSERVATION COMMISSION, SANTA FE, NEW MEXICO

Comes now the undersigned, Lowry et al Operating Account, with offices at 142 Munroe NE, Albuquerque, New Mexico, and respectfully requests this commission to accept this as an amendment to its petition in the above styled cause:

1. Petitioner requests that its well designated as T-85 be designated as a water injection well, pursuant to the petition filed in this cause.

2. That the Commission consider the testimony and exhibits heretofore offered in this case in connection with this amended petition.

3. That in the event additional testimony is required by the commission, that this case be set for special hearing at an early date, and that the Commission enter its order granting the petition in all respects as requested, except as herein amended.

Respectfully submitted,

Jason W. Kellahin
Attorney for Petitioner

OIL CONSERVATION COMMISSION
P. O. BOX 871
SANTA FE, NEW MEXICO

July 6, 1954

Mr. Thomas B. Scott
Brookhaven Oil Company
P. O. Box 644
Albuquerque, New Mexico

Dear Mr. Scott: RE: OCC Case 697

We attach for your information copy of the legal notice as sent out today in Case 697, which as you will note is being readvertised for special hearing at 9 a.m. on July 21, 1954.

Very truly yours,

W. B. Macey
Chief Engineer

WBM:mr

COPY

NOTICE OF PUBLICATION
STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION
SANTA FE - NEW MEXICO

The State of New Mexico by its Oil Conservation Commission hereby gives notice pursuant to law and the Rules and Regulations of said Commission promulgated thereunder of the following special public hearings to be held at 9 o'clock a.m. on July 21, 1954, Mabry Hall, State Capitol, Santa Fe, New Mexico.

STATE OF NEW MEXICO TO:

All named parties and persons having any right, title, interest or claim in the following case, and notice to the public.

CASE 697: (Readvertisement)

In the matter of the application of Lowry et al Operating Account for the approval and extension of its pilot pressure maintenance program in the South Blanco-Tocito Pool, Rio Arriba County, New Mexico, and for permission to gauge oil at a common tank battery.

Applicant, in the above-styled cause, seeks an order authorizing the extension of its pilot pressure maintenance program in the South Blanco-Tocito Pool, Rio Arriba County, New Mexico, as originally granted in Order R-340 issued in Case 555, by the addition of wells to be utilized for water-injection purposes, and by increasing the amount of water to be injected. Applicant also seeks authority to gauge oil at a common tank battery.

GIVEN under the seal of the Oil Conservation Commission of New Mexico at Santa Fe, New Mexico, this 6th day of July, 1954.

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

R. R. SPURRIER,
Secretary

S E A L

WBM— Publish
Issue proposed order
in Case 697. (Other
Copies in file ——)

NEW MEXICO OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
COMMISSION OF THE STATE OF
NEW MEXICO FOR THE PURPOSE OF
CONSIDERING:

CASE NO. 697
ORDER NO. R-_____

THE APPLICATION OF LOWRY, ET AL.
OPERATING ACCOUNT FOR THE APPROVAL
OF AN EXTENSION OF ITS PILOT PRESSURE
MAINTENANCE PROGRAM IN THE SOUTH
BLANCO-TOCITO POOL, RIO ARRIBA
COUNTY, NEW MEXICO, AND PERMISSION TO
GUAGE OIL AT A COMMON TANK BATTERY

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 o'clock a. m. on July 21, 1954, on the amended petition of Lowry et al. Operating Account, before the Oil Conservation Commission of New Mexico, hereinafter referred to as the "Commission."

NOW, on this _____ day of _____, 1954, the Commission, a quorum being present, having considered the testimony and exhibits offered therein, and the record pertaining to geolobical and engineering information received in Commission Cases Nos. 537, 555, and 607, received in this case, and testimony and evidence presented at the hearing in this cause on the original petition, on date May 19, 1954, and being fully advised in the premises,

FINDS:

1. That due notice having been given as required by law, the Commission has jurisdiction of this cause and the subject matter thereof.

2. That petitioner has operated a pilot pressure maintenance program in the South Blanco-Tocito Pool, San Juan County, New Mexico, under authority of Commission Order No. R-349, and has made regular reports as required by said order.

3. That evidence introduced at the hearing on May 19, 1954, shows that the pilot pressure maintenance program has been suc-

essful in maintaining pressures in the South Blanco-Tocito Pool, will result in a greater ultimate recovery of oil, with reduced waste of gas and will protect and utilize reservoir energy to the best advantage.

4. That for successful operation of the pressure maintenance project, said project should be expanded by the addition of injection wells, as hereinafter provided, and water injection should be increased.

5. That by its amended petition applicant seeks approval for the use of its well, T-85, located in the SW¼, Sec. 4, T. 26 N., R. 6 W., N. M. P. M., and that in all other respects the petition herein is the same as that originally filed.

6. That, in order to facilitate operations and reduce economic losses, petitioner should be permitted to meter or guage oil production from its leases in the South Blanco-Tocito Pool into a central tank battery, and such procedure will affect two basic leases of common royalty ownership, and that the rights of royalty owners and owners of overriding royalties will not be impaired, but rather will be fully protected.

7. That extension of the pressure maintenance program and metering or guaging of oil into a central tank battery by petitioner is in the interests of conservation, will prevent waste, result in an increased ultimate recovery of oil, and that correlative rights will be protected.

IT IS THEREFORE ORDERED:

1. That the application of Lowry et al Operating Account for permission to extend its pressure maintenance program in the South Blanco-Tocito Pool be, and the same hereby is, approved.

2. That petitioner be authorized to utilize its well T-85, SW¼, Sec. 4, T. 26 N., R. 6 W., N.M.P.M., as an injection well, as an addition to the authority heretofore granted in Commission Order No. R-349, water to be injected to enter the Tocito sands, producing formation of the South Blanco-Tocito Pool, Rio Arriba County, New Mexico.

3. That in the event prorationing of oil is instituted in the South Blanco-Tocito Pool, suitable provision shall be made for the transfer of allowables from injection wells to other producing wells.

4. That petitioner, as operator, shall submit monthly reports to the Commission showing the monthly oil production, monthly water production, the amount of water injected into each well bore, and such other information as the Commission may from time to time require for the purpose of keeping fully informed as to the progress of operations under the terms of this order.

5. That petitioner may, as abandonment of producing wells is necessitated by water encroachment, utilize such wells as additional water injection wells upon submitting proper notice to the Commission Secretary and Director, and thereafter reporting operations affecting such wells as hereinabove provided; provided, however, notice of such proposed utilization shall also be given to all parties at interest, an d in the event a protest is filed with The Commission within 20 days after the date such notice is served, the Commission may, in its discretion, set the matter for hearing.

IT IS FURTHER ORDERED:

1. That the application of Lowry et al. Operating Account for permission to guage or meter oil production from Federal Lease NM-03551 and Federal Lease SF-079035-A in a common or central tank battery be, and the same hereby is approved, provided, however,

(a). That Petitioner make suitable provision for the metering of oil production to the end that proper accounting can be made to all persons having an interest in such production;

(b). That tests be made at regular intervals of not less than once each month to determine water content of oil produced, for the purposes of accounting for oil production under the method of accounting set up by petitioner as operator.

DONE at Santa Fe, New Mexico, on the day and year hereinabove designated.

NEW MEXICO OIL CONSERVATION COMMISSION

Edwin L. Mechem, Chairman

E. S. Walker, Member

S E A L

W. B. Macey, Secretary

Case 697

BROOKHAVEN OIL COMPANY
INTERNATIONAL BANK BUILDING
(MAIL) P. O. BOX 644
Albuquerque, New Mexico
PHONE 7-1152 TELETYPE AQ-96

July 29, 1954.

Loury et al Operating Account
P. O. Box 8008
Albuquerque, New Mexico

Gentlemen:

Please be advised that the undersigned notes that you have failed to offset Johnston's #6 Tocito well located in the Southeast Quarter (SE/4) of Section 6, Township 26 North, Range 6 West.

Having an overriding royalty under the Southwest Quarter (SW/4) of Section 5, Township 26 North, Range 6 West, I wish to advise that we will require your drilling an offset to the Tocito formation in the Southeast Quarter (SW/4) of Section 5 in order to avoid drainage by Johnston's well #6.

Very truly yours,

BROOKHAVEN OIL COMPANY
DACRESA CORPORATION

Thos. B. Scott, Jr.
President

TFS:ms

CC: U.S. Geological Survey
P. O. Box 6721
Roswell, New Mexico

Mr. W. B. Macey
Oil Conservation Commission
State Capitol
Santa Fe, New Mexico

P.S. to Mr. Macey:

For your information re Case 697.

TFSJr.

for Case 697 file

Lowry Oil Company

P. O. Box 8008

Albuquerque, New Mexico

MAIN OFFICE OCC
1954 JUL 26 AM 9:41

July 23, 1954

Oil Conservation Commission
Box 871
Santa Fe, New Mexico

Attention: Mr. W. B. Macy
Secretary and Director

Gentlemen:

Lowry et al Operating Account presented Case Number 697 on July 21, 1954, requesting approval of certain plans from the New Mexico Oil Conservation Commission relating to the expansion of the pressure maintenance project for the South Blanco Tocito Pool.

At this Hearing Mr. Thomas B. Scott stated to the Commission, in substance, that no consideration had been given toward unitization of properties in the South Blanco Tocito Pool. This statement was refuted by Mr. Jason Kellahin representing Lowry Oil Company, and the Commission was advised that Mr. Scott had received a letter stating that unitization of properties would be considered providing the drilling of a test well proved his leases productive.

A copy of the above-mentioned letter was not available for presentation to the Commission during the proceedings of the Hearing. Attached for your information and file is a photostatic copy of our copy of the letter which was written by Mr. T. G. Lowry to Mr. Thomas B. Scott proposing unitization of properties providing a test well proves production.

Yours very truly,

LOWRY OIL COMPANY

A. F. Holland

AFH:mhw

encl.

cc: Mr. Jason Kellahin
Mr. Thomas B. Scott

ILLEGIBLE

LAW OFFICES

ECKERT, PETERSON & LOWRY

FIELD BUILDING

135 SOUTH LA SALLE STREET

CHICAGO 3

ABE R. PETERSON
TIMOTHY G. LOWRY
OWEN RALL
HENRY P. [illegible] W. HARRER
WALTER A. ROSS, JR.
JOHN R. [illegible]RTER
HAROLD A. HUFF
RICHARD V. HENRY, JR.
J. HAYDEN MACDONALD
WILLIAM A. CANNON
LEWIS E. BUCKELEY, JR.
WALTER P. STEFFEN
GERHARD E. SEIDEL
HERBERT C. LOTH, JR.
ELROY C. SANDQUIST, JR.
IRVING G. SWENSON
ROBERT G. SCHLOERB
JOHN W. GILLIGAN
THEODORE J. TSOUMAS

WALTER H. ECKERT
[illegible]
TOM LEEMING
[illegible]

ANDOVER 3-7300

June 21, 1954

Mr. Thomas B. Scott, Jr., President
Brookhaven Oil Company
First National Bank Building
Albuquerque, New Mexico

Dear Tom:

I'm afraid I do not entirely comprehend the suggestion in your letter of June 18th.

Is it that you propose that we now assign to you an additional ORR of 2-1/2% on some 13,700 acres, of which about 2500 are proven producing Tocito, in return for an assignment of lease rights below the Pictured Cliff on your 160 acres which is neither producing nor proven?

If so, I don't think we can get together, and suggest that if you can get someone to drill a test well on your 160, that we then unitize on a basis of acre feet of pay for the water injection program if your test proves production, which we believe is quite uncertain.

I would appreciate it if you would discuss this preliminarily with Red Hunt.

Very truly yours,

TGL

TGL/M

cc: A. A. Hunt

I CERTIFY THAT THIS IS A TRUE AND EXACT PHOTO
COPY OF THE ORIGINAL RECEIVED AND WAS MADE BY ME
THIS 17 DAY OF

Photostat Operator
R. M. METCALFE, INC.
ALBUQUERQUE, NEW MEXICO

Lowry Oil Company

MAIN OFFICE OCC

1954 JUN 15 AM 8:19

P. O. Box 8008
Albuquerque, New Mexico

June 14, 1954

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

Attention: Mr. R. R. Spurrier
Secretary and Director

Dear Mr. Spurrier:

On May 19, 1954, the New Mexico Oil Conservation Commission heard Case No. 697 relating to an application by Lowry et al Operating Account for permission to expand the pressure maintenance project for the South Blanco Tocito Pool. At this hearing it was stated that attempts were being made to secure a cooperative program in the pool by securing the participation of the Johnston Oil and Gas Company in the project.

Subsequent to the hearing the Johnston Oil and Gas Company have advised that they do not desire to participate in the pressure maintenance program at this time. They have further advised that they have no objection to the pressure maintenance project now being operated by Lowry, and that they have no objection to our proceeding to inject water in any of the Tocito wells operated by Lowry et al Operating Account.

Attached for your information and file is a photostatic copy of the letter received from the Johnston Oil and Gas Company stating they have no objection to the operation of a pressure maintenance project by the Lowry et al Operating Account in the South Blanco Tocito Pool.

Yours very truly,

LOWRY OIL COMPANY

A. F. Holland

AFH/leh

Enclosure

CC: Mr. Jason W. Kellahin w/encl
Mr. Tom B. Scott w/encl

Memo

From
W. F. Macey
~~R. R. SPURRIER~~
Director

To attached is Rhodes report on Lowry waterflood and more particularly on Seath's letter.

I agree with him and suggest we write another based on his recommendations. Believe the Canyons could check into enforced unitization

W. F. M.
6/11

9 June 1954

Memorandum to W. B. Macey

Subject: Case 697

SOUTH BLANCO TOCITO RESERVOIR DATA:

STRUCTURE:

Lenticular sand reservoir. Occurs as sand lens in Tocito sandstone. Dips approximately 80 feet per mile northeast. Upper portion of sand is fairly porous and permeable. Lower portion is very tight and is productive only bedause of fracture system.

RESERVOIR DATA:

Permeability: Upper Sand: 121 mds. hor., 31.6 mds. vert. (gross pay)
Lower Sand: 1.06 mds. hor., .41 mds vert.
Weighted Average Reservoir Permeability: [redacted] mds. hor. (Based on gross pay section)
Apparent K_w: 32.12 mds. 71
Apparent K_g/K_o: .02[redacted]

Porosity: Upper Sand 13.9 %
Lower Sand 11.0 %

K = 109 mds based on net pay section

Saturation Pressure: 2051 psig
Reservoir Pressure, (7-26-51): 2197 psig
Reservoir Pressure, (4-1-54): 1944 psig
Pressure Drop per Thousand Barrels Produced: .273 psig
Reservoir Temperature: 175 deg. F.
Gas in Solution: 862 cu ft per bbl.
Producing GOR as of 6-51: 1510 cu ft per bbl.
Producing GOR as of 4-54: 1360 cu ft per bbl.
Formation Volume Factof: 1.52
Viscosity of Liquid Phase: .39 cps.
Average Sand Thickness: 11.0 feet. (net)

PRODUCTION:

Cumulative Oil to 5-1-54: 925,817 bbl.
Cumulative Gas to 5-1-54: 1,480,355 MCF

Production for year 1953: Oil: 404,906 bbl
Gas: 739837 MCF
Water: .1 %

RESERVES:

Total reserves as of discovery: 13,602,220 bbls. (13,054,860 bbls upper sand)
(547,360 bbls lower sand)

Recovery Factors: Upper Sand: 25.00 %
Lower Sand: 10.00 %

Recoverable Reserves as of date of discovery: 3,330,230 bbls. (by primary rec.)

Remaining Recoverable Reserves as of 5-1-54: 2,404,413 bbls. (1314 bbls per acre)

DISCUSSION OF STATEMENT BY THOS. B. SCOTT JR.

Page 2 of statement:

1. A study of various pressure maintenance projects employing water as the pressuring medium shows many projects injecting 5, 6, or as high as 8 barrels of water per barrel of oil recovered.

2. Scott's statement concerning the decline of pressures in all areas except in the vicinity of the injection well serves to confirm the effectiveness of the water flood program in the reservoir.

3. True, well T-134 topped the Tocito at -168 feet while T-109 called same at -188 feet. However, T-134 is open in the interval -178 feet to -220, while T-109 produces from open hole below -190 feet, thereby reducing the net difference to 12 feet rather than 20 feet as Scott suggests. Even the 20 foot difference should make little difference in the effects of the water flood program particularly when considering the irregularities which could be present in the vertical delineation of this sand lens.

Page 3 of statement:

1. The wall rock of the injection well bore could easily become clogged with sediment, organiic matter and particularly precipitated salts. It would therefore be logical to assume that the "injectivity index" of a water injection well would suffer a gradual reduction as the flood program progresses and that a gradual build-up in pressure would be noted although the volume of water injected remained constant.

2. T-157 is directly southwest of the injection well, T-134. The South Blanco Tocito structure dips to the northeast. Therefore, the water is seen to be migrating up-structure as it should A water influx pattern in a water flood project such as this would take the form of a truncated ellipse or lemiscate when viewed from above. Such ellipse would have the "a" or long axis running directly through the injection well, with the injection well located at or near the lower end of the axis, depending on the dip of the structure. The long axis of the figure would trend directly up-dip. Assuming this influx pattern to be the case here, T-157 would be the logical well to water out first since it lies directly up-dip from the injection well and hence directly on the long axis of an elliptical water influx pattern. A radial influx pattern such as Mr. Scott assumes to exist could only be obtained if all recovery wells remained shut in while the water injection program continued.

3. Scott's contention that the pay thickness increases down dip is apparently based on a very scanty bit of information. 11.2 feet of pay section were encountered in well T-85, .2 feet above the average for the reservoir. 8.2 feet of pay were encountered in well D-83 which is even closer to Scott's property than is T-85. While I cannot say for certain that the pay section increases in thickness down dip, I can say without fear of much contradiction that the permeability in the Tocito section very definitely decreases. Lowry found the Tocito so tight in D-83 that they were unable to complete a commercial well in the section. The permeability in T-85 is well below the average at 5.1 mds.

Page 4 of statement:

1. Pressure maintenance through gas injection is not too attractive a proposition in the South Blanco Tocito reservoir due to a high apparent K_g/K_o ratio. This is a situation which has been aggravated since discovery due to the increased ratio of gas to oil in the reservoir. The ratio encountered here approximates [redacted] at 30 % saturation. → see note at end of memo, .024

oil

Another factor to be considered when contemplating gas injection as a means of pressure maintenance in this reservoir is the rapid rise in GOR's during the early life of the field. These high GOR's were apparently caused by high rates of production at that time. This rapid increase in GOR's indicates that there will be higher gas saturation in the vicinity of the producing well bores than in the unproduced segments of the reservoir. This variation in gas saturation throughout the reservoir would promote gas channelling, thereby reducing the efficiency of a gas injection program.

In a flat dipping structure such as this, it is reasonable to assume that injected gas would channel directly through to recovery wells, thereby preventing the maintenance of uniform pressure conditions.

I realize that the plan to inject water into well T-123 is now abandoned due to the reluctance of Johnston to join in the pressuring plan, and that Scott's objection to water injection is necessarily abandoned also as far as this well is concerned. I include the above considerations to call your attention to the situation as it does exist, and to comment at this time on any program proposing gas injection which may come up in the future.

2. Well D-83 is a commercial gasser completed in the Dakota. However, the question involved in deciding the merits of plugging this well back to the Tocito for use as an injection well is a question of economics and conservation rather than a question of conservation as such. Economics favor the plugging back of this well to use it as a water injection well for the purpose of pressure maintenance in the Tocito oil reservoir thereby contributing to the increased ultimate recovery of oil from the Tocito. This is especially true since Lowry's intention is to recomplete the well in the Dakota when its usefulness as a water injection well is ended. Should Lowry actually do as they propose in effecting this recompletion, the interests of conservation would be served providing, of course, the value of the Dakota gas is not lessened in the interim.

3. It would be possible to set a bridging plug in D-83 and employ the well for injection purposes by recompleting in the Tocito at a depth of approximately -170 feet. Well T-85, located approximately 1/2 mile distant, is completed at a depth of -180 feet, 5 feet below the top of the Tocito. T-109 is completed at -190 feet ro 2 feet below the top of the Tocito, and is located 1 1/2 miles distant from D-83. These diferences in elevation, particularly over these distances, should make little or no difference in the effectiveness of the water flood. Any up-dip force exerted by the injected water also has a down-dip component which is directly proportional to the volume of water injected. It looks to me as if T-85 would make a better injection well than would D-83. The permeability in T-85 is 5.1 mds. against 3.9 mds in D-83. Permeability to water in T-85 is given as .160 mds while water permeability in D-83 runs only .106 mds. T-85 produces on the order of 17 BOPD so the loss of the well would make little difference in the overall production picture.

4. As for any damage to oil reserves under the NW/4 of section 5 owned by Brookhaven and Dacresa, such damage is possible providing there are any oil reserves under this piece of real estate. It is noted that D-83, the nearest Tocito test to the NW/4 of the section could not make a well in the Tocito. Permeability in D-83 is only 3.9 mds and permeability in T-85, another close well, is only 5.1 mds. Tocito porosity in both D-83 and T-85 was below average being 10.6 and 11.2 % respectively. Pay section in D-83 (Tocito) is but 8.2 feet. Sounds to me as if the lens is lensing out in the direction of the NW/4 of section 5. Also, as mentioned above, any water injection program has a component of force in both the up-dip and down-dip directions. A down-dip flood is not so efficient as is an up-dip flood, and is effective to a degree directly proportional to the volume of water introduced into the reservoir. When this fact is considered, it seems quite possible that the reservoir under the NW/4 of

section 5 could be helped just as easily as it could be harmed. The reservoir has good vertical permeability, thereby allowing fluids to segregate easily within the confines of the reservoir.

5. It is within the realm of possibility that, in the later stages of the pressuring program, oil now under the Lowry properties could wind up under the Johnston properties. Recommendations to be made at the end of this memorandum will help to counteract such migration and serve to protect the correlative rights of those concerned.

Page 5 of statement:

1. Eventually, it may be necessary to employ well T-109 as an injection well and to drill additional injection wells in the south half of section 4, in section 6 or 32 and in section 31. Drilling of these additional wells would assist in maintaining a uniform rate of frontal advance upstructure — a desirable feature in any water flood program.

2. Based upon my study of the South Blanco Tocito reservoir, I find that the reservoir lends itself particularly well to pressure maintainence through water injection. This is the only practical method of obtaining increased ultimate recovery. The injection of gas is not too attractive a proposition as mentioned earlier.

Page 6 of statement:

1. I can see no reason why Lowry should not be allowed to produce into a common tank battery so long as they meter the production of each lease separately. The ownership of both leases presently concerned is identical. Even though the ownership picture may change in the future as Scott points out, such changes would be made with the knowledge that the leases produce into common tankage, and i can foresee no difficulties of any consequence arising because of such ownership changes, particularly if the entire reservoir is unitized.

COMMENTS ON LOWRY'S APPLICATION:

1. The only quarrel (a weak one) I can find with Lowry's application and the proposed order presented by Jason W. Kellahin Esq., is Lowry's intention to use well D-83 as their second injection well. It is my thought that well T-85 would better serve the purpose due to the greater permeabilities encountered as pointed out in paragraph 5, page 3 of this memorandum. Bear in mind that both well D-83 and T-85 will eventually be employed as water injection wells regardless of any characteristics which may make one better for the purpose than the other.

RECOMMENDATIONS:

1. I agree with Mr. Scott in that some sort of cooperative agreement between Lowry, Johnston and possibly others should be effected for the purpose of conducting a pressure maintenance program by water injection in the entire reservoir. Unitization of the Tocito zone would remove a great number of petty differences between operators and would lay the groundwork for a 100% effective water flood operation. Hayhaps the Commission could write an order intended to promote such an agreement.

2. I recommend that the Commission conduct a study to determine an optimum producing rate for this reservoir along with the determination of an optimum water injection rate at an optimum pressure. My calculations show the rupturing pressure for this reservoir to be approximately 8,000 psi. The current injection pressure is consider-

ably under this figure, but may not be an optimum.

3. I recommend that Lowry's application for an extension fo the current water flood program be approved, but that they reconsider lightly their proposal to convert well D-83 to a water injection well in preference to well T-85.

4. I recommend that Lowry be permitted to produce into a common tank battery providing they meter production from each lease separately, and that they run periodic tests on each well to determine the water-oil ratio.

HNR

NOTE: Refer to last paragraph, page 2 of memorandum

The apparent Kg/Ko ratio of .024 was calculated assuming a free gas saturation of 2.7 percent with total oil in reservoir of 10,000,000 barrels. This is a minimum volume of oil and hence would provide the highest ratio. This ratio is appreciably higher than any published ratio for similar reservoirs with similar free gas saturation.

Assuming a free gas saturation of 3.5 percent — which more nearly approximates reservoir conditions as they now exist — and assuming 10,000,000 barrels of oil in the reservoir, the Kg/Ko ratio figures out to .049 — still much higher than any published ratio for reservoirs with similar free gas saturation.

HNR

BROOKHAVEN OIL COMPANY
FIRST NATIONAL BANK BUILDING
(MAIL) P. O. BOX 644
Albuquerque, New Mexico
PHONE 7-8853 TELETYPE AQ-86

June 11, 1954.

New Mexico Oil Conservation Commission
State Capitol
Santa Fe, New Mexico

Att: Mr. R. R. Spurrier, Secretary

Dear Sirs:

Referring to Case 697 and to the undersigned's statement sent you under cover of June 1st, we are in receipt today of copy of letter dated June 9th from Mr. Kellahin, Attorney for Lowry et al Operating Account, to the New Mexico Oil Conservation Commission, wherein he requests withdrawal from consideration the utilization of well T-123 for water injection purposes, giving as reason the lack of full cooperation on the part of Johnston Oil and Gas Company, owners of offsetting leases.

It is our understanding from said letter, that Lowry et al Operating Account continues to seek approval to plug back well D-83 (located in the NW/4 SE/4 of Section 5-26N-6W), from the Dakota formation where it is now producing commercially, to the Tocito formation and, without producing it or even attempting to produce it from said Tocito formation, to inject water into said formation.

Please be advised that the undersigned companies own all the lease rights below the Pictured Cliffs formation under the NW/4 Section 5-26N-6W, offsetting to the northwest well D-83, and that there has been no attempt for agreement nor is there presently any understanding between Lowry et al Operating Account and the undersigned with reference to water injection in well D-83; and, without such an agreement or the unitization of the NW/4 of Section 5 with the other three-fourths of this section, it would not be feasible for Lowry to inject water into the Tocito formation in well D-83, this being the same reasoning as is acknowledged with reference to the Johnston properties and well T-123. As a matter of fact, injection of water in well D-83 without unitization of Section 5 would be highly damaging to the lease rights owned by the undersigned in the NW/4 of said section. Please refer to our statement of June 1, 1954, page 4, second paragraph under "Comment".

Very truly yours,

BROOKHAVEN OIL COMPANY
DACRESA CORPORATION

Thos. B. Scott, Jr.
President

TBS:ms
CC: Gov. Edwin L. Mechem, Chairman
Mr. E. S. Walker, Member
Lowry et al Operating Account
Mr. Jason W. Kellahin
Mr. Jack M. Campbell

BEFORE THE

Oil Conservation Commission

SANTA FE, NEW MEXICO

IN THE MATTER OF:

CASE NO. 697

TRANSCRIPT OF PROCEEDINGS

July 21, 1954

ADA DEARNLEY AND ASSOCIATES
COURT REPORTERS
ROOMS 105, 106, 107 EL CORTEZ BUILDING
TELEPHONE 7-9546
ALBUQUERQUE, NEW MEXICO

BEFORE THE
OIL CONSERVATION COMMISSION
STATE OF NEW MEXICO
Santa Fe, New Mexico

Special Hearing
July 21, 1954

REGISTER

NAME	REPRESENTING	ADDRESS
Art Holland	Lowry Oil Company	Albuquerque, N. M.
Jason Kellahin	Lowry Oil Company	Santa Fe, N. M.
H. M. Rhodes	Oil Conservation Commission	Santa Fe, N. M.
Thomas B. Scott, Jr.	Brookhaven & DaCresa	Albuquerque, N. M.
Jack M. Campbell	Brookhaven & DaCresa P. O. Box 644	Roswell, New Mexico Albuquerque, N. M.

IN THE MATTER OF:

The application of Lowry et al Operating Account for the approval and extension of its pilot pressure maintenance program in the South Blanco-Tocito Pool, Rio Arriba County, New Mexico, as originally granted in Order R-349 issued in Case 555, by the Addition of Wells to be utilized for water-injection purposes, and by increasing the amount of water to be injected. Applicant also seeks authority to gauge oil at a common tank battery.

Case No. 697

ADA DEARNLEY & ASSOCIATES
STENOTYPE REPORTERS
ROOM 105-106-107 EL CORTEZ BLDG.
PHONES 7-9645 AND 5-9546
ALBUQUERQUE, NEW MEXICO

BEFORE:

E. S. (Johnny) WALKER, Commissioner

WILLIAM B. MACEY, Director

TRANSCRIPT OF HEARING

MR. MACEY: Meeting will come to order.

Before we start with Case 697, I would like for the record to show that Cases 751 and 752 are continued until the regular monthly hearing for the month of August, which is August 18, the Cases will have to be readvertised.

Now, Case 697, Mr. Kellahin.

MR. KELLAHIN: Jason Kellahin, Santa Fe, appearing for the applicant in Case 697.

As the Commission will remember, this is a continuance of the case which was originally presented May 19. The petitioner filed filed an amended petition, the affect of which was merely to specify the applicant's well, T-85, as an injection well. In the original application, no injection well was specified because at that time the applicant was attempting to work out an agreement with one of the off-set operators, which agreement was not consummated. The testimony presented at the May 19 hearing was concerned with the use of the applicant's well B-83 as an injection well. The purpose of this hearing today then is merely to show the location and structure and reasons for wanting to use T-85 as an injection well, supplementing the testimony previously given in this case.

We have one witness, Mr. Art Holland.

MR. CAMPBELL: Did you file a formal amended application?

MR. KELLAHIN: Yes.

MR. CAMPBELL: I wonder if I could see that, I haven't seen the application. May I see the original petition, is it in this file?

MR. MACEY: It is in the other file.

MR. CAMPBELL: I assume, Mr. Kellahin, that since this is a continuation of the May 19 hearing, that you will have no objection in conjunction with the use of this new well for questions to be asked that relate to the testimony at that hearing, will you?

MR. KALLAHIN: I believe the -- I assume you are a protestant?

MR. CAMPBELL: Yes.

MR. KELLAHIN: I believe a protestant was present at the May 19 hearing, and had full oppoertunity for cross examination.

MR. CAMPBELL: Of course, you have a new case here involving an entirely new program.

MR. KELLAHIN: Insofar as the testimony in evidence today changes our case, I will have no objection.

MR. CAMPBELL: Your case is changed by virtue of changing the well by virtue of a new well by a water flooding program, is it not?

MR. KELLAHIN: I can't see it is materially changed, no, sir.

MR. CAMPBELL: We will see what your testimony develops, but I think that this case, as far as the use of this well T-85 as a water injection well in this pool, the effect of that on the pool reservoir is a wide open question and we intend to proceed on that basis. However, we may not have any argument about it. I think our questions will be pertinent to the use of this well or any other well as a water injection well.

MR. MACEY: Who do you represent?

MR. CAMPBELL: Brookhaven and Dacresa Corporation.

MR. MACEY: I might say in connection with the case, that it will appear to me, I haven't discussed it with Mr. Kitts or Mr. Walker, but it appears since the case was completely advertised and I assume you are going to refer to the previous testimony, that the entire matter would be theoratically wide open again. I don't see how we could consider it in any other light.

MR. CAMPBELL: It seems to me that way. I don't believe -- possibly there won't be any argument about the type of questions we have, so let's just proceed and if you have any objections, we will argue it out at that time. I wanted to tell you I am operating at this time on the assumption that this case having been readvertised, is open for questioning relative to the water flooding program in the Tocito Pool.

MR. KELLAHIN: I would like to say we don't plan at this time to offer any additional testimony as to the merits of the water flood program we are relying on the testimony that was previously given in this case.

MR. CAMPBELL: Insofar as that testimony bears on the program you now propose, which has been readvertised, I think it is pertinent for either of us to make reference to the testimony heretofore offered in that other hearing relative to the effect of water flooding on this reservoir.

MR. MACEY: Go ahead and proceed.

MR. KELLAHIN: Swear Mr. Holland as a witness.

(Witness sworn.)

A. F. H O L L A N D

having first being duly sworn, testified as follows:

DIRECT EXAMINATION

By MR. KELLAHIN:

Q Would you state your name, please?

A A. F. Holland.

Q Are you the same Mr. Holland who previously testified in the case now before this Commission?

A I am.

Q Were your qualifications at that time accepted, Mr. Holland?

A Yes, sir, they were.

(Marked Exhibit No. 1, for identification).

Q I hand you what has been marked as Exhibit 1 in Case 697 and ask you to state what that shows.

A The plat presented as Exhibit No. 1 is a plat of a portion of the area of the South Blanco-Tocito Pool, Rio Arriba County, New Mexico. It includes the present limits of the pool as defined by the New Mexico Oil Conservation Commission. However, there is one producer in the pool which is not shown on the plat. This well is located northwest of Section 6, Township 26 North, Range 6 West. It is a recent completion and our latest reports are that the well produces about five barrels of oil per day.

Q Where is that well located in relation to D-83, about which you previously testified, Mr. Holland?

A It is approximately two miles northwest of D-83. I mentioned the well because it is a recent completion and it is not shown on the plat. It has no significant bearing on the hearing

today. However, it does represent a producer which is not shown, but will probably be included within the pool limits at some later date.

MR. CAMPBELL: Mr. Kellahin, weren't your Exhibits in the first case numbered one through? Why don't we make these, this is the ase number, make it 1-A or else another number?

MR. KELLAHIN: Yes, sir. Thank you.

MR. CAMPBELL: If you want to, we will add them to the numbers in the other case.

MR. KELLAHIN: 1-A will be satisfactory.

MR. CAMPBELL: Is that the well this is shown here as a drilling well clear up northwest of 6?

A No, it is over in the next section, I believe Section 31.

MR. MACEY: It would be, is it north of it or is it Section 36?

A It would be 36, yes.

MR. CAMPBELL: In thesoutheast of 36 or where?

A Southeast of 36, that would be 27 north, 7 west.

Q Mr. Holland, I hand you what has been marked as Exhibit No. 2-A and ask you to state what that shows.

A Exhibit 2-A is a resume of thecompletion information for well T-85, which is being proposed at this hearing for conversation to water, to a water injection well. T-85 is shown on the plat presented as Exhibit 1-A and is located in the Southwest Quarter Section 4, Township 26 North, Range 6 West, Rio Arriba County, New Mexico. Also on this plat which was presented as Exhibit 1-A, is shown the present water input well being used for the pressure maintenance

projects, that well being T-134, located in the Northwest Quarter, Section 10, Township 26 North, Range 6 West.

Q Now, on Exhibit No. 2-A, at what depth was that well completed?

A This well was completed at a total depth of 6,691 feet.

Q And is there any other information shown there that would be pertinent to the uses in this case. Mr. Holland?

A Not on the Exhibit, but the producing potential of this well now is presently 17 barrels of oil per day.

Q Mr. Holland, I hand you what has been marked as Exhibit No. 3-A and ask you to state what that shows.

A Exhibit No. 3-A is a contour map of the South Blanco-Tocito Pool. This map has been presented in other hearings to this Commission, and is being resubmitted to show that well T-85, is one of the lowest wells on structure of the Tocito formation.

Q And where is that well located structurally in relation to offset the areas owned by offset operators?

A It is lower than most of the wells which have been completed by the Johnson Oil and Gas Company. They are the only other operators in the South Blanco-Tocito Pool.

Q And would the use of that well as a water injection well, have any adverse effect on the Johnson properties, in your opinion?

A They have given approval to Lowry Oil Company for their using whichever well they might select, by that I mean Lowry might select to use for water injection purposes. That letter was filed with this Commission.

Q In other words, they also approved the use of Well D-83 which was located much closer to that property, is that correct?

A Their letter stated they had no opposition to any well Lowry might select for water injection purposes which would include D-83.

Q On the testimony originally presented in this case, it was Lowry's proposal to use a well designated as D-83 as a water injection well. Would you state to the Commission why you changed your plans in regard to that?

A At the time of the hearing held on May 19 it was proposed to use well D-123 and well D-83 for water input service. At that time we were attempting and had some assurance that Johnson Oil and Gas Company would cooperate in the water injection pressure maintenance program. They later, Johnson Oil and Gas Company advised that they did not wish to participate in the program at this time. Therefore, it became necessary for Lowry to reconsider the wells to be used for water input service. Another objection was received from an offset operator to D-83 and for those reasons Lowry decided to request that T-85 be permitted to be used for water injection in the pressure maintenance program.

Q Now, was it your opinion originally, Mr. Holland, that the use of D-83 would have any adverse effect on the interest of offset operators?

A The use of D-83 in our opinion would not adversely affect any other operator.

Q Does the use of the well designated as T-85 add to the assurance that no adverse effect will result, in your opinion?

A We have moved further away from offset operator property lines.

Q Are you also lower on the structure?

A The well is some six feet lower than well D-83. Both wells in our opinion are suitable for water injection purposes.

Q I hand you what has been marked as Exhibit No. 4-A, and ask you to state what that shows, Mr. Holland.

A Exhibit No. 4-A is a list of the interest owned on the present two producing leases operated by Lowry which have production from the South Blanco-Tocito Pool. The royalty ownership on these two leases is common.

Q And was this Exhibit offered in the previous hearing?

A This Exhibit was not. The statement was made that the royalty ownership was the same.

MR. KELLAHIN: We offer in evidence Exhibits, Applicant's Exhibits No. 1-A through 4-A inclusive.

MR. MACEY: Is there objection to the introduction of these Exhibits?

MR. CAMPBELL: If the Commission please, I believe there may be an error in the computation in 1-A. It is not of particular significance except for the sake of accuracy, I believe the interest of Brookhaven Oil Corporation and Frank A. Schultz may be that fraction shown of an eighth rather than 7/8ths of the production. Mr. Holland, are you familiar enough --

A I think if you add this up you will find it is of the 7/8's. This was presented in this manner because this is how it appears on the division of interest on the statements we received from Malco Refining Company. Now this, if you will multiply these values by .875, it will give you the equivalent of the 8/8's value.

MR. CAMPBELL: Oh, I see, you have recomputed it on the basis of the 7/8's which are actually paying on the basis of the 8/8's

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MR. CAMPBELL: Oh, I see, you have recomputed it on the basis of the 7/8's which are actually paying on the basis of the 8/8's

on a different percentage factor, is that it?

A This is how they have set it up on the Malco statements, and that is why it was presented in this manner.

Q In other words, you are paying in this manner?

A If you add up the division on the 7/8ths you will find out it comes out 100% interest of the 7/8's which would be a 7/8's and a half interest of the 8/8's.

MR. CAMPBELL: All I wanted to make clear was the interest of Pacresa and Brookhaven is 2½% of 8/8's.

Q Mr. Holland—

MR. MACEY: (Interrupting) Pardon me, I want the record to show the exhibits are introduced.

Q Have you checked the proposal to use the well T-85 with any other engineering firm?

A We have an engineering firm, Erlacher Engineering Company, who have had a considerable amount of experience in this type of project. They have participated actively in the development and planning of the project, and they have recommended the use of T-85 as a water injection well, and have recommended this change in view of the developments since the last hearing, that is that it has been determined that Johnson Oil and Gas Company does not wish to participate in the project.

Q Is it now your recommendation that T-85 well be approved as a water injection well?

A Those are our recommendations to the Commission.

Q Do you have anything to add to your testimony, Mr. Holland?

A I believe not.

MR. KELLAHIN: That is all.

MR. MACEY: Are there any questions of the witness?

MR. CAMPBELL: Yes, if the Commission please, Jack M. Campbell, Roswell, New Mexico, representing Brookhaven Oil Company and Dacresa Corporation. I would like to ask a question or two for my own information before I proceed, that perhaps Mr. Holland or Mr. Kellahin, one or the other, can tell me about.

By Mr. CAMPBELL:

Cross Examination

Q Is the Lowry Oil Company a Corporation?

A The Lowry Oil Company is.

Q A corporation?

A Is a corporation.

MR. KELLAHIN: This application, Mr. Campbell, is brought in the name of the Lowry et al Operating Account which is a non--

Q (Interrupting) That is what I am trying to find out, who is the Corporation, Lowry et al --

MR. KELLAHIN: Lowry et al, Operating Account.

A Lowry et al, Operating Account is controlled by Mr. Tim G. Lowry. It is the, he is the operator of these properties. Lowry Oil Company is a Corporation, furnishing management service in the operation of the properties.

Q I am trying to find out who is responsible for anything that goes wrong with this program. Here is an application filed by Lowry, et al, Associates. Are these leases assigned by them held by him or how are they held?

A They are held individually for the people he represents. The leases, I believe, are assigned individually to them.

Q To him?

A To them.

Q I see. Now, will you tell me, based on your new application here and your previous application, whether or not you are now seeking an unlimited extension of your authority to inject water into this pool through this I-85 well?

MR. KELLAHIN: I ask that counsel define what he means by "unlimited."

Q You ask in your application for an extension. Do you mean for a year, two years, a carte blanc open authority to proceed indefinitely, or what are you seeking, that is what I am trying to find out. I don't know what you mean by an extension.

MR. KELLAHIN: We object to the question on the ground there was no limit imposed on the water injection program originally, and there is no mention in the present petition of any limitation, and no limitation is imposed on it except subject to the limitation of the Commission.

MR. CAMPBELL: That answers the question. You apparently want it to be unlimited.

MR. KELLAHIN: Of course.

MR. CAMPBELL: Now, do you in your statement in the other case, Mr. Kellahin, you indicated that whenever any of these wells lost their commercial value as oil producers, you wanted to put them into the program without additional hearing?

MR. KELLAHIN: That is right.

MR. CAMPBELL: I assume you also seek that at this time?

MR. KELLAHIN: That is correct, with the approval of the Commission.

MR. CAMPBELL: In other words, you anticipate coming to the

Commission for hearing --

MR. KELLAHIN: Submit data to the Commission to show it; if the Commission desires a hearing at that time, certainly we will have one.

MR. CAMPBELL: What do you think about any other parties desiring a hearing?

MR. KELLAHIN: I don't know what other parties would be interested, Mr. Campbell.

MR. CAMPBELL: Well, I am here representing some that are. I wouldn't be here if they weren't. But what you are asking for, that is what I am trying to find. Your application simply seeks an extension of this program.

MR. KELLAHIN: We would not be opposed, Mr. Campbell, to further hearings in the event it appears necessary, or other parties desire them.

Q Now, Mr. Holland, you stated that you had changed your proposed program here, as I gathered, because of the refusal of Johnson Oil and Gas Company to cooperate in this water flooding program, is that correct?

A That is partly correct, and the people that you represent objected to the use of the well; we changed for those two reasons.

Q Was there any other reason why you made a change?

A None.

Q I believe you stated that Johnson Oil and Gas Company wrote you a letter which was submitted to the Commission setting out their views in connection with the program that you now propose by using T-85 as an injection well?

MR. KELLAHIN: No, sir.

A That is not my statement.

Q What did you say?

A My statement was we had a letter from the Johnson Oil and Gas Company stating that they had no objection to the pressure maintenance program expansion and to Lowry using whichever of their wells Lowry might select. I have that letter, I can read it.

Q Would you produce that letter for me, please?

MR. KELLAHIN: You have the original there, Mr. Campbell.

Q No, I don't have the original letter, this is a copy. It is addressed to Lowry Oil Company, I assume they have the original.

MR. MACEY: This is a photostat.

MR. CAMPBELL: We can use the photostat if it is agreeable, I would like to have it made a part of the record.

MR. KELLAHIN: It is a part of the record.

MR. CAMPBELL: No, it isn't, you just submitted it to the Commission.

MR. KELLAHIN: That is correct.

A Here is the original letter.

Q We can use that. It is satisfactory to use one of the copies if you prefer, and keep that in your file.

A I would like to keep the original.

Q Would you mark this B-1.

(Marked Exhibit B-1 for identification)

Q I hand you what has been identified as Exhibit B-1 in Case 697 and ask you to state what that is.

A That is a photostatic copy of a letter which Lowry Oil Company received from Mr. Ralph A. Johnson, President of the Johnson Oil and Gas Company.

Q This is the letter that you referred to in your testimony awhile ago, that you received from the Johnson Oil and Gas Company?

A That is the letter, yes, sir.

Q Now, at the time this letter was written, or you received this letter, I assume that you had already decided not to use Johnson Well No. 11 and your well T-123 as water injection wells, is that correct?

A We were reviewing the entire situation at that time.

Q Now, if Johnson Oil and Gas Company by virtue of their position that they didn't feel their properties were within an officially developed area, refused to go along and use their Well No. 11 as a water injection well, and you used your Well T-123 as a water injection well, wouldn't that result in oil being driven from your property to the Johnson property?

A We don't intend to use Well T-123.

Q Is that the reason you decided not to?

A We reviewed the whole matter in view of the developments and decided not to use the wells that were originally picked.

Certainly we wanted a cooperative arrangement up in that portion of the field, and when we were unable to achieve that, we rearranged our planning.

Q But your planning at that time, if you had gotten the cooperation of Johnson, of course, there, and they had used the 11, their Well 11 and T-123, there wouldn't have been any danger of your driving any oil off your property on to Johnson's property because the wells are both used for water flooding?

A That was the thought in working out that injection arrange-

ment.

Q Now, on Well T-85, which you now propose to use, which is some mile and a half further away from the Johnson properties than is Well T-123, but which is lower on the structure than the Johnson's wells, isn't it just a matter of time until the same result will occur?

A The well is a considerable distance away. According to our pressure information, the migration will not be in that direction.

Q Well, we might as well go into that. Where do you think the migration will be?

A Well, the area of low pressure is towards the east.

Q Toward the East?

A Yes.

Q How far to the East does that low pressure area move, all the way down to the furtherest wells to the East?

A Well, there is a pressure gradient from the west to the east.

Q It is my recollection that you previously testified that the only information you had as to the movement of water from the original injection well T-134 was to the southwest, inasmuch as you were getting some water production from well T-157?

A That would be to the southeast. No, I beg your pardon, you are right, southwest, but that is in the, that is in the area of lower pressure. We have, roughly, two and a half to three million barrels of oil at stake in this program. We will control the rate and amount of water injected subject to the jurisdiction

of the Conservation Commission. We have roughly 35 times more at stake than the client you represent. We do not intend to migrate oil to the Johnson Oil and Gas Company properties.

Q Well, I hope, I am confident that all of the factors being equal, that you wouldn't want to do that. There are a lot of economic factors now-a-days that are not all directed to conservation, however.

A We naturally are interested in securing the greater ultimate amount of oil from these properties and --

Q (Interrupting) Are you concerned wi h the rate at which you recover that oil, the speed with which you recover it?

A Well, what do you mean?

Q How fast the clients of Lowry et al Associates recover their investment?

A We have tried to operate the property consistent with good reservoir management, and propose to do that in the future.

Q Now, Mr. Holland, how many wells has Lowry drilled in this pool?

A Lowry, you mean wells that have been completed in the Tocito?

Q Yes.

A Lowry has drilled 13 wells.

Q In your opinion, have the limits of this pool been defined?

A They have not.

Q Do you have an estimate of how much undeveloped acreage there might still be in the Tocito Pool?

A I have no way of making such an estimate. My personal opinion is that there is more productive acreage to the east. Now

the north side of the field, the west side of our properties, and the south side have virtually been developed.

Q You are a reservoir engineer, are you?

A I am a petroleum engineer.

Q You are a petroleum engineer. Now, as a petroleum engineer, do you believe that it is in the interest of good conservation practice to inaugurate a water flooding project in an oil pool before you have defined pretty specifically the limits of that pool?

A This particular pool, I do believe that. We have, we considered that question at the time we went in this program and designed the program with that in mind. This type of pool, to achieve the best results from a pressure maintenance program, should have such a program commenced as soon as possible. And that is what we have attempted to do.

Q Go ahead and explain why you reached that conclusion.

A Why we did? To achieve the best use of our gas and pressure energy, it is necessary to start a program for a pool with oil characteristics such as this, at an early date. The oil is a high shrinkage type oil, as the pressure drops the gas in solution, the gas available for oil expulsion becomes increasingly more inefficient as time proceeds. To best use that energy and best be able to control the migration of fluids, a program such as this must be started as soon as possible for the type of field that the South Blanco-Tocito Pool is.

Q Now, in what you say, there, all I can gather is that your basis for starting this program at this stage before the field is fully developed, is because there is a high Shrinkage of the oil.

Is that your testimony?

A There are a number of inter-related factors, best use of gas energy, shrinkage of oil, all of them enter into the pressure maintenance program, and to best use those elements it is advisable to start the program as soon as possible.

Q Tell me how the injection of water at the rate you are putting water into this oil pool, helps utilize your gas energy?

A Essentially it maintains high liquid percentages in the reservoir. By so doing, the gas drive is more efficient.

Q What type of original reservoir energy do you think existed here?

A I would like to further elaborate, and you can review the information we presented to the Commission. Where before we started this program we had wells producing with gas-oil ratios much in excess of the gas in solution in the oil, after commencing this program we cut those ratios for the wells being affected roughly in half. So that means that for every barrel of oil we produce, we were just using half as much gas as was being used before this program commenced. Now, there is a further advantage in that those tend to increase where we have cut it in half, if we had -- if you let the normal depletion proceed, those ratios would increase in great magnitude so that is the reason that you make better use of your gas reservoir energy.

Q Well, could you accomplish the same thing in a cheaper manner, perhaps a more efficient manner, by injecting gas instead of water?

MR. KELLAHIN: If the Commission please, I would like to object on the ground all of this testimony has been presented in

previous cases, it was offered in evidence in the present case without any objection whatever from the present opponents to the program, and I don't feel that it has any bearing on the present application to transfer over and use Well T-85 as an injection well.

MR. MACEY: Let's take a short recess.

(Recess.)

MR. MACEY: Meeting will come to order.

MR. Kellahin, your objection is overruled because the Commission feels that the reservoir data, reservoir engineering data is pertinent to this case. I might tell you I intended to ask him the same question that Mr. Campbell asked him.

MR. KELLAHIN: I would like to state the basis for the objection is not that the reservoir data is not pertinent, but the fact it has previously been offered in this case and received by the Commission without objection, although the present opponents were present at that time. I would like to take an exception to the Commission's ruling.

MR. MACEY: The record will so show.

Q. Now, Mr. Holland, what, in your opinion, was the original reservoir energy for this Tocito Oil Pool, was it gas cap, was it gas in solution, which was it, or was it both?

A The reservoir has initially had a gas cap in my opinion, and also has a considerable amount of gas in solution.

Q Now, all the wells that you have drilled in this Pool have produced without pumping, have they not?

A That is correct.

Q They produced, they have produced casing-head gas along

with the oil, is that correct?

A Yes, that is correct.

Q That casing-head gas has been flared since the inception of this pool. We have made attempts to get an outside source to gather this gas and have been unsuccessful. We have contacted, I don't have an exact count, but at least ten different individuals or firms with the idea of their putting in a plant. We, at one time, had a signed contract for the erection of a plant and the buyer of the gas voided the contract, he refused to comply. We do have plans now to, providing we receive approval from the Commission, to compress this gas and sell it. It is not a significant amount, it has amounted to, oh, about a million two hundred fifty thousand cubic feet of gas per day from ten to thirteen widely scattered wells, and it is not a very attractive economic picture.

Q Do you feel that if you went ahead with the additional development in this field it might become a more attractive economic matter?

A If the field were greatly magnified, economics certainly would change, yes.

Q What I am getting at, Mr. Holland, in connection with this case is this, you have testified that by the replacement of the oil with water that you have made it possible to maintain gas-oil ratios at a good level. But the fact is that even in doing that you are still wasting the gas in production, aren't you? What are you accomplishing by that?

A Are you asking or stating?

Q I am asking you that.

A What is your question?

Q What is the particular advantage other than getting your oil out in a hurry, of keeping your gas-oil ratios up if you don't utilize your gas when produced?

A Increased oil recovery, that is the sole objective of this program.

Q But your gas, until you find a market for it or until you use it for injection, it is still going to be wasted.

A We have no plans to inject it, Mr. —

Q (Interrupting) Why are you not injecting gas in Well T-85 instead of water?

A Because our opinion is that water, water injection is a much better oil recovery medium than gas injection for this pool.

Q Is it not true, Mr. Holland, that water flooding and the injection of water into a reservoir which had no original water drive, that at a stage of development where the field is not fully defined, is a much more treacherous approach to pressure maintainance than gas injection insofar as the future of the pool is concerned?

A We don't think so or we wouldn't be making the request we are making here today.

Q But up to this time you have absolutely, as far as I can determine, no engineering knowledge of what is happening or what will happen to water which is injected in T-85, do you?

A We have conducted a program for approximately eight or nine months, we started the program October the 17th.

Q 1953?

A I believe that is November, December, January. It has been in effect nine months.

On the basis of that program, we are asking permission from the Commission to add additional injection wells and proceed with increased amounts of water injection.

Q Well, now, since you started in October 1953, to date, if my calculations are correct, you have injected more water into this pool than you have withdrawn oil. Now, do you have any information based on your continued studies in this pool as to where that water is going and in which direction the oil is migrating by virtue of your water flooding?

A We do have that information. And it was stated in the last hearing, that we have observed the wells in the vicinity of the water injection well, have noted that all of those wells were being influenced by the water injection program. That influence has been shown by both the gas production history and the bottom hole pressure history.

Q What, in your opinion, will be the direction of movement of the water and oil when you commence, if you commence injecting water into Well T-85?

A If it follows the lines of less pressure, the water movement will be toward the southwest.

Q Southwest? A That is right.

Q I understood awhile ago that you testified that the movement would be to the east.

A I beg your pardon, I would like to correct the record, to the southeast.

Q Now, isn't that in the direction in which you have

previously testified you feel there may be undeveloped oil acreage?

A The undeveloped acreage is quite a ways from T-85, Mr. Campbell.

Q Well, I realize that, but there is no barrier that will stop this water if you inject enough of it, is there?

A Well, my opinion is that there will be no migration into undeveloped areas, if you are asking my opinion.

Q Do you feel there has been any migration from the injection of T-134 in an undeveloped area?

A I don't believe so.

Q You think that the only areas that have been affected by that water injection are the ones in which you have already drilled wells, is that correct?

A That is my opinion.

Q Well, that is just because that is the only one you can make any tests on, isn't it, is there an engineering reason?

A We believe that our water is migrating notably from the present water injection well. Now, over to the east, there are no drainage holes. We believe that the water is merely compressing the oil and gas in that area. It would be principally oil which would be very very little compressibility and, therefore, water would not migrate in that direction.

Q I am sorry, would you state that again for me?

A What I said was that the water that we are injecting in T-134 we believe is following a radio pattern to some extent in the area of that injection well. Now, the area to the east

has no drainage holes.

Q Right.

A Therefore, our opinion is that the water is merely compressing the fluid or gas in that direction, and that when we do develop in that area we possibly will encounter higher pressures than we would have encountered without this program, but no water movement into that area.

Q Until you actually have drilled holes to make the determination, that is purely a matter of speculation, isn't it?

A Well, it is a matter of physics really.

Q Well, doesn't it also involve other factors, aren't you over simplifying it, isn't it a matter of porosity, permeability, lines of least resistance, as well as reduced pressure by reason of the hole in the ground?

A Well, we think this area of, the pressures in that area should be higher than the area where we are injecting water, and if you are considering the weight of the different fluids, the water is heavier, we are relatively low at that injection spot, our opinion is that the area to the east is not being damaged by our water injection program, and we wouldn't be injecting water if we thought any other way.

Q You recognize that there is a possibility of that damage occurring?

A Well, anything is possible, but highly improbable.

Q Now, a few questions with reference to this T-85, which you intend to use as a water injection well. You stated that one of the factors was that it was one of the lowest wells

on the structure. Do you now think that the best place at which to inject water in an oil pool is at the wells which are lower on the structure?

A If we could secure the cooperation of the Johnson Oil and Gas Company and didn't have a lot of objections by your client, we would still recommend the program as originally recommended.

Q Do you feel that possibly Johnson's agreement to go along with you on using any other wells except their own might be because they feel you are driving oil on to their property?

A I don't, my thoughts along those lines would be speculation. I don't know what their reasons are.

Q Do you speculate that might be one reason?

A I wouldn't speculate.

Q Mr. Holland, there is no Tocito well in Section 5 is there?

A One well was drilled through there. There are no producing wells there now, no.

Q So that if your water did migrate from T-85 into Section 5 into the Tocito, it would affect the future possibilities of oil recovery from Tocito wells drilled in that section, would it not?

A Well, our opinion is there would be no water migration in that direction.

Q If you were wrong that would be true however, wouldn't it?

A The area of which you are talking about is a northeast,

northwest of Section 5, is that the lease you have reference to?

Q I am just referring to Section 5. Of course, my clients are in the northwest quarter. I am talking about an adjoining well that has no well in the adjoining Tocito and the effect of your injection, if there was an injection of water in the Tocito formation under that section.

A Well, we wouldn't be presenting this program if we thought our properties would be adversely affected.

Q What is the average daily production of these oil wells?

A The past month, virtually 1200 barrels per day from the wells that Lowery operates.

Q In other words, the wells are averaging 1200 barrels a day because there are 13 wells, less your one injection well?

A Yes, that is right.

Q Has the daily rate of production increased since you inaugurated the water flooding program?

A It has been up and down. It has varied from roughly 900 barrels a day up to 1200.

Q Certainly these oil wells are not marginal oil wells, then, are they?

A Well, there are different quality of wells.

Q You mean some producing considerably in excess of 100 barrels a day?

A Some of the wells, T-85 will only produce 17 barrels a day.

Q Has that well ever been shot, sand-fracted, anything done to increase the production?

A The well was treated, naturally.

Q Have any of the wells been sand-fracted or shot?

A We shot this well T-134 we are using for water injection purposes.

Q No satisfactory results?

A No satisfactory results.

Q You never sand-fracted any of these wells?

A We have not; other operators in the pool have.

Q Now, there is an engineering question that I want to ask you, which I still don't understand. Lots of them I don't understand, but this one particularly, that is the effect-- first let me ask you this. How much pay do you have in your T-85, how much Tocito, did you go clear through it?

A We drilled the entire Tocito section.

Q How much of the Tocito did you find there?

A We had about three feet in that well which had permeability that could be expected to contribute anything to production, that is about all.

Q You are telling me about pay zone. Can you tell me about the Tocito formation?

MR. KELLAHIN: You asking for the gross?

Q Gross zone. Not the effective. You said you didn't sand-frac it or anything.

A There was possibly 15 feet of gross sand in the well, of which about three feet could be expected to contribute anything to production.

Q Without treatment, of course.

A Well, yes, it was fairly shaley, treatment would

probably have helped somewhat.

Q Now, if you inject water in there, will it penetrate into that whole zone of 15 feet, is that what you hope?

A We hope so.

Q Does that include a gas cap zone at all?

A The gas cap is, well, removed from that well some mile and a half, roughly.

Q Where is the gas cap in the pool?

A It is shown on Exhibit 3-A.

Q Well, now, what I was--now to get to the question I was going to ask you, what is the effect of the gas in this reservoir, gas cap or gas in solution of injecting in with it quite large amounts of water?

MR. KELLAHIN: There is no testimony we are going to inject gas into the gas cap zone.

Q Well, you are doing that, it is in T-134, you are gas cap, aren't you? A No.

Q Where is it, is it this area here?

A It is indicated on the map, Mr. Campbell.

Q I see. 123 would have been, had you gone ahead with that.

A Yes, it was in the gas cap and it was stated thus at the last hearing.

Q Well now, in any event, suppose the gas in solution which you say exists there, when you reach the point at which these wells start producing water which in inevitable eventually, is it then the matter of expensive treatment to utilize the gas that comes out with the oil separation and so forth?

A Well, I don't follow you, you mean use the gas, what do you mean?

Q Well, these wells aren't going to continue to produce oil and gas with no water indefinitely if you keep putting no water in the reservoir.

A That is right.

Q When they start producing water, oil and gas, it then becomes a matter to commercially utilize the gas at the expense of making the necessary separation, is that right, get the water out of it?

A If we are able to proceed with the program that we want to, we will treat the wells that are producing oil and water and gas, separate the gas, compress the gas and sell it and reinject the water.

MR. MACEY: Mr. Holland, you don't mean treat the well, you mean treat the oil produced by the wells?

A That is correct. If I said wells, I meant oil.

Q Now, I have one more question on this injection. Do I understand it to be your testimony that the reason you do not want to use this casing-head gas or any other gas in the area available for injection of gas rather than water flooding, is first you feel water flooding is more productive of results. Is there any other reason?

A That is essentially the basic reason. We believe that the greatest ultimate recovery from this reservoir can be achieved by water pressure maintenance, and so we are requesting approval of such a program.

Q Now, there are only two leases involved at this time in this pool, are there not? A Two wells.

Q I believe your Exhibit —

A (Interrupting) That is for the Lowery operated properties. (Continuing) 4-A

Q T-109 indicates that. Well, isn't well T-85 and T-109 on which you already have authority to inject, the only wells on one of those leases, and all your productive wells are on the same lease? A That is correct.

Q What do you need a common tank battery for?

A Why do you?

Q If they are all on one lease.

MR. KELLAHIN: If the commission please, we object to the question for the reason in the testimony presented at the previous hearing there was opportunity for cross examination and no objection was made at that time.

Q I don't know what you are talking about, a common tank battery, I assume there were a number of leases involved.

MR. KELLAHIN: That was gone into at the previous hearing, Mr. Campbell, and I submit my objection to the Commission.

MR. MACEY: Mr. Campbell, do I understand your question to infer that theoretically all of the oil that would be produced from the Lowery properties is on a common lease?

MR. CAMPBELL: Yes, I don't see what you are talking about, a common tank battery, that is my only question.

MR. MACEY: The objection is overruled.

Q I simply want to find out what your reason is, I am sure you must have one.

A Well, it is to avoid duplication of equipment and we propose to meter an account for the oil individually by leases, have an oil meter on each well.

Q We have no objection to doing it by leases and it all coming from one lease, but I don't see what your problem is, that is what I am getting at.

A Well now, when we convert T-85, T-109 is still oil productive and is different than the lease from which the majority of the wells, are producing. We have a two-lease problem.

Q You still do not intend to use 109?

A It is still oil-productive.

Q Do you know where you would locate that common tank battery?

A We would locate this battery slightly east of the well T-129 that is shown on that plat.

Q 129? A Yes, 129.

MR. CAMPBELL: I believe that is all.

MR. MACEY: Any other questions of the witness?

BY MR. RHODES:

Q Mr. Holland, you testified that the reasons for switching from Well D-83 to Well T-85 as the injection well, all the reasons which you presented so far, because of difficulties encountered in negotiating with offset operators, is that right?

A Yes.

Q Do you see any reason, from the engineering standpoint, for making the switch from D-83 to T-85?

A Mr. Rhodes, I believe either well is suitable for water injection purposes. Now, T-35 has more permeability than was encountered in D-83 and is located slightly lower, structurally,

which are favorable characteristics of T-85 for water injection purposes.

Q Well, Mr. Holland, with regard to the water influx pattern, do you think that the controlling factor will be the pressure gradient, or do you think structure might enter into it?

A Well, I believe it will be a combination of both.

Q Which do you think would be the controlling factor?

A Well, I believe both will enter into it.

Q Would you say as much pressure gradient as structure?

A Well, the degree I do not know. I think there is a considerable pressure gradient toward the area to the east now, and I would expect that our principal water movement would be in that direction. Now, I don't intend to say that there won't be any migration to the west, but we — as I said before, as far as oil migration onto offset operators' properties, we have a lot at stake there and do not plan to — we would rather have the barrel of oil than the offset operator. We are just selfish.

Q Do you feel that you are injecting a sufficient amount of water in this reservoir to cause this injection program to have a, shall we say, down-dip component, particularly in the case of T-85? You feel that water injected will migrate down-dip to any extent?

A Mr. Rhodes, I don't believe it will.

MR. RHODES: I believe that is all I have.

MR. MACEY: Any other questions of the witness?

REDIRECT EXAMINATION

BY MR. KELLAHIN:

Q Now Mr. Rhodes, Mr. Campbell asked you, in regard to whether there were any wells located in Section 5, were there any tests?

Do you have a well located in Section 5?

A Well, D-83 was drilled through the Tocito and the well was tested.

Q With what results?

A Negative. The sand was very tight and, as I remember it, I have a record of that test, the only thing that was recovered was a slight amount of drilling mud.

Q The record of that test is before the Commission in this case, is it not?

A It has been presented.

Q Now, is there any production in the northwest quarter from the Tocito Sands in Section 5?

A D-83 is the only well that has been drilled to or through the Tocito Sand in Section 5.

Q Now, in connection with the problem of gas injection as a pressure maintenance program, did you make a study of that problem?

A We have made preliminary studies and have obtained data. We have had relative permeability measurements made on cores and in observing the gas drive efficiency in this pool have concluded that recovery by gas injection would be very low.

Q Did you investigate the possible cost in connection with the amount of recovery?

A We made no estimate of cost, but from participation on engineering committees and other gas injection projects I can assure you it would be a substantial amount.

MR. KELLAHIN: That is all.

MR. KITTS: Let the record show Mr. Kellahin was questioning Mr. Holland. I believe the record shows Mr. Rhodes.

MR. KELLAHIN: I am sorry, did I say Mr. Rhodes?

MR. MACEY: Mr. Rhodes.

RECROSS EXAMINATION

BY MR. RHODES:

Q Mr. Holland, your reservoir volume factor is about 1.5?

A That is correct.

Q Would you define for us, tell us exactly what that ratio means?

A It means that at initial conditions, initial reservoir conditions, one and a half barrels of reservoir fluid are required to secure one barrel of stock tank oil at the surface.

Q In other words, then, for every one and a half barrels or -- Beg your pardon -- For every one barrel of oil recovered, reservoir fluid, theoretically, to replace that void in the reservoir requires the injection of one and a half barrels of water?

A That is correct, providing you are producing at gas solution ratio.

Q I see, according to the injection report for May, you injected 33,908 barrels into the 7134, is that right?

A If you are reading from that report, yes, sir, that is correct.

Q And you recovered 29,985 barrels from the reservoir, is that not correct?....I am reading it from here.

A Yes.

Q Let's assume that it is. In other words, you are presently injecting something greater than one barrel, or something greater than one barrel of water for every barrel of oil produced?

A That is correct. At the same time, the latest data we

have would show that we are maintaining approximately 50 percent of our reservoir voidage.

Q Now, Mr. Holland, do you feel that in time to come the expansion of this water injection program will require that Well D-83 be used as a water injection well?

A I believe that we would like to use it providing we don't meet strenuous objections by offset operators and for the present time we would just like to forego any consideration of the using of that well.

Q Do you feel that any additional well, other than possibly D-83 may eventually be required to conduct the pressure maintenance program in a satisfactorily or efficient manner?

A I think so, yes.

MR. RHODES: That is all.

MR. MACEY: Do I understand it correctly that in the event you do desire a further expansion of your injection program that you will make application to the Commission, or do you desire that authority to expand your program now, at your own choice?

A Our request, Mr. Macey, is that we be allowed to use T-85 as a water injection well, and then with the approval in writing by the Secretary of the Commission that we be allowed to convert any well which is abandoned, due to water injection, water encroachment, rather, as a water injection well.

MR. MACEY: But, in the event you ever desire to convert a productive well, an oil producing well into an injection well, you would want to come before this complete Commission before you got that authority, am I right in that?

A That is in accordance with our request, yes, sir.

MR. MACEY: Any other questions?

MR. CAMPBELL: Yes, two questions.

BY MR. CAMPBELL:

Q The first question is this, with reference to Mr. Rhodes question, do I understand your statement to be that you feel it is going to be necessary to inject three barrels of water for every two barrels of oil you get out of this reservoir?

A To maintain reservoir pressures, Mr. Campbell, the present producing characteristics of our properties require that we inject about two and a half barrels of water for each barrel of oil produced in order to maintain pressures at the same levels.

Q Well, where has the rest of that water gone?

A The two and a half barrels per barrel of water injected is comprised of, roughly, one and a half barrels to replace the oil volume in the reservoir. The other is to replace the energy or voidage created by the production of free gas in the reservoir.

Q Now, you think that until you know how large this pool may be that you can make accurate calculations on what is happening, for instance, in that regard?

A Well, those measurements are surface measurements plus the data that we acquired by securing a sample of the sub-surface fluid.

Q You could determine that from one well then in a pool, could you?

A Well, all wells are included in that computation.

Q Do you contemplate no more drilling in this field?

A I think we will do additional drilling. We have, at least I have recommended additional drilling and to the east. Now, when they will do that I don't know.

Q You don't think they will get any water when they do?

A I do not.

Q I hope you are right. What do you intend to do about Well T-109? You have authority, as I understand --

A Continue to produce the well.

Q You have authority to use it as a water injection well now?

A We requested it on our initial application and we have no plans to convert it to water injection service until it is abandoned, due to water encroachment.

Q In other words you --

A (Interrupting) Those are our plans now and I believe that is the procedure that we will follow, unless some conditions, other conditions come up.

Q What kind of oil well is it?

A It will produce about 75 barrels per day.

Q But you are not going to convert it to a water injection well until it becomes a non-commercial oil well?

A We have no plans at this time to convert it to a water injection well.

Q Are you asking -- Well, you have that authority. Are you asking for a continuation of that authority, if you want to, without another hearing?

A We would like the authority continued. If the Commission would rather not continue it, it is all right with us.

MR. CAMPBELL: No more questions.

MR. MACEY: Does anyone else have a question of the witness?

REDIRECT EXAMINATION

BY MR. KELLAHIN:

Q Mr. Holland, if you determine that a well is no longer a commercial, due to water encroachment, and you apply to the Commission, to the Director of the Commission, for permission to convert it to an injection well, would you be adverse to giving notice to anyone holding offset interest?

A No, we wouldn't be adverse to that.

Q You would not object to such a provision in the order?

A No.

MR. CAMPBELL: Let's make it anybody having an interest in production. You wouldn't object to that either, I assume?

A I don't think so.

RECROSS EXAMINATION

BY MR. RHODES:

Q One more question. Mr. Holland, if additional reserves are found to exist to the north, in the northeast, the injection of this water then would essentially be, shall we way, in the center of your reservoir, would it not? That is, as it now stands, is there a possibility this could become a center line flood?

A We have drilled the wells along the north boundary, one, two, three at least. They are all marginal producers. The best well is T-109. We believe we have the northern edge fairly well defined. Now, the answer to your question is, if production is found to the north in equal amounts as to the south, then we would have the center line flood,that is correct.

Q Do you know of any disadvantage which might be garnered from the center line flood propocition?

A Well, I know of several water pressure maintenance programs that are using that ype of flood and I think that program would be successful for this pool, too.

MR. MACEY: Any other questions of the witness?

BY MR. CAMPBELL:

Q I don't want to get into the center line flood --

A I don't either.

Q Where are these pools you are talking about?

A The Salt Creek Pool in Texas. I believe that flood is operated by General Crude. Now, the other flood I had reference to, -- I said it was in effect, I don't believe it is, they want to put it in -- it is in Kelly-Snyder.

Q There is considerable objection to it there?

A There was considerable objection, but I understand that program has been appr - l now.

Q It is on appeal, isn't it?

MR. CAMPBELL: That is all.

BY MR. RHODES:

Q That Kelly-Snyder reservoir is a little different kind of reservoir than we have here?

A That is right. Another place where they have this type of flood, they didn't split the field, is in the Hainesville Project in Louisiana, and that project has a considerable amount of successful history.

Q Is that unitized?

A That is the Hainesville unit.

MR. MACEY: Any other questions of the witness? If not the witness may be excused.

(Witness excused)

MR. MACEY: Mr. Kellahin, do you have anything further?

MR. KELLAHIN: Nothing further.

MR. CAMPBELL: I want to offer this letter in evidence.

MR. MACEY: Is there objection to the introduction of this letter in evidence?

MR. KELLAHIN: No objection.

MR. MACEY: The exhibit will be admitted in evidence and I would like to correct the record to show that the previous exhibits offered by Lowry were admitted in evidence. I believe I said introduced instead of admitted. Did I excuse the witness? Do you have anything further? Mr. Campbell, do you have anything?

MR. CAMPBELL: Yes, I have one witness. As the Commission knows, the statement was presented by Brookhaven and Dacresa after the other hearing. Since this case has been readvertised, I feel it is advisable to put this witness on the stand for cross examination and to offer essentially the same matters which were presented in the statement. I would like to call Mr. Tom Scott, and have him sworn.

MR. KELLAHIN: May I inquire, Mr. Campbell, is the witness going to testify as to the contents of the statement or --

MR. CAMPBELL: No, sir, he is going to testify, original testimony.

MR. KELLAHIN: We do not have a copy of his statement.

MR. CAMPBELL: You had one, didn't you?

MR. KELLAHIN: He said Mr. Holland --

MR. CAMPBELL: It was accepted by the Commission in the other matter, but I feel I should make him available for cross

examination in a new case.

THOMAS B. SCOTT, JR.,

called as a witness, having been first duly sworn, testified as follows:

DIRECT EXAMINATION

BY MR. CAMPBELL:

Q Would you state your name, please?

A Thomas B. Scott, Jr.

Q Mr. Scott, will you briefly give to the Commission your background in the oil and gas business with particular reference to the production end of the business?

A I started in the producing oil and gas business in 1919, and I worked in the field for the Empire Gas and Fuel Company for two years, doing all the jobs like roustabouting, cleaning out, stuff like that, then I went with the Standard of New Jersey and I was with them in the field and executive positions for 17 years in Oklahoma, Kansas, Argentina and Bolivia. Then I believe it was 1937 or '38 I resigned and organized Brookhaven Oil Company where we drilled and produced. I also operated the Embassy-Beatty Field account and I have operated as head or manager of also the Dacresa Corporation and some other out-field operations.

Q Now, Mr. Scott, what interest does the Brookhaven Oil Company and Dacresa Company have in this Tocito Pool area that is involved in Case 697?

A They have a two and a half percent interest, over-riding royalty on all of the Lowry's production, and also own the lease rights below the Pictured-Cliff in the northwest quarter of Sections 5, 26, 6. They also have a few other lease rights, but

they are not pertinent to the case in question at the present time.

(Marked Brookhave, Exhibit No. 2 for identification)

Q Now, referring to what I have handed you, marked Exhibit Number 2, which you have a copy of there, marked as Exhibit No. 2, Brookhaven, will you state what that is?

A This is a map of the producing area in the Pictured Cliff and the Tocito Pool, known as the Lowry area, or South Blanco-Pictured Cliff, and Tocito Pool.

Q And in the northwest quarter of Section 5, state what you have shown there?

A The Pictured Cliff rights are owned by Robert E. Mead. We have an over-riding interest in them and all the lease rights below the Pictured Cliff is owned by Brookhaven and Dacresa, undivided.

Q I notice that you have certain wells on that exhibit circled in green. Would you state what that indicates?

A There are three wells, one drilled by Johnson in the southeast quarter of Section 30, 27 North, and 6 West; another one drilled by one of the Lowry accounts in the northeast quarter of Section 18 and in the northwest quarter of Section 24, 26 North, and 6 West. Those indicate that these wellw were drilled to the Dakota zone formation and it gave the appearance that they could not be productive in the Tocito nor in the Dakota.

Q Now, Mr. Scott, have you made any study of the production history of wells in this South Blanco-Tocito Pool?

A Yes, I have.

Q You have heard the testimony of Mr. Holland that there wasn't any original water drive indicated and that there was apparently gas in solution coupled with some gas cap in the area. Do you concur in that - -

A (Interrupting) I do.

Q (Continuing) - - statement of his.

(Marked Brookhaven Exhibit No. 3 for identification.)

Q I now hand you Exhibit 3 and ask you to state what that is.

A This is a map showing contours on the top of the Tocito Formation in the South Blanco-Tocito Pool.

Q You prepared that contour map?

A Yes, sir, with an office geologist.

Q You have seen the Exhibit offered by Lowry of their contour. Do these essentially present the same geological picture on the top of the Tocito?

A Essentially the same.

Q You have also heard the testimony of Mr. Holland that in his mind this pool has not been fully developed or defined, do you concur in that?

A I do.

Q Do you have any opinion with reference to the possible undeveloped area in the pool?

A Well, I think it would be logical to believe that Section 5 will produce Tocito Oil in commercial quantities, possibly the north half of Section 4, but certainly the southeast quarter of Section 4; and certainly the remainder of Section 10; the south

half of 11 has great prospect and I would say at least half of both Sections 13 and 14, and possibly a quarter of Section 15. I am speaking now only of the Lowry properties.

Q Now, Mr. Scott, prior to the initiation of this water flooding program, was there any effort, to your knowledge, made to unitize this old area for this water flooding project?

A As far as I know no effort was made.

Q Insofar as your company was concerned there was no effort to unitize your acreage in this area?

A That is correct.

Q Now, will you state to the Commission what your concern is with reference to possible effects of this water flooding, particularly with reference to Well T-85 which is now sought as a water injection well?

A Well, it seems to me logical that water, under normal conditions will spread in all directions. Now, the lesser pressures are to the south and to the west. Johnson is producing at present two oil wells, and I am not sure about the gas well, therefore, if water is injected in T-85, the southwest quarter of Section 4, it is logical to believe that that water will migrate across 5 and including the northwest quarter, and eventually drive oil on to the Johnson properties.

Q Now, you have -- I am confused now as to where the lower pressure area exists. I believe Mr. Holland testified that in his opinion the water would move to the southeast toward the lower pressures. You have indicated you think it will move to the west.

A Well, I think it will move probably south, and it will go some north, but it will move in the easiest direction. That will

depend on porosity, permeability, the lesser pressures, and where the flow underground, the direction of the flow underground. In other words, if you are producing to the west and the south and the southeast it is normal to believe that some water will go in that direction.

Q And that that water will drive oil ahead of it?

A Yes, sir. Therefore I believe that water in T-85, some of it will be driven west due to the production in Section 6.

Q Now, that, of course, involves a question of correlative rights. Do you have any opinion with reference to the possible effect of water injection in T-85 and continued injection of T-134 on the conservation of oil and gas and prevention of waste?

A As over-riding royalty owners, we don't wish to see oil being driven on the Johnson property and as lease owners we don't wish the Tocito Formation watered, which means that some water, some oil will be driven away from it, and also if it is drilled the water will be difficult to produce with oil.

Q Do you see any danger of entrapping any oil which might not be recovered, particularly where there is undeveloped acreage?

A I think it will be trapped north, northeast -- We are speaking now of the effect of T-85?

Q Yes, sir.

A And, of course, there will be some entrapment even to the southeast, south and southwest, because this water will follow the paths and strands of sand that give it the least resistance. In other words, the sands that have the highest permeability and the highest porosity.

Q How do you feel about the possibility of gas injection as

a pressure maintenance program in this pool, if one is required?

A Well, it is the logical conservation measure, it is the logical pressure maintenance measure. They are wasting the gas now and the light ends from the casinghead gas, the original pressures in the field were approximately 2200 or 2250 pounds. Presently they are between 1800 and 2050 pounds. There is a drop of something like — well, you could say 400, anyway it is between 200 and 400, anyway it is between 200 and 400 pounds and that gas being produced with the oil is still being blown to the air.

Q You feel that might have been utilized as gas, injection gas?

A Good engineering practice and production practice would say so, yes.

Q Is there other gas available in the area?

A Yes, sir, there is in the — from the Pictured Cliffs Formation. That is being sold now to Southern Union under a back pressure of about 500 pounds, and not much is being sold. I figure that the wasted casinghead gas from the Tocito is about a third from what is being sold from the Pictured Cliffs. I believe that is correct from the records furnished by Mr. Holland.

Q Do you have any comments to make to the Commission with reference to the request of Lowry for a common tank battery in this area?

A Well, I suppose there are cases, but I have never seen a case where you take oil and gas off of the property before you measure it, and it might be worked out with the proper checks and so forth, but it seems to me it is a complicated system subject to great error. Those men that operate those valves and settling

tanks all are hired help. They don't give much of a damn what is happening. I would say there is great danger in somebody being hurt.

MR. CAMPBELL: That is all.

MR. MACEY: Any questions of the witness?

(Recess.)

CROSS EXAMINATION

BY MR. KELLAHIN:

Q Mr. Scott, have you had any experience as a pressure maintenance man, in the pressure maintenance field?

A Only supervisor.

Q You are not an engineer, is that correct?

A I am not a graduate engineer.

Q Have you had experience as a reservoir engineer?

A I would say only normal field experience and supervisory. I am a graduate of Harvard, and I took engineering and geologic studies, being in the oil business.

Q None of your experience has actually included reservoir management in the engineering field?

A That is correct.

Q You stated, I believe, you thought Section 5 had distinct possibilities as in the Tocito?

A Yes, sir.

Q You own a lease in that section, do you not?

A The Brookhaven.

Q In the northwest quarter?

A Yes.

Q How long have you had that lease?

A Oh, since maybe '47, something like that.

Q You haven't drilled?

A Yes, the Pictured Cliff.

Q You have not drilled the Tocito?

A That is correct.

Q You didn't drill the Pictured Cliff, did you?

A We drilled it jointly with Robert Mead.

Q Didn't you have an agreement with Mr. Mead to also drill the Tocito?

A No, he had an option to do it, if we got an offset well and he gave up his rights when he didn't wish to offset your Dakota well.

Q That was based on the fact the Dakota well did not test satisfactorily in the Tocito, is it not?

A Not that I know of.

Q In other words, you did not have an offset well, did you?

A We did not have a Tocito, it is a Dakota.

Q Do you have any plans to drill that acreage?

A No definite plans for a definite date.

Q Are you in the habit of drilling offsets to dry holes, Mr. Scott?

A No.

Q That Dakota well is a dry hole as far as you know, isn't it?

A No, it is not.

Q I mean it is the Tocito?

A I don't know, you can't prove a well merely by casual drill stem tests.

Q But, at the present time you would say you have no immediate plans to drill the Tocito?

A No immediate, no definite plans.

Q Now, has Lowry offered to unitize with you, Mr. Scott?

A No, sir.

Q Did you get a letter from Lowry offering to unitize if you would drill the northwest quarter of Section 5?

A No, sir, Mr. Lowry called me up one day on the telephone and said that he wished that we would convert our lease interest in the northwest quarter of 5 to a uniform pattern of over-riding royalties over the whole field and I made an offer which he turned down.

Q Mr. Scott, you say that was not a letter?

A I don't remember any letter.

Q You don't remember a letter?

A I am quite sure it wasn't.

Q Mr. Lowry offered to unitize with you provided you would drill to the Tocito in the northwest quarter of Section 5?

A I don't believe so. I don't remember anything like that.

MR. KELLAHIN:

If the Commission please, we have a copy of the letter which was not available. We were not aware it was going to come up. I think we would like to submit it to the Commission but unfortunately -- we --

(Interrupting)

A I think it should be submitted. The only letter I have received from Mr. Lowry was turning down the offer.

Q Which you made him. Did he not make you a counter-propo-

sition?

A No, sir. He asked me to go up and see Mr. Hunt to see if a well could be drilled.

Q Would you be willing to unitize your royalty interest, Mr. Scott?

A Well, would I be willing to sell or something depends on the price and other conditions.

Q I am not talking about selling, I am talking about unitizing.

A Unitizing the lease?

Q Yes, sir.

A Well, that would depend on whether Lowry is going to drill in Section 5. You are talking about unitizing Section 5?

Q Lowry has already drilled in Section 5, has it not?

A No, no, Tocito.

Q Would you unitize your royalty interest under the two producing leases, now?

A Would I do what?

Q Would you unitize your royalty interest under the two producing leases?

A What two producing leases?

Q Those embraced in the present Lowry operating properties?

A Well, I would have to consider other people, I don't see any principal objection to it.

Q You think you might be willing to unitize?

A Well, I don't wish to say at this time. You don't make decisions like that offhand.

Q Your interests are the same throughout, are they not?

A Yes.

Q What objection would you have to unitizing them?

A Well, I think that is my decision and not yours.

Q Certainly, I agree with you. I am asking if you have objection.

A We might want to sell the over-rides from one lease and keep the other, we don't know yet.

Q Well, I didn't mean to embarrass you or ask questions out of line, Mr. Scott, but you brought up the question of unitization and I wanted to dispose the possibility.

A We merely said from testimony we had never been offered unitization.

Q As I understand your testimony, now, if it were offered you would not care to commit yourself to whether you would accept it?

A Just speaking outloud, I see no objection to it.

Q Now then, Mr. Scott, I believe, if I understood your testimony it was to the effect that this water flood program would probably cause oil to migrate over to the Johnson properties, is that correct?

A I don't see how it could help doing it.

Q Now, do you base that on the permeability of the formation -- on what do you base that conclusion, Mr. Scott?

A Well, you waste it on sand formation with permeability and porosity, and certainly if you pile in a lot of water on the present content of oil and gas and you put that water under pressure greater than the formation, the gas and oil has got to migrate.

Q You think that a prudent operator would carry on such a program to cause oil to migrate to other properties, thereby losing his own?

A I don't think that a prudent operator would, no.

Q From which direction from Well D-83 is the porosity and permeability best, Mr. Scott?

A Now, you are talking about D-83 or --

Q (Interrupting) D --

A (Continuing) -- or T-85?

Q D-83.

A It would be, oh, I would say, southwest, probably south, southeast.

Q You are not sure. It would be in a general southern direction, is that correct?

A I would have to look up the record, I can't say.

Q Would that have any effect on your conclusions as to migration of oil from the injection of water in T-85?

A Now, we are switching to T-85?

Q Well, we are proposing to inject water in T-85. I am talking about permeability in the direction --

A You said D-83, we are switching wells.

Q I chose D-83, Mr. Scott, because it is located nearest your properties.

A That is right, and I see no difference from water going towards Johnsons as against going southwest, south, southeast. I think it has just as much chance in Johnson producing in Section 6, of the water going across Section 5 and driving oil on to Johnsen. He is producing the same rate you are.

Q In which direction is migration now taking place, Mr. Scott, from the Johnson property.

A There is no injection in there.

Q Is it your testimony then you do not think there is any migration taking place?

A Migration of what?

Q Of oil from the Johnson — from or to the Johnson properties?

A I think there is migration from Section 5 or Johnson's because you haven't offset Johnson's wells on Section 5.

Q Do you think there is a migration —

A (Interrupting) You are going to be required to do it, by the way.

Q Do you think there is migration from the Johnson property at the present time?

A To the Johnson property from Section 5. You have offset wells there which you haven't offset, and they are producing.

Q In which direction is gascap expanding, Mr. Scott?

A Well, I would say, generally speaking, from a northwest, southeast line, northeast.

Q You say it is expanding northeast?

A Yes.

Q You mean southeast?

A Well, I -- no, I mean northeast. Well, take your own map, and you have a gascap line there, the gascap is expanding northeast.

Q Now, does that result in oil migrating to the Johnson properties?

A It results from oil being produced.

Q Doesn't it also result in oil migrating as you referred to in Section 5?

A Result what?

Q Wouldn't it also result in the migration of oil toward Section 5 in that general direction, assuming there is permeability and porosity?

A I am sorry, Jason, try to phrase that question again.

Q What I mean is, if the gascap is expanding in the direction you state, which direction is the oil moving then?

A I don't know. I would have to study that.

Q You haven't made any study of it?

A No, you can get that answer from your own gas oil ratio.

Q I think it is in the record, Mr. Scott, as a matter of fact.

A Yes.

Q Now, I believe you stated that gas injection would be the logical procedure for pressure maintenance in this pool, is that correct?

A It would seem so to me, yes.

Q Have you made any study of relative permeability and have you any figures which would support your conclusions?

A Only to the extent that we have Schlumbergers on all the wells, and have some of the core analyses, we know that the formation is thickening in the general direction, down-dip.

Q In which direction is that?

A That is northeast.

Q But, it is your conclusion that gas injection would be more satisfactory. Have you any other reason for that?

A None except that I have seen a great many oil and gas fields who do principally have a gas drive, where gas injection has been very effective.

Q Were the characteristics of those reservoirs similar to the South Blanco-Tocito?

A Not identical. It was a paraffin base oil with a porosity of perhaps a little more permeability and so forth.

Q You couldn't say they were comparable?

A No, I would say the migration of water, I believe Mr. Holland will collaborate this, is much more difficult than the migration of gas. Therefore, it seems to me if you put gas in the top of the structure where you already have gas it would expand with greater facility.

Q Now, Mr. Scott, Mr. Holland has testified that their studies indicate that gas injection would be relatively ineffective, that there are considerable migrations without movement of the oil in the reservoir.

A I thought Mr. Holland testified he hadn't studied it.

Q Mr. Holland testified he had studied the movement of the reservoir fluid.

A He testified this morning he had not studied the effect of gas injection.

MR. KELLAHIN:

I believe the record will speak for itself, Mr. Holland's testimony was somewhat different than Mr. Scott is concluding on that point.

Q Have you made any studies of the possible cost of a gas injection program?

A No, sir, I have not.

Q Now, in regard of the utilization of gas, Mr. Scott, have you considered putting a gas plant in there yourself?

A Why, I am not the lease owner.

Q Would you be willing to?

A I would have to study it. It seems to me it is up to the operator to put in the plant in the over-riding royalty.

Q Do you know whether pipeline connections have been available to the South Blanco-Tocito Wells?

A To what?

Q The wells involved in this hearing?

A Yes, to Malco.

Q I am referring to gas connections, Mr. Scott, pipeline connections. Are they available to the Tocito Wells?

A Under the conditions of pressures and dry gas.

Q Do you know whether Southern Union and El Paso are connected to the Pictured Cliffs in the area?

A Yes, they are.

Q Do you know whether or not they have refused to connect to the Tocito Wells?

A No, I do not, but they wouldn't connect to a Tocito until the gas was dried up and sufficient pressure put in the pipeline.

Q Do you know anything of the relative expense in performing that operation, considering the amount of gas available?

A No, sir, I haven't computed it.

Q You haven't made a study of that?

A That is right.

MR. KELLAHIN: That is all.

MR. MACEY: Any questions?

RE-DIRECT EXAMINATION

BY MR. CAMPBELL:

Q Mr. Scott, you pretty well have to fully develop the field to see what is available before it would be a wise economic venture, for anyone to put any plant in there, wouldn't you?

A Yes, it would, and what they are doing now is to diminish the number of producing wells without drilling further wells, diminishing the number of producing wells by making them water injection wells.

MR. CAMPBELL: No more questions.

MR. MACEY: Anyone have any questions of the witness?

RECROSS EXAMINATION

BY MR. RHODES:

Q Mr. Scott, you testified that you were not familiar with the relative permeabilities in this reservoir?

A No, I don't think I did.

Q Would you feel qualified to draw any conclusions from the relative permeability if you did know of their magnitude?

A Well, I have some core analyses in the office and I think I had one here. I would have to gather the data and summarize it to give a conclusion, but I feel that they are reasonably on the lower side.

Q On the low side?

A On the low side, yes, sir.

Q Are you familiar with the producing rate in this field during its early life?

A You were talking about permeability.

Q I was talking about relative permeability ratios, namely between gas and oil here.

A I misunderstood, No, I haven't made any studies on the ratios of gas against oil.

Q Do you feel a relative permeability ratio between gas and oil would be a very significant factor in deciding the proper method for pressure maintenance in this reservoir?

A No, I say the relative ratio between gas and water —

Q Relative permeability between gas and water?

A Yes, those are the compressure medium.

Q No, you have to confine to a common base the relative permeability of gas versus oil and water versus oil. You advocate the admission of gas in this reservoir as a repressure medium. In that case wouldn't the relative permeability ratio between gas and oil be a very significant factor in deciding whether or not to allow gas to enter this reservoir?

A Well, I haven't considered it thoroughly. Offhand I would say, "No". I would say if you are going in to determine how you repressure a field, you take the relationship between gas and water.

Q But you have no common base. It would have to be between gas and oil and water and oil, wouldn't it?

A I wouldn't think so, no. Perhaps I am not understanding your question thoroughly, but I wouldn't think so. You have the oil there anyway, you see, and that is the thing you are trying to move.

Q Yes, I know, but then wouldn't the relative permeability of the reservoir rock to gas, to the relative permeability of that same rock to oil indicate whether or not that gas was going to effectively move that oil?

A Yes, I would say you would have to take the effect on oil of the water or gas.

Q Then if you had a very high relative permeability ratio in a reservoir, is it not true then the gas would tend to channel through the reservoir without materially affecting the position of the oil?

A That is, as Mr. Holland said, speculative. I am not willing to speculate.

Q Are you familiar with the producing rates in this pool?

A What?

Q Oil producing rates in this pool during its early life?

A Yes.

Q Would you tell us if they were excessive or normal?

A I would say due to the drop in pressure, excessive.

Q If you had been producing in this pool at an excessive rate, isn't it reasonable to assume you would develop a condition of very diverse and divergent gas saturation in this reservoir, particularly as regards the area around the well bores and unproduced segments of the reservoir?

A I would say so.

Q It would be a very uneven gas saturation through the reservoir?

A You are producing at such a high rate you are bringing gas out of solution.

Q If you were to inject the gas in the reservoir, what would the uneven saturation mean?

A All you would have to do would be to maintain pressure and put gas in the reservoir, which you could later use.

Q You would maintain pressure in the same manner you maintain pressure with water, only you would be putting it up-dip rather than where water should be down-dip. Don't you think the unequal gas saturation would promote channeling?

A No more so than water. You still have a specific gravity of all those materials.

Q In the area?

A I think one of the troubles is your well is over produced and you haven't drilled the field up.

Q Now then you say that you are familiar with gas injection programs in other reservoirs?

A Yes, sir.

Q Have any of those been relatively flat-dipping reservoirs such as this one is dipped, of approximately 80 to 90 feet per mile?

A I don't remember specifically. I know some of them were on faulted or crumbled structures. I don't remember the rate of dip, but I believe in the Lowden Pool in Illinois and some of those pools, they first put in gas and they are later going to put in water. I think we could look that up and see. I don't know just offhand.

Q Your sole reason for advocating gas injection in this reservoir is that it has been done in other places?

A No, it is the utilization of gas.

Q The utilization of the gas?

A That is right. It is being wasted and flared to the air right now.

Q In other words, if you were going to paint your house, you are going to have to buy white paint, but you had purple paint out there in the garage, you would paint the house purple because you had that paint, is that right?

A I don't know about that, we are talking about houses now. Here you put an additional element like water into a formation, it is going to jeopardize or devalue the reserves, it is going to increase the cost of production eventually and lead to a lot of other things which I think are absolutely wrong.

MR. RHODES: That is all.

MR. MACEY: Any other questions of the witness? If not the witness may be excused.

(Witness excused.)

MR. MACEY: Do you have anything further?

MR. CAMPBELL: I would like to just — Maybe Jason wants to first. I want to make a very brief statement.

In the first place I do not believe I will make this in the form of a formal objection, perhaps it is too late for that, but I think that the application in this case is probably improper inasmuch as it is filed in the name of a non-existent legal entity of any sort. I believe the application should be filed in the name of the owner of the property or in the name of Lowry Oil Company. As far as the proceedings before this Commission are concerned it may not be of a great deal of importance, but if damage occurs in this reservoir in the future we would like the record to show that we feel that the same parties who appeared

before this Commission and offered evidence are the parties who would, of necessity, have to be defendants in any litigation in Court.

Our position in this matter, I think, is relatively clear. We do not object to water injection if the water flooding is such under the proper sections and at the proper time. We feel it is very dangerous to undertake a water flooding program at relatively early stages of development in any oil pool.

When it is admitted that that pool is not as yet completed, developed or definied, it seems apparent to us that any suggestions as to what is happening in that reservoir, displacement of this fluid or that fluid, gas, oil or water is rank speculation until you have a complete picture of what the potential amount of that pool may be.

This pool has not been developed on the 80-acre pattern that has been approved by the Commission. We have no objection to that program, we have none, now, but we feel further development should be undertaken, the rate of production reduced and if pressure maintenance is necessary, that it be done through utilization of gas that is now being wasted. That is a matter of conservation and it is a basic problem of the Oil Conservation Commission.

In the selfish point of view, we are concerned that this water flooding project will drive oil, of which we hold and overriding royalty, on to the property of other people who are developing their properties and producing their oil. We want to ask the Commission to deny the extension of this project, to deny the use of the Well T-85 as an additional water injection well in this pool, and that water flooding be stopped until such time as the

pool is developed and the rights of all parties in the area are definitely protected, either by agreement or by adequate controls in a fully developed oil pool.

MR. KELLAHIN: If the Commission please, Mr. Campbell has referred, first of all, to the parties who had brought this action and I would like to call the Commission's attention to the fact that the bond on file with the Commission is in the same name, sets forth the names of the parties involved and has been accepted and approved by the Commission and therefore, we felt that the application should be brought in the same name as the parties who have posted a bond with this Commission. I think that answers Mr. Campbell's question fully on that point. The State of New Mexico accepted them as responsible parties, and I am sure that the other interested parties can do the same.

MR. CAMPBELL: Does it have the names of the individuals on the bond?

MR. KELLAHIN: Yes.

MR. CAMPBELL: It is not just Lowry et al. Association?

MR. KELLAHIN: No. Now, in regard to the question of utilization of gas from the pool for pressure maintenance, Mr. Holland's testimony clearly shows that it is not a practical medium for pressure maintenance, due to the fact that the reservoir has been produced and is in such condition there is extreme danger of channeling of gas, the gas would not result in any appreciable movement of the oil in the reservoir and to follow such a program would result in loss of oil in the reservoir, which would constitute waste. The maximum production would not be achieved and that is one of the goals this Commission

is set up to achieve.

Now, on the other hand, it instituted the pressure maintenance program by means of water injection, first of all as a pilot program for the purpose of making a thorough test and analysis of the effect of this injection before we proceeded any further, and the Commission approved that pilot program. We appeared here again, we have made our monthly reports and appeared here in this hearing and showed the Commission the effect of that program, that it was working, that gas-oil ratios have been materially reduced, that we have also established the direction in which the oil is migrating, by the information submitted to the Commission on production figures from the various wells within the vicinity of the injection well.

The matter of utilizing gas for sale has been gone into thoroughly, the testimony shows that the applicant has made strenuous efforts to obtain a gasoline plant and now plans to put in a compressor in order to utilize this gas and sell it to the pipelines. The testimony also reflects Souther Union and El Paso both refused to build lines to the Tocito Wells, for the reason the gas was not usable, and I don't believe Mr. Campbell would advocate any of his clients shut in their wells and fail to produce merely because they had no immediate market for the gas. It has not been the practice of this Commission to enforce such a condition, and we are taking every steps possible to correct the situation as we can, and at the same time we are entitled to produce our oil.

The question of unitization was raised in the course of the hearing and at this time I would like to state Lowry is willing to

communitize with Mr. Scott the royalty interest underlying the interest operated by Mr. Lowry. They will also be willing to unitize the production interest if Mr. Scott is willing to drill a Tocito Well on the acreage held by him in the northwest quarter of Section 5 and if Mr. Scott desires to explore that matter further we will be happy to talk to him.

In the interest of conservation the pressure maintenance program should be expanded at the present time. The effect of our pilot program has been very beneficial, and to expand it at the present time I believe our testimony clearly shows will be of further benefit and result in the recovery of oil which would otherwise be lost in the reservoir.

The operator is naturally interested in producing the greatest amount of oil possible. He has full control of the amount of water to be injected. It is quite possible for him to keep track of any migration in the reservoir and in the event there is the migration which the protestant feels will occur, toward the Johnson properties, in that event the operator can take steps to remedy that situation. The monthly reports filed by the operator with the Commission will also reflect what is actually occuring each month. The amount of water injected is reported to the Commission, the production figures are available and it is very easy to keep a close check on the conditions in the South Blanco-Tocito Pool at all times. For that reason we feel that the use of T-85 Well as an injection well should be approved by the Commission and further that when, and if, wells are flooded out by water encroachment we should be allowed to use those two for water injection purposes and have we no objection to giving notice to

those having interest in the pool and to the offset operators that such is our intention and if a hearing is desired at that time, they would have the right and opportunity to request it.

We Also request that the Commission approve our application for a common tank battery on the grounds that it will result in a considerable saving of money, simplify the operations and all interested parties will be protected by the metering system to be installed by the operator in connection with the utilization of this common tank battery. That is all.

MR. MACEY: Is there anything further in the case? Is there objection to the introduction of these exhibits?

MR. CAMPBELL: No objection.

MR. KELLAHIN: No objection.

MR. MACEY: If not, they will be admitted. The case will be taken under advisement and the hearing is adjourned.

STATE OF NEW MEXICO)
: ss.
COUNTY OF BERNALILLO)

I, Marianna Meier, Court Reporter, do hereby certify that the foregoing and attached transcript of proceedings before the New Mexico Oil Conservation Commission at Santa Fe, New Mexico, is a true and correct record to the best of my knowledge, skill and ability.

IN WITNESS WHEREOF I have affixed my hand and notarial seal this 23rd day of August, 1954.

Marianna Meier.
Notary Public, Court Reporter

My Commission Expires:

April 8, 1956

Case 697 (Readvertised for July 21 1954)

File: Case 697

BROOKHAVEN OIL COMPANY
FIRST NATIONAL BANK BUILDING
(MAIL) P. O. BOX 644
Albuquerque, New Mexico
PHONE 7-8853 TELE TYPE AQ-96

June 1, 1954.

Mr. R. R. Spurrier, Secretary
New Mexico Oil and Gas Conservation Commission
State Capitol
Santa Fe, New Mexico

Dear Mr. Spurrier:

In accordance with the Transcript of Proceedings Case No. 697, Regular Hearing May 19, 1954, the undersigned submits the attached statement requesting that Lowry's application Case 697 be denied, either with or without continuance of the Case for further testimony and cross examination.

It is requested that Order R-349 be rescinded.

Very truly yours,

BROOKHAVEN OIL COMPANY
DACRESA CORPORATION

Thos B. Scott
President

TBS:ms

CC: Gov. Edwin L. Mechem, Chairman
Mr. E. S. Walker, Member

SUMMARY STATEMENT TO NEW MEXICO OIL AND GAS CONSERVATION COMMISSION
BY THOS. B. SCOTT, JR., PRESIDENT
OF BROOKHAVEN OIL COMPANY AND DACRESA CORPORATION
JUNE 1, 1954.

IN CASE NO. 697 - TO EXTEND THE PILOT PRESSURE MAINTENANCE PROGRAM IN THE SOUTH BLANCO TOCITO OIL POOL AND PERMISSION TO GAUGE OIL AT COMMON TANK BATTERY. Brookhaven Oil Company and Dacresa Corporation are overriding royalty owners in all of the Lowry Tocito oil production and are the lease owners below the Pictured Cliffs formation of NW/4 Section 5, Township 26 North, Range 6 West, offsetting one of the proposed water injection wells (D-83).

REFERENCE:

CASE NO. 537 - Re Spacing Wells Tocito Sandstone South Blanco Tocito Pool, Rio Arriba County.

CASE NO. 555 WITH RESULTING ORDER R-349 - Re Pilot Pressure Maintenance Program South Blanco Tocito Pool, Rio Arriba County.

CASE NO. 607 - Re Oil Proration San Juan Basin.

CASE NO. 697 - Re Extension Pilot Pressure Maintenance Program and Permission to Gauge Oil at Common Tank Battery, South Blanco Tocito Pool, Rio Arriba County, together with Transcript of Proceedings before the Oil Conservation Commission May 19, 1954.

REQUEST:

Because of the scope and the seriousness of Case No. 697, as it affects conservation of oil and gas, and correlative rights, it is requested that this statement be included in the proceedings of the Case, and the Case be continued for further testimony and cross examination at the Oil Conservation Commission hearing the middle of June, 1954.

STATEMENT:

The undersigned, Thos. B. Scott, Jr., has testified previously before the Oil and Gas Conservation Commission. The undersigned is a graduate of Harvard College, Class of 1918, with concentration in mathematics and studies in engineering and geology. The undersigned has been in the oil and gas producing and pipeline business continuously since 1919, both in the field and in executive positions; i.e. two years with the Empire Gas & Fuel Co. in Oklahoma and Kansas, seventeen years with the Standard Oil Company (New Jersey) and its subsidiaries in Oklahoma, Kansas, Argentina,

Bolivia, and executive offices in New York, and thereafter to the present (15 years) as head or manager of independent oil and gas producing companies and operations.

CASE 555 AND RESULTS

Lowry et al Operating Account, in Case 555, petitioned and was granted by the Commission under date of July 16, 1953, by Order R-349, permission to establish a pilot pressure maintenance program by injecting water into the Tocito sand in one or both of two wells, namely, T-109 located in the SW/4 SW/4 of Section 3-26N-6W and T-134 located in the NE/4 NW/4 of Section 10-26N-6W, South Blanco Tocito Pool, Rio Arriba County, New Mexico.

COMMENT

Since this permission was granted, water has been injected into the Tocito sand since October 1953 in only one of the two wells, namely, No. T-134. Previous to injecting water, this well produced oil and gas from the Tocito formation. The amount of water injected into this one well since November 1953 is greater than oil produced from twelve Tocito wells on the Lowry properties. At the same time, the relatively rich casinghead gas from the oil production of these twelve wells has been blown to the air, with the result that, except in the vicinity of the input well, bottom hole pressures continue to decline. (The amount of casinghead gas produced and blown to the air, according to Lowry's records for the first four months of 1954, amounts to aproximately one-third of the total gas produced and marketed from approximately thirty-one Pictured Cliffs wells on the Lowry properties.) This gas, being relatively rich casinghead gas, contains liquid petroleum products and casinghead gasoline.

The pool has been producing and marketing oil since September 1951.

Up to the time of injection water (October 1953), no water, except connate, has been found in the Tocito sand formation. The oil is of high gravity, containing, in many cases, free gas and gas in solution. The field is not defined. The water injection well, T-134, is not the lowest well in the field, the same being structurally, on top of the Tocito sandstone, approximately 20 feet higher to its northwesterly offset. No offsets have been drilled to the north, northeast, east and southeast. In these directions, no Tocito drilling has been made although from the contour map it appears likely that the pool will extend a considerable distance in the general east and southeast direction. The injection well, T-134, was the original well in the field drilled to the Dakota sandstone, but due to mechanical difficulties, it was a poor producer and plugged back to the Tocito formation, where a window was cut in the casing. From this formation it produced approximately 20 barrels per day, plus gas. The Schlumberger of the Tocito

formation in this well indicates the sand to be as good, if not better, than any other well in the field. It is assumed that the well did not produce greater quantities of oil because the sand was mudded up. The injection pressure is constantly rising although the amount of water injected is not increasing.

Injected water, as shown in the Transcript of Proceedings, is first showing up dip in the southwest offset T-157. This well also shows the best reduction in gas oil ratios. These facts are evidence that the water, following the strands of the greatest porosity and permeability, is not moving from the injection well in a uniform manner. In other words, oil will be trapped behind the water table.

The South Blanco Tecito Pool is not a "pilot" pressure maintenance program. It is experimental as indicated in the Commission's Order R-349.

The South Blanco Tocito Pool remains to date undefined except for probably three dry holes (see Exhibit A and B), namely,

Johnston's well SE/4 Sec. 30-27N-6W
Lowry et al wells NE/4 Sec. 16 and NW/4 Sec. 24-26N-6W,

these wells being some distance from present production. Johnsten has recently extended the pool northwest in well #10 in the SE/4 of Section 36-27N-7W. The east end and the north borders of the pool still remain undefined with excellent chances of large amounts of additional production. Spacing of the present oil wells is not uniform. The characteristics of the Tocito sand are:

Original production marketed September 1951,
Original B.H.P. 2200 to 2250# P.S.I.,
Present B.H.P. 1800 to 2050# P.S.I. depending
on the date of first production and
the amount of oil and gas produced,
Thickness 10 to 30 feet, with greater thickness
down dip,
Porosity averages approximately 15%,
Permeability averages approximately 138 millidarcys,

porosity and permeability varying throughout the thickness of the sand in each well and from well to well
Gas oil ratios - original - unavailable
present - see transcript

CASE 697

This new case No. 697 asks extension of the "pilot" pressure maintenance program, requesting approval of injecting water into three wells, namely, T-123, NE/4 Sec. 7-26N-6W (this being a gas well presently shut-in and, structurally on the top of the Tocito sand, the highest well in the pool), well D-83, NW/4 SE/4 Section 5-26N-6W (after plugging back from the Dakota formation from which it is now producing to the Tocito formation), and Johnston's well No. 11 in the SE/4 SW/4 Section 6-26N-6W (presently shut in as a very high gas oil ratio well) with continuing permission to inject water into T-109, SW/4 Section 3-26N-6W.

COMMENT

Well T-123 should be used as a gas injection well with that gas presently being blown to the air supplemented, if practical, by gas from the Dakota and Pictured Cliffs formations. If water were injected into this well, it would eventually disperse water throughout the Tocito formation, not only on Lowry's but Johnston's, Brookhaven's and Dacresa's properties and, through mixing the water with the gas and oil, devalue the production and reserves.

Well D-83 is presently a commercial producer in the Dakota formation and should continue as such. In looking at the Schlumberger of the Tocito formation in this well, it appears that it would make a commercial producer in the Tocito sand. To plug back this well from the Dakota formation and open up the Tocito formation for water injection would be a dissipation of valuable resources. This well, in accordance with Lowry's contour map on top of the Tocito formation, is approximately 10 feet higher than the east producing offset T-85, and approximately 20 feet higher than the oil production in well T-109 SW/4 Section 3. Additionally, if water were injected into the Tocito formation in this well, it would damage the oil reserves in the NW/4 Section 5 owned by the undersigned companies. In other words, it would drive oil from the NW/4 of Section 5 or co-mingle the water with the oil so as to devalue the production and reserve.

Although Lowry et al Operating Account has given the Commission the impression that Johnston Oil & Gas Company may cooperate in a water flooding or pressure maintenance project, I have the personal assurance of Johnston Oil & Gas Company, owner of the lease rights under Section 6, that they will in no way agree to or countenance such a project. Without Johnston flooding or repressuring the area, the oil under Lowry's properties would eventually in part be driven across the borders to Johnston's properties. This we suspect is the reason Lowry wishes to inject water into wells T-123 and D-83.

Summary

The water flooding pressure maintenance project should be stopped until such time as

1. The pool has been defined by additional drilling on uniform spacing.

2. The area unitized or agreements had to control project for all the pool.

3. Correlative rights have been protected for all parties.

4. Waste gas has been utilized (through compressor station now being constructed.)

5. Further efforts made through production methods to reduce oil gas ratios - casing and tubing settings, more wells, lesser production per well, regular production.

6. Gas injection on top of structure.

7. Water drive on north edge on down dip in only non-commercial wells.

TESTIMONY AND EXHIBITS PRESENTED AT HEARING OF COMMISSION MAY 19, 1954, BY A. F. HOLLAND, ENGINEER OF LOWRY ET AL OPERATING ACCOUNT.

The exhibit records show behavior of the pool through bottom hole pressures (Exhibit 3) from August 1953, and gas oil ratios (Exhibit 2) since July 1953. The first production was marketed from the pool in September 1951. The first wells had bottom hole pressures of 2200 to 2250#. In other words, there was a drop of 200 to 400# from beginning to earliest date on the exhibits. I have not learned what the original gas oil ratios were.

Exhibit I - Map South Blanco Pool - unduly limits the pool area - present and potential. Please refer to our Exhibit A which shows Johnston's new oil well #10 SE/4 Section 26-27N-7W, also the three wells (green) drilled unproductive through the Tocito, these being te date the only limiting factors to the pool's extensions.

Exhibit - Centrour Map - Top Tocito Sandstone - unduly limits the pool area - present and potential.

Please refer to our Exhibit B which shows our contour map on top of the Tocito sandstone - over a larger area. This map clearly shows the unlimited prospective extent of the pool along the strike and enlarged area prospective up and down dip.

Exhibit #4 (7th General Survey Jan. 11-13/54) and #5 (8th General Survey April 1-3/54) - average reservoir pressures - gives the impression of a limited pool area particularly on the east end which remains unexplored, and highly prospective (see our Exhibit B). General Survey #1 through 6 are not included in either the testimony or the exhibits.

REFER TO TRANSCRIPT OF DIRECT TESTIMONY

Page 3 - We do not understand why it is necessary or not necessary to use well T-109 presently a commercial oil producer as a water injection well.

Page 4 - There is no Johnston agreement. There is no agreement with Brookhaven Oil Company and Dacresa Corporation. Therefore, Lowry without such agreements and the protection of correlative rights may not inject water into wells T-123 and D-83. As mentioned above, without doing this or injecting gas into T-123, the present program of water injection will drive Lowry's oil onto Johnston's properties.

Page 5 - The use of commercial oil producing wells for water injection wells is, to our mind, the destruction and devaluation of oil production and oil reserves. Injection of water in a well will, of course, reduce the oil gas ratios. The question is will injection of water into a formation decrease or increase oil recoveries in the best manner.

Page 9. - Lowry's program will not protect correlative rights as indicated above.

Page 10 - A central tank battery for the metering of oil (and gas and water) is impractical and jeopardizes ownership. The ownership of all the leases will not remain the same forever. Unless the area is communitized, the central tank battery should not be installed.

REFER TO TRANSCRIPT OF CROSS EXAMINATION

Page 12 - It is impractical and a waste of natural resources and devalues production and reserves to plug present Dakota producing well D-83 to the Tocito formation which will probably also produce oil, use the Tocito formation for a water injection well in that formation, then recomplete in the Dakota for oil production. In addition, such an operation would devalue the oil and gas reserves in the Tocito formation through water flooding the NW/4 of Section 5 belonging to the undersigned.

Page 13 and 14 - Lowry et al proposes to put water in the gas cap so that the oil driven up dip will not enter the gas cap. This is contrary to orthodox concepts that it needs no further comments.

Page 14 - Lowry proposes to disperse water throughout the field. Water is one of the principal things that should not be produced with the oil. Additionally, it will devalue the production due to the expense of segregating gas, water and oil before marketing.

Page 15 - We agree with Mr. Cogin's thoughts on the matter of a common tank battery.

Finally, it is requested that Lowry's application Case 697 be denied, either with or without continuance of the Case fer further testimony and cross examination.

It is requested that Order R-319 be rescinded.

BROOKHAVEN OIL COMPANY
DAGRESA CORPORATION

Frank B Scott
President

6/1/54.

CASE 697: Lowry et al Operating Account
For extension of pilot pressure maintenance
program in South Blanco-Tocito Pool

BEFORE THE

OIL CONSERVATION COMMISSION

STATE OF NEW MEXICO

Santa Fe, New Mexico

* * * * *

TRANSCRIPT OF PROCEEDINGS

CASE NO. 697

Regular Hearing

BEFORE THE
OIL CONSERVATION COMMISSION
STATE OF NEW MEXICO
Santa Fe, New Mexico
May 19, 1954

IN THE MATTER OF:

Application of Lowry et al Operating Account for the approval and extension of its pilot pressure maintenance program in the South Blanco-Tocito Pool, and for permission to gauge oil at a common tank battery. Case No. 697

BEFORE THE FULL COMMISSION

TRANSCRIPT OF PROCEEDINGS

MR. SPURRIER: The meeting will come to order. The next Case on the docket is 697.

MR. KELLAHIN: Jason Kellahin representing Lowry Oil Company, the Lowry et al Operating Account applicant in this Case. In the interest of saving time and in order that the Commission might have a complete picture of the entire history of this field, we ask that the Commission take notice of the extensive geological and engineering information which has heretofore been offered by Lowry in connection with Cases 537 which is concerned with 80 acre spacing. 555 which approved a pilot pressure maintenance program and 607 oil proration case coupled with that we will offer information today to supplement the geological and engineering information offered in those previous cases and will bring the record down to date and with the testimony and exhibits offered in those previous cases, the Commission will have a complete and full picture of the entire history of this pool to guide them in drafting an order in this Case.

This Case is an application for an extension of the pilot pressure maintenance program which was approved by the Commission in Case No. 555, Order No. R-349. We would like to call Mr. Art. Holland as a witness.

A. F. H O L L A N D

a witness, having been first duly sworn, testified as follows:

DIRECT EXAMINATION

By: MR. KELLAHIN:

Q State your name please? A My name A. F. Holland.

Q By whom are you employed?

A I am employed by the Lowry Oil Company.

Q In what capacity?

A As a petroleum engineer for that company.

Q Is the Lowry Oil Company, the operator for the Lowry et al Account? A That is correct.

Q Have you testified before this Commission before as an expert engineer? A Yes, sir, I have.

Q Have your qualifications been accepted by the Commission?

A They have been accepted.

MR. KELLAHIN: We submit that the witness is qualified.

MR. SPURRIER: He is.

Q Mr. Holland, the Commission has before it at this time an application for an extension of the pilot pressure maintenance program in the South Blanco-Tocito Pool, which was heretofore approved in Case 555 by Order No. R-349, are you familiar with the pilot pressure maintenance program now in effect?

A I am familiar with that program.

Q Have you drafted the plans for the extension?

A I have helped work out the extension program,yes, sir.

Q I hand you what has been marked as Exhibit No. 1 and ask you to state to the Commission what that shows?

A Exhibit No. 1 is a plat of the South Blanco-Tocito Pool. The area colored in yellow on the plat represents the acreage operated by Lowry. The plat includes all of the producing wells in the field which are operated both by Lowry and by the Johnson Oil and Gas Company. On the plat are shown in addition to the producing wells the proposed expansion program of the pressure maintenance project. The wells proposed by Lowry to be converted to water injection wells are their well T-123 and their well D-63, T-123 is located in Section 7, Township 26 North, Range 6 West and well D-63 is located in Section 5, Township 26, North, Range 6 West. Both wells in Rio Arriba County. In addition is shown the present well being used for water injection purposes and that is well T-134 located in Section 10 of the same township and range as before.

Q Has another well been approved by this Commission as a proposed water injection well?

A The application for the pilot program requested approval of two wells. T-134 which is presently being used and P-109 which has never been converted to water injection purposes. The reason for requesting two wells was to be able to use the two wells instead of the one, if it became necessary. So far, it has not.

Q Now, I noticed on examining the Exhibit No. 1 that a well not on Lowry property has beencircled in red, is it proposed to use that as a water injection?

A This is the Johnson Oil Company Rincon unit No. 11, Lowry

has been attempting to work out a cooperative water injection program with the Johnson Oil and Gas Company. We thought we had those arrangements complete, however, we do not have final approval on it and therefore are requesting only approval of our portion of the program.

Q Mr. Halland, I hand you what has been marked as Exhibit No. 2 and ask you to state what that is designed to reflect?

A Exhibit No. 2 is a summary of the gas-oil ratio tests conducted for the Lowry wells of the South Blanco-Tocito Pool. These tests are presented commencing with July 1st, 1953 in order to show tests before and after institution of the pressure maintenance project.

Q This Exhibit coupled with the Exhibits in the previous cases mentioned at the outset of this hearing, does that complete the record on these tests for the life of the field?

A It does, it includes all of the tests which have been performed. The tests are more numerous than are required by the South Blanco-Tocito Pool rules. The reason for taking so many tests was to follow the progress of the program. I would like to call the Commission's attention to some of the wells that are offsetting the water injection well. The first well, I would like to point out is well T-157. This well had a producing gas-oil ratio before commencing the pressure maintenance program as high as 1768 cubic feet per barrel. At the present time, after six months of approximately water injections, the well has a ratio of 922 cubic feet per barrel.

The next well I would like to point out is well T-109, that well before water injection had gas-oil ratio as high as 2280 cubic

feet per barrel. The latest test on that well showed a gas-oil ratio of 652 cubic feet per barrel. The next well, I would like to point out is well T-132, this well had ratios as high as 1653 cubic feet per barrel prior to water injections and at the present time it has a producing ratio of 628 cubic feet per barrel. One thing I haven't mentioned is that water injection commenced during October, October 7, 1953. These three wells have shown the biggest drop in producing gas-oil ratio. Other wells have been effected, T-128 has been affected, T-207 has been affected.

Q I hand you what has been marked as Exhibit No. 3 and ask you to state what that shows, Mr. Holland?

A Exhibit No. 3 is a bottom hole pressure test record of tests taken since July the 1st, 1953, it shows that tests have been performed at intervals of each three months and shows for the wells in the pilot water flood area that pressure drops have been nil, have gained pressure or have been materially arrested, during the last three months survey that was taken during April, 1954.

Q You are referring now to Exhibit No. 5?

A The data is on Exhibit No. 5. Exhibit No. 3 will reflect that during the period, January , 1954 to April, 1954 that well T-109 gained 15 pounds, well T-157 gained 1 pound, well T-207 gained 8 pounds. T-132 had a decrease of 5 pounds, and well T-182 also had a decrease of 5 pounds. Before pressure maintenance operations were commenced, pressure drops ranged from as high as 20 pounds between surveys to as much as in excess of 50.

Q Have you prepared any isobaric maps reflecting the results of your bottom hole pressure tests, Mr. Holland?

A Isobaric maps have been prepared and are submitted for the last two pressure surveys.

Q That is Exhibit No. 4?

A Exhibit No. 4 would be the pressure survey conducted during January, 1954.

Q Exhibit No. 5, what does it reflect?

A Exhibit 5 would reflect the bottom hole pressure tests taken during April, 1954.

Q Calling your attention to Exhibit No. 6, Mr. Holland, would you discuss that?

A Exhibit No. 6 represents production data from all of the Lowry operated wells in the South Blanco-Tocito Pool since July, 1953.

Q Supplementing this Exhibit No. 6 with the information that is heretofore been presented to the Commission, does it give a complete production history of the South Blanco-Tocito operation by Lowry?

A It does, it supplements part of the information that has been presented in order to review data before and since the institution of the project.

Q Have you any further comments on Exhibit No. 6?

A Only that I would like to point out the gas-oil ratio for all of the wells that there has been a substantial decrease in these ratios since the project was commenced.

Q That reflects the same information substantially as Exhibit No. 2 on gas-oil ratios, does it not?

A It is a field wide figure instead of the individual well figures.

Q Now, I hand you Exhibit No. 7, and ask you to state what that

is?

A Exhibit No. 7 is a graphical repetition of data contained in the other Exhibits. It shows graphically oil production rates, gas-oil ratio, gas production, reservoir pressure performance, number of producing wells and accumulative production for Leary operated wells.

Q Does that Exhibit show that gas-oil ratio has been reduced?

A It does, it shows that gas-oil ratios in excess of 2300 cubic feet per barrel were obtained before pressure maintenance and at the present time, the producing gas-oil ratio is 1354 cubic feet per barrel.

Q Does it also reflect that pressures have been stabilized to some --

A (Interrupting) It does, it shows that there has been material decrease in the bottom hole pressure decline between surveys.

Q Now, I hand you Exhibit No. 8 and ask you to state what that is, Mr. Holland?

A Exhibit No. 8 is a record of the water injected into the water injection well T-134 through April 15, 1954, 871,081 barrels had been injected.

Q Is that the total injection of water under the present program?

A That represents every barrel of water that has been injected.

Q Now, I hand you the Exhibit No. 9, Mr. Holland, and ask you to state what that shows?

A Exhibit No. 9 is a graphical representation of the water injected and it just shows the results in graphical form.

Q I now hand you Exhibit No. 10, Mr. Holland, and ask you to discuss that Exhibit.

A This Exhibit represents production information for the five wells that encircle the pilot pressure maintenance area. It is a total of the production from these five wells T-109, T-83 , T-157, T-162, and T-207. These five wells were selected because they have shown the most marked influence from the pressure maintenance program. That, naturally is true because they are the wells nearest the injection well. It shows that during the month of September, 1953, that the producing gas-oil ratio of these five wells was 1980 cubic feet per barrel. Water injection was commenced during October 1953 and the producing gas-oil ratio of these five wells during April, 1954 was 1082 cubic feet per barrel. There has been a decrease in the producing gas-oil ratio from the experimental area of roughly 900 cubic feet per barrel.

Q I hand you what has been marked as Lowry's Exhibit No. 11 and ask you to state what that shows?

A Exhibit No. 11 is an analysis of the bottom hole pressure information prior to water injection and after water injection. The wells in the experimental pressure maintenance area are separated from the remaining Lowry operated wells and appear at the top of the Exhibit. It shows that prior to pressure maintenance for the five wells in the pressure maintenance area that the oil produced per barrel per pound drop for the individual wells varied from 128 to 475. After the program was placed in operation and through the period, October, 1953 through April, 1954, three of the wells had no drops, two of the wells had produced from 715 to 845 barrels per

pound bottom hole pressure drop. It reflects that all five wells are being effected and we believe that this evidence coupled with the gas-oil ratio information indicates that the water is being dispersed throughout the formation to best achieve an increase in ultimate oil recovery.

MR. KELLAHIN: At this time, we would like to offer in evidence Lowry's Exhibits 1 through 11, inclusive.

MR. SPURRIER: Is there objections? Without objections they will be admitted.

Q Mr. Holland, in your opinion, will the proposed expansion of the water injection program as a pressure maintenance project result in a beneficial effect on the South Blanco-Tocito Pool?

A We believe it will. The reason for the expansion is so that a greater area will be affected. We hope to maintain reservoir pressure and possibly restore some pressure in order to increase the ultimate oil recovery from the pool. That is the reason that we are asking for the extension.

Q In your opinion, will correlative rights be protected by the program proposed by Lowry?

A I believe they will. As I mentioned at the start of the hearing, we haven't completed arrangements with Johnson Oil and Gas Company but that program was arranged so that they would maintain or it was recommended to them that they maintain their reservoir voidage, by that I mean restore their approximate reservoir voidage to the reservoir and Lowry would essentially do the same. In that manner, we proposed to protect correlative rights.

Q In your opinion, should the program be taken off the pilot status and made a permanent water pressure maintenance and water

injection program?

A We believe it is successful. We have injected 271,000 barrels of water and have produced no water except during the past few days. One of the wells, T-157 has shown a slight percentage of water. We have had a casing leak with that well before. We had trouble, we are not certain whether the water is coming from the injection well or the packer which we set in the well is leaking.

Q In the event the Commission approves this application, is Leary willing to supply the Commission with any data required in order that they may keep track of your progress and the results thereof?

A Well, we have been furnishing monthly production and water injection values and any other information and we will furnish whatever they request.

MR. KELLAHIN: That is all.

MR. SPURRIER: Anyone have a question of the witness?

MR. CAMPBELL: Yes, I have.

MR. KELLAHIN: We have some matters here. Included in the application is a request for the installation of central tank battery for the metering of oil. Mr. Holland, what is proposed in connection with the setting of the central tank battery?

A The plans that we hope to place in effect are to locate all separators, we plan to set a separator and fluid meter and a gas meter for each individual well and we plan to locate those at the central point. We will measure the fluid from each well and then we would like to request permission to produce this well into a common tank battery.

Q How many basic leases would be involved in that?

A At the present time, there are two leases and our records indicate that the royalty and ownership both regular and overriding are the same.

Q The royalty ownership is it Federal?

A These are Federal Leases.

Q Have you checked this proposal with the U.S.G.S.?

A I have. We have presented the plan to the U.S.G.S. and we do have an approval from them to do it.

Q And have you presented the pressure maintenance pressure program to the U.S.G.S.?

A We have, it was presented to them that we had the cooperation of the Johnson Oil and Gas Company. We thought we had and we will still continue to try to work out a cooperative program with them. They have approved it on that basis.

Q If Lowry is allowed to set a central tank battery, will they be in a position to account for all the production in accordance with their lease contracts?

A Yes, that is right. Records will be maintained on the individual leases.

MR. KELLAHIN: That is all.

MR. CAMPBELL: If the Commission please, I would like to enter an appearance here and ask a few questions of Mr. Holland about the proposed extension of this plan. I would like to enter an appearance on behalf of Brookhaven and Dacresa Corporation who as I understand, own two and a half percent overriding royalty on most ofthe production from this Dacresa overriding interest on this pool.

Questions by MR. CAMPBELL:

Q I assume your application, I have not seen it, I assume it asks the Commission to take this program out of the pilot stage and put it on a permanent basis?

A We would like to expand the program and add additional injection wells.

Q Do you feel that the experience you have gained on only one water injection well in this area is enough to satisfy you fully with regard to the program?

A We think so, yes.

Q Do you intend to continue water injection in this T-134, the well you are now using?

A We plan to continue using that well plus the other wells that we are requesting approval here today.

Q You no longer intend to use the T-109 as a water injection well or do you intend to use that also?

A We will probably want to use that well. At such time that water encroachment invades that area and the well is no longer of any use for oil production.

Q Now, I notice that two wells that you proposed to use for water injection, T-123 and B-83 are both shown on your plat as gas wells. Would you explain the method by which you intend to use gas wells as water injection wells in this area?

A B-83 is a well producing from the Pocito formation. What we would propose to do is plug that well back to the Pocito zone perforate and inject water into the Pocito zone and use the well so long as it is necessary, then when the well is no longer needed for water injection purposes to again complete in the Pocito and

deplete the Dakota formation.

Q What is the status of T-123?

A T-123 is shown as a gas well. It is a well in the gas cap of the South Blanco-Tocito Pool.

Q How do you intend to use that as a water injection well? What, mechanically, do you intend to do to protect the gas cap gas there?

A We intend to inject water into the Tocito zone just as the well is presently completed. It is perforated in the Tocito zone.

Q It isn't necessary, in your opinion, to shut off the gas cap gas from that water injection?

A Well, the zone is about roughly ten feet and I don't know of any way that we could do otherwise than we have recommended.

Q You do not feel, I assume, that you will cause any damage to the gas cap or the reservoir as a whole by using a gas cap well in that manner for water injection?

A We don't think so. We don't intend to abandon that gas cap gas. We think that possibly it is of considerable magnitude and value. We at some date will probably propose to produce that gas cap gas.

Q You don't think it requires any protection?

A Well, I don't know just what you have in mind.

Q I am not sure either, but what I am getting at is, isn't it a rather unorthodox procedure to use as a water injection well a well which is essentially a gas well?

A This field has low relief somewhere in the approximate value of 60 feet per mile. The reason we are recommending this program is that we want to prevent gas oil migration into the gas cap. To

get the best results from our program and we, by that we will attempt to keep our wells flowing as well as possible, we need to maintain or restore bottom hole pressure. We have been concerned in so doing with migrating oil into the gas cap. For that reason and in view of the fact that there is not much relief for the pool, we would like to ask the approval of the program to inject water into these wells.

Q Would you mind explaining to me what the reason is that you can't use some of these oil wells that are lower on structure for your water injection program rather than taking the well of the type 7-12) there higher on the structure and injecting the water there?

A Well, we would like to get the water dispersed for one reason to different areas of the field. We can use the wells low and will propose doing it at such time that they are of no value for oil production. Well, in fact, that is what our program is now. We are injecting water in one of the lower wells.

Q Isn't it customary in the water injection programs to inject the water at the lower points on structure to force oil up structure? Isn't that customary procedure?

A I think generally, most projects are worked that way.

Q All I am trying to get at, I am not trying to attack your program necessarily, I am trying to find out why you want to use the wells higher on structure, wells that are now gas wells instead of using the oil wells that are on the flank?

A The reasons are those I have given you.

Q I didn't understand what they were. Is it the water disposal?

A Water disposal is one attempt to prevent migration of oil

into the gas cap is another reason which is, it is not an important reason but was a way of working out a cooperative arrangement with the Johnson Oil and Gas Company, that is another reason.

Q They would prefer you to use these wells at these points, is that it? They would rather you would use these than some of the others?

A I frankly don't know. We have talked to the Johnson people about this program and had proceeded along the lines that they would join in this cooperative arrangement.

MR. CAMPBELL: I think that is all.

MR. SPURRIER: Anyone else?

By: MR. KELLAHIN:

Q In the event that Johnson did join the program, the use of that well would be more beneficial to them, would it not?

A Well, the well is presently shut in, both of these wells are shut in there. Presently no income is being derived from these wells.

MR. KELLAHIN: That is all.

MR. COGIN: A. L. Cogin, Dallas, representing W. C. Smith, one of the overriding royalties under some tracts of land covered by the Lowry leases.

Questions by MR. COGIN:

Q I don't think that the royalty ownership, the overriding royalty ownership will be the same all through your acreage there and in the setting of this common tank by the use of your separator and gauging the fluid to the separator and then lift it to the common tank, do you think that you can adequately protect the interest of the party where the ownership is different?

A I think so. We will measure the fluid from each well. Now, that will represent both oil and water and we will take periodic tests on these wells and I think the answer is to your question, is yes.

Q I doubt it.

MR. COGIN: That is all.

MR. SPURRIER: Why do you doubt it?

MR. COGIN: It seems to me they have to catch the oil and measure it before it goes into the central tank.

MR. SPURRIER: That is what they said they were going to do. They said they were going to meter from each one of the wells.

MR. KELLAHIN: What they propose to do is to meter the fluid from each well and take periodic tests as to the water ratio. What it boils down to is whether they are a good operator and whether they are not a good operator. I think they have demonstrated here that they have been a good operator in the past.

MR. SPURRIER: Anyone else?

MR. KELLAHIN: We would also like to ask that as these wells are abandoned by water encroachment that they be allowed to go to water injection wells without any necessity for further hearing before the Commission.

MR. SPURRIER: Anyone else? If not, the witness may be excused.

(Witness excused.)

MR. CAMPBELL: If the Commission please, I would like to make a request to ask the applicant if it would be agreeable. The companies which I represent have not had an opportunity to analyze the effects of the proposed extension insofar as these new injection

wells are concerned. Without intending to necessarily delay the extension of the program, if it is feasible and proper they would like to have some time to check that situation with reference to those particular wells. Perhaps it will be entirely agreeable, I do not know if it is, the Commission and the applicant could be advised. If it isn't they would like the opportunity to put some evidence on in this Case.

MR. KELLAHIN: The only difficulty with your position, the longer this program is delayed, the harder it is going to be to catch up with the drop in pressure. While we have no idea of forclosing, Mr. Campbell's companies from entering an appearance, in fact Mr. Scott talked to me and asked if it would be all right to submit a written statement. I told him we would have no objection to that. We would want some indication of how long your--are you, in effect, asking for a continuance of this Case?

MR. CAMPBELL: Not necessarily. The position that he is in, that prior to the time that the testimony was offered, he didn't have the basis for the use of these particular wells for water injection as I have indicated. I think he would like an opportunity to look at the transcript and put on testimony in the event, he feels that it would be damaging to his interest in there. How long it would take to get the transcript, I don't know. I could try to give him the information and present it here. I can't give it to him like an engineer does.

MR. KELLAHIN: If Mr. Scott would come to Lowry's office, we would be glad to give him the information that is available even the testimony that has been presented.

MR. CAMPBELL: If the Commission would stay that, Mr. Scott or these companies should have a period of time, I don't think he should have necessarily until next month.

MR. SPURRIER: How many days?

MR. CAMPBELL: Two weeks, it maybe entirely satisfactory. I think he is entitled to a chance to look this over.

MR. KELLAHIN: If Mr. Scott will come to Leamy's office in Albuquerque, they will be glad to discuss the matter with him and show him everything they have. That offer was made to him prior to the mailing of this hearing. We feel like he had the opportunity at least.

MR. CAMPBELL: Suppose we leave it he has two weeks to file a written statement. If no written statement is filed, the matter is agreeable to him.

MR. SPURRIER: We will expect that by June 2nd, that is two weeks.

MR. KELLAHIN: We have no objection to that.

MR. SPURRIER: Anything further? We will take the Case under advisement according to stipulation until June 2nd and move on to Case 698.

STATE OF NEW MEXICO)
: ss.
COUNTY OF BERNALILLO)

I, ADA DEARNLEY, Court Reporter, do hereby certify that the foregoing and attached transcript of proceedings before the New Mexico Oil Conservation Commission at Santa Fe, New Mexico, is a true and correct record to the best of my knowledge, skill and ability.

IN WITNESS WHEREOF I have affixed my hand and notarial seal this 28th day of May, 1954.

Ada Dearnley
Notary Public, Court Reporter

My Commission Expires:

June 19, 1955

After 15 days, return to
OIL CONSERVATION COMMISSION,
Box 271,
SANTA FE, NEW MEXICO.

[illegible] P. L. and R.
[illegible] POSTAGE
Paid
[illegible] NEW MEXICO.
Permit No. 8

[illegible]

JUN 8 - '54

INTER-OFFICE TRANSMITTAL SLIP

TO R. L. Sherrin

FROM Edwin L. Mechem

( ) For Approval

( ) For Signature

(✓) Note and Advise

( ) Note and Return

( ) For Your Files

( ) For Your Handling

Remarks:

Mr. Scott's opinions are not evidence and if he & Johnston wish to object, why didn't they for the record & apparently our staff will recommend approval of the project

June 1, 1954.

Mr. R. R. Spurrier, Secretary
New Mexico Oil and Gas Conservation Commission
State Capitol
Santa Fe, New Mexico

Dear Mr. Spurrier:

In accordance with the Transcript of Proceedings Case No. 697, Regular Hearing May 19, 1954, the undersigned submits the attached statement requesting that Lowry's application Case 697 be denied, either with or without continuance of the Case for further testimony and cross examination.

It is requested that Order R-349 be rescinded.

Very truly yours,

BROOKHAVEN OIL COMPANY
DACRESA CORPORATION

Thos B Scott
President

TBS:ms

CC: Gov. Edwin L. Mechem, Chairman
Mr. E. S. Walker, Member

SUMMARY STATEMENT TO NEW MEXICO OIL AND GAS CONSERVATION COMMISSION
BY THOS. B. SCOTT, JR., PRESIDENT
OF BROOKHAVEN OIL COMPANY AND DACRESA CORPORATION
JUNE 1, 1954.

IN CASE NO. 697 - TO EXTEND THE PILOT PRESSURE MAINTENANCE PROGRAM IN THE SOUTH BLANCO TOCITO OIL POOL AND PERMISSION TO GAUGE OIL AT COMMON TANK BATTERY. Brookhaven Oil Company and Dacresa Corporation are overriding royalty owners in all of the Lowry Tocito oil production and are the lease owners below the Pictured Cliffs formation of NW/4 Section 5, Township 26 North, Range 6 West, offsetting one of the proposed water injection wells (D-83).

REFERENCE:

CASE NO. 537 - Re Spacing Wells Tocito Sandstone South Blanco Tocito Pool, Rio Arriba County.

CASE NO. 555 WITH RESULTING ORDER R-349 - Re Pilot Pressure Maintenance Program South Blanco Tocito Pool, Rio Arriba County.

CASE NO. 607 - Re Oil Proration San Juan Basin.

CASE NO. 697 - Re Extension Pilot Pressure Maintenance Program and Permission to Gauge Oil at Common Tank Battery, South Blanco Tocito Pool, Rio Arriba County, together with Transcript of Proceedings before the Oil Conservation Commission May 19, 1954.

REQUEST:

Because of the scope and the seriousness of Case No. 697, as it affects conservation of oil and gas, and correlative rights, it is requested that this statement be included in the proceedings of the Case, and the Case be continued for further testimony and cross examination at the Oil Conservation Commission hearing the middle of June, 1954.

STATEMENT:

The undersigned, Thos. B. Scott, Jr., has testified previously before the Oil and Gas Conservation Commission. The undersigned is a graduate of Harvard College, Class of 1918, with concentration in mathematics and studies in engineering and geology. The undersigned has been in the oil and gas producing and pipeline business continuously since 1919, both in the field and in executive positions; i.e. two years with the Empire Gas & Fuel Co. in Oklahoma and Kansas, seventeen years with the Standard Oil Company (New Jersey) and its subsidiaries in Oklahoma, Kansas, Argentina,

Bolivia, and executive offices in New York, and thereafter to the present (15 years) as head or manager of independent oil and gas producing companies and operations.

CASE 555 AND RESULTS

Lowry et al Operating Account, in Case 555, petitioned and was granted by the Commission under date of July 16, 1953, by Order R-349, permission to establish a pilot pressure maintenance program by injecting water into the Tocito sand in one or both of two wells, namely, T-109 located in the SW/4 SW/4 of Section 3-26N-6W and T-134 located in the NE/4 NW/4 of Section 10-26N-6W, South Blanco Tocito Pool, Rio Arriba County, New Mexico.

COMMENT

Since this permission was granted, water has been injected into the Tocito sand since October 1953 in only one of the two wells, namely, No. T-134. Previous to injecting water, this well produced oil and gas from the Tocito formation. The amount of water injected into this one well since November 1953 is greater than oil produced from twelve Tocito wells on the Lowry properties. At the same time, the relatively rich casinghead gas from the oil production of these twelve wells has been blown to the air, with the result that, except in the visinity of the input well, bottom hole pressures continue to decline. (The amount of casinghead gas produced and blown to the air, according to Lowry's records for the first four months of 1954, amounts to approximately one-third of the total gas produced and marketed from approximately thirty-one Pictured Cliffs wells on the Lowry properties.) This gas, being relatively rich casinghead gas, contains liquid petroleum products and casinghead gasoline.

The pool has been producing and marketing oil since September 1951.

Up to the time of injection water (October 1953), no water, except connate, has been found in the Tocito sand formation. The oil is of high gravity, containing, in many cases, free gas and gas in solution. The field is not defined. The water injection well, T-134, is not the lowest well in the field, the same being structurally, on top of the Tocito sandstone, approximately 20 feet higher to its northwesterly offset. No offsets have been drilled to the north, northeast, east and southeast. In these directions, no Tocito drilling has been made although from the contour map it appears likely that the pool will extend a considerable distance in the general east and southeast direction. The injection well, T-134, was the original well in the field drilled to the Dakota sandstone, but due to mechanical difficulties, it was a poor producer and plugged back to the Tocito formation, where a window was cut in the casing. From this formation it produced approximately 20 barrels per day, plus gas. The Schlumberger of the Tocito

formation in this well indicates the sand to be as good, if not better, than any other well in the field. It is assumed that the well did not produce greater quantities of oil because the sand was mudded up. The injection pressure is constantly rising although the amount of water injected is not increasing.

Injected water, as shown in the Transcript of Proceedings, is first showing up dip in the southwest offset T-157. This well also shows the best reduction in gas oil ratios. These facts are evidence that the water, following the strands of the greatest porosity and permeability, is not moving from the injection well in a uniform manner. In other words, oil will be trapped behind the water table.

The South Blanco Tocito Pool is not a "pilot" pressure maintenance program. It is experimental as indicated in the Commission's Order R-349.

The South Blanco Tocito Pool remains to date undefined except for probably three dry holes (see Exhibit A and B), namely,

Johnston's well SE/4 Sec. 30-27N-6W
Lowry et al wells NE/4 Sec. 16 and NW/4 Sec. 24-26N-6W,

these wells being some distance from present production. Johnston has recently extended the pool northwest in well #10 in the SE/4 of Section 36-27N-7W. The east end and the north borders of the pool still remain undefined with excellent chances of large amounts of additional production. Spacing of the present oil wells is not uniform. The characteristics of the Tocito sand are:

Original production marketed September 1951,
Original B.H.P. 2200 to 2250# P.S.I.,
Present B.H.P. 1800 to 2050# P.S.I. depending
on the date of first production and
the amount of oil and gas produced,
Thickness 10 to 30 feet, with greater thickness
down dip,
Porosity averages approximately 15%,
Permeability averages approximately 138 millidarcys,

porosity and permeability varying throughout the thickness of the sand in each well and from well to well
Gas oil ratios - original - unavailable
present - see transcript

CASE 697

This new case No. 697 asks extension of the "pilot" pressure maintenance program, requesting approval of injecting water into three wells, namely, T-123, NE/4 Sec. 7-26N-6W (this being a gas well presently shut-in and, structurally on the top of the Tocito sand, the highest well in the pool), well D-83, NW/4 SE/4 Section 5-26N-6W (after plugging back from the Dakota formation from which it is now producing to the Tocito formation), and Johnston's well No. 11 in the SE/4 SW/4 Section 6-26N-6W (presently shut in as a very high gas oil ratio well) with continuing permission to inject water into T-109, SW/4 Section 3-26N-6W.

COMMENT

Well T-123 should be used as a gas injection well with that gas presently being blown to the air supplemented, if practical, by gas from the Dakota and Pictured Cliffs formations. If water were injected into this well, it would eventually disperse water throughout the Tocito formation, not only on Lowry's but Johnston's, Brookhaven's and Dacresa's properties and, through mixing the water with the gas and oil, devalue the production and reserves.

Well D-83 is presently a commercial producer in the Dakota formation and should continue as such. In looking at the Schlumberger of the Tocito formation in this well, it appears that it would make a commercial producer in the Tocito sand. To plug back this well from the Dakota formation and open up the Tocito formation for water injection would be a dissipation of valuable resources. This well, in accordance with Lowry's contour map on top of the Tocito formation, is approximately 10 feet higher than the east producing offset T-85, and approximately 20 feet higher than the oil production in well T-109 SW/4 Section 3. Additionally, if water were injected into the Tocito formation in this well, it would damage the oil reserves in the NW/4 Section 5 owned by the undersigned companies. In other words, it would drive oil from the NW/4 of Section 5 or co-mingle the water with the oil so as to devalue the production and reserves.

Although Lowry et al Operating Account has given the Commission the impression that Johnston Oil & Gas Company may cooperate in a water flooding or pressure maintenance project, I have the personal assurance of Johnston Oil & Gas Company, owner of the lease rights under Section 6, that they will in no way agree to or countenance such a project. Without Johnston flooding or repressuring the area, the oil under Lowry's properties would eventually in part be driven across the borders to Johnston's properties. This we suspect is the reason Lowry wishes to inject water into wells T-123 and D-83.

Summary

The water flooding pressure maintenance project should be stopped until such time as

1. The pool has been defined by additional drilling on uniform spacing.
2. The area unitized or agreements had to control project for all the pool.
3. Correlative rights have been protected for all parties.
4. Waste gas has been utilized (through compressor station now being constructed.)
5. Further efforts made through production methods to reduce oil gas ratios - casing and tubing settings, more wells, lesser production per well, regular production.

6. Gas injection on top of structure.

7. Water drive on north edge on down dip in only non-commercial wells.

TESTIMONY AND EXHIBITS PRESENTED AT HEARING OF COMMISSION MAY 19, 1954, BY A. F. HOLLAND, ENGINEER OF LOWRY ET AL OPERATING ACCOUNT.

The exhibit records show behavior of the pool through bottom hole pressures (Exhibit 3) from August 1953, and gas oil ratios (Exhibit 2) since July 1953. The first production was marketed from the pool in September 1951. The first wells had bottom hole pressures of 2200 to 2250#. In other words, there was a drop of 200 to 400# from beginning to earliest date on the exhibits. I have not learned what the original gas oil ratios were.

Exhibit I - Map South Blanco Pool - unduly limits the pool area - present and potential. Please refer to our Exhibit A which shows Johnston's new oil well #10 SE/4 Section 26-27N-7W, also the three wells (green) drilled unproductive through the Tocito, these being to date the only limiting factors to the pool's extensions.

Exhibit - Controur Map - Top Tocito Sandstone - unduly limits the pool area - present and potential.

Please refer to our Exhibit B which shows our contour map on top of the Tocito sandstone - over a larger area. This map clearly shows the unlimited prospective extent of the pool along the strike and enlarged area prospective up and down dip.

Exhibit #4 (7th General Survey Jan. 11-13/54) and #5 (8th General Survey April 1-3/54) - average reservoir pressures - gives the impression of a limited pool area particularly on the east end which remains unexplored, and highly prospective (see our Exhibit B). General Survey #1 through 6 are not included in either the testimony or the exhibits.

REFER TO TRANSCRIPT OF DIRECT TESTIMONY

Page 3 - We do not understand why it is necessary or not necessary to use well T-109 presently a commercial oil producer as a water injection well.

Page 4 - There is no Johnston agreement. There is no agreement with Brookhaven Oil Company and Dacresa Corporation. Therefore, Lowry without such agreements and the protection of correlative rights may not inject water into wells T-123 and D-83. As mentioned above, without doing this or injecting gas into T-123, the present program of water injection will drive Lowry's oil onto Johnston's properties.

Page 5 - The use of commercial oil producing wells for water injection wells is, to our mind, the destruction and devaluation of oil production and oil reserves. Injection of water in a well will, of course, reduce the oil gas ratios. The question is will injection of water into a formation decrease or increase oil recoveries in the best manner.

Page 9. - Lowry's program will not protect correlative rights as indicated above.

Page 10 - A central tank battery for the metering of oil (and gas and water) is impractical and jeopardises ownership. The ownership of all the leases will not remain the same forever. Unless the area is communitized, the central tank battery should not be installed.

REFER TO TRANSCRIPT OF CROSS EXAMINATION

Page 12 - It is impractical and a waste of natural resources and develops production and reserves to plug present Dakota producing well D-83 to the Tocito formation which will probably also produce oil, use the Tocito formation for a water injection well in that formation, then recomplete in the Dakota for oil production. In addition, such an operation would devalue the oil and gas reserves in the Tocito formation through water flooding the NW/4 of Section 5 belonging to the undersigned.

Page 13 and 14 - Lowry et al proposes to put water in the gas cap so that the oil driven up dip will not enter the gas cap. This is contrary to orthodox concepts that it needs no further comments.

Page 14 - Lowry proposes to disperse water throughout the field. Water is one of the principal things that should not be produced with the oil. Additionally, it will devalue the production due to the expense of segregating gas, water and oil before marketing.

Page 15 - We agree with Mr. Cogin's thoughts on the matter of a common tank battery.

Finally, it is requested that Lowry's application Case 697 be denied, either with or without continuance of the Case for further testimony and cross examination.

It is requested that Order R-349 be rescinded.

BROOKHAVEN OIL COMPANY
DACRESA CORPORATION

Thos B Scott
President

6/1/54.

Legal Notice OCC Hearing

Date: _____

CASE _____:

Publication:

IN THE MATTER OF THE APPLICATION OF LOWRY, ET AL OPERATING ACCOUNT FOR THE APPROVAL OF AN EXTENSION OF ITS PILOT PRESSURE MAINTENANCE PROGRAM IN THE SOUTH BLANCO-TOCITO POOL, RIO ARRIBA COUNTY, NEW MEXICO, AND PERMISSION TO GUAGE OIL AT A COMMON TANK BATTERY.

Applicant, in the above styled case, seeks an order authorizing the extension of its pilot pressure maintenance program in the South Blanco-Tocito Pool, Rio Arriba County, New Mexico, as originally granted in Order R-349 issued in Case 555, by the addition of wells to be utilized for water injection purposes and increasing the amount of water to be injected. Applicant also seeks authority to guage oil at a common tank battery.