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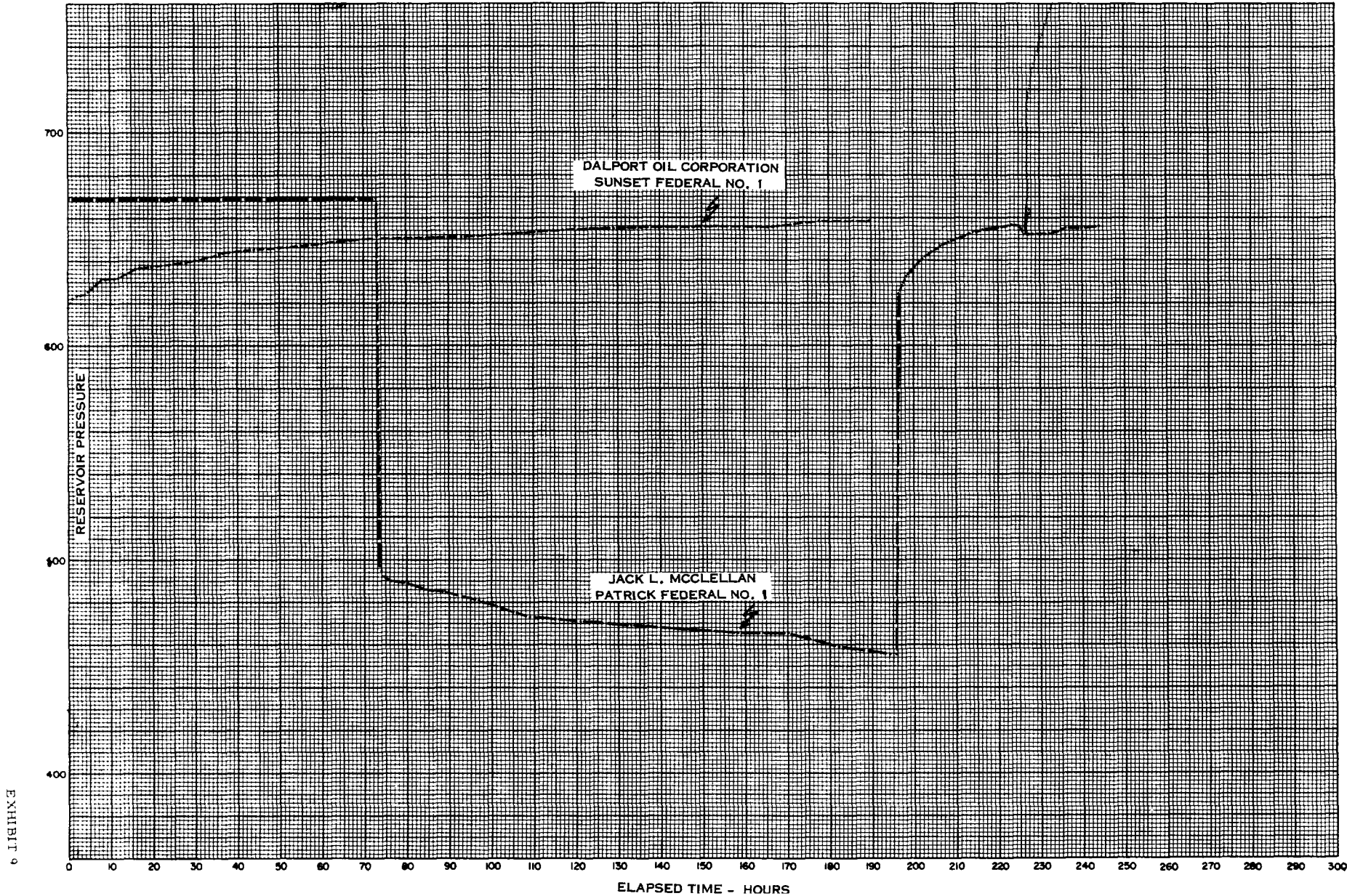
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GAS ANALYSES
DOUBBLE L, SULMAR AND UNDESIGNATED QUEEN GAS POOLS
CHAVES COUNTY, NEW MEXICO
Ralph H. Viney & Associates
Engineering Consultants

UNDESIGNATED QUEEN GAS POOL		SUMMAR QUEEN OIL POOL							DOUBLE L QUEEN OIL POOL			UNDESIGNATED QUEEN GAS POOL	
Lease	McClellan	McClellan	McClellan	McClellan	McClellan	McClellan	McClellan	McClellan	McClellan	Dalport	Dalport	Dalport	Continental Oil
	Patrick Federal	Lisa "A"	Lisa "A"	Lisa "B"	Lisa "C"	Lisa "C"	Lisa "C"	Lisa "C"	Marion Federal	Sunset Federal	Rob	Rob	Means
Well Number	1	2, 3, 4, 6	2, 3, 4, 5, 6, 7	3, 4	2, 3, 4	1, 2, 3, 4	1, 2, 3, 4	1, 2, 3, 4	1	1	1	2	1
Section, Township (S)													
Range (T)	12-15-29	13 & 24-15-30	13 & 24-15-30	13-15-30	13-15-30	24-15-30	24-15-30	24-15-30	7-15-30	12-15-29	1-15-29	1-15-29	28-14-30
Date of Test	9-5-68	9-12-69	10-13-69	5-22-69	9-15-69	5-21-69	9-12-69	10-13-69	12-10-69	5-8-70	5-18-70	5-18-70	3-31-70
Mol% N2	62.930	37.9200	50.510	29.240	26.580	17.990	19.55	22.220	41.030	9.860	29.050	51.900	67.7100
GPM	1.186	3.7200	3.839	8.036	8.294	11.237	8.40	9.137	4.132	13.386	7.918	2.572	1.4400
BTU wet basis	491	963	825	1376	1422	1738	1504	1526	968	1985	1376	740	468
Specific gravity	0.894	0.9147	0.975	1.103	1.105	1.215	1.16	1.128	0.976	1985.000	1376.000	740.000	0.9297
GOR	dry gas	4441	2195	679	1331	230	368	468	--	--	--	--	dry gas

RESERVOIR INTERFERENCE AND LIMIT TEST
DOUBLE L POOL AND UNDESIGNATED GAS POOL
CHAVES COUNTY, NEW MEXICO
Ralph H. Viney & Associates
Engineering Consultants

Elapsed Time Hours	Reservoir Pressure psig (+1940) Datum		Remarks
	Dalport Oil Corporation	Jack McClellan	
	Sunset Federal Well No. 1	Patrick Federal Well No. 1	
0	618.0	669.0	Sunset Well produced 121 BOPD on 19/64" choke prior to commencing pressure buildup test at 1220 hours, May 4, 1970. Cumulative oil production estimated at 3170 barrels.
0.500	620.0		
1.000	622.0		
2.000	623.0		Patrick Federal, Well No. 1, has been shut in since completion on September 20, 1969.
4.000	624.0		
8.000	631.0		
12.000	632.0		
16.000	636.0		
20.000	637.0		
28.000	639.0		
36.000	643.0		
44.000	645.0		
52.000	646.0		
60.000	648.0		
69.750	650.0		
71.833		669.0	
72.416		669.0	
72.916		669.0	Drawdown Test commenced 1430 hours, May 7, 1970.
73.416		497.0	
73.916		495.0	
74.416		492.0	
76.416		490.0	Flow Rate on Patrick Federal No. 1 - 3629 MCFD.
80.416		489.0	
84.416		486.0	
88.416		485.0	
93.000	650.9		
96.916		481.0	
108.916		473.0	
117.000	654.3		
120.916		471.0	
129.000	655.5		
132.916		469.8	
141.500	655.5		Flow Rate on Patrick Federal No. 1 - 3612 MCFD.
145.916		467.3	
153.500	655.5		
157.916		465.6	
165.500	655.5		
169.916		465.1	
177.500	658.7		
181.916		458.9	
189.500	658.7		Final Measurement of Dalport Sunset Federal No. 1 buildup pressure. Final Flow Rate on Patrick Federal No. 1 - 3596 MCFD. Well shut in for pressure buildup.
193.916		457.8	
195.500		457.8	
196.200		625.0	
197.200		628.0	
198.200		632.5	
199.200		635.0	
200.200		637.0	
202.200		640.7	
204.200		644.2	
206.200		647.0	
208.200		648.8	
210.200		650.0	
212.200		651.7	
214.200		652.9	
216.200		654.5	
220.200		655.7	
223.300		656.8	
225.150		656.6	
226.000		652.2	
228.000		652.5	
232.000		653.3	
234.000		653.8	
236.000		655.0	
240.000		655.3	
244.000		656.0	



$$\frac{13}{568} = \frac{x}{320}$$

RESERVOIR PRESSURE BUILDUP

DALPORT OIL CORPORATION, SUNSET FEDERAL, NO. 1 WELL

DOUBLE L FIELD

CHAVES COUNTY, NEW MEXICO

Ralph H. Viney & Associates

Engineering Consultants

CUSSION

Calculations presented are based on generally accepted and used methods originally formulated by Horner and modified by others. The equation used for determination of permeability has wide acceptance. The distance to a boundary using pressure buildup data uses an equation by Gray and Hawkins where multiple boundary conditions could exist. The examiner is referred to the AIME Monograph No. 1 publication, "Pressure Buildup and Flow Tests in Wells," by Mathews and Russell.

Permeability Calculations

K = (162.6) (q0) (Bo) (uo) / mh

- where q0 = daily oil production - barrels
- Bo = formation volume factor
- uo = oil viscosity centipoises
- m = slope psi/cycle

K = (162.6) (121) (1.10) (3.30) / (3.8) (10) = 1879 md.

Sunset - Federal No. 1
Distance to Boundaries

d = sqrt(0.00105 (K) Δt / φ u Co)

- where d = distance to boundary in feet
- K = permeability, millidarcies
- Δt = time after shut in, hours
- φ = porosity, friction of bulk volume
- u = oil viscosity, centipoises
- Co = oil compressibility (Average)

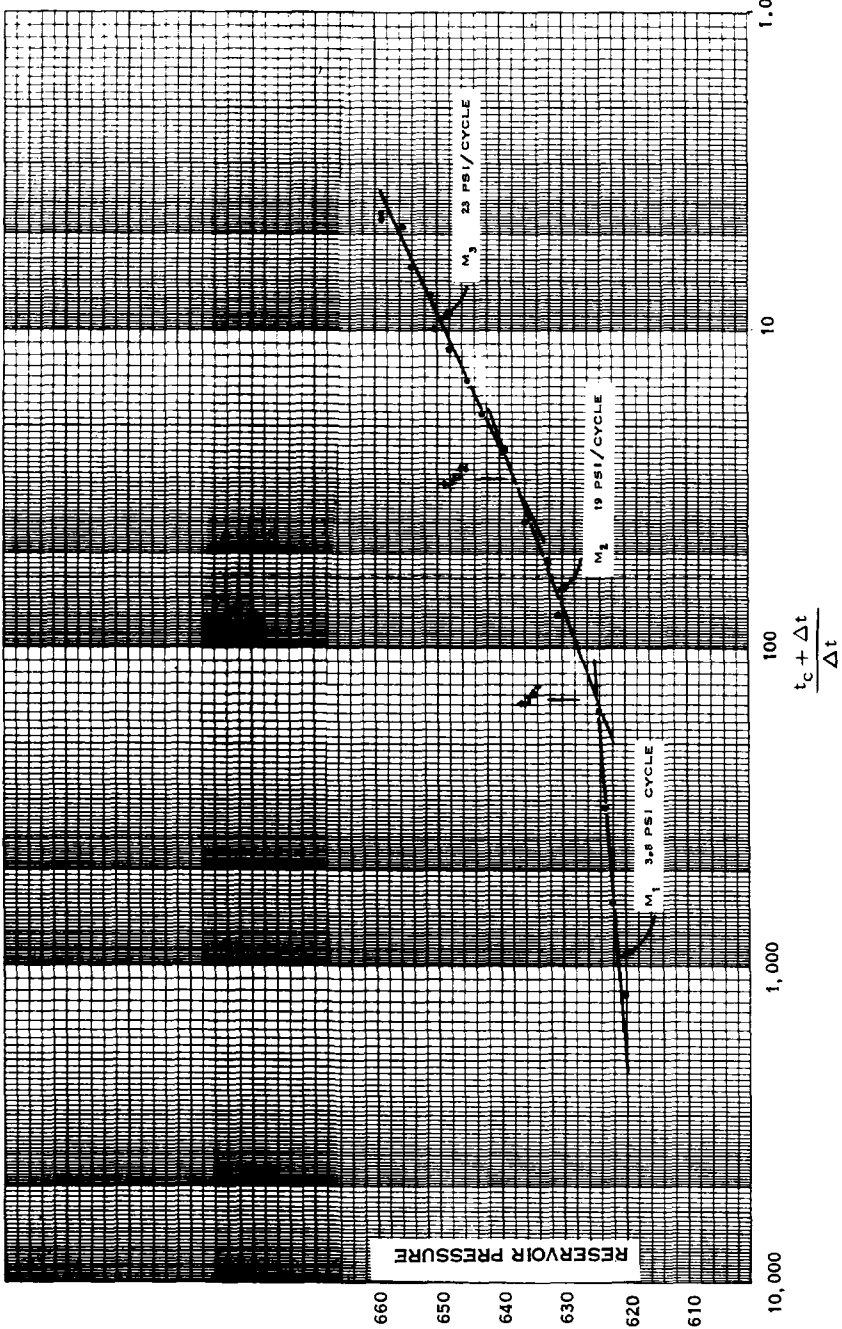
Two boundary conditions are noted on buildup curve, namely at 4.5 hours and 20.3 hours. The shape of the buildup curve suggests that the inflection represents boundaries rather than interference from other wells.

First Boundary

d1 = sqrt(0.00105 (1879 x 4.5 / (0.28 x 3.30 x 17.68 x 10^-6))) = 737 feet

Second Boundary

d2 = sqrt(0.00105 (1879 x 20.3 / (0.28 x 3.30 x 17.68 x 10^-6))) = 1566 feet



Shut In Time	Reservoir Pressure psig	t _c + Δt	t _c + Δt / Δt
0	618.0	629.0	1259.0
0.5	620.0	629.5	630.0
1.0	622.0	630.0	315.5
2.0	623.0	631.0	158.3
4.0	624.0	633.0	79.6
8.0	631.0	637.0	53.4
12.0	632.2	641.0	40.3
16.0	636.0	645.0	32.5
20.0	637.2	649.0	23.5
28.0	639.0	657.0	18.5
36.0	643.0	665.0	15.3
44.0	645.0	673.0	13.1
52.0	646.2	681.0	11.5
60.0	648.0	689.0	10.0
69.8	650.0	698.8	7.8
93.0	650.9	722.0	6.4
117.0	654.3	746.0	4.8
165.5	655.5	794.5	4.5
177.3	658.7	806.3	4.3
189.3	658.7	818.3	

Test commenced 1220 hours May 4, 1970

Cumulative production (N_p) 3,170 barrels
Daily oil production prior to test (q) 121 barrels
Effective life (t_c) hours (24 N_p/q) 629 hours
Oil viscosity (u_o) 3.30 centipoises
Formation volume factor (B) 1.10 barrels/barrels

RESERVOIR PRESSURE DRAWDOWN OR LIMIT TEST

JACK MCCLELLAN, PATRICK FEDERAL, NO. 1 WELL.

UNDESIGNATED QUEEN GAS POOL.

CHAVES COUNTY, NEW MEXICO

Ralph H. Viney & Associates

Engineering Consultants

DISCUSSION

Two boundaries were observed in the test on the Jack L. McClellan Patrick Federal No. 1 Well. The first boundary was determined to be 1494 feet from the well bore, and the second was calculated to be 3380 feet. The calculated radius of investigation was 3816 feet during the five-day test period.

The methods and information used are shown below. The terms and nomenclature are common to the industry.

<u>First Boundary</u>	
t_{b1}	= 0.79 days
d_1	= $2\sqrt{706,746 t_b}$ = 1681.36 $\sqrt{t_{b1}}$
d_1	= <u>1494 feet</u>
<u>Second Boundary</u>	
t_{b2}	= 4.04 days
d_2	= <u>3380 feet</u>
<u>Radius of Investigation (Ri)</u>	
t_{b1}	= 5.15 days
Ri	= <u>3816 feet</u>
<u>Basic Data</u>	
Initial shut-in pressure	5-4-1970
Final Flowing Pressure	123.75 hours
Average Pressure	669 psig
Reservoir Temperature	457.8 psig
Specific Gravity (Air = 1.0)	576.6 psig
ug	87° F.
Bg	0.894
qg	0.01638 cps.
h	4.09148
Ø	3606 MCFD
Sw	9 feet
	27.5%
	40.0%
$C_{ge} = \frac{(0.600)(0.00180175) + (0.400)(3.35 \times 10^{-6}) + (3.25 \times 10^{-6})}{0.60} = 0.0018094$	

Formulae, Calculations and Nomenclature

The permeability of the contributing reservoir was calculated to be 546 millidarcies.

$$K_g = \frac{(162.6)(3606)(0.01638)(4.09148)}{(8)(9)} = 546 \text{ millidarcies}$$

$$d = 2\sqrt{N t_b}$$

where

d = distance to barrier, in feet

t_b = actual time for pressure waves to reach barrier, days

N = diffusivity constant = $\frac{(6.33 \times 10^{-3})(Kg)}{\phi_{HC} \mu g C_{ge}}$

Kg = effective permeability to gas = $\frac{162.6 \text{ qg } \mu g Bg}{m_1 h}$

ϕ_{HC} = hydrocarbons porosity fraction = $\phi(1-S_w)$

ug = gas viscosity at reservoir conditions, centipoise

C_{ge} = effective gas compressibility = $\frac{(C_g S_g) + [S_w C_w] + C_f}{S_g}$

qg = daily gas production, MCF

Bg = gas formation volume factor, reservoir barrels/MCF

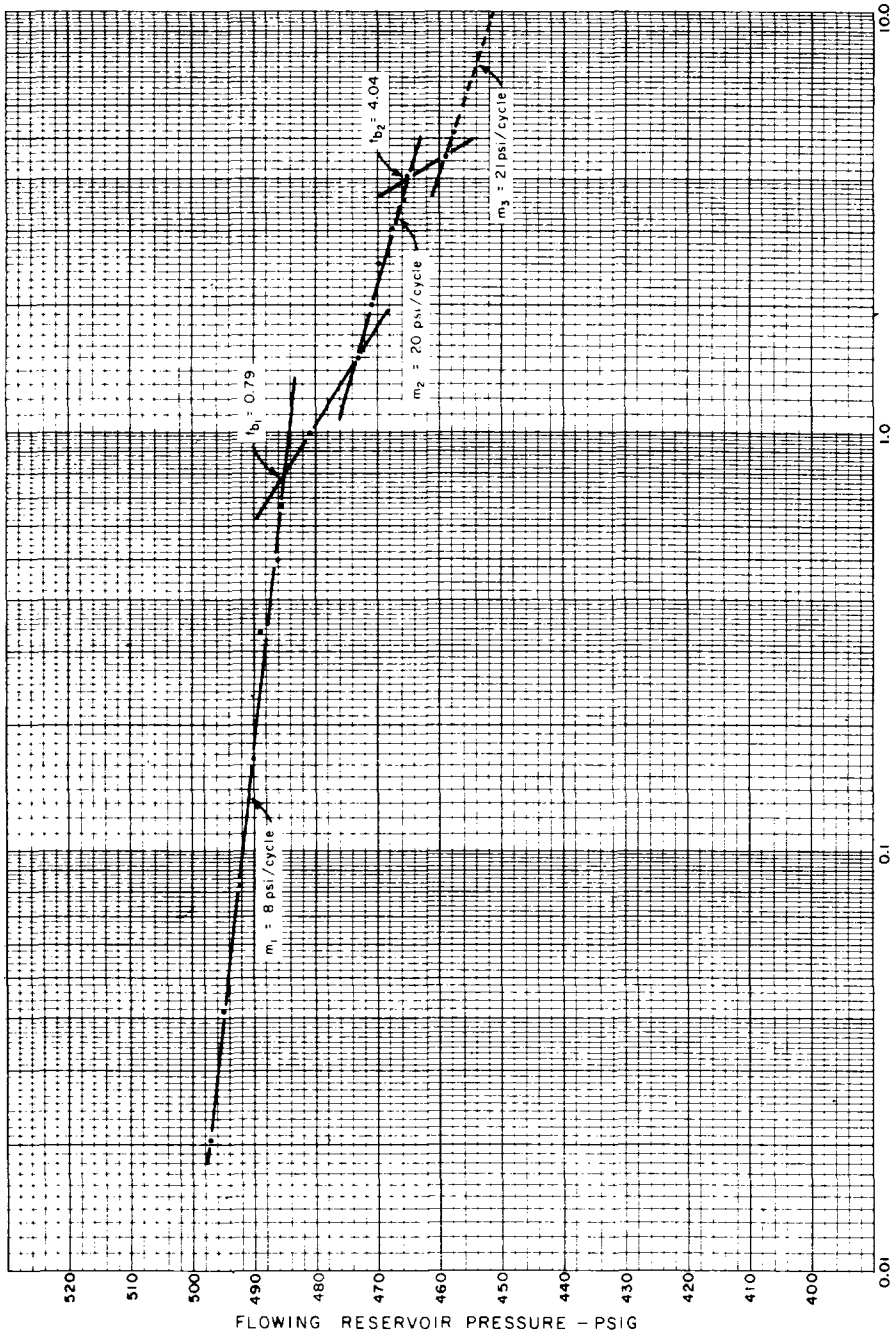
= $\left(\frac{1}{5.615}\right)\left(\frac{13.2}{P_{avg.}}\right)\left(\frac{T_r}{520}\right) Z_{avg.}$

m_1 = initial slope of pressure drawdown curve, psi/cycle

h = formation thickness, feet

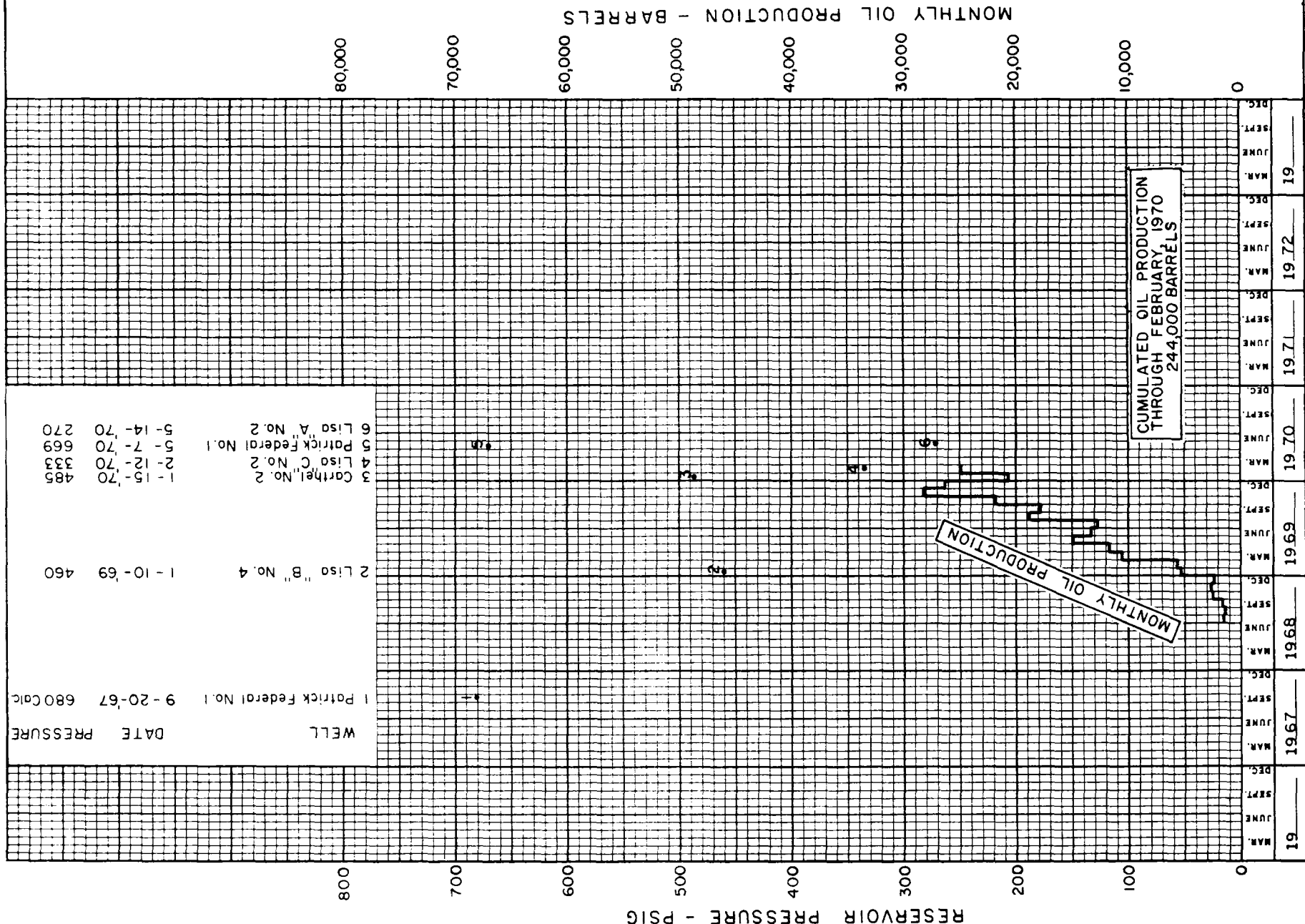
Sw, Sg = saturation fraction of pore space, to water, to gas

Cg, Cw, Cf = compressibility psi⁻¹, gas, water, formation

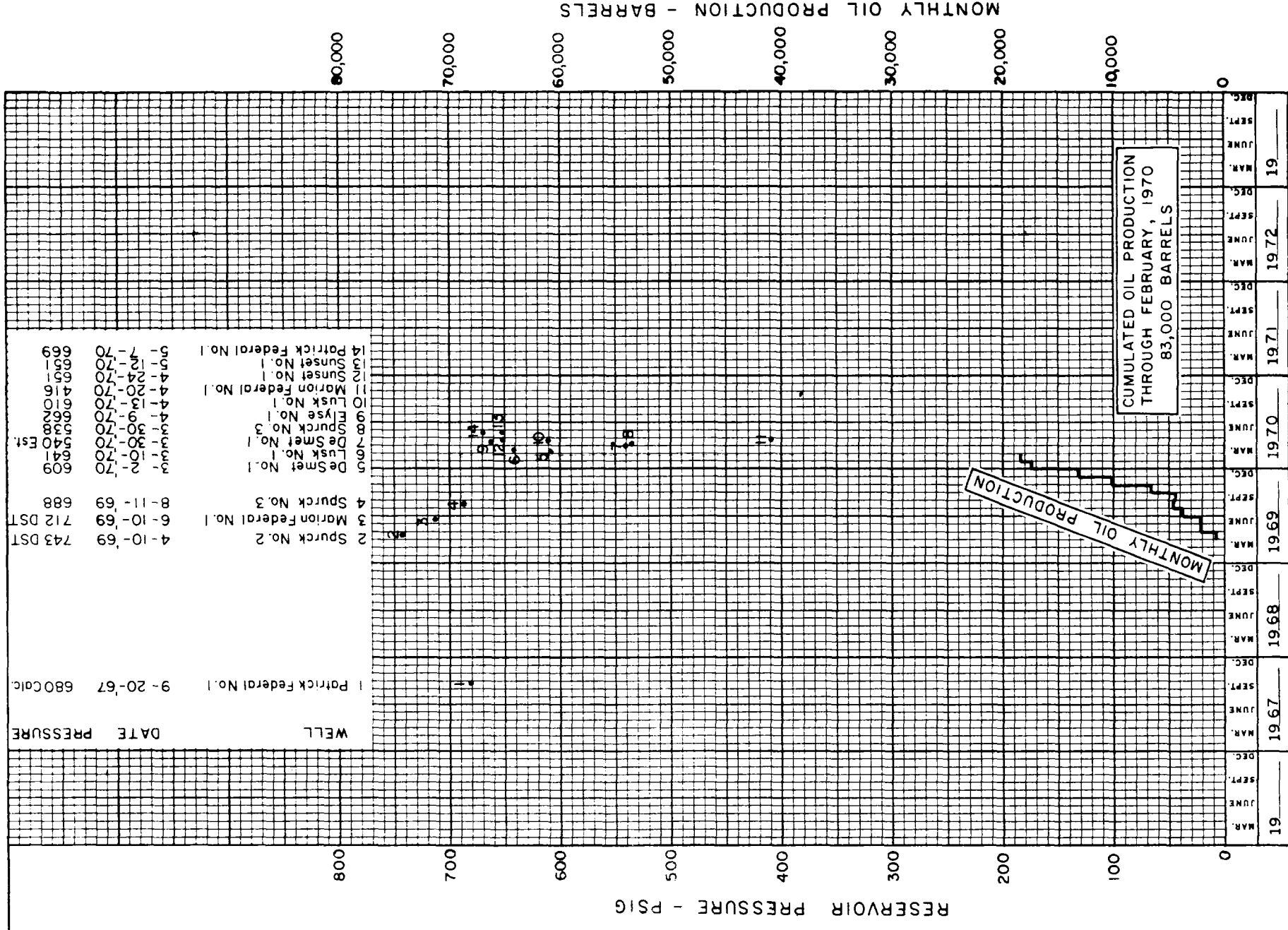


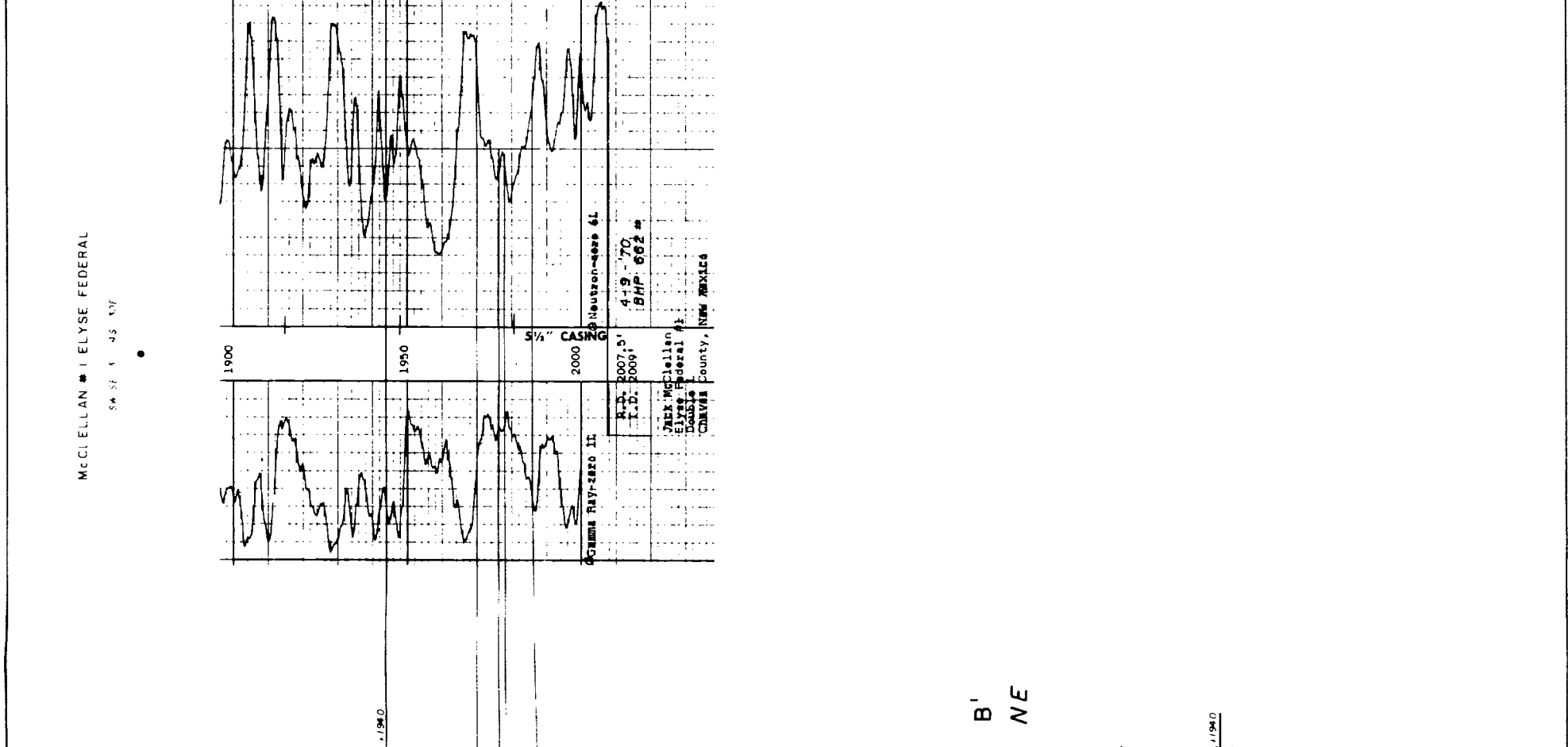
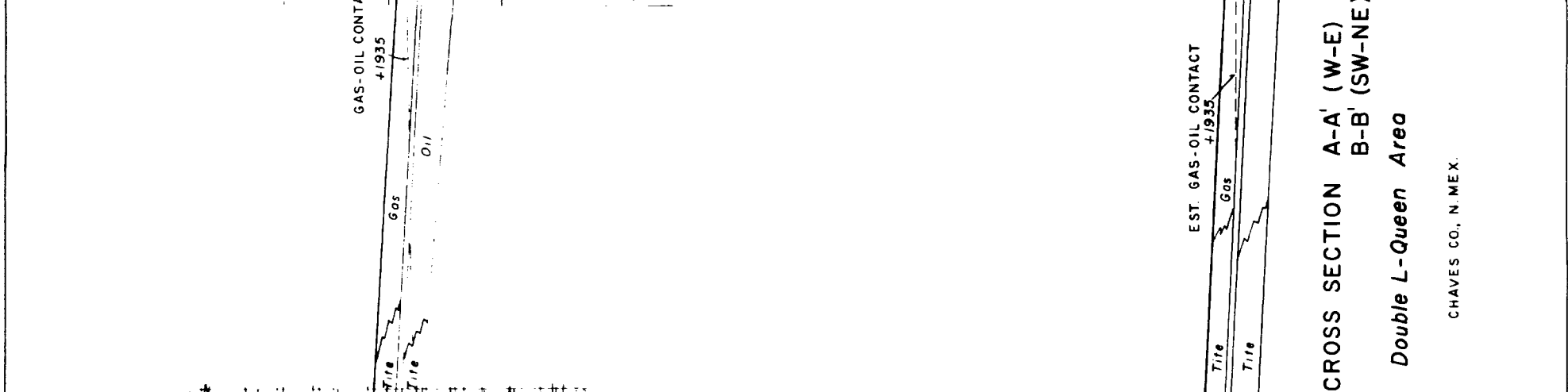
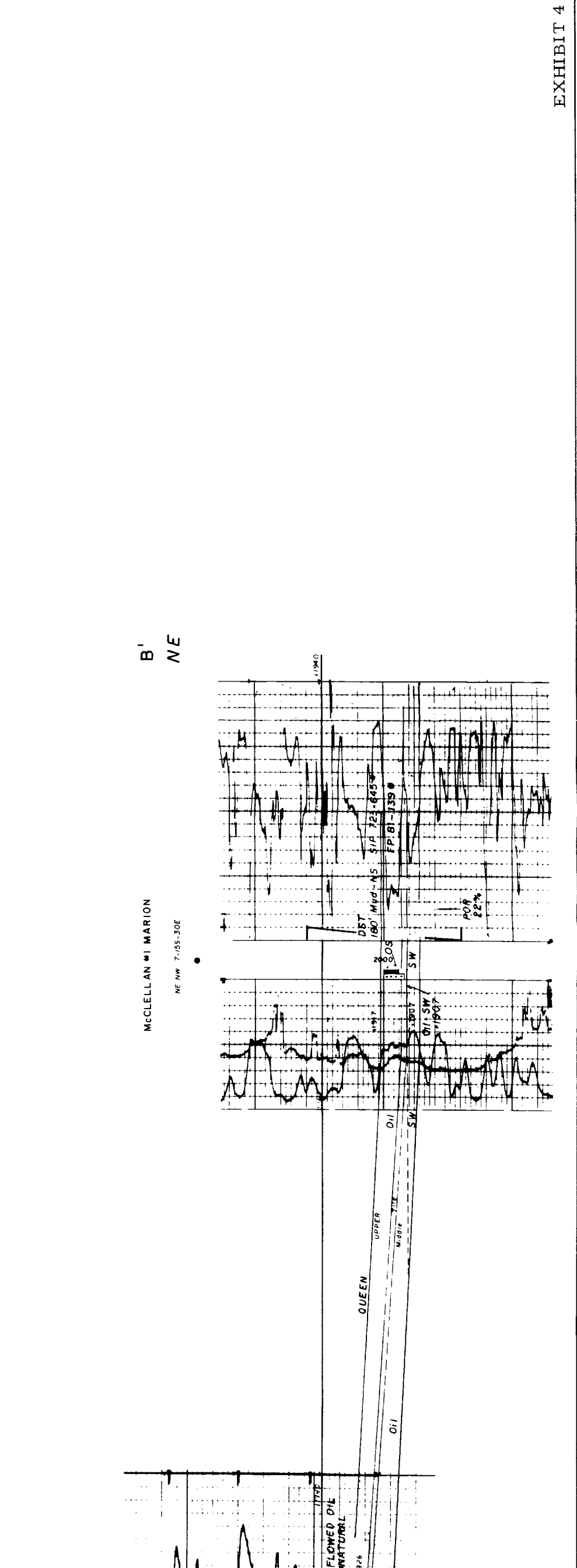
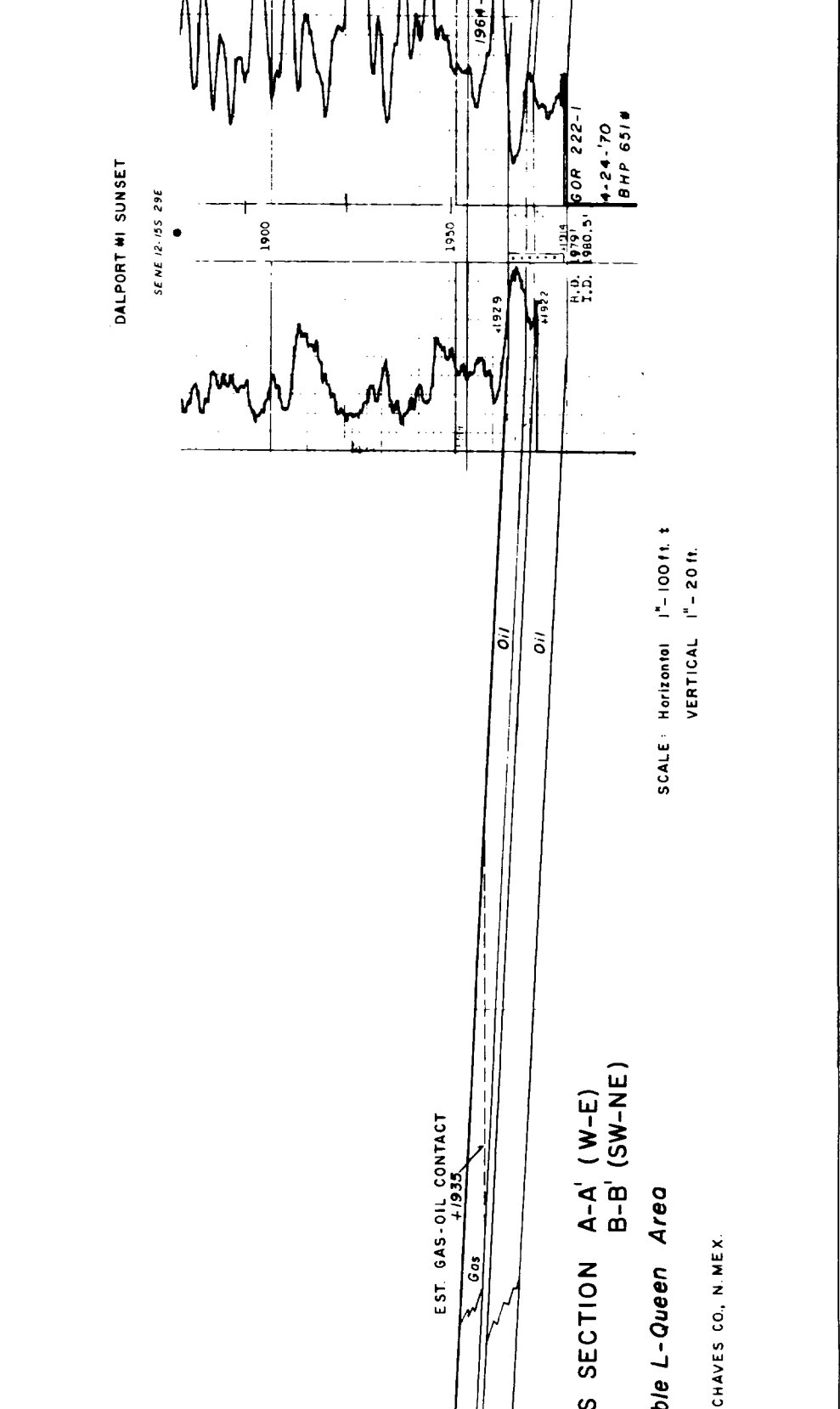
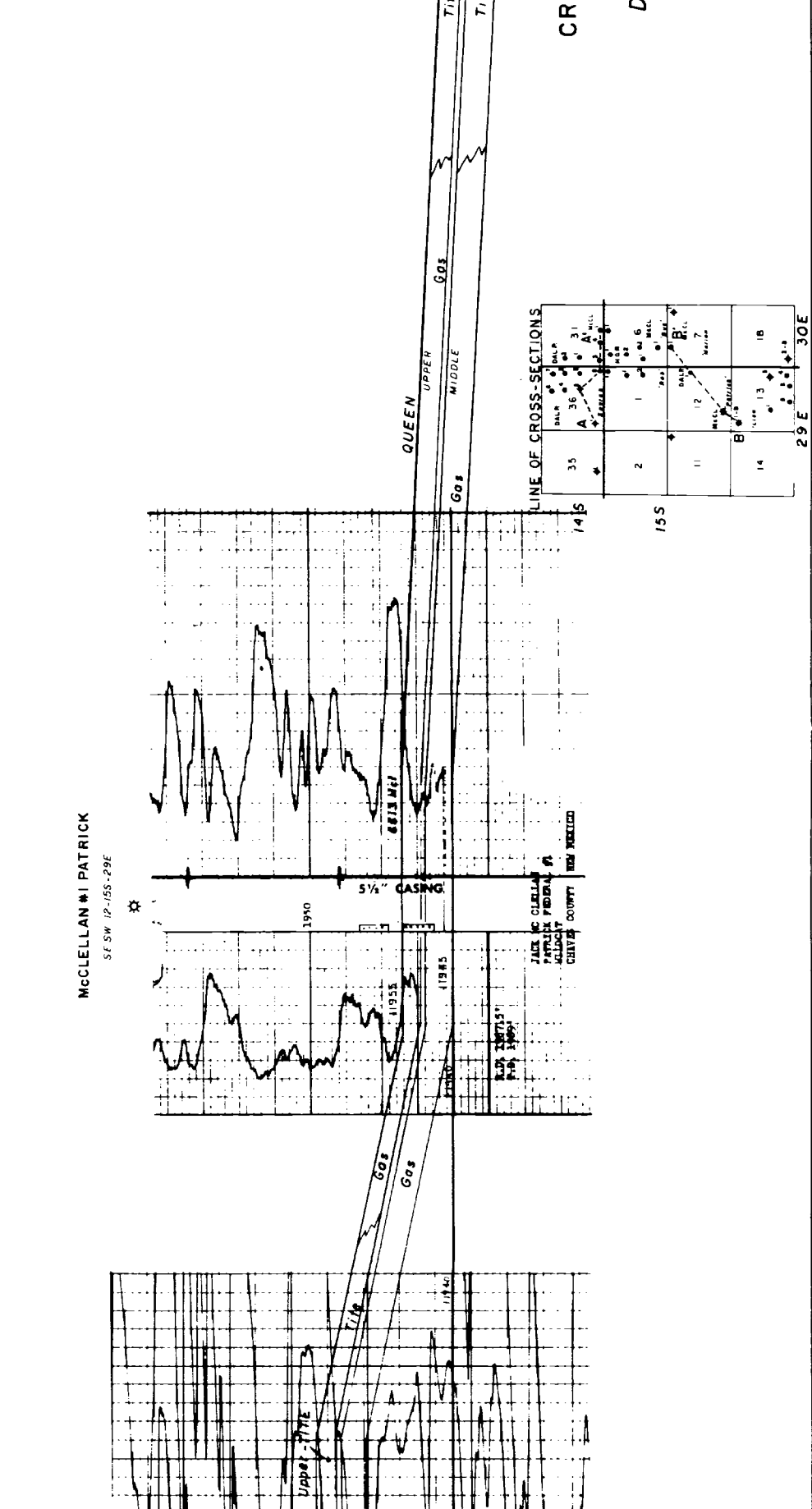
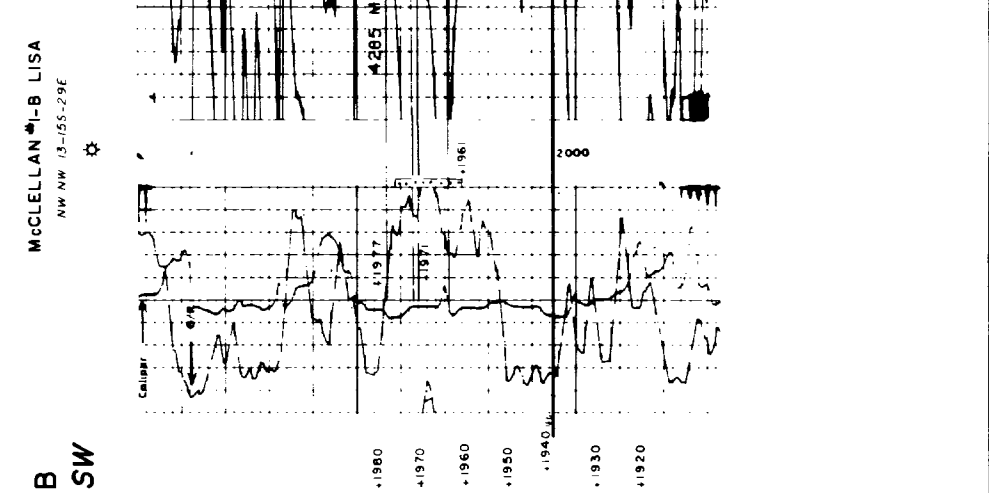
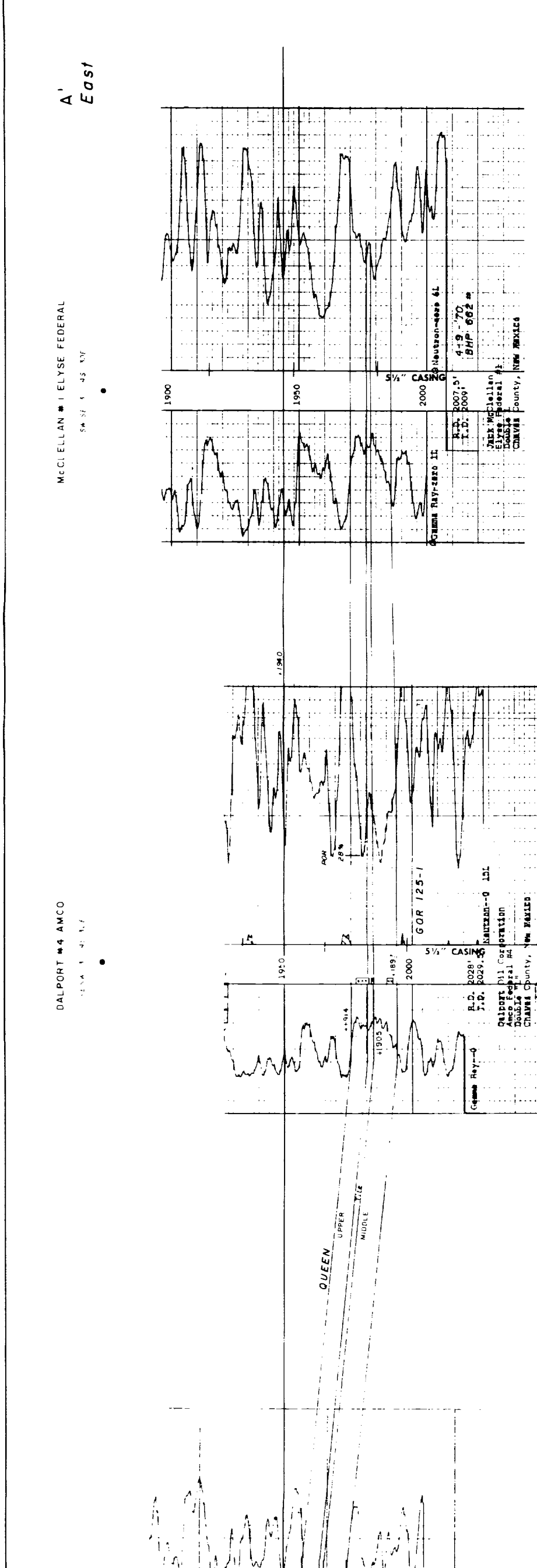
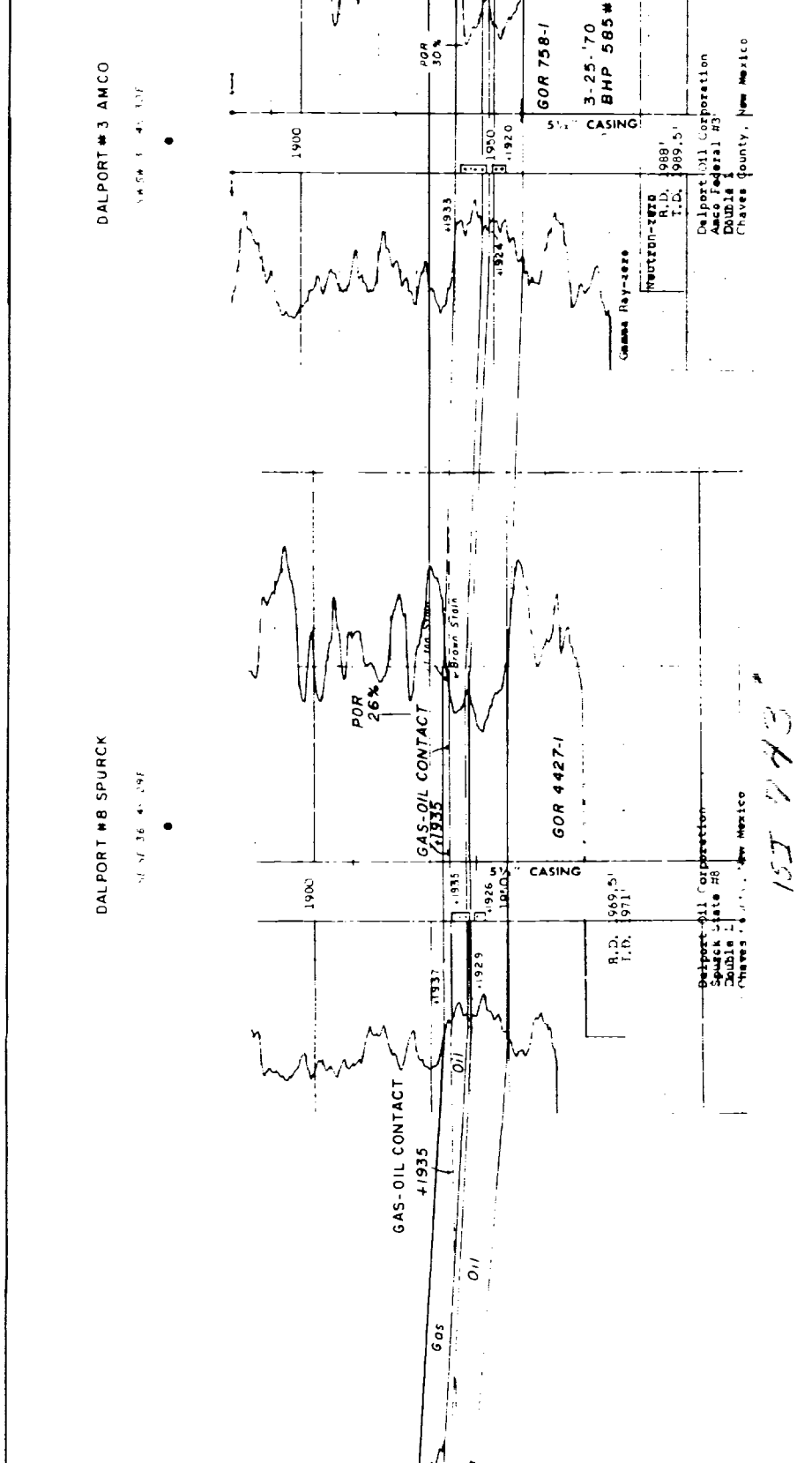
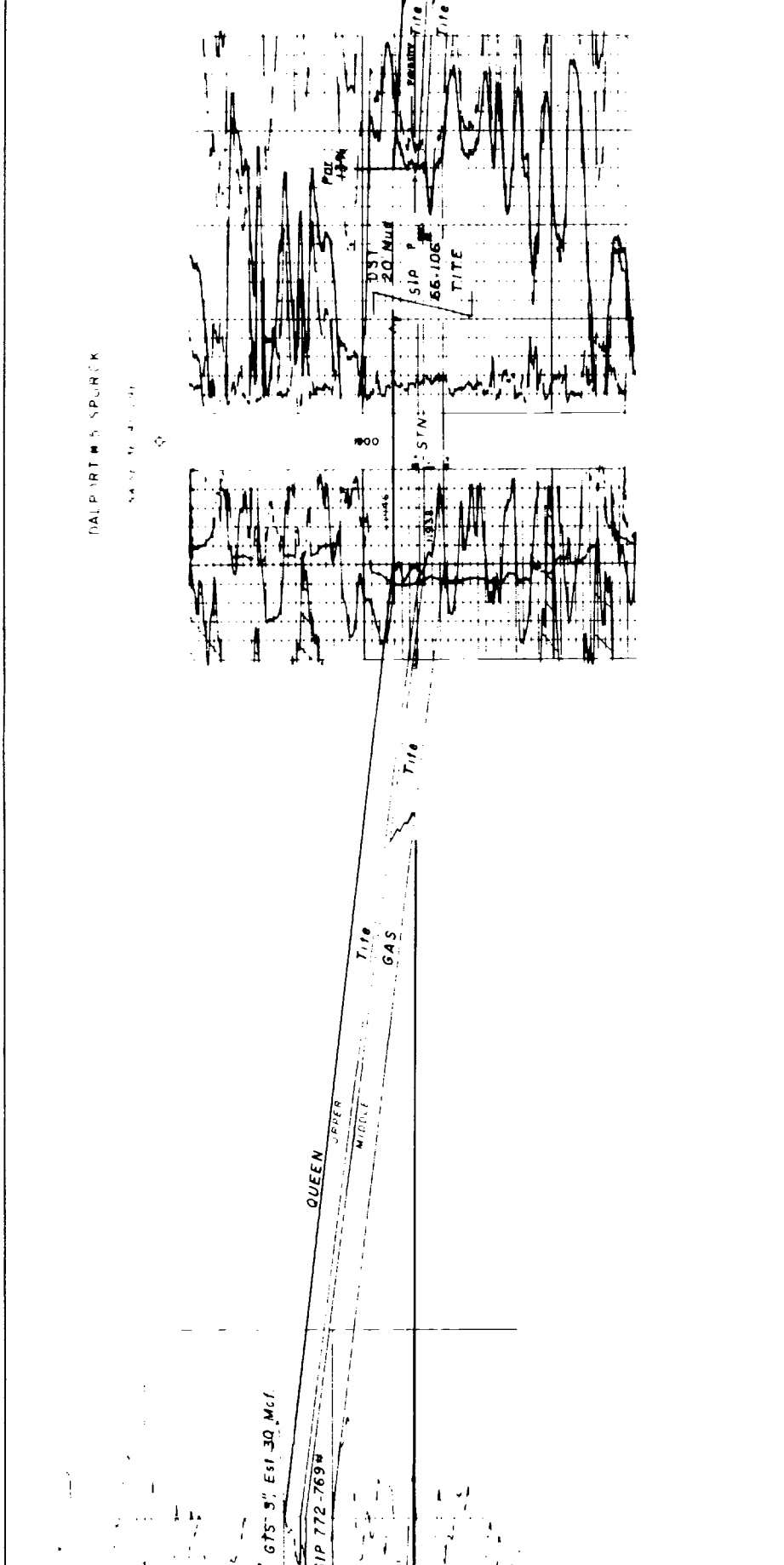
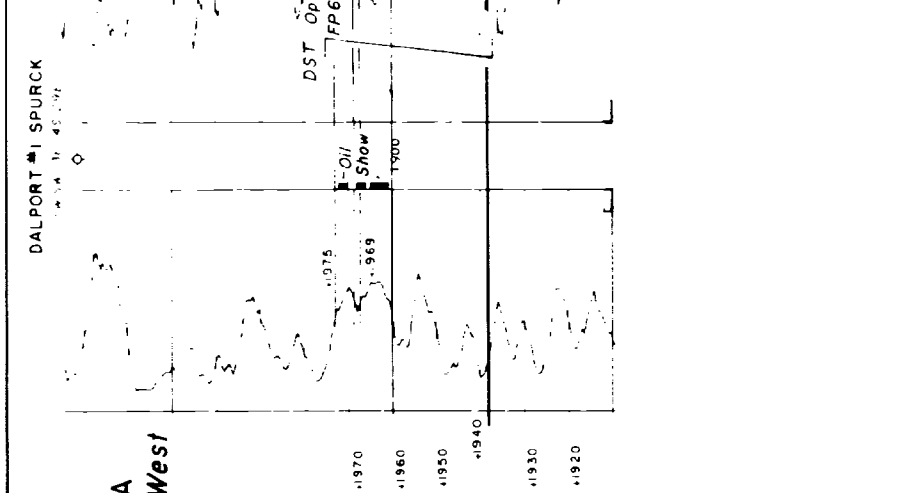
Elapsed Time (t)		Reservoir Pressure psig	Δ Time Days	Δ Pressure psig	$\frac{\Delta \text{Pressure}}{\Delta \text{Time}}$	Remarks
Hours	Days					
0	0	669.0	0	0	--	Shut in gas well. Completed September 1, 1967. Test commenced 1430 hours, May 7, 1970.
0.50	0.02083	497.0	0.02083	152.0	--	
1.00	0.04167	495.0	0.02084	2.0	95.969	
2.00	0.08334	492.0	0.04167	3.0	71.994	Rate - 3,629 MCFD @ 13.2 psig and 60° F.
4.00	0.16667	490.0	0.08333	2.0	24.000	
8.00	0.33334	489.0	0.16667	1.0	6.000	
12.00	0.50000	486.1	0.16666	2.9	17.400	
16.00	0.66667	485.8	0.16667	0.3	1.799	
24.00	1.00000	481.0	0.33333	4.8	14.400	
36.00	1.50000	473.0	0.50000	8.0	16.000	Rate - 3,612 MCFD @ 13.2 psig and 60° F.
48.00	2.00000	471.0	0.50000	2.0	4.000	
60.00	2.50000	469.8	0.50000	1.2	2.400	
73.00	3.04166	467.3	0.54166	2.5	4.615	Rate - 3,596 MCFD @ 13.2 psig and 60° F. Well shut in for pressure buildup.
85.00	3.54166	465.6	0.50000	1.7	3.400	
97.00	4.04166	465.1	0.50000	0.5	1.000	
109.00	4.54166	458.9	0.50000	6.2	12.400	
123.75	5.15625	457.8	0.51459	1.1	2.137	

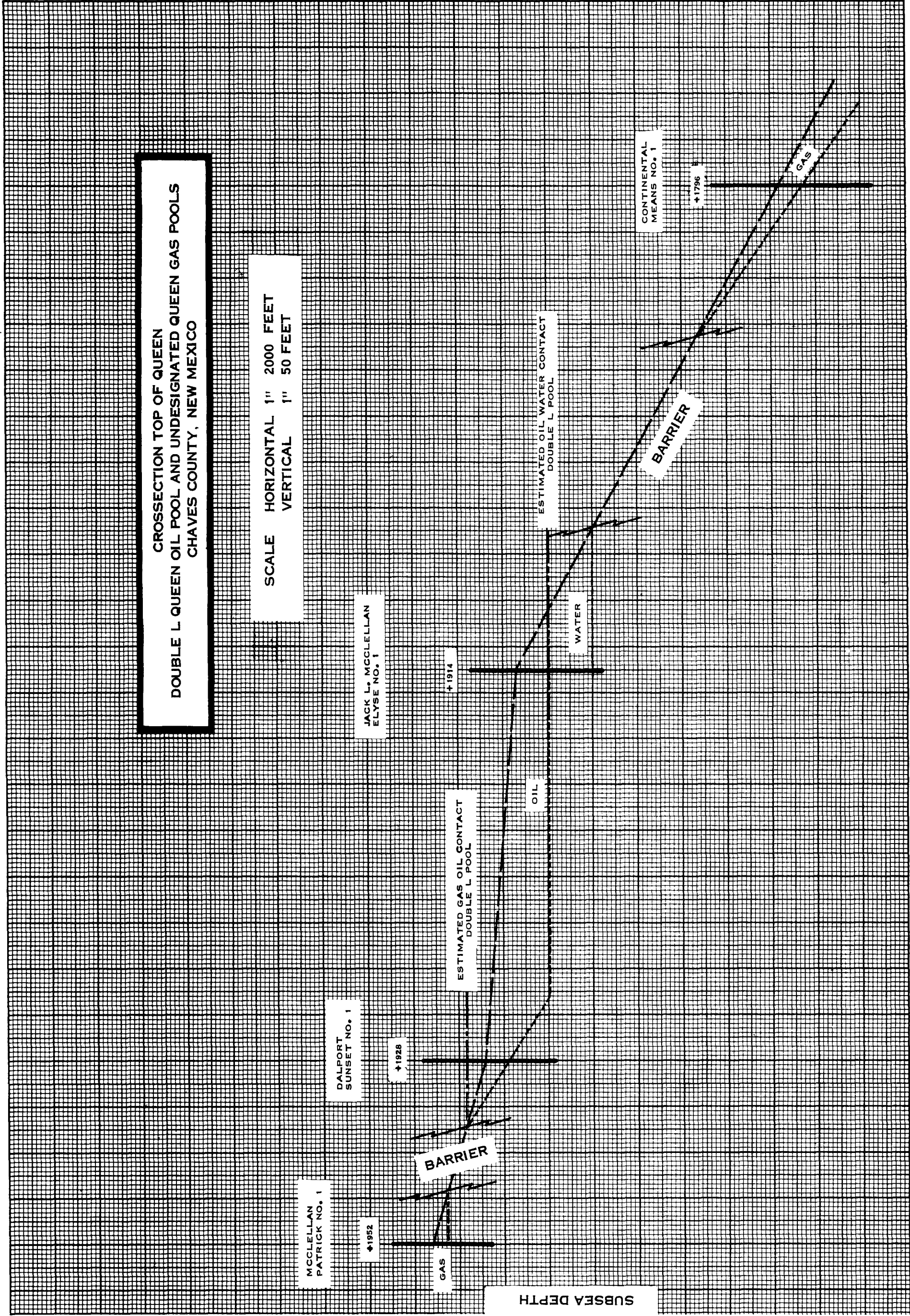
SULIMAR FIELD
CHAVES COUNTY, NEW MEXICO



DOUBLE L FIELD
CHAVES COUNTY, NEW MEXICO







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