TOTAH GALLUP FIELD, SAN JUAN COUNTY, NEW MEXICO

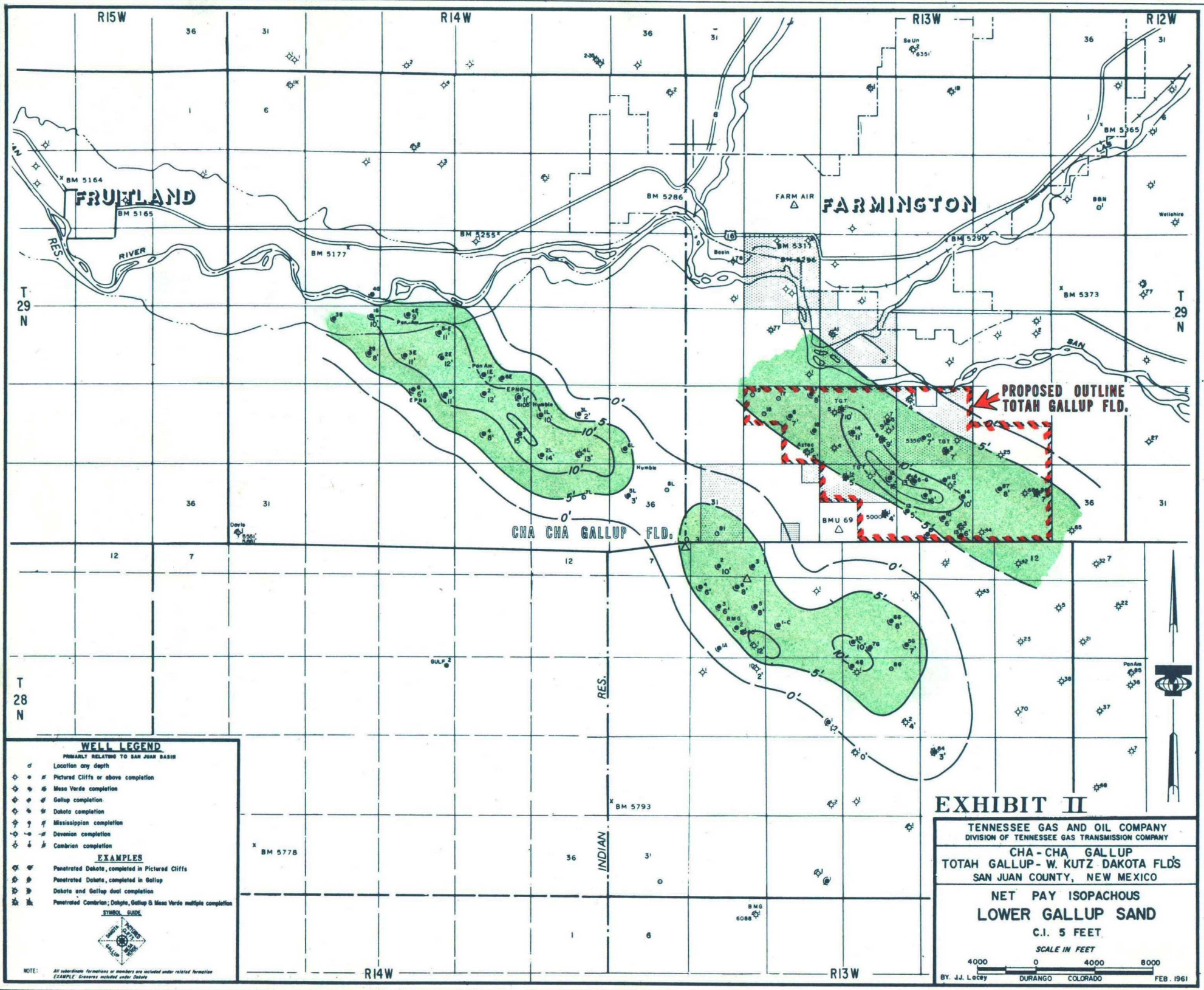
PERTINENT DATA

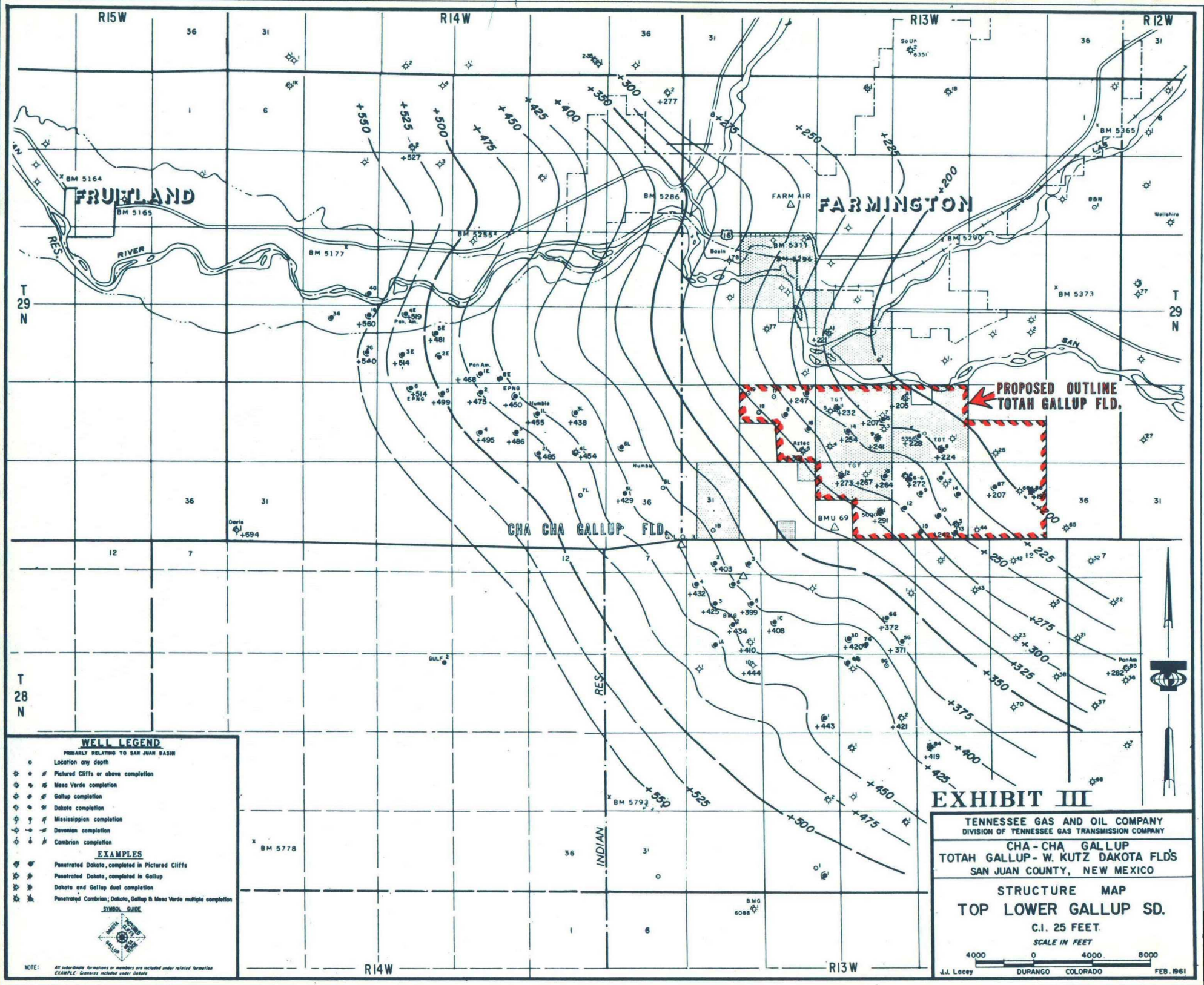
Date of Discovery	September 4, 1959
Name of Producing Formation	Lower Gallup
Type of Structure	Stratigraphic
Type of Producing Formation	Sand and Shaley Sand
Producing Mechanism	Solution Gas Drive
Pipeline Serving Field	None (Four Corners Pipeline Now Being Constructed)
Type Crude	Sweet
Type Gas	Sweet
Gravity of Oil	41.0° API @ 60° F.
Average Depth of Pay	5600'
Cumulative Production 1/1/61	
Oil	208,607 Bbls
Water	None
Number of Producing Wells 1/1/61	15
Number of Dry Holes	None
Number of Drilling and Completing 1/1/61	7
Top Allowable	
Field Developed Acreage 40-acre Spacing 1/1/61	600
Present Producing Rate 1/1/61	1066
Top Well Allowable BOPD	94

RESERVOIR DATA

Average Porosity of Pay	14.2%)
Average Permeability	106 md) Core Data
Average Water Saturation	29.7%)
Initial Reservoir Pressure	
PSIG @ +188' Datum	1634
Solution Gas-Oil Ratio ft. ^{3}/bbl	615
Original Reservoir Volume Factor	1.377
Bottom Hole Temperature	155° F.

EXHIBIT I


R15W
R14W
R13W
R12W
T 29 N
T 28 N
FRUITLAND
FARMINGTON
FARM AIR
BM 5164
BM 5165
BM 5177
BM 5255
BM 5286
BM 5311
BM 5296
BM 5290
BM 5365
BM 5373
BM 5793
BM 5778
RIVER
RES.
SAN
INDIAN
CHA CHA GALLUP FLD.
PROPOSED OUTLINE
TOTAH GALLUP FLD.
BMU 69
Humble
Pan Am.
EPNG
TGT
Aztec
Davis
GULF
BMG
Basin
Wellshire
WELL LEGEND
PRIMARILY RELATING TO SAN JUAN BASIN
Location any depth
Pictured Cliffs or above completion
Mesa Verde completion
Gallup completion
Dakota completion
Mississippian completion
Devonian completion
Cambrian completion
EXAMPLES
Penetrated Dakota, completed in Pictured Cliffs
Penetrated Dakota, completed in Gallup
Dakota and Gallup dual completion
Penetrated Cambrian; Dakota, Gallup & Mesa Verde multiple completion
SYMBOL GUIDE
DAKOTA
PICTURED CLIFFS
MESA VERDE
GALLUP
NOTE: All subordinate formations or members are included under related formation
EXAMPLE: Greenhorn included under Dakota
EXHIBIT II
TENNESSEE GAS AND OIL COMPANY
DIVISION OF TENNESSEE GAS TRANSMISSION COMPANY
CHA-CHA GALLUP
TOTAH GALLUP-W. KUTZ DAKOTA FLDS
SAN JUAN COUNTY, NEW MEXICO
NET PAY ISOPACHOUS
LOWER GALLUP SAND
C.I. 5 FEET
SCALE IN FEET
4000 0 4000 8000
BY. J.J. Lacey
DURANGO COLORADO
FEB. 1961


R15W
R14W
R13W
R12W
T 29 N
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FRUITLAND
FARMINGTON
RIVER
SAN
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CHA CHA GALLUP FLD.
PROPOSED OUTLINE
TOTAH GALLUP FLD.
BM 5164
BM 5165
BM 5177
BM 5255
BM 5286
BM 5311
BM 5290
BM 5365
BM 5373
BM 5793
BM 5778
FARM AIR
BMU 69
WELL LEGEND
PRIMARILY RELATING TO SAN JUAN BASIN
Location any depth
Pictured Cliffs or above completion
Mesa Verde completion
Gallup completion
Dakota completion
Mississippian completion
Devonian completion
Cambrian completion
EXAMPLES
Penetrated Dakota, completed in Pictured Cliffs
Penetrated Dakota, completed in Gallup
Dakota and Gallup dual completion
Penetrated Cambrian; Dakota, Gallup & Mesa Verde multiple completion
SYMBOL GUIDE
NOTE: All subordinate formations or members are included under related formation
EXAMPLE Graneros included under Dakota
EXHIBIT III
TENNESSEE GAS AND OIL COMPANY
DIVISION OF TENNESSEE GAS TRANSMISSION COMPANY
CHA-CHA GALLUP
TOTAH GALLUP - W. KUTZ DAKOTA FLD'S
SAN JUAN COUNTY, NEW MEXICO
STRUCTURE MAP
TOP LOWER GALLUP SD.
C.I. 25 FEET
SCALE IN FEET
4000 0 4000 8000
J.J. Lacey
DURANGO COLORADO
FEB. 1961

AVERAGE PER WELL RESERVES FOR TOTAH GALLUP FIELD

Weighted Average Porosity	14.2% (Core Data)
Water Saturation	29.7% (Capillary Pressure Data)
Reservoir Volume Factor	1.377 (Bottom Hole Fluid Sample)
Recovery Factor	12.5% (Based on Material Balance Calculations, k_g/k_o Core Data Bottom Hole Fluid Sample)

$$7758 \frac{(1')(.142)}{1.377}(1-.297)(.125) = 70.2 \text{ BO/Ac-Ft}$$

Average per well recovery on 80-acre spacing based on 80-acre spacing and 9.1' net pay

51,000 Bbl

EXHIBIT X

ECONOMICS OF TOTAH GALLUP FIELD DEVELOPMENT ON 80-ACRE SPACING

Completed Well Cost (5500')	$65,000
Pumping Unit, Engine, Sucker Rods, Pump, Etc.	6,000
Prorata Share Lease Facilities, Tank Battery, Flow Line, Etc.	1,000
Total	$72,000
Value of Crude Well Head Price	$2.75/bbl
Value of Crude After Trucking, Taxes, Basic 1/8 Royalty	$2.00/bbl
Barrels of Stock Tank Oil Recovery Required to Pay Bank Investment (Not Considering Operating Cost)	36,000 bbl
Average Direct Operating Cost During Life	$150/mo/well
Value of Recoverable Reserves	$102,000
Less Development Costs	- 72,000
Less Direct Operating Costs	- 6,300
Profit to Operator	$ 23,700 (33% of Investment)

EXHIBIT XI

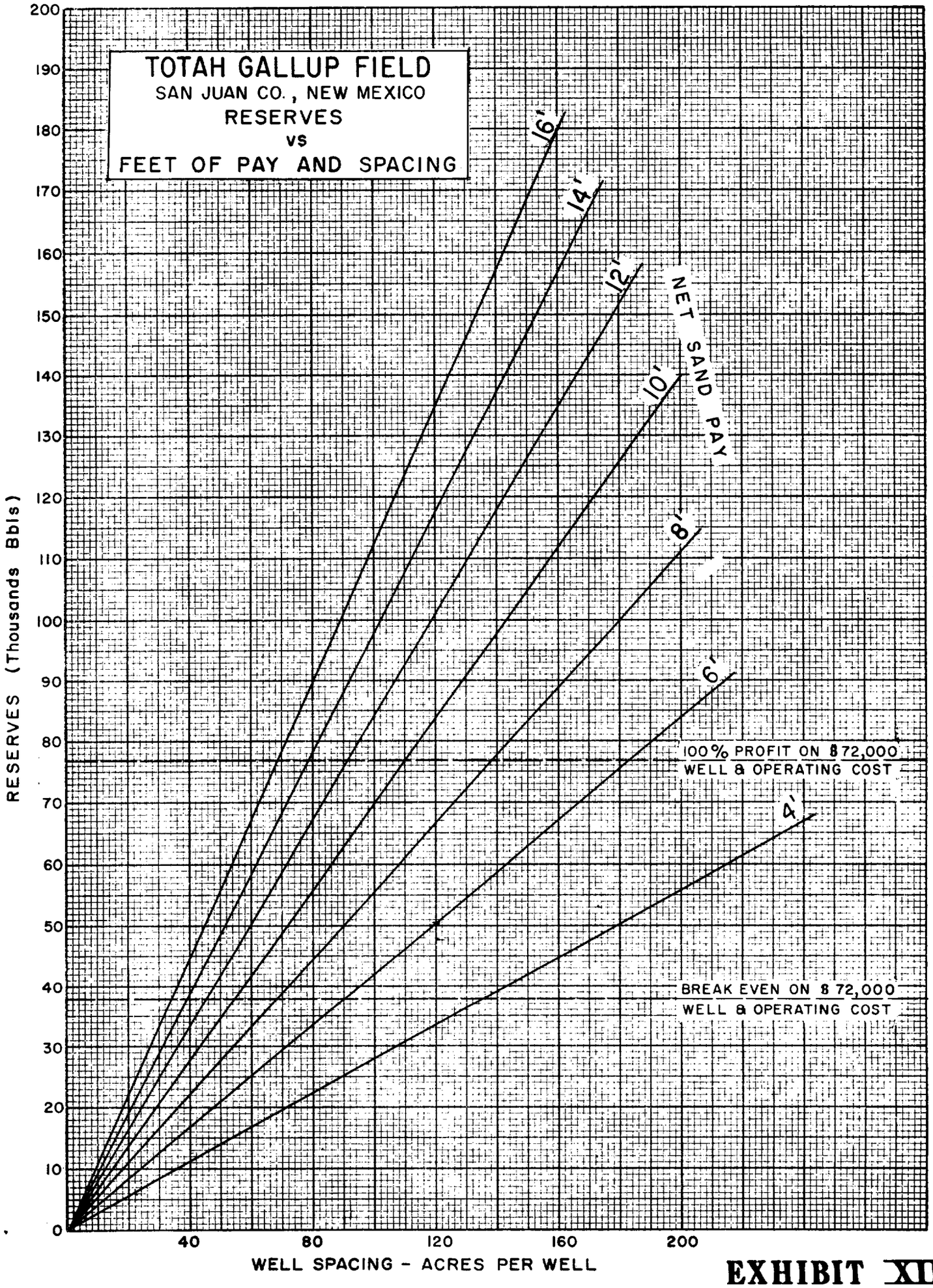

TOTAH GALLUP FIELD
SAN JUAN CO., NEW MEXICO
RESERVES
VS
FEET OF PAY AND SPACING
16'
14'
12'
10'
8'
6'
4'
NET SAND PAY
100% PROFIT ON $72,000
WELL & OPERATING COST
BREAK EVEN ON $72,000
WELL & OPERATING COST
RESERVES (Thousands Bbls)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
40
80
120
160
200
WELL SPACING - ACRES PER WELL

EXHIBIT XII

TOTAH GALLUP FIELD

Tenneco Oil Company, Callow Lease
BHP DATA

LEASE	WELL	DATE	SHUT-IN TIME PRIOR TO BHP TEST, HRS.	BHP AT 188' DATUM PSIG
Callow	8	9-3-59	134	1634 *
		3-31-60	96	1548
Callow	9	12-1-59	72	1603 *
		3-31-60	122	1564
		9-1-60	112	1543
Callow	11	1-3-60	116	1608 *
		4-5-60	93	1582
		10-31-60	1558	1562
		6-3-61	72	1543
Callow	12	8-26-60	72	1623 *
		4-5-60	96	1594
Callow	13	10-10-60	78	1592 *
		6-4-61	72	1370
		12-8-61	124	763
Callow	14	12-4-60	72	1537 *
		6-3-61	73	1337
Callow	15	1-8-61	72	1473 *
		6-4-61	92	1361
Callow	16	3-20-61	61	1473 *
		6-3-61	72	1367
Callow	17	6-3-61	74	1350
Callow	18	4-7-61	75	1469 *
		6-4-61	75	1328

* Initial BHP, well shut in immediately after potential test.

Case 2184
Tenneco Ex 15

EXHIBIT III

BOTTOM HOLE PRESSURE DATA
ASPEN FEDERAL NO. 1-11
TOTAH GALLUP OIL POOL

Completion Date	August 2, 1961
Date of Pressure Measurement	August 5, 1961
Shut in Time	72 hours
Bottom Hole Pressure @ + 200 Datum	1337 psig
Original Pressure of Totah Gallup Oil Pool @ + 200 Datum	1623 psig
Loss of Pressure in Federal No. 1-11 due to Interference	286 psi

CALCULATION OF PRESSURE INTERFERENCE AREA

Nearest Producing Well to Federal No. 1-11 at Time of Completion (Gallegos Canyon Unit No. 99)	1450 feet
Area of Circle with Radius of 1450 feet	151 acres
Area of Pressure Interference	151 acres

BEFORE EXAMINER NUTTER
OIL CONSERVATION COMMISSION
PanAm EXHIBIT NO. 2
CASE NO. 2184 (3-7-62)

BOTTOM HOLE PRESSURE DATA
GALLEGOS CANYON UNIT NO. 92
TOTAH GALLUP OIL POOL

Completion Date	May 1, 1961
Date of Pressure Measurement	May 8, 1961
Shut in Time	64 Hours
Bottom Hole Pressure @ + 200 Datum	1535 psig
Original Pressure of Totah Gallup Oil Pool @ + 200 Datum	1623 psig
Loss of Pressure in Gallegos Canyon Unit No. 92 due to Interference	88 psi

CALCULATION OF PRESSURE INTERFERENCE AREA

Nearest Producing Well to Gallegos Canyon Unit No. 92 at Time of Completion (Aztec's Hagood No. 13-G)	1850 feet
Area of Circle with Radius of 1835 feet	246 acres
Area of Pressure Interference	246 acres

BEFORE EXAMINER NUTTER
OIL CONSERVATION COMMISSION
Pan Am EXHIBIT NO. 3
CASE NO. 2184 (3-7-62)

COMPARISON OF
PERTINENT RESERVOIR DATA
TOTAH GALLUP AND CHA CHA GALLUP POOLS
SAN JUAN COUNTY, NEW MEXICO

	Totah Gallup Field	Cha Cha Gallup Field
Original Reservoir Pressure, psig	1623	1560
Reservoir Temperature, °F.	155	158
Saturation Pressure, psig	1463	1560
Solution Gas-Oil Ratio, Cu. Ft./Bbl.	615	649
Formation Volume Factor	1.377	1.392
Crude Viscosity At Bubble Point Pressure, cp.	0.470	0.415
Average Crude Gravity, °API	41.0	43.0
Producing Mechanism	Solution Gas Drive	Solution Gas Drive
Average Porosity, %	14.33	15.0
Average Permeability, Md.	143.2	53.7
Average Water Saturation, %	20.0	30.0
Average Net Pay Thickness, Ft.	5.2	6.5
Type Accumulation	Sand Bar	Sand Bar

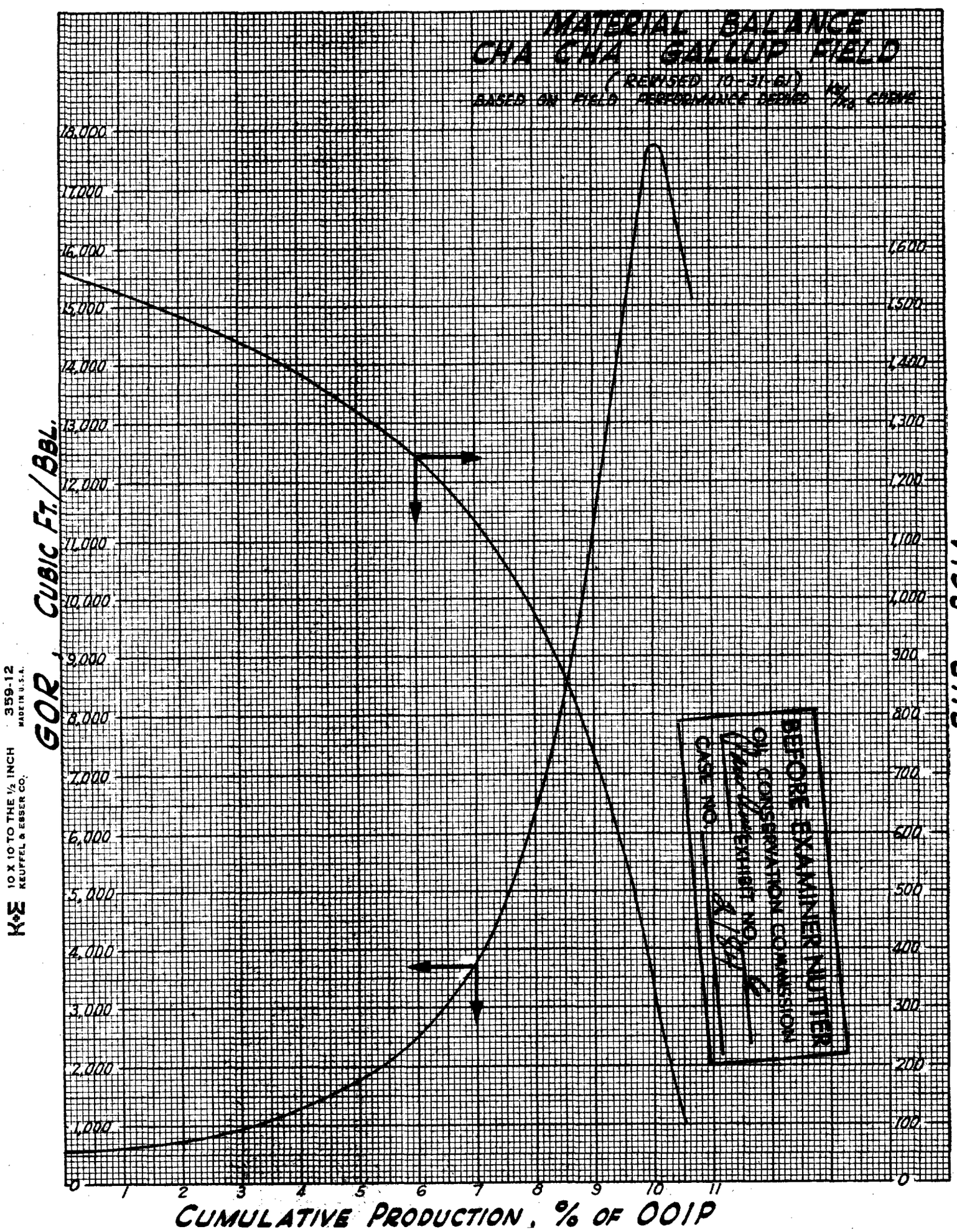
BEFORE EXAMINER NUTTER
OIL CONSERVATION COMMISSION
Pan Am EXHIBIT NO. 4
CASE NO. 2184 (3-7-62)

ECONOMIC ANALYSIS - 40 ACRE DEVELOPMENT
AVERAGE WELL IN TOTAH GALLUP POOL
SAN JUAN COUNTY, NEW MEXICO

based on 10.7% recovery

Average Net Effective Pay (Engr. Committee Est.)	7.9 feet
Acres	40 acres
Reserves, Bbls./ac.-ft.	70
Barrels Per Acre	553
Barrels Per 40 Acres	22,100
Net Reserves To Working Interest, Bbls.	19,300
Value Of Barrel Of Oil, Gross value $2.75 less .05 pipeline gathering charge	$2.70
Gross Income From Reserves	$52,300
Less Taxes At 6.7% (Engr. Committee Est.)	$3,500
Less Operating Costs, 3 yrs. at $150/mo.	$5,400
Net Income From Operations	$43,300
Well Cost (Engr. Committee Est.)	$52,400
Lease & Well Equipment Cost	$13,000
Total Well & Lease Equipment Cost	$65,400
Net Loss on Well	($21,100)

BEFORE EXAMINER NUTTER
OIL CONSERVATION COMMISSION
PAN AM EXHIBIT NO. 5
CASE NO. 2184 (3-7-62)


MATERIAL BALANCE
CHA CHA GALLUP FIELD
(REVISED 10-31-61)
BASED ON FIELD PERFORMANCE DERIVED 14% CURVE
GOR, CUBIC FT./BBL.
BUP, PSIA
CUMULATIVE PRODUCTION, % OF OOIP
0
1,000
2,000
3,000
4,000
5,000
6,000
7,000
8,000
9,000
10,000
11,000
12,000
13,000
14,000
15,000
16,000
17,000
18,000
100
200
300
400
500
600
700
800
900
1,000
1,100
1,200
1,300
1,400
1,500
1,600
1
2
3
4
5
6
7
8
9
10
11
BEFORE EXAMINER NUTTER
OIL CONSERVATION COMMISSION
CASE NO.
EXHIBIT NO.
K+E 10 X 10 TO THE 1/2 INCH 359-12
KEUFFEL & ESSER CO.
MADE IN U.S.A.

TOTAH GALLUP FIELD

Tennessee Oil Company, Callow Lease
BHP DATA

LEASE	WELL	DATE	SHUT-IN TIME PRIOR TO BHP TEST, HRS.	BHP AT 180' DATUM PSIG
Callow	8	9-3-59	134	1634 *
		3-31-60	96	1548
Callow	9	12-1-59	72	1603 *
		3-31-60	122	1564
		9-1-60	112	1543
Callow	11	1-3-60	116	1608 *
		4-5-60	93	1582
		10-31-60	1558	1562
		6-3-61	72	1343
Callow	12	2-26-60	72	1623 *
		4-5-60	96	1594
Callow	13	10-10-60	78	1592 *
		6-4-61	72	1370
		12-8-61	124	763
Callow	14	12-4-60	72	1537 *
		6-3-61	73	1337
Callow	15	1-8-61	72	1473 *
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Callow	16	3-20-61	61	1473 *
		6-3-61	72	1367
Callow	17	6-3-61	74	1350
Callow	18	4-7-61	75	1469 *
		6-4-61	75	1328

* Initial BHP, well shut in immediately after potential test.

BEFORE EXAMINER NUTTER
OIL CONSERVATION COMMISSION
Tennessee EXHIBIT NO. 15
CASE NO. 2184

EXHIBIT 15

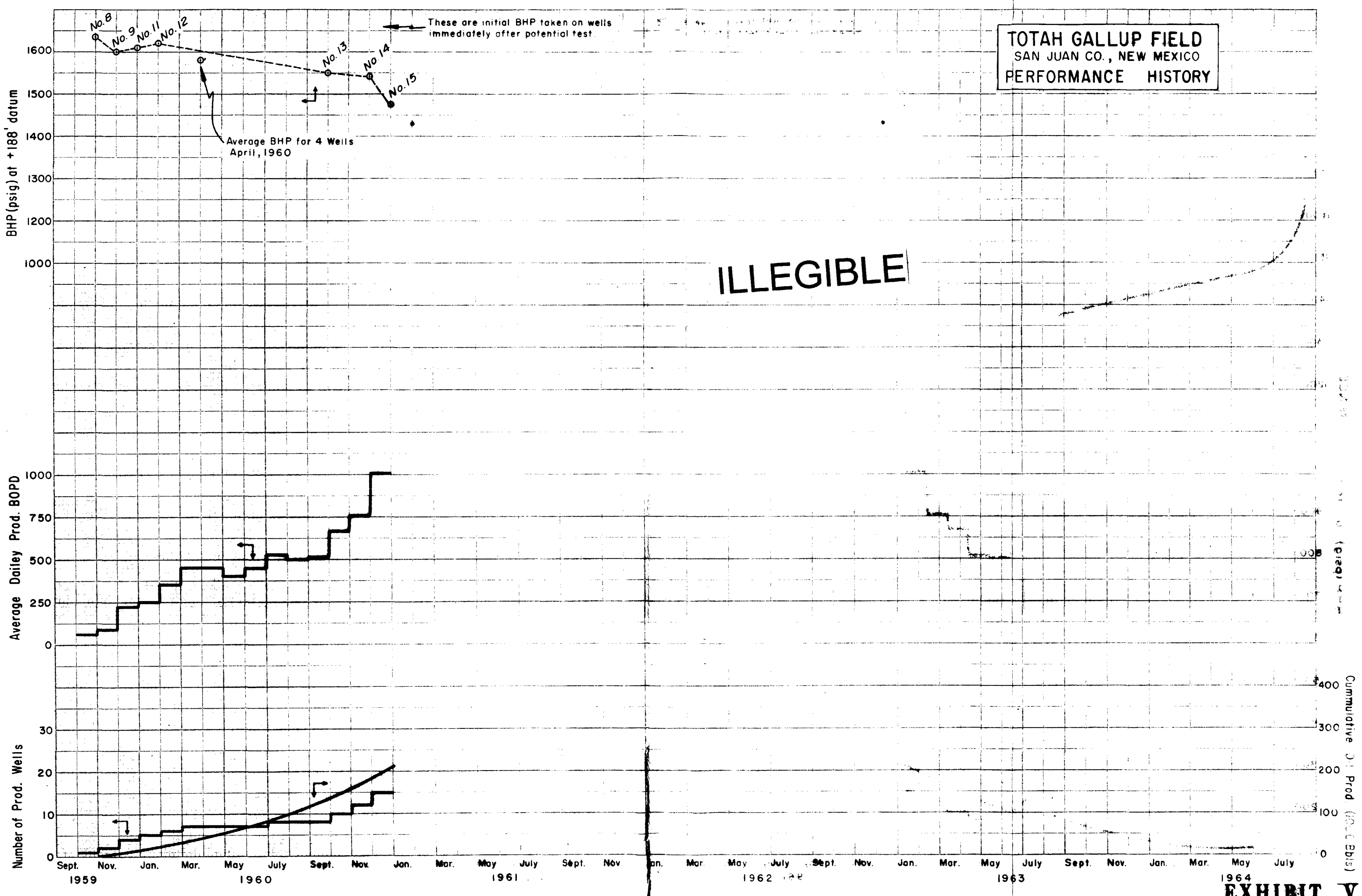
TOTAH GALLUP FIELD
SAN JUAN CO., NEW MEXICO
PERFORMANCE HISTORY
BHP (psig) at +188' datum
1600
1500
1400
1300
1200
1000
No. 8
No. 9
No. 11
No. 12
No. 13
No. 14
No. 15
These are initial BHP taken on wells immediately after potential test.
Average BHP for 4 Wells April, 1960
ILLEGIBLE
Average Daily Prod. BOPD
1000
750
500
250
0
Number of Prod. Wells
30
20
10
0
Cummulative Oil Prod (000 Bbls)
400
300
200
100
0
Sept.
Nov.
Jan.
Mar.
May
July
Sept.
Nov.
Jan.
Mar.
May
July
Sept.
Nov
Jan.
Mar.
May
July
Sept.
Nov.
Jan.
Mar.
May
July
Sept.
Nov.
Jan.
Mar.
May
July
1959
1960
1961
1962
1963
1964

EXHIBIT V

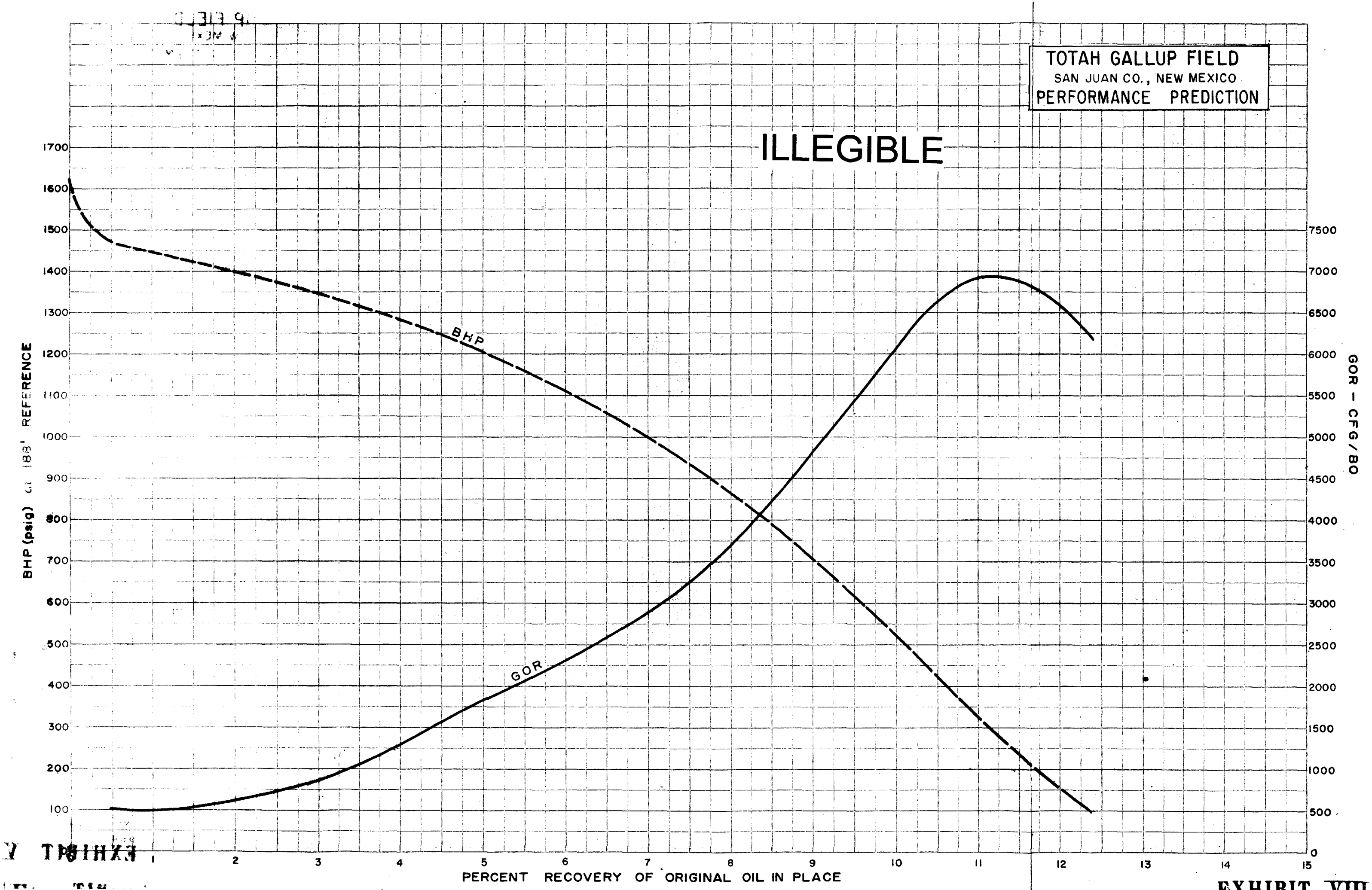

EXHIBIT VIII

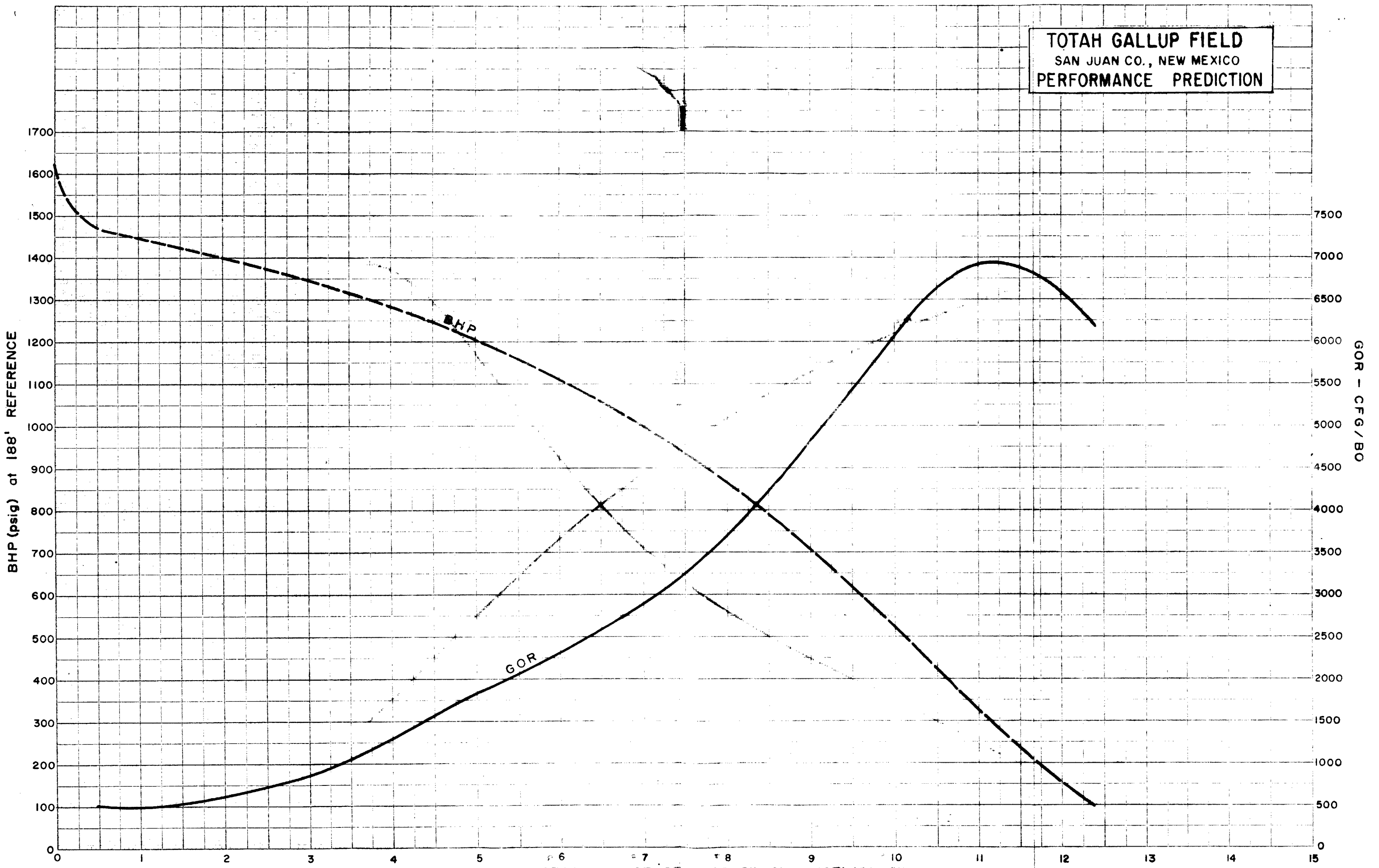
TOTAH GALLUP FIELD
SAN JUAN CO., NEW MEXICO
PERFORMANCE PREDICTION
BHP (psig) at 188' REFERENCE
GOR – CFG/BO
BHP
GOR
PERCENT RECOVERY OF ORIGINAL OIL IN PLACE
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
1700
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
6500
7000
7500
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15

EXHIBIT VII

LARGE FORMAT EXHIBIT HAS BEEN REMOVED AND IS LOCATED IN THE NEXT FILE

LARGE FORMAT EXHIBIT HAS BEEN REMOVED AND IS LOCATED IN THE NEXT FILE

LARGE FORMAT EXHIBIT HAS BEEN REMOVED AND IS LOCATED IN THE NEXT FILE

LARGE FORMAT EXHIBIT HAS BEEN REMOVED AND IS LOCATED IN THE NEXT FILE

TOTAH GALLUP FIELD - BOTTOM HOLE PRESSURES

LEASE	WELL	DATE	SHUT-IN PRIOR TO BHP TEST HRS.	BHP AT 188' DATUM PSIG
Callow	8	9/3/59	134	1634*
		3/31/60	96	1548
Callow	9	12/1/59	72	1603*
		3/31/60	122	1564
		9/1/60	112	1543
Callow	11	1/3/60	116	1608*
		4/5/60	93	1582
		10/31/60	1558	1562
Callow	12	2/26/60	72	1623*
		4/5/60	96	1594
Callow	13	10/10/60	78	1552*
Callow	14	12/4/60	72	1537*
Callow	15	1/8/61	72	1473*

* Initial BHP taken immediately after potential test

EXHIBIT VI

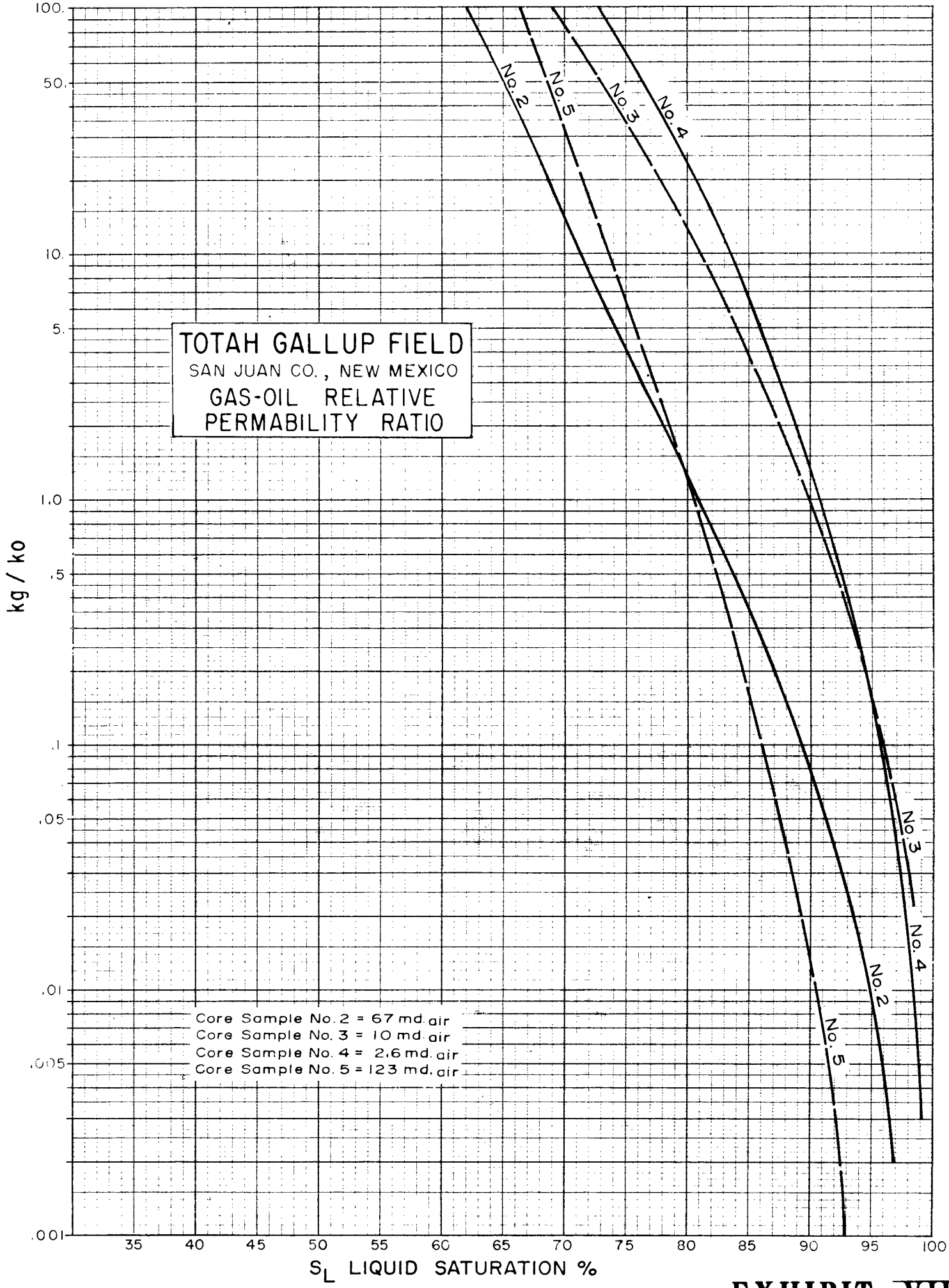
TOTAH GALLUP FIELD
SAN JUAN CO., NEW MEXICO
GAS-OIL RELATIVE
PERMABILITY RATIO
kg / ko
100.
50.
10.
5.
1.0
.5
.1
.05
.01
.005
.001
35
40
45
50
55
60
65
70
75
80
85
90
95
100
S_L LIQUID SATURATION %
No. 2
No. 5
No. 3
No. 4
No. 3
No. 4
No. 2
No. 5
Core Sample No. 2 = 67 md. air
Core Sample No. 3 = 10 md. air
Core Sample No. 4 = 2.6 md. air
Core Sample No. 5 = 123 md. air

EXHIBIT VII

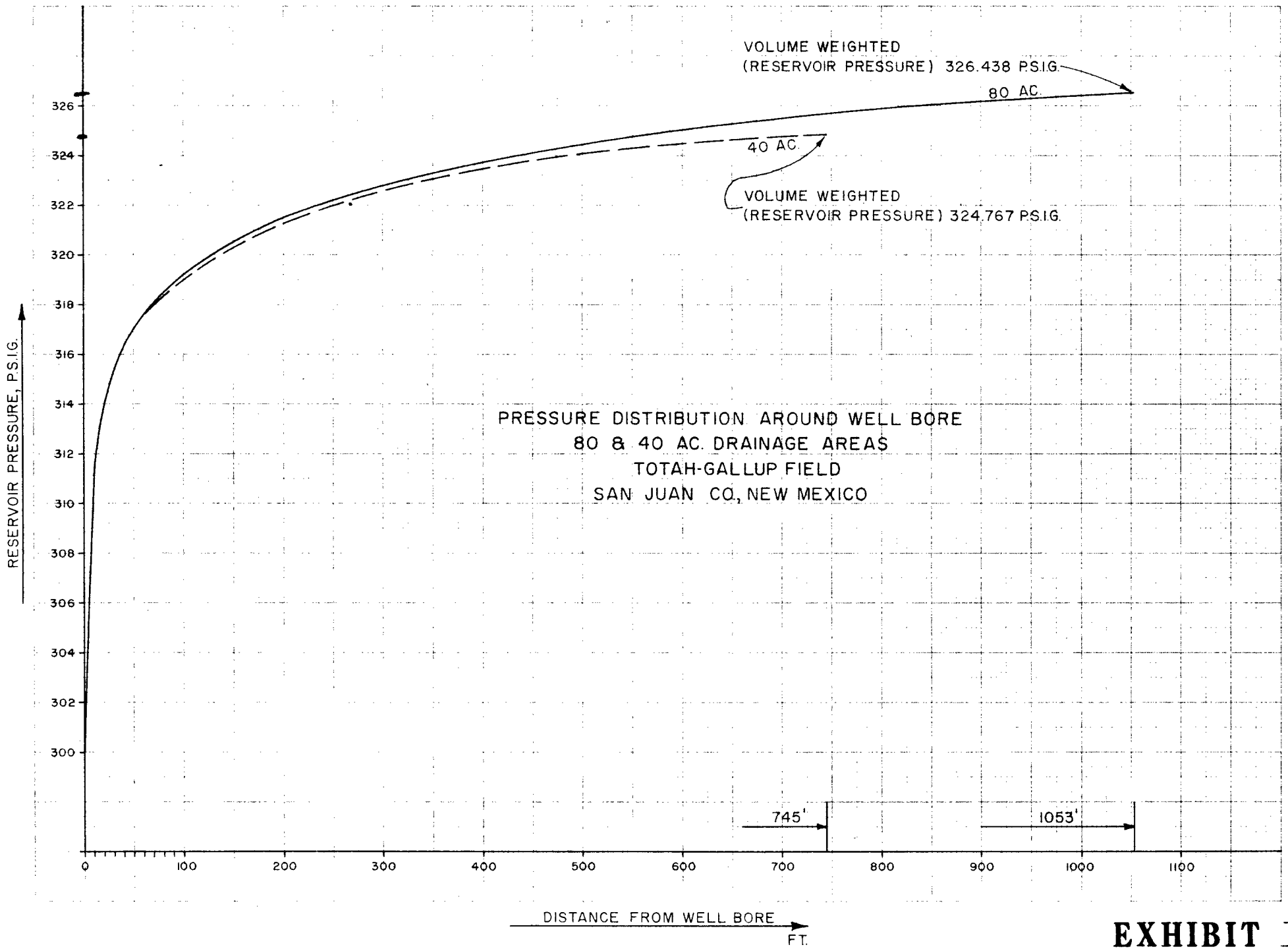
VOLUME WEIGHTED
(RESERVOIR PRESSURE) 326.438 P.S.I.G.
80 AC.
40 AC.
VOLUME WEIGHTED
(RESERVOIR PRESSURE) 324.767 P.S.I.G.
PRESSURE DISTRIBUTION AROUND WELL BORE
80 & 40 AC. DRAINAGE AREAS
TOTAH-GALLUP FIELD
SAN JUAN CO., NEW MEXICO
RESERVOIR PRESSURE, P.S.I.G.
326
324
322
320
318
316
314
312
310
308
306
304
302
300
745'
1053'
0
100
200
300
400
500
600
700
800
900
1000
1100
DISTANCE FROM WELL BORE
FT.

EXHIBIT IX