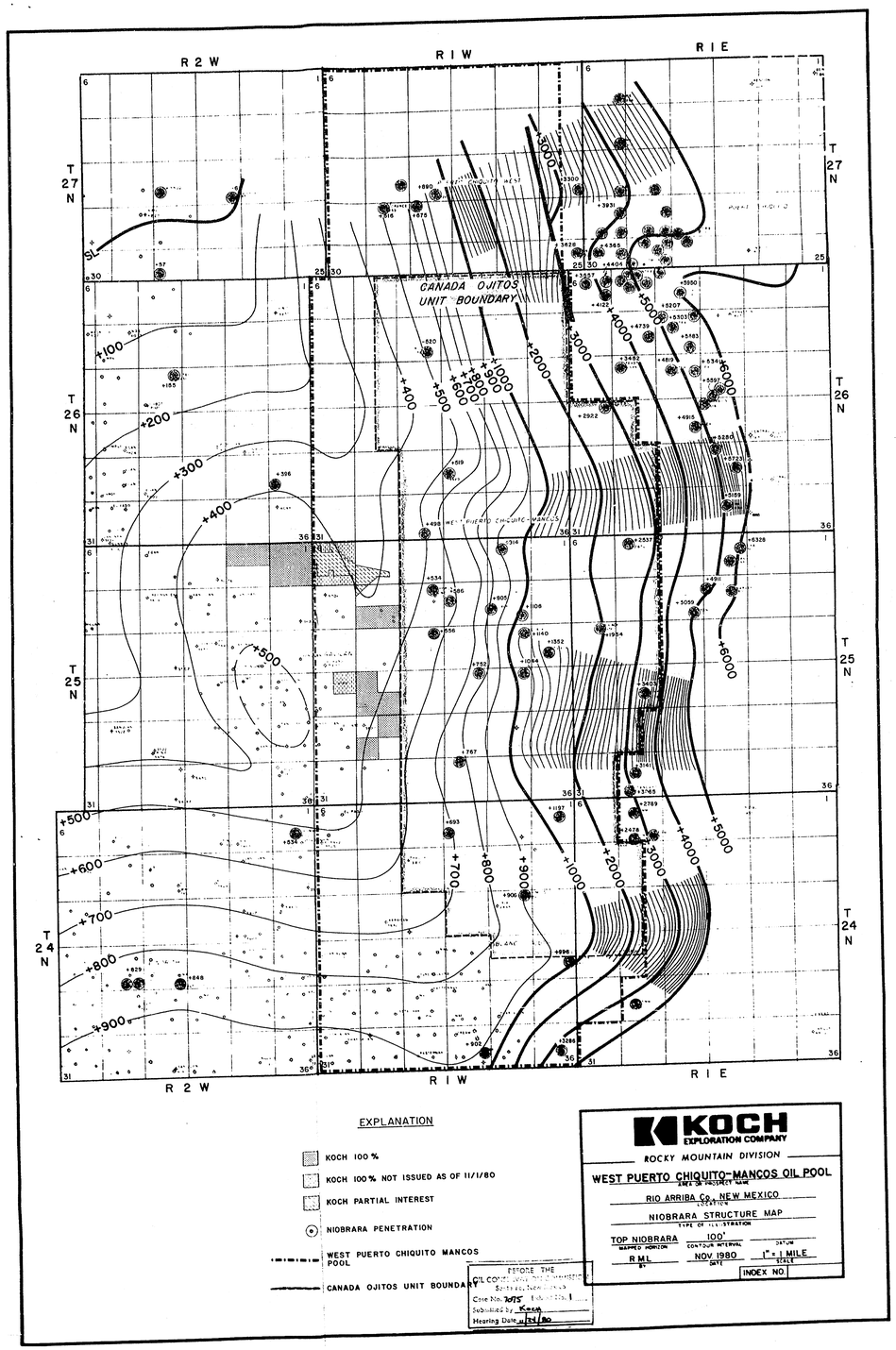
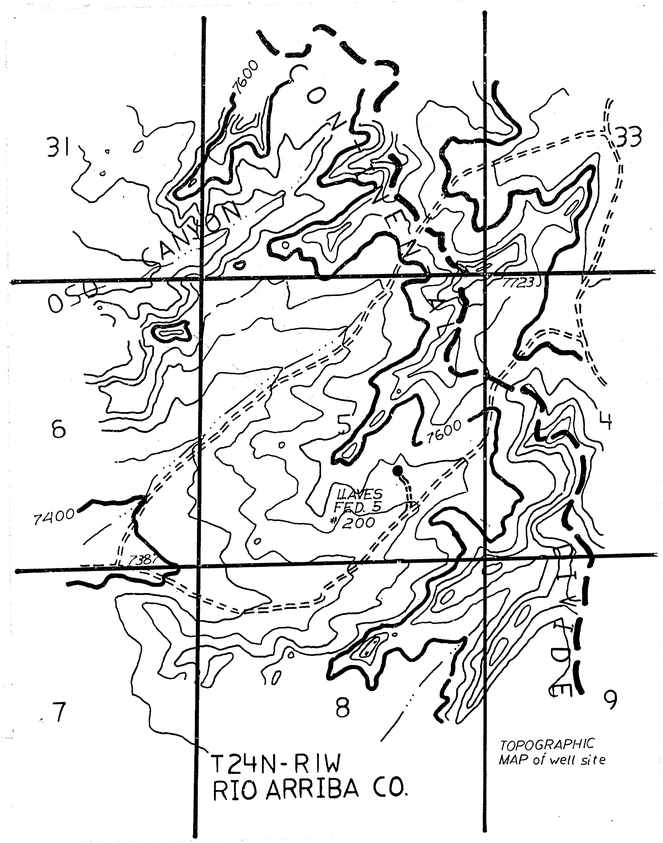
Case No.
7075

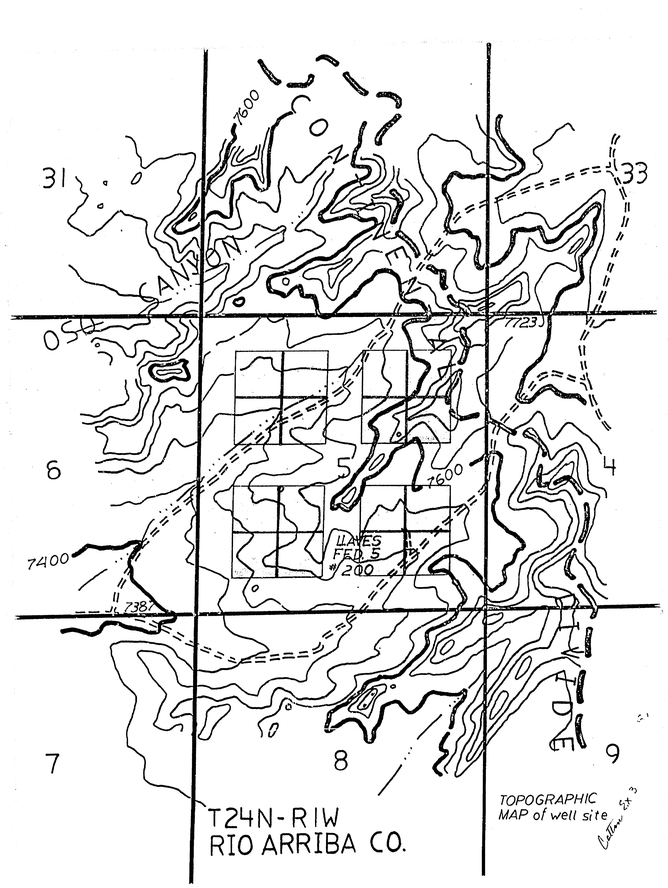
Large Exhibits



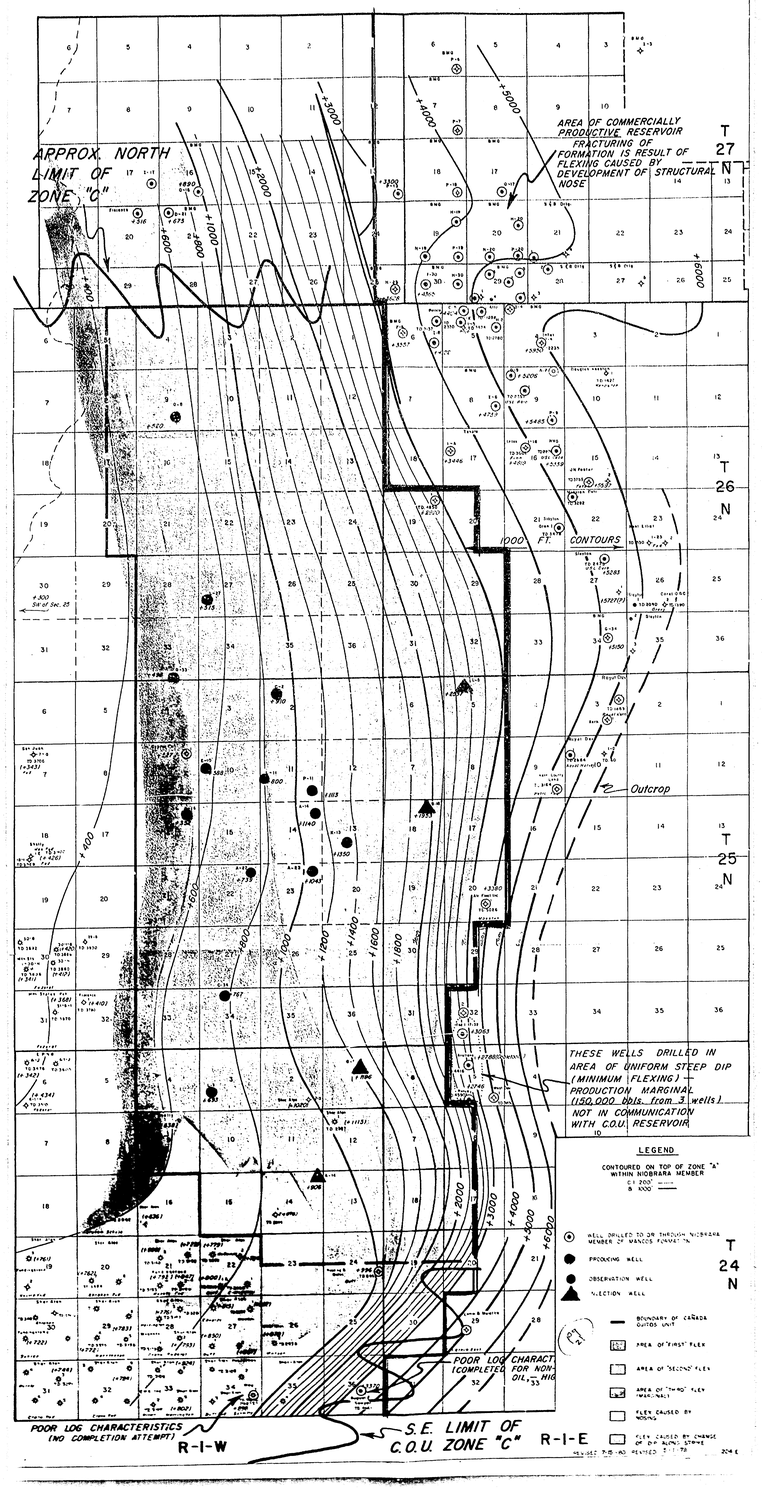

R 2 W
R 1 W
R I E
T 27 N
T 26 N
T 25 N
T 24 N
CANADA OJITOS UNIT BOUNDARY
+100
+200
+300
+400
+500
+600
+700
+800
+900
+1000
+2000
+3000
+4000
+5000
+6000
SI
EXPLANATION
KOCH 100 %
KOCH 100 % NOT ISSUED AS OF 11/1/80
KOCH PARTIAL INTEREST
NIOBRARA PENETRATION
WEST PUERTO CHIQUITO MANCOS POOL
CANADA OJITOS UNIT BOUNDARY
KOCH EXPLORATION COMPANY
ROCKY MOUNTAIN DIVISION
WEST PUERTO CHIQUITO-MANCOS OIL POOL
LEASE OR PROJECT NAME
RIO ARRIBA Co., NEW MEXICO
LOCATION
NIOBRARA STRUCTURE MAP
TYPE OF ILLUSTRATION
TOP NIOBRARA
MAPPED HORIZON
100'
CONTOUR INTERVAL
DATUM
R M L
BY
NOV 1980
DATE
1" = 1 MILE
SCALE
INDEX NO.
BEFORE THE
Case No. 7915
Submitted by Koch
Hearing Date 12/4/80



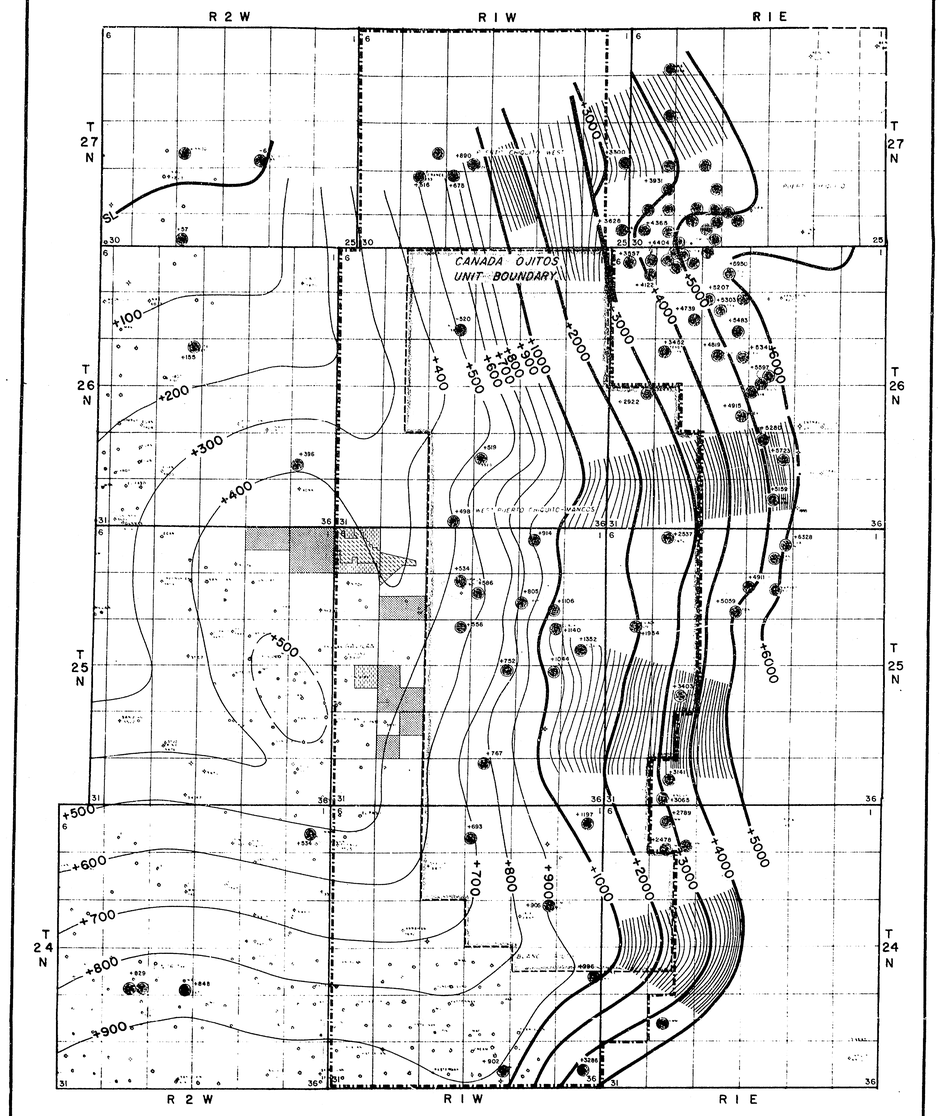
TOPOGRAPHIC
MAP of well site


31
33
6
5
4
7
8
9
7600
7600
7400
7387
7123
LAVES
FED. 5
#200
T24N-R1W
RIO ARRIBA CO.
TOPOGRAPHIC
MAP of well site

CONTOURED ON "A" MARKER IN NIOBRARA



U.S.B.M.-C.F. MICROGRAPHICS
BEST AVAILABLE COPY



EXPLANATION

- KOCH 100 %
- KOCH 100 % NOT ISSUED AS OF 11/1/80
- KOCH PARTIAL INTEREST
- NIOBRARA PENETRATION
- WEST PUERTO CHIQUITO MANCOS POOL
- CANADA OJITOS UNIT BOUNDARY

BEFORE THE
OIL CONSERVATION DIVISION
Santa Fe, New Mexico
Case No. 7675
Submitted by Koch
Hearing Date 12/3/80

KOCH EXPLORATION COMPANY

ROCKY MOUNTAIN DIVISION

WEST PUERTO CHIQUITO-MANCOS OIL POOL
AREA OR PROSPECT NAME

RIO ARRIBA Co., NEW MEXICO
LOCATION

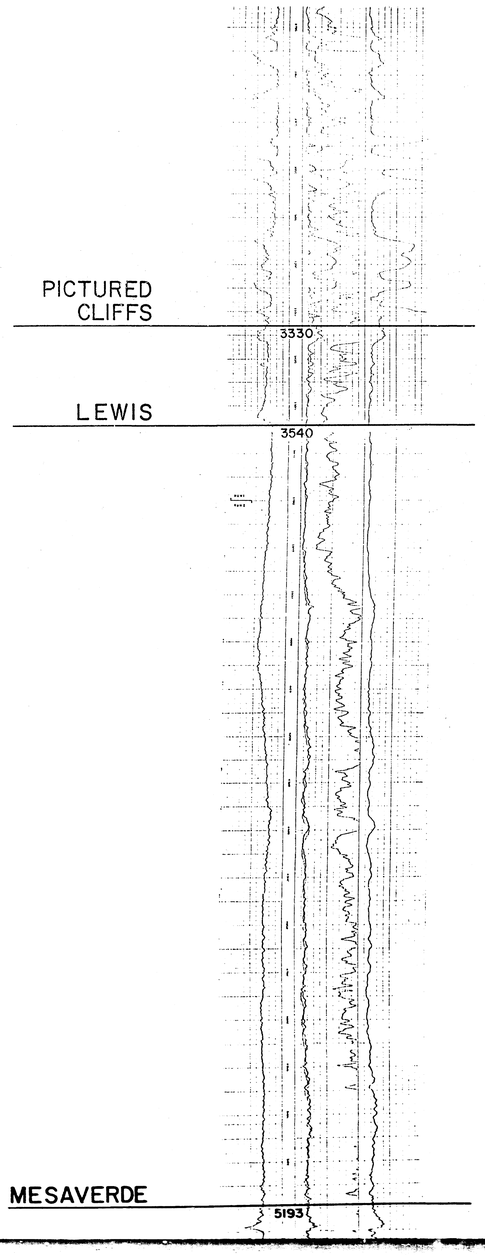
NIOBRARA STRUCTURE MAP
TYPE OF ILLUSTRATION

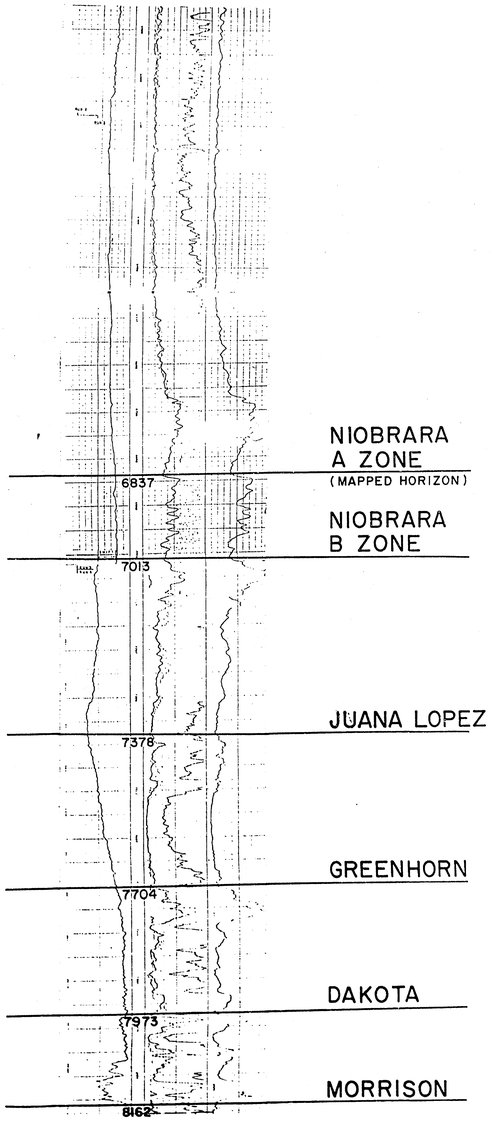
TOP NIOBRARA	100'	
MAPPED HORIZON	CONTOUR INTERVAL	DATUM
R.M.L.	NOV. 1980	1" = 1 MILE
BY	DATE	SCALE

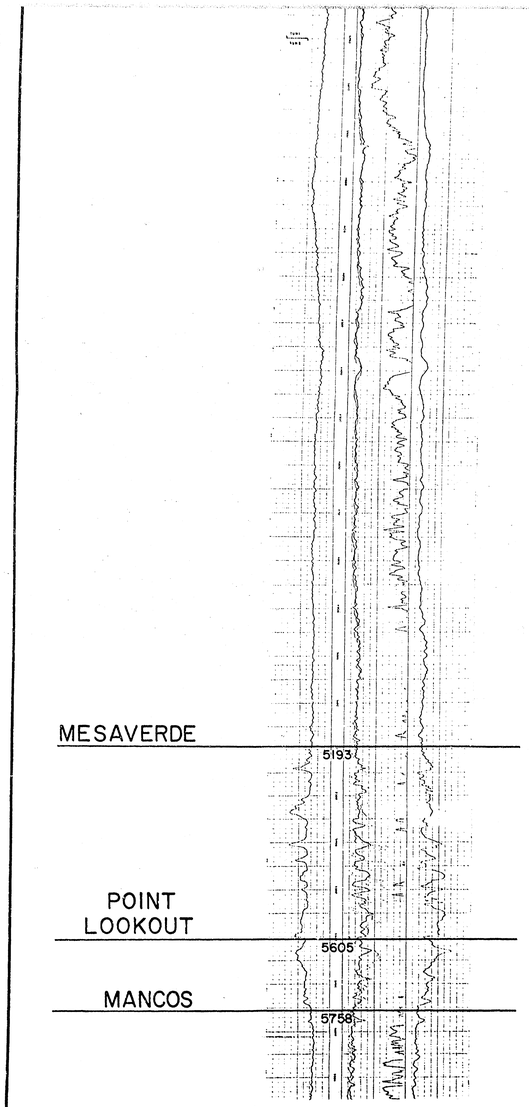
INDEX NO.

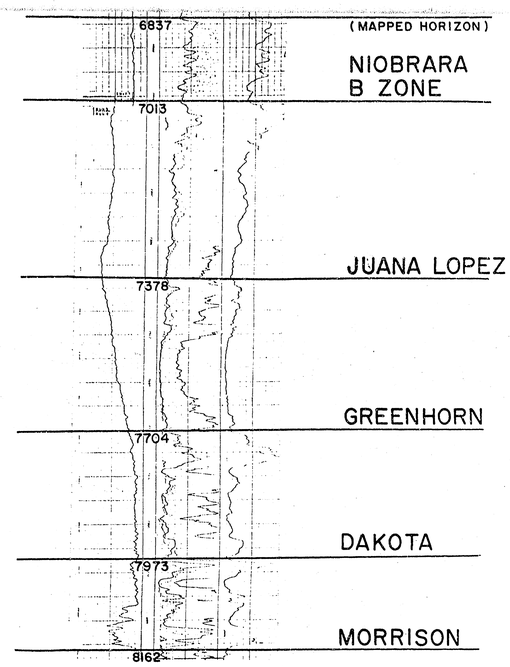
AREA TYPE LOG

CYPRUS BOLACK FEDERAL #1
SW NE NE SEC. 9 T25N-R1W
KB 7371
TD 8182









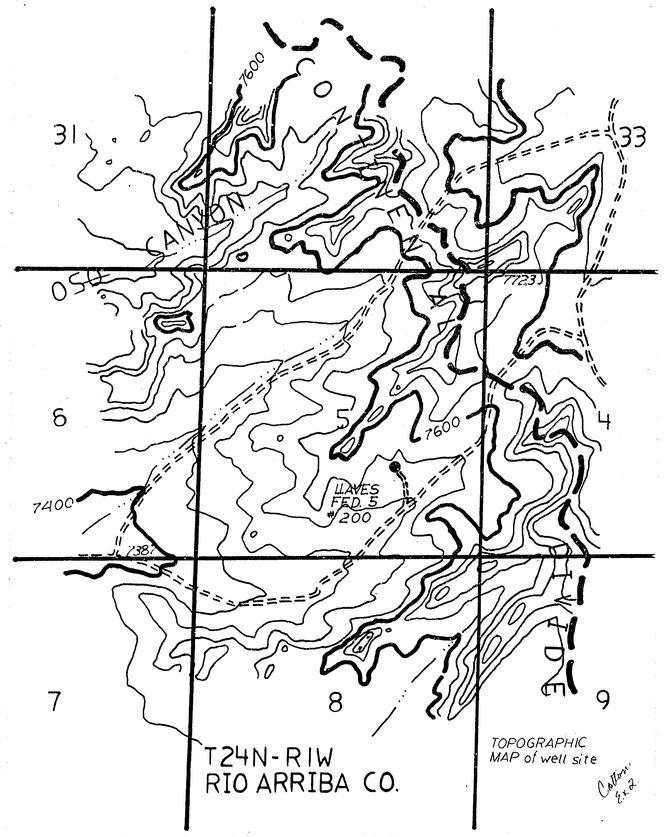
BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
Case No. 7075 Exhibit No. 2
Submitted by Koch
Hearing Date 8/2nd/En

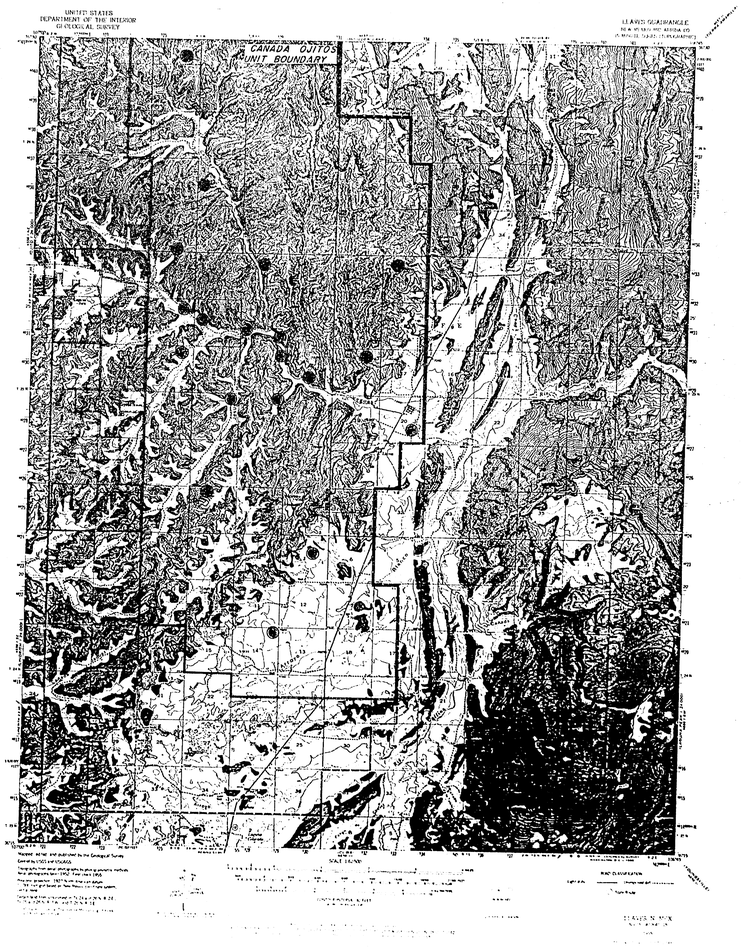
KOCH EXPLORATION COMPANY
ROCKY MOUNTAIN DIVISION
WEST PUERTO CHIQUITO-MANCOS OIL POOL
AREA OR PROSPECT NAME
RIO ARRIBA Co., NEW MEXICO
LOCATION
AREA TYPE LOG
TYPE OF ILLUSTRATION

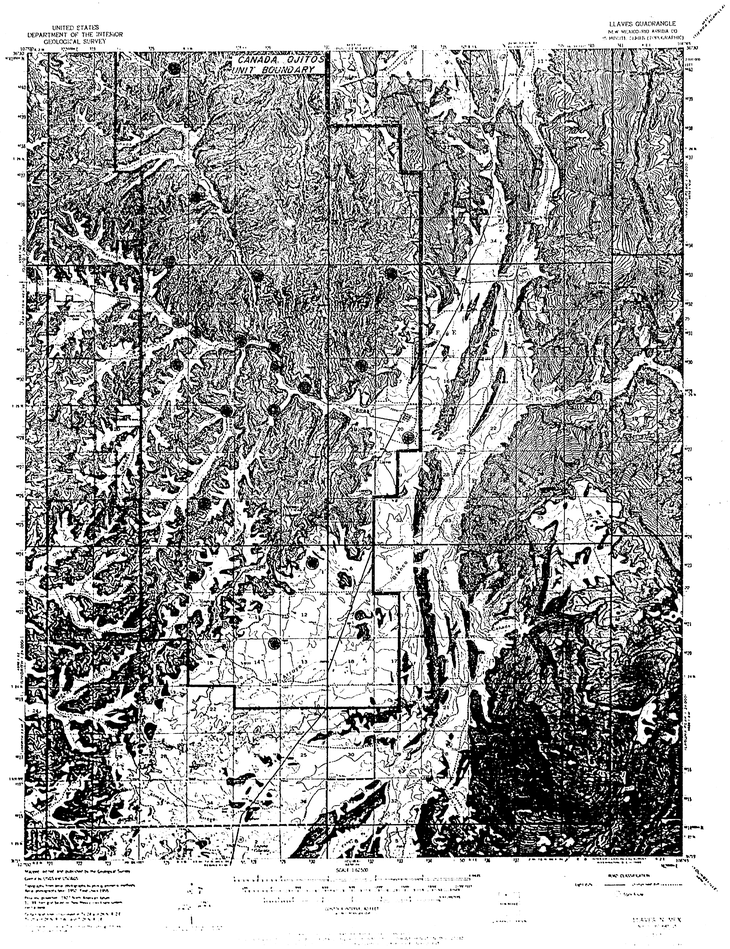
MAPPED HORIZON	CONTOUR INTERVAL	DATUM
R. M. L.	NOV 1990	VERT: 1" = 100'
BY	DATE	SCALE

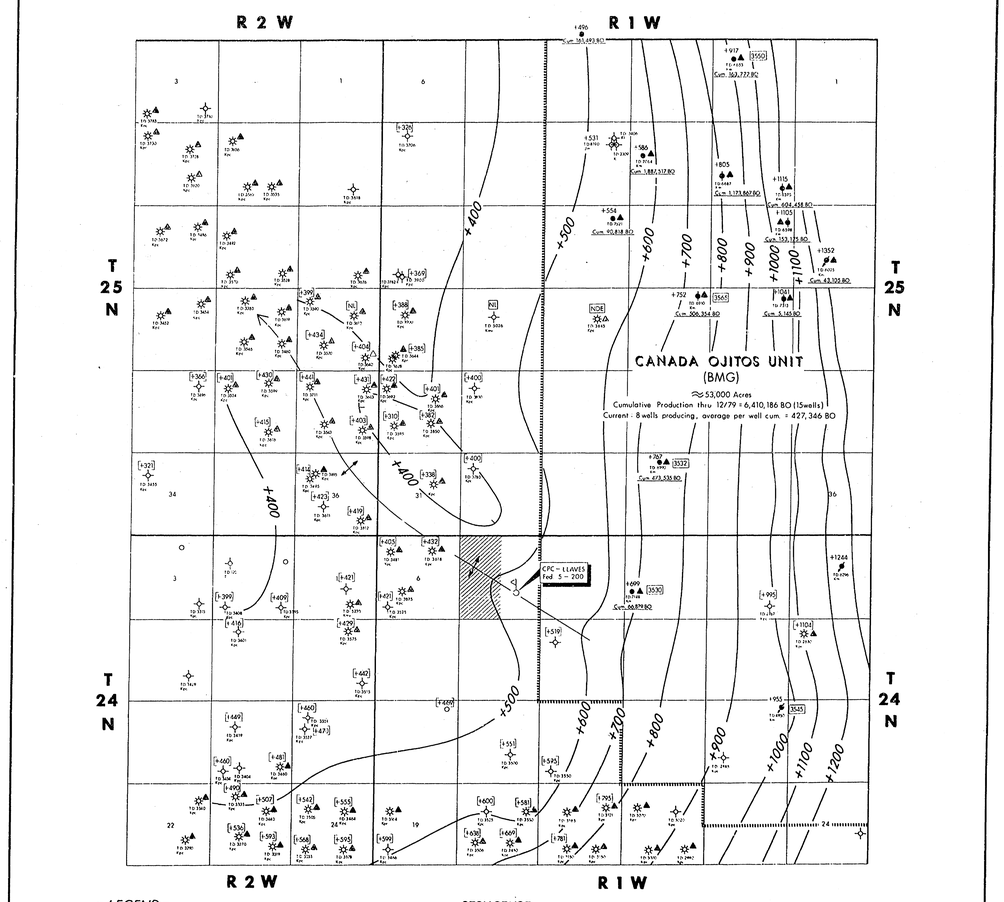
INDEX NO.




31
33
SANYON
6
4
7600
7723
7400
7387
LAVES FED 5 #200
7
8
9
T24N-R1W
RIO ARRIBA CO.
TOPOGRAPHIC MAP of well site


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
CANADA QUITOS
JOINT BOUNDARY
ULAWIS QUADRANGLE


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
CANADA
LIMIT BOUNDARY
LLAVES QUADRANGLE
SCALE 1:62500



– LEGEND –

- Oil Well
- Mancos Fm Oil Well
- Injection Well
- St Mancos Oil Well
- Gas Well
- Pictured Cliffs
- Niobrara
- Dry Hole

Kpc Pictured Cliffs
Kmv Mesaverde
Km Mancos
Kd Dakota
Jm Morrison

+554 Datum

[+622] Phantom Datum based on Average Isopach thickness of 1930 feet from Pictured Cliffs to Niobrara

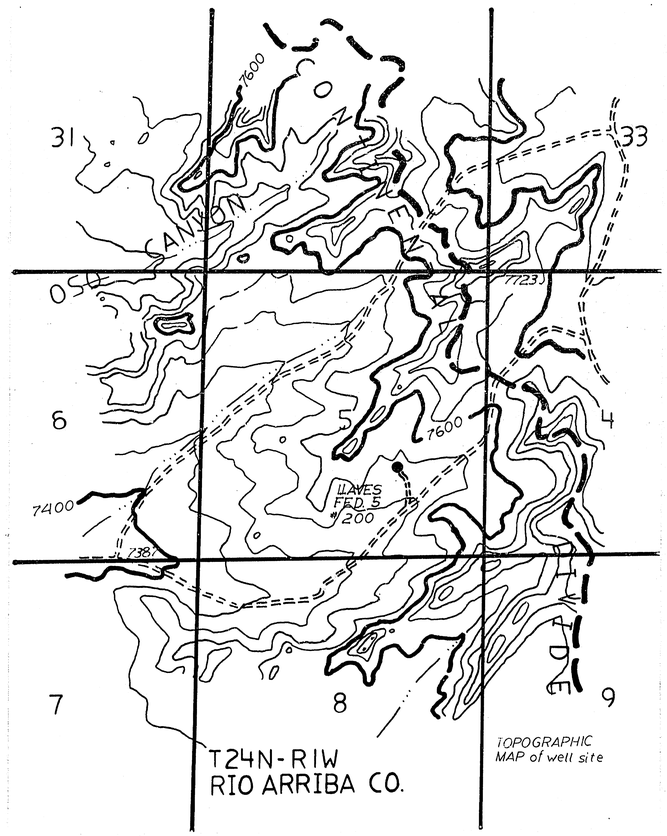
STRUCTURE
TOP NIOBRARA MEMBER
MANCOS SHALE
C.I. = 100 feet

COTTON PETROLEUM CORP.
DENVER DIVISION

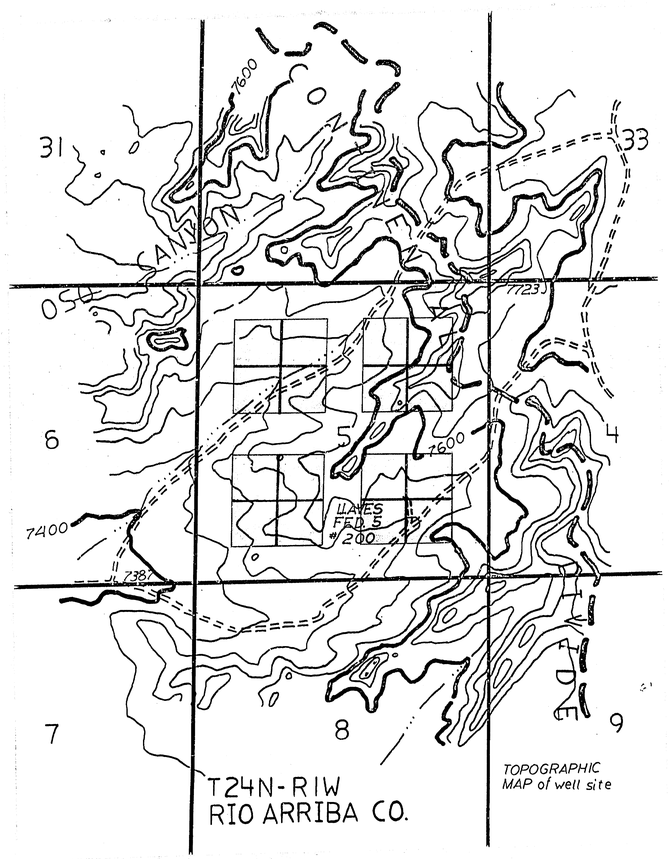
GAVILAN PROSPECT
RIO ARRIBA COUNTY, NEW MEXICO

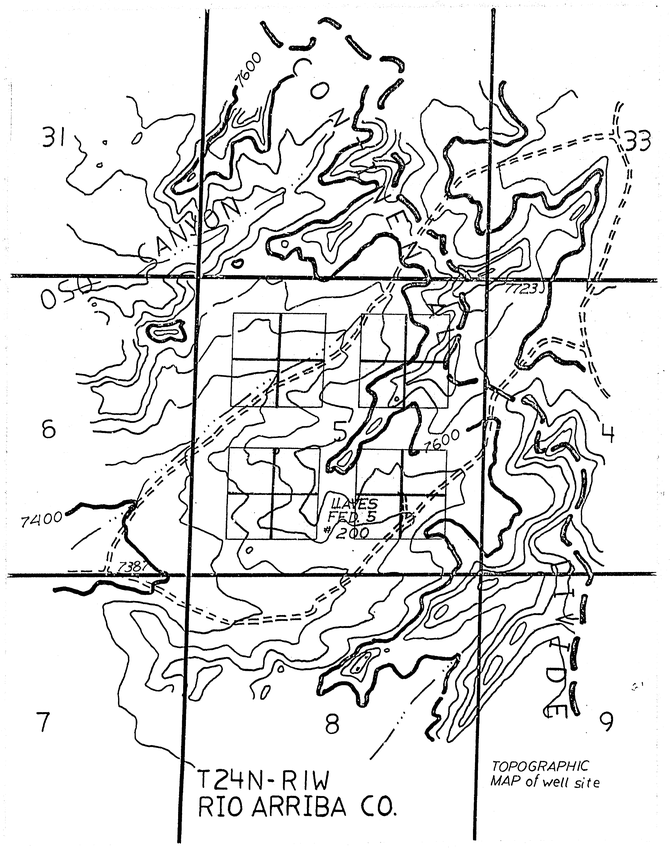
SCALE 1" = 3000 feet

Exhibit No. 1
Submitted by Cotton
Hearing Date



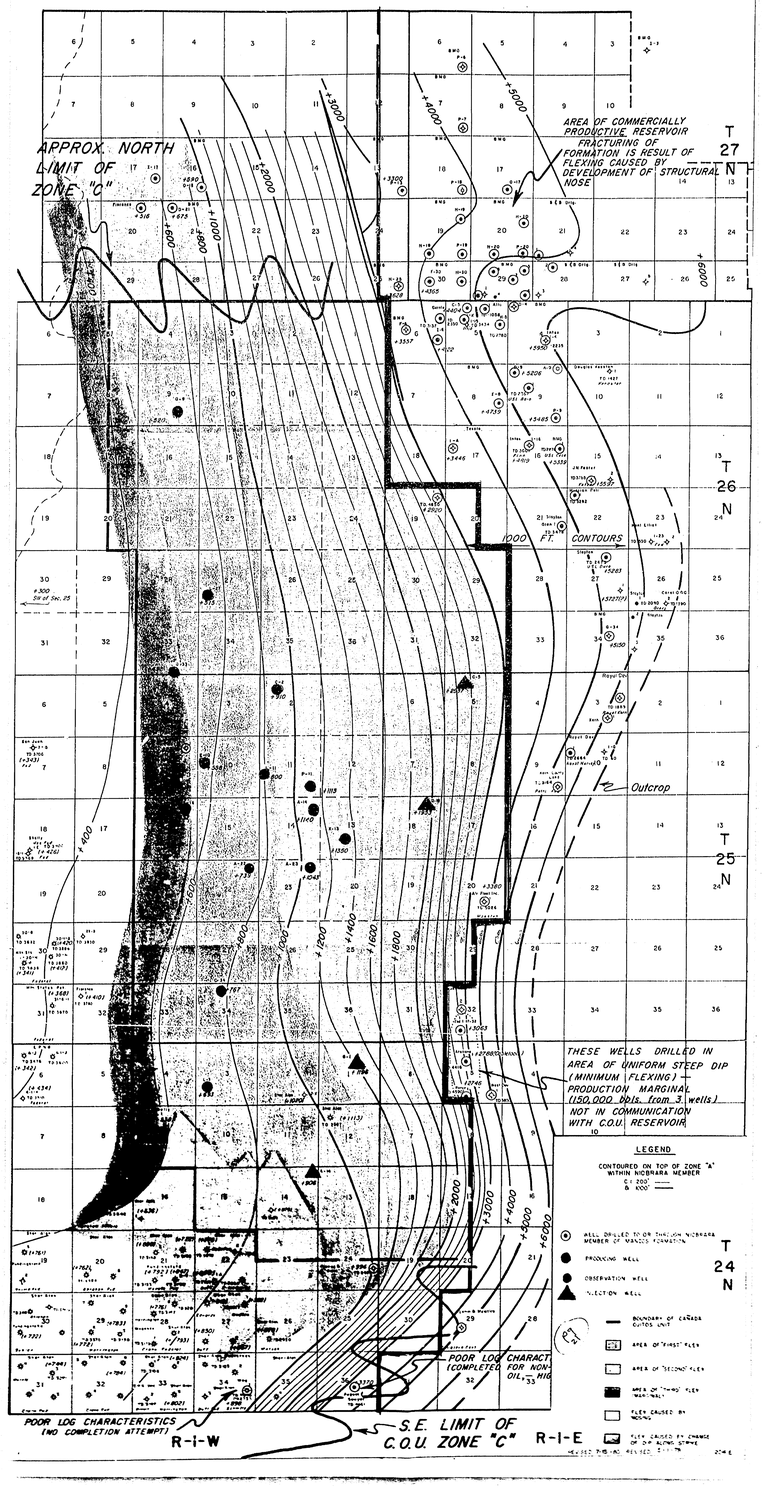
TOPOGRAPHIC
MAP of well site


31
33
6
5
4
7
8
9
7600
7600
7400
7387
7230
LAVES
FED. 5
#200
TOPOGRAPHIC
MAP of well site
T24N-R1W
RIO ARRIBA CO.



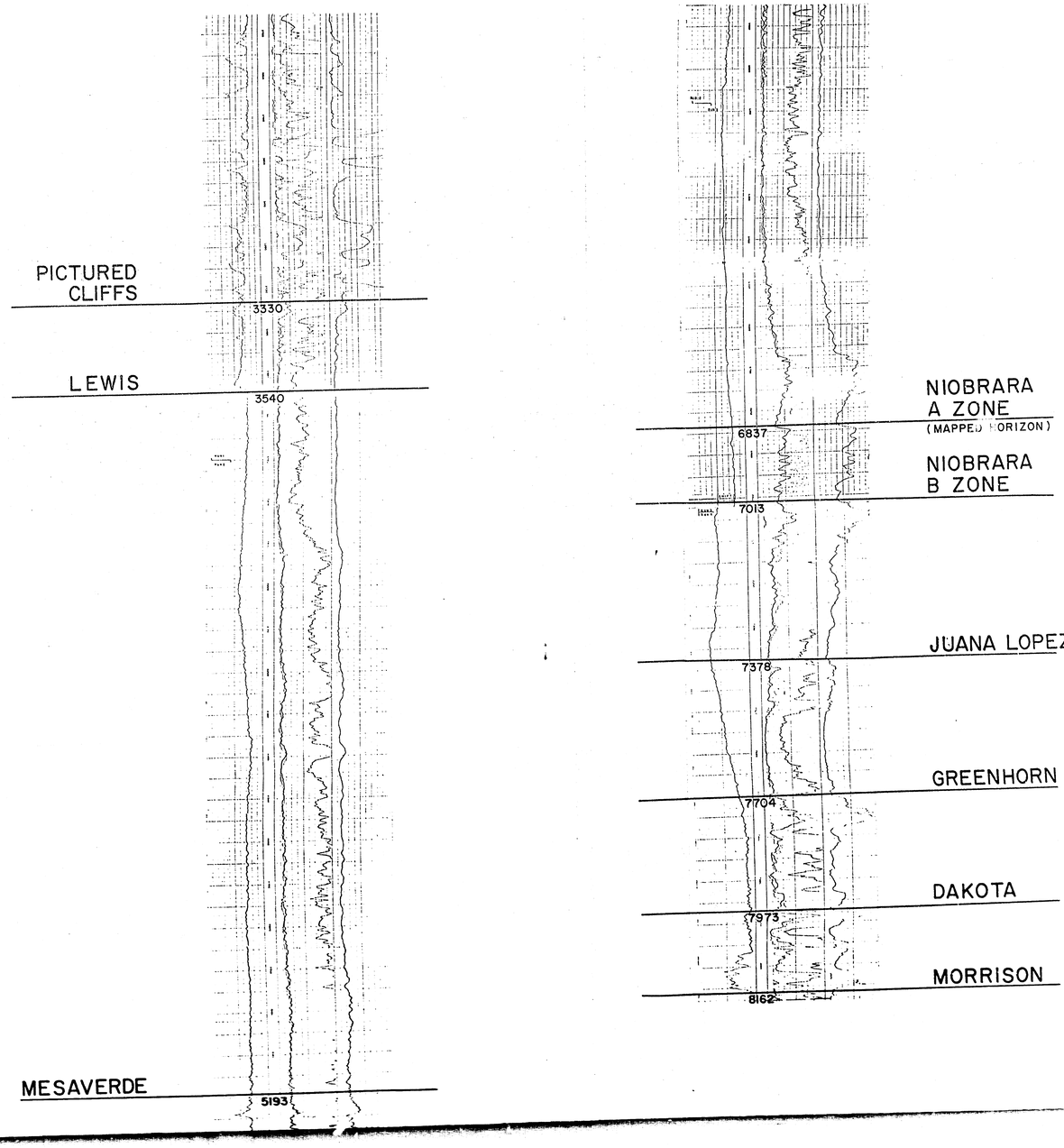
TOPOGRAPHIC MAP of well site

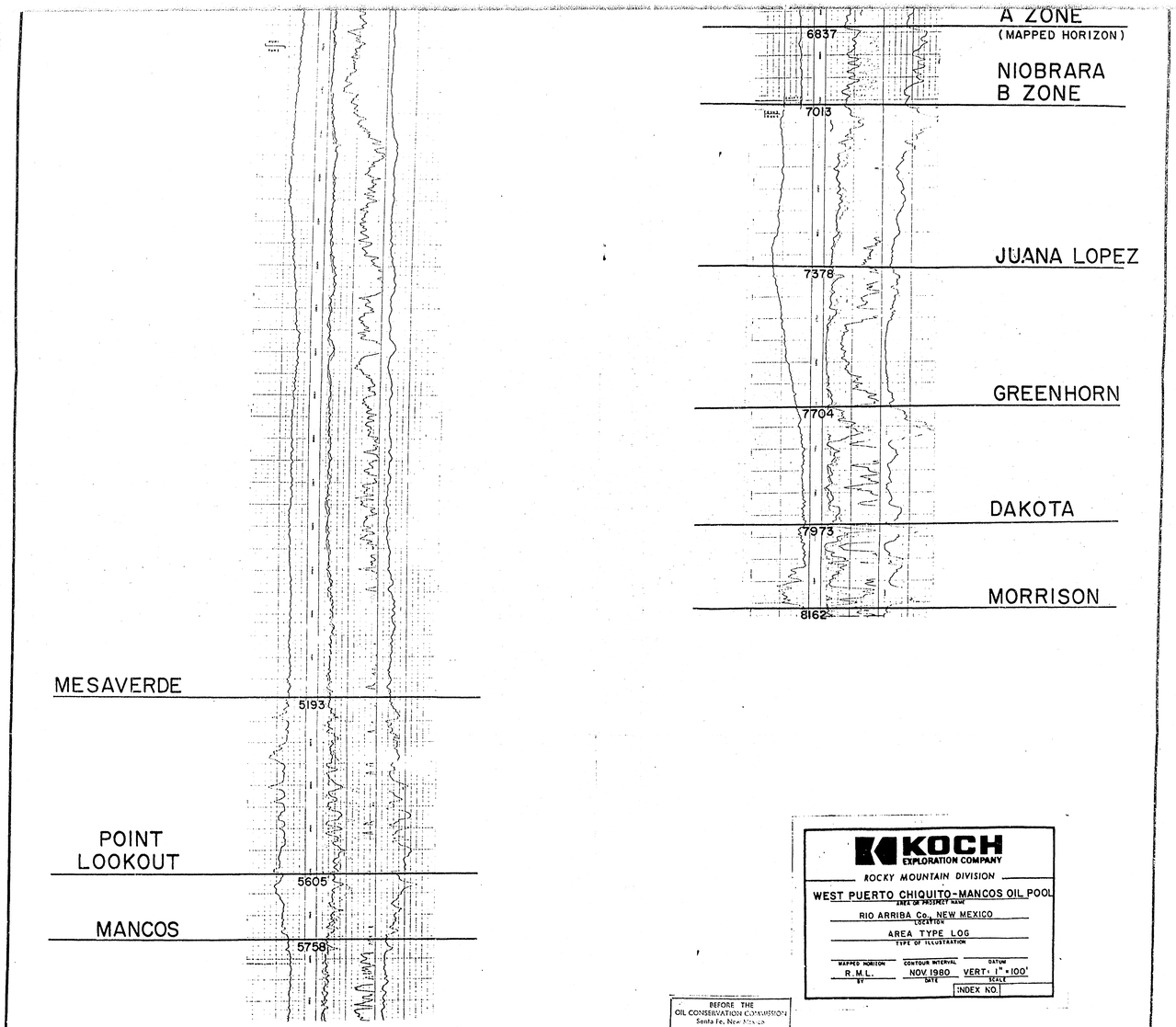
CONTOURED ON "A" MARKER IN NIOBRARA



AREA TYPE LOG

CYPRUS BOLACK FEDERAL #1
SW NE NE SEC. 9 T25N-R1W
KB 7371
TD 8182





KOCH EXPLORATION COMPANY

ROCKY MOUNTAIN DIVISION

WEST PUERTO CHIQUITO-MANCOS OIL POOL
AREA OR PROSPECT NAME

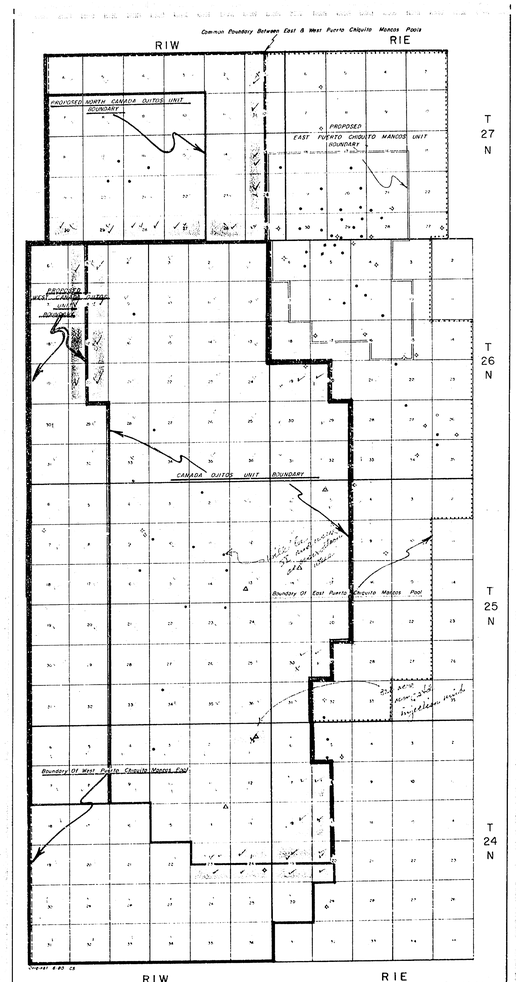
RIO ARRIBA Co., NEW MEXICO
LOCATION

AREA TYPE LOG
TYPE OF ILLUSTRATION

MAPPED HORIZON	CONTOUR INTERVAL	DATUM
R.M.L.	NOV 1980	VERT: 1" = 100'
BY	DATE	SCALE

INDEX NO.

BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
Case No. 795 Exhibit No. 2
Submitted by Koch
Hearing Date 11/24/80

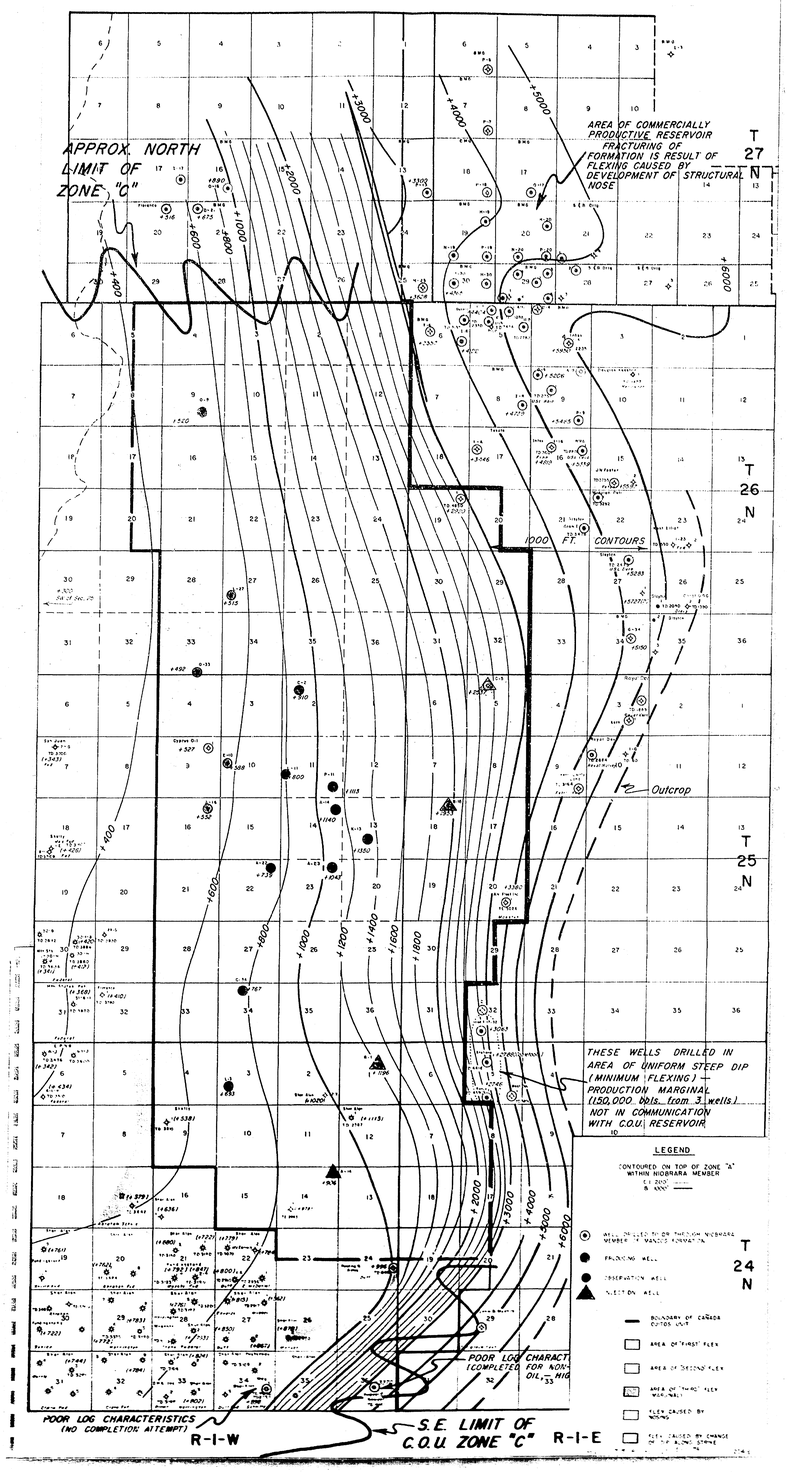


EAST AND WEST
PUERTO CHIQUITO MANCOS POOLS
RIO ARRIBA CO., NEW MEXICO

June 15, 1980

U.S.G.S. RECONNAISSANCE
BEST AVAILABLE COPY

CONTOURED ON "A" MARKER IN NIOBRARA

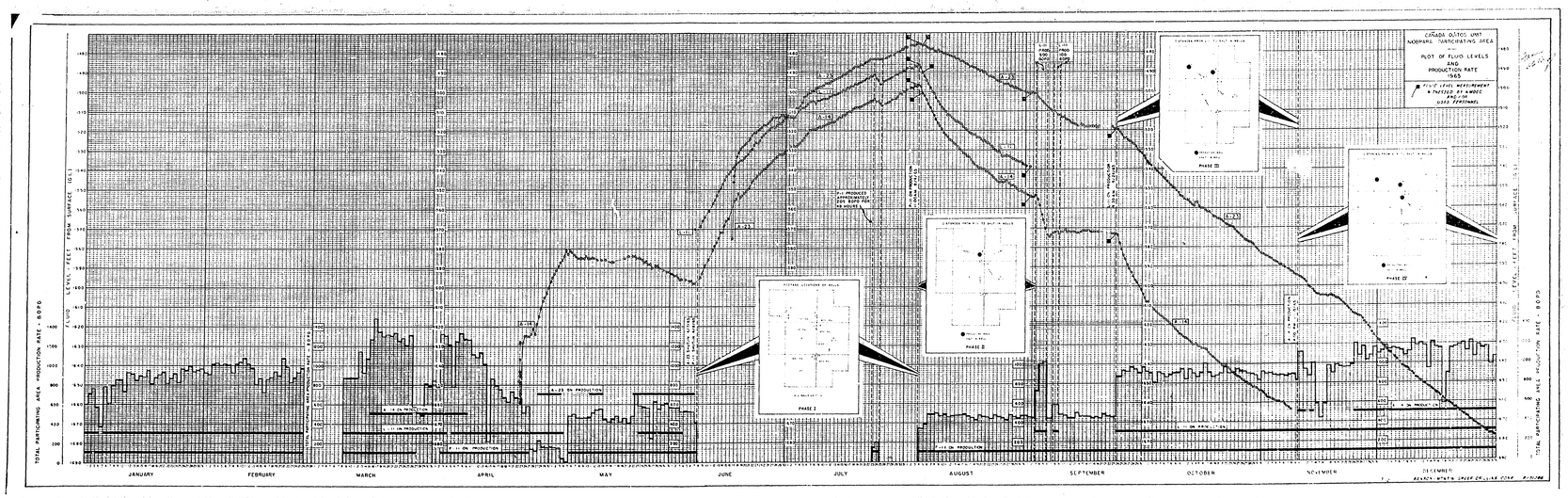


U.S.G.S. RECONNAISSANCE
BEST AVAILABLE COPY

IDENTIFICATION OF MAIN PRODUCING ZONES
NORTHEAST PUERTO CHIQUITO
AND
SOUTHWEST PUERTO CHIQUITO

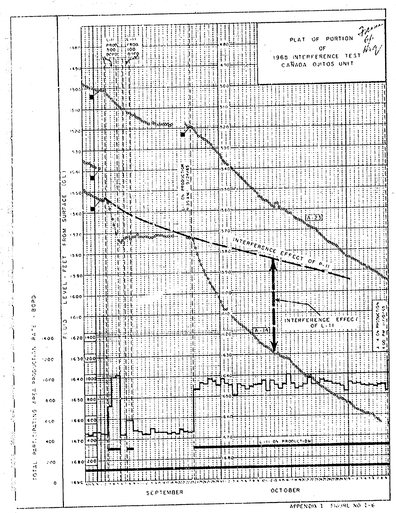
BENSON-MONTIN-GREER DRLG. CORP.
CAÑADA OJITOS UNIT NO. B-18

A
STANDARD OIL COMPANY OF TEXAS
FEDERAL 17-32 No.1
660' FSL and 1830' FWL
Sec.32-25N-11E
BOLACK - GREER
BOLACK No.2
1785' FSL and 2105' FWL
Sec. 19 - 25N-11W
BOLACK - GREER
BOLACK No.1
1090' FSL and 1920' FEL
Sec. 9 - 25N - 11W
BENSON-MONTIN-GREER DRLG CORP.
JICARILLA No. P-15
660' FSL and 660' FEL
Sec. 15 - 27N-11E
BENSON-MONTIN-GREER DRLG. CORP.
APACHE No. D-17
660' FSL and 1980' FEL
Sec. 17-27N-11E
BENSON-MONTIN-GREER DRLG CORP.
EL POSO RANCH No. 2-3
1980' FSL and 660' FEL
Sec 3-27N-11E
A'
R11W
R11E
T 27 N
T 26 N
CANADA OJITOS UNIT
POTATO CHIQUITO UNIT
BENSON-MONTIN-GREER
BOLACK
STANDARD OIL OF TEXAS FEDERAL 17-32
BENSON-MONTIN-GREER DRLG. CORP.
FARMINGTON, NEW MEXICO
STRATIGRAPHIC CROSS SECTION
PART OF
NIOBRARA MEMBER
OF
MANCOS FORMATION
EASTERN FLANK OF SAN JUAN BASIN
RIO ARRIBA COUNTY - NEW MEXICO
LEGEND
LOCUS OF SOUTH-NORTH CROSS SECTION
WELL LOCATION - CROSS SECTION
SCALE
Blue line datum

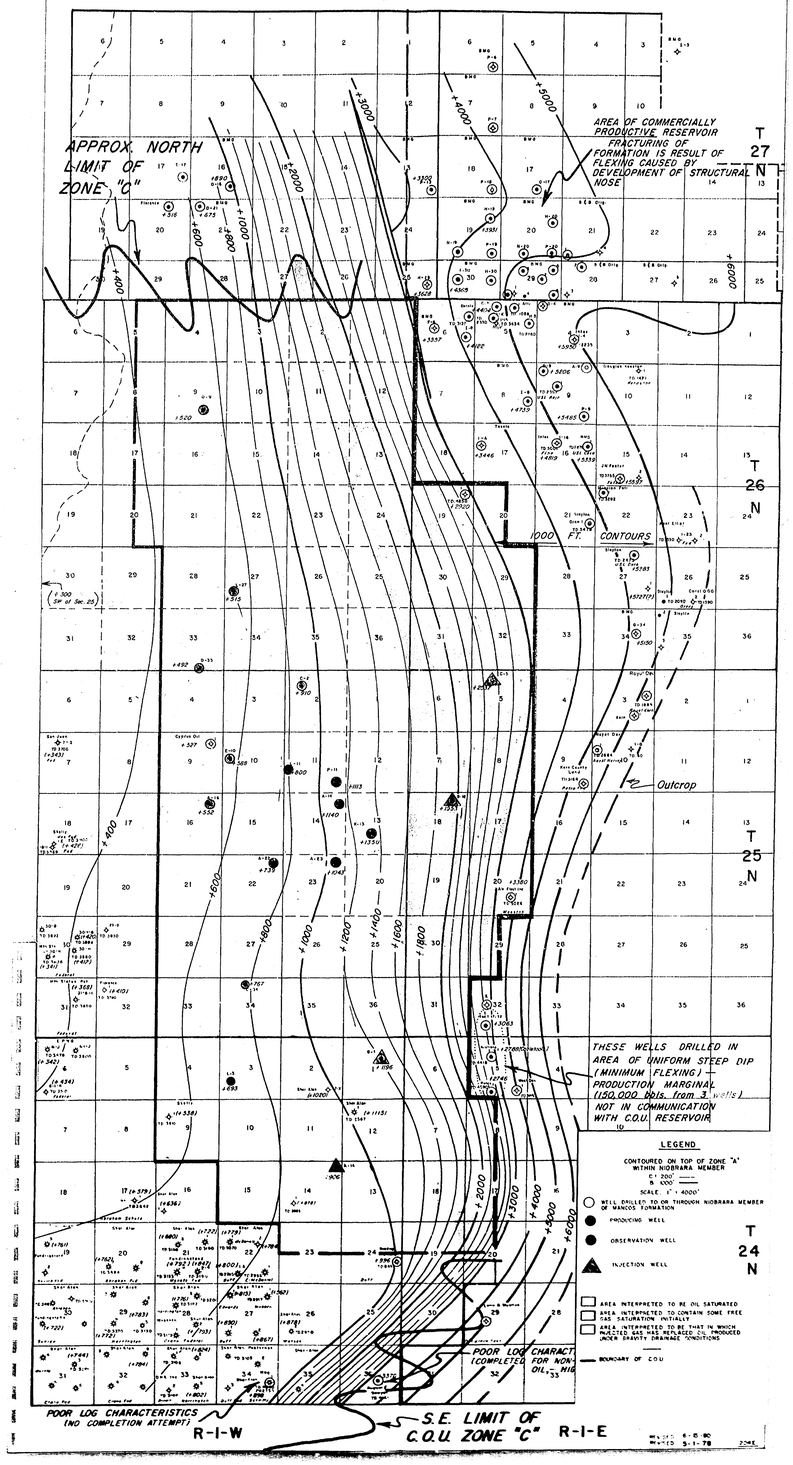


U.S.G.S. RECORDS

BEST AVAILABLE COPY


PLAT OF PORTION
OF
1965 INTERFERENCE TEST
CANADA OUTOS UNIT
INTERFERENCE EFFECT OF L-11
INTERFERENCE EFFECT OF L-11
SEPTEMBER
OCTOBER
APPENDIX I FIGURE NO 1-6

CONTOURED ON "A" MARKER IN NIOBRARA



LEGEND

CONTOURED ON TOP OF ZONE "A" WITHIN NIOBRARA MEMBER

C.I. 200' ——
S 1000' ——

SCALE 1" = 4000'

- WELL DRILLED TO OR THROUGH NIOBRARA MEMBER OF MANCOS FORMATION
- PRODUCING WELL
- OBSERVATION WELL
- INJECTION WELL

- AREA INTERPRETED TO BE OIL SATURATED
- AREA INTERPRETED TO CONTAIN SOME FREE GAS SATURATION INITIALLY
- AREA INTERPRETED TO BE THAT IN WHICH INJECTED GAS HAS REPLACED OIL PRODUCED UNDER GRAVITY DRAINAGE CONDITIONS

—— BOUNDARY OF C.O.U.

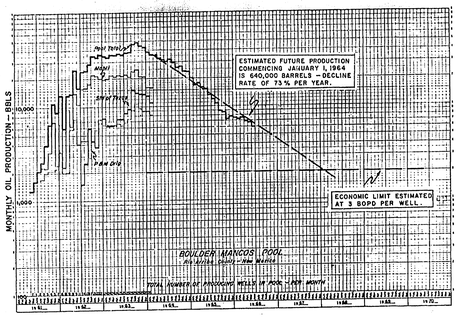
Revised 6-8-90
Revised 5-1-78

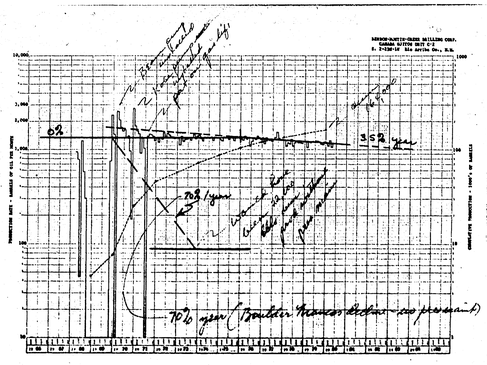
2345

U.S.G.S. RECORDS

GET YOUR MAPS OFF

red = high capacity (twice as pink wells)
blue = low capacity (with 1/2 blue wells)


MONTHLY OIL PRODUCTION - BBLS
10,000
1,000
ESTIMATED FUTURE PRODUCTION COMMENCING JANUARY 1, 1964 IS 640,000 BARRELS - DECLINE RATE OF 73 % PER YEAR.
ECONOMIC LIMIT ESTIMATED AT 3 BOPD PER WELL.
BOULDER MANCOS POOL
TOTAL NUMBER OF PRODUCING WELLS IN POOL, LAST MONTH


10,000
1,000
100
10
1
0.1
0%
35% /year
70% /year

NOTES REGARDING PRODUCTION BEHAVIOR OF
NAVAJO REFINING CORP. C-2
AND AREA DRAINED BY WELL

1. For comparison a 70% decline rate (as was experienced by the Boulder Field wells) is indicated. For this well, C-2, produced to an economic limit of 3 BOPD, this 70% rate of decline would have resulted in a cumulative production of 22,000 bbls. (Actual cumulative to 1-1-80 is 164,000 bbls.)

2. Gravity Drainage Consideration: With the well's low initial stabilized production rate (approximately 45 BOPD) its immediate drainage area is too tight to permit substantial gravity drainage. The gravity drainage rate for a 1 mm-millidarcy supporting 45 BOPD and the dip of the formation of approximately 100' per mile would be approximately 8 BOPD per linear mile along the strike. For 640-acre spacing the maximum gravity drainage rate would then be about 8 BOPD.

3. Since approximately 80% of the well's production must come from something other than gravity drainage of its own immediate area, one must conclude that:

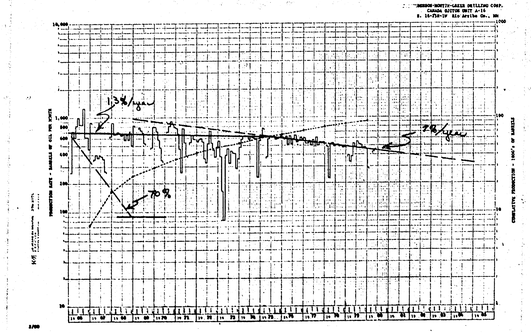
   (1) the wells production has resulted from its participation in the overall reservoir system as described by the "Ojbaya" mileage of tight blocks and high capacity fracture system; and that the pressure and production in its immediate area has been maintained by the pressure maintenance system (nearest injection well approximately 3 miles away);

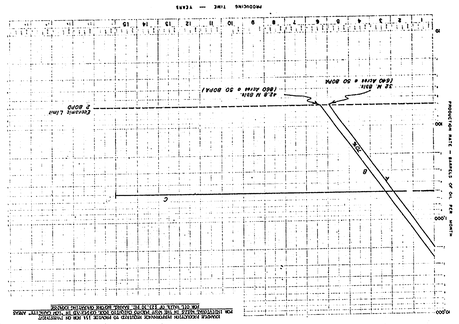
   or

   (2) If production is not supported by the system as described in 3(1) above and since 80% of the production must come from something other than gravity drainage, it would then have to be from solution-gas drive, and if one assumes the reservoir it is draining would be of the same character as that in the vicinity of the well, and that the well would continue along its present 5% maximum rate of decline, then the ultimate recovery would be about 400,000 bbls. If 80% is from solution-gas drive this would mean 320,000 bbls. from this. At 50 bbls/acre (5% of 1,000 BOPA in place maximum estimate for tight reservoirs) this would indicate 6,400 acres being drained by the well.

4. Of the two possibilities, the most logical one is that the well is part of the overall drainage system as earlier described and is draining its share of several thousand acres. The fact that the well produced until 1976 with practically no decline coincides with the pressure maintenance which was rather "complete" for the period 1972 to 1976 in which the well had its annual rate of decline in production. In 1976 the well took on an increased rate of decline which is estimated to be in the range of 3.5% to 5% per year. The pressure decline in the gas cap (Section F-4 herein) of approximately 1% per year, along with possible additional decline in pressure as indicated in F-4d herein, would account for only 1% to 2% rate of reservoir decline. The additional production decline rate could be the result of reduction in relative permeability to oil since pressure in the vicinity of the well is now probably below the bubble point. On the other hand, it has been observed in other wells in this area, and in other fractured Niobrara reservoirs, that productivity often drops at a much faster rate than can be accounted for by either or both pressure decline and decline in relative permeability to oil. It has been postulated that this could be the result of fractures squeezing together following pressure decline and this could be a factor here.

5. Under any rational interpretation, however, the well must be draining several thousand acres.





* Average lease burdens assumed higher (23%) on newly discovered leases.

OIL VALUES W.TX. POSTED CRUDE PRICE			
Estimated for October, 1981 using 1980 market price of $39.00 and approximate 1980 base prices			
(Skelating production is nearly all lower elec. mitn is approximately $6.00/bbl, depending on rate, BHCL, etc.)			
	EXISTING PRODUCTION FOR INVESTED AND CURRENTLY PRODUCING LEASES		NEWLY DISCOVERED OIL
	Integrated Oil Company ($/bbl)	Qualified Independent Working Interest ($/bbl)	All Owners ($/bbl)
MARKET PRICE	39.00	39.00	39.00
BASE PRICE APPROX.	13.00	13.00	18.00
SEVT APPROX.	18.20	13.00	6.30
MINIMUM	20.80	26.00	31.70
LESS ROYALTY AND LEASE BURDENS OF 17% to 23% *	17.20	21.60	25.20
LESS PRODUCTION TAXES OF 7-1/2%	15.90	20.00	23.30
NET TO NORMAL INVESTOR BEFORE OPERATING EXPENSES	15.90	20.00	23.30

* Average lease burdens assumed higher (23%) on newly discovered leases.

EXAMPLE PRODUCTION PERFORMANCE REQUIRED TO PROVIDE 15% ROR ON INVESTMENT
FOR INDIVIDUAL WELLS IN "OIL-WET" POORLY DEVELOPED POOL CONSIDERED TO "FLOW QUANTITY" AREAS
FOR OIL VALUE OF $21.50 PER BARREL BEFORE OPERATING EXPENSE

Curve	Initial Production Rate (BOPD)	Decline Rate Percent/Year	Cumulative Production (M bbls)	Cumulative Operating * Expense at 2 BOPD ($ M bbls)	Cumulative Production After Operating Expense (M bbls)	VALUE Undiscounted Cumulative After Operating Expense ($M)	VALUE Average Discount	VALUE Present Worth at 15% ($M) after discounting
A	63.4	70	32.0	3.6	28.4	662	.72	475
B	84.5	70	42.8	3.8	39.0	905	.83	750
C	16.7	0	91.4	10.9	80.5	1875	.40	750

A (1) Solution gas drive performance: 50 BO/acre recovery
(2) 640-acre spacing and 70%/year production decline rate (Note: PW of production less than well cost)

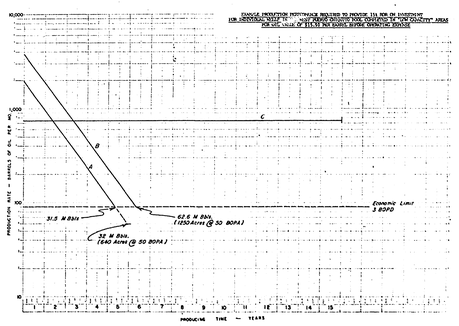
B (1) Solution gas drive performance, 50 BO/acre recovery
(2) Spacing and initial productivity required (860 acres and 84 BOPD) at 70%/year decline rate to permit 15% ROR on $750K well cost

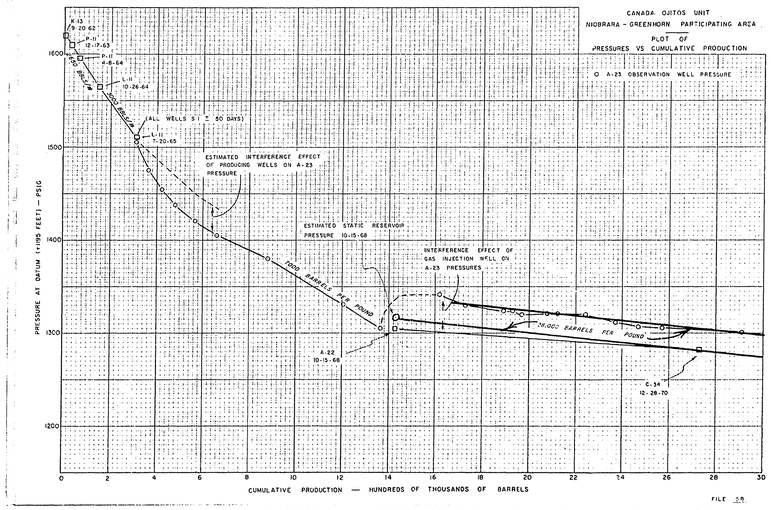
C Minimum production rate (16.7 BOPD) required for 0% decline and 15 years production to yield 15% ROR on $750K well cost

* Cost of pressure maintenance by gas injection and cost of take-up gas not included.
Those costs are anticipated to be recovered at a later date when gas is sold.

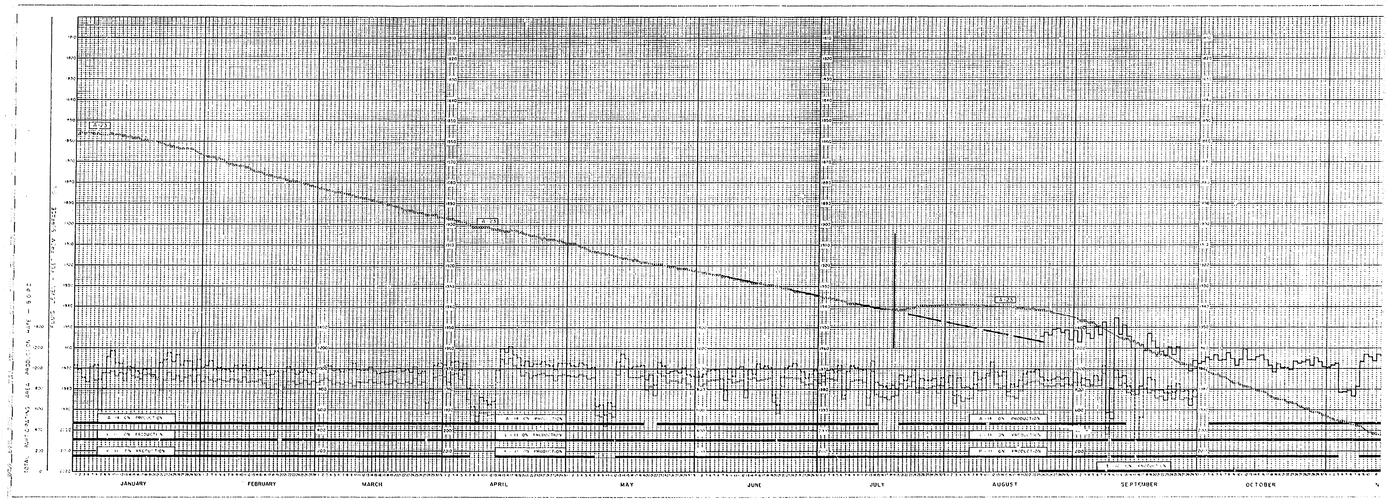
NOTE 1. Minimum well cost of $75M used here. Costs could be as high as $1,000M/well

2. For wells capable of producing 15% ROR on cost of $750M, the initial productivity (84 BOPD) required means that the reservoir transmissibility must be high enough to support such a well; which in turns means a transmissibility high enough to support 640 acre (plus) per well drainage.

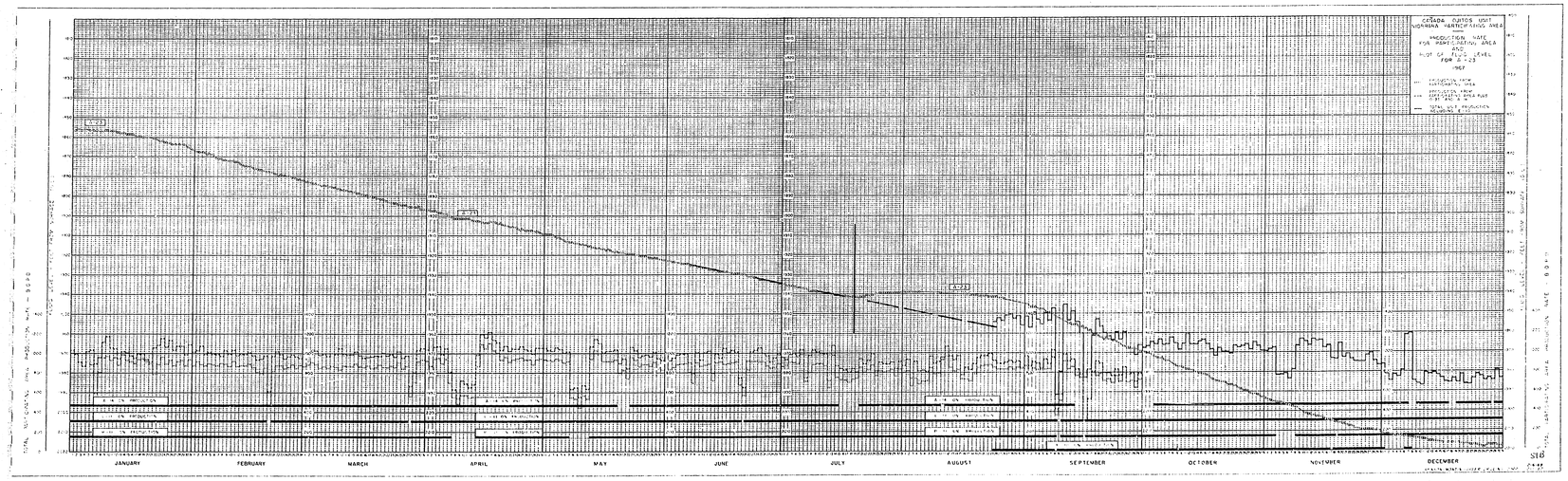



CANADA OJITOS UNIT
NIOBRARA - GREENHORN PARTICIPATING AREA
PLOT OF
PRESSURES VS CUMULATIVE PRODUCTION
O A-23 OBSERVATION WELL PRESSURE
K-13
9-20-62
P-11
12-17-63
P-11
4-8-64
L-11
10-26-64
ALL WELLS SI ≥ 90 DAYS
L-11
7-20-65
ESTIMATED INTERFERENCE EFFECT
OF PRODUCING WELLS ON A-23
PRESSURE
ESTIMATED STATIC RESERVOIR
PRESSURE 10-15-68
INTERFERENCE EFFECT OF
GAS INJECTION WELL ON
A-23 PRESSURES
2000 BARRELS PER POUND
A-22
10-15-68
16,000 BARRELS PER POUND
C-14
12-28-70
PRESSURE AT DATUM (+1195 FEET) — PSIG
1600
1500
1400
1300
1200
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
CUMULATIVE PRODUCTION — HUNDREDS OF THOUSANDS OF BARRELS
FILE 59


U.S.B.I.F. RECLAMATION
BEST AVAILABLE COPY

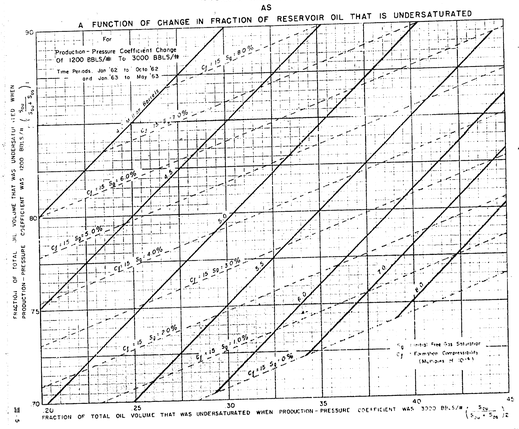


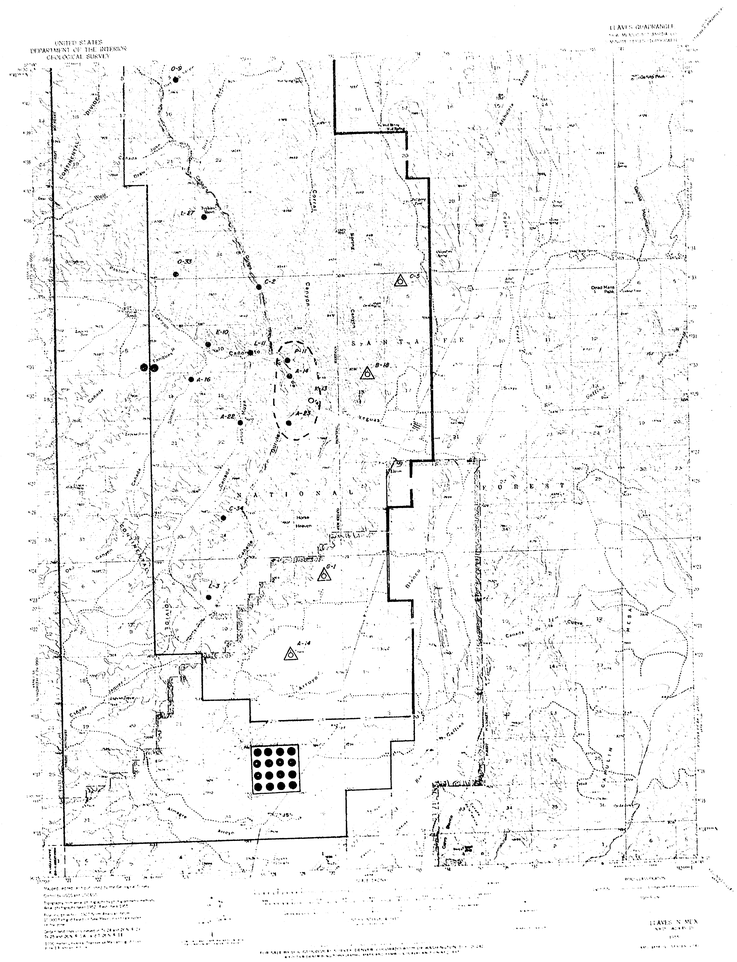
U.S.D.C.T. RECORDS/PHOTOS
BEST AVAILABLE COPY



U.S.G.S. MICROGRAPHICS
BEST AVAILABLE COPY

BOULDER POOL
NIOBRARA RESERVOIR OIL IN PLACE
AS
A FUNCTION OF CHANGE IN FRACTION OF RESERVOIR OIL THAT IS UNDERSATURATED

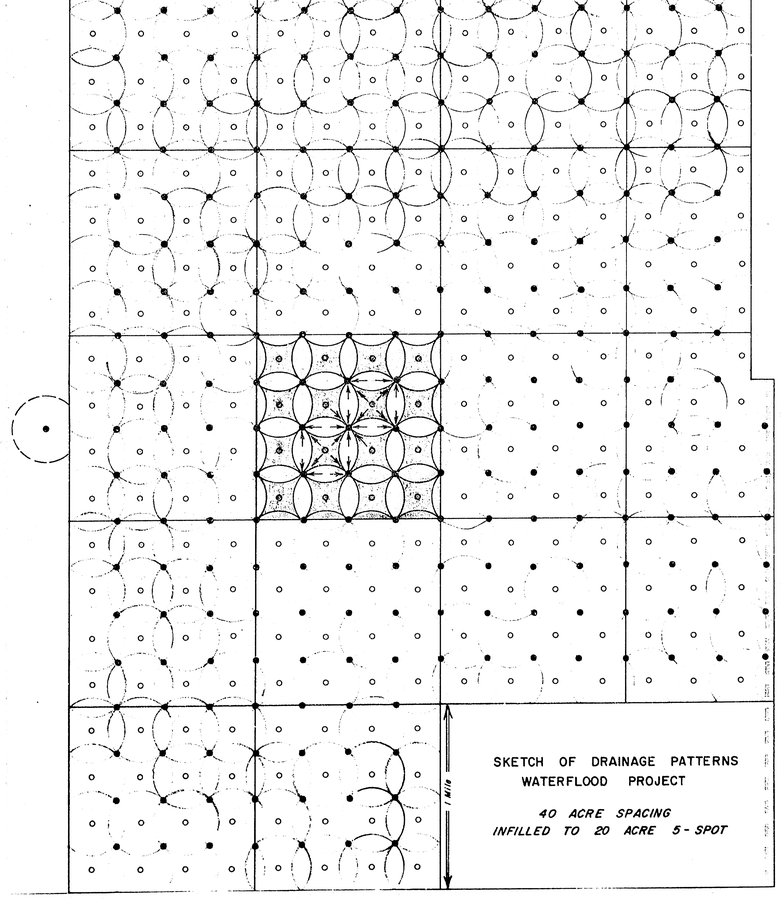




U.S.G.S. PHOTOGRAPHICS

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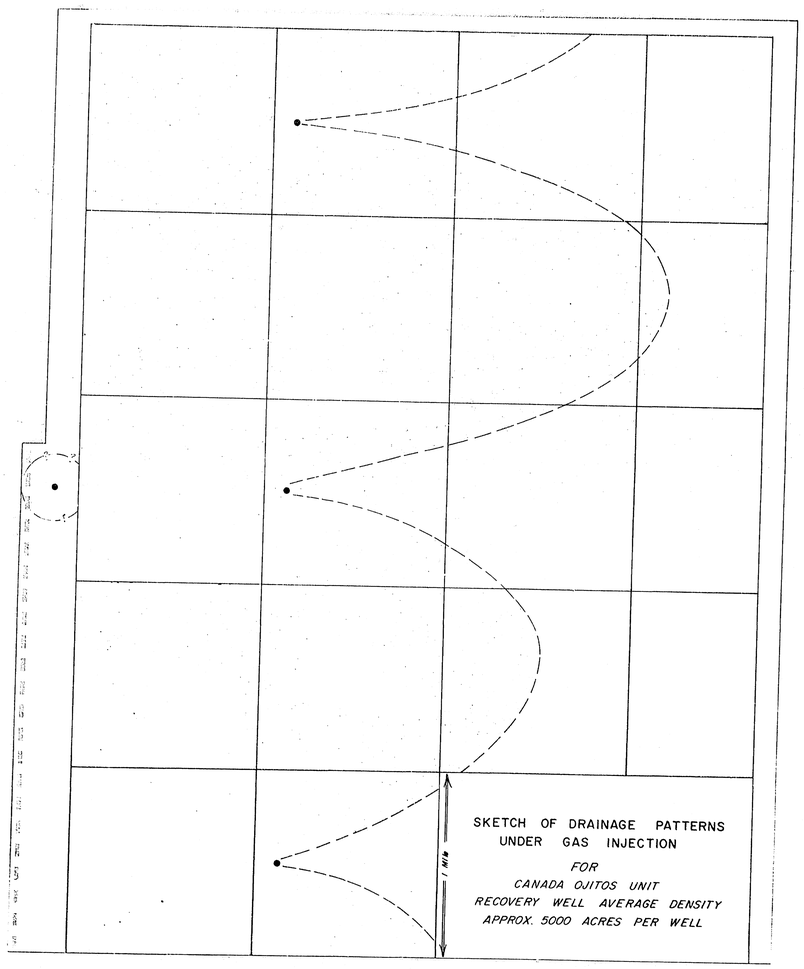
V.P.I.C.Y. MICROGRAPHICS
BEST AVAILABLE COPY


1 MILE
SKETCH OF DRAINAGE PATTERNS
WATERFLOOD PROJECT
40 ACRE SPACING
INFILLED TO 20 ACRE 5-SPOT

1-Bosh at the camps in WF

1-Gas allowable (1,230,000 cu ft) will produce 3 times as much gas as is now being purchased. Have to close down project

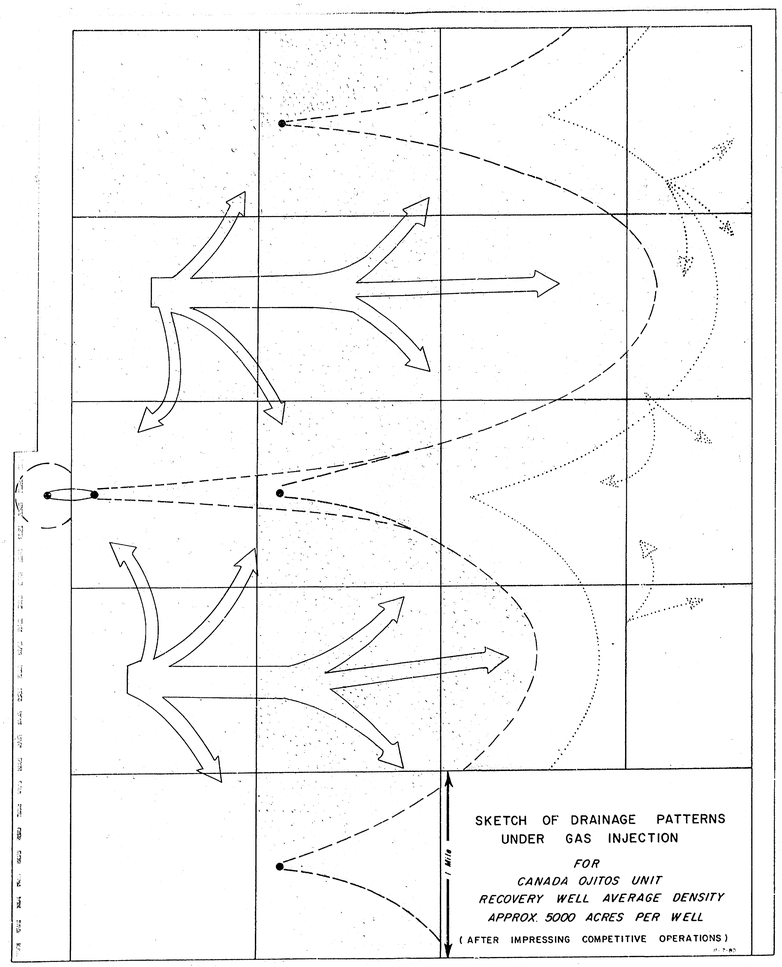




SKETCH OF DRAINAGE PATTERNS
UNDER GAS INJECTION

FOR

CANADA OJITOS UNIT
RECOVERY WELL AVERAGE DENSITY
APPROX. 5000 ACRES PER WELL

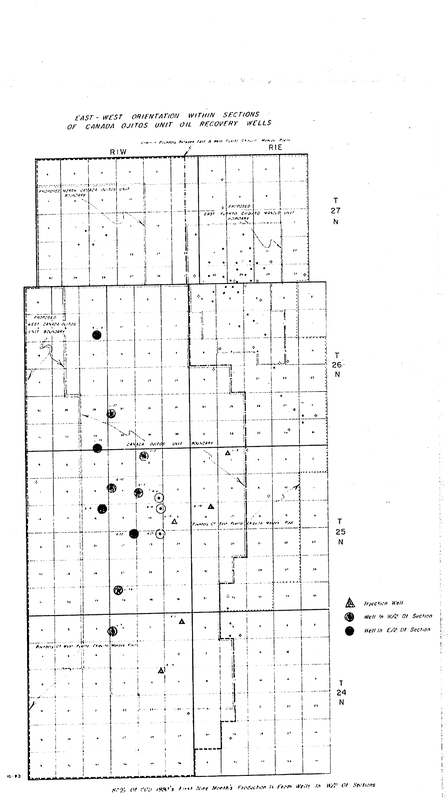


SKETCH OF DRAINAGE PATTERNS
UNDER GAS INJECTION

FOR
CANADA OJITOS UNIT
RECOVERY WELL AVERAGE DENSITY
APPROX. 5000 ACRES PER WELL

(AFTER IMPRESSING COMPETITIVE OPERATIONS)

EAST - WEST ORIENTATION WITHIN SECTIONS
OF CANADA OJITOS UNIT OIL RECOVERY WELLS



V.P.R.C.F. MICROGRAPHICS
BEST AVAILABLE COPY

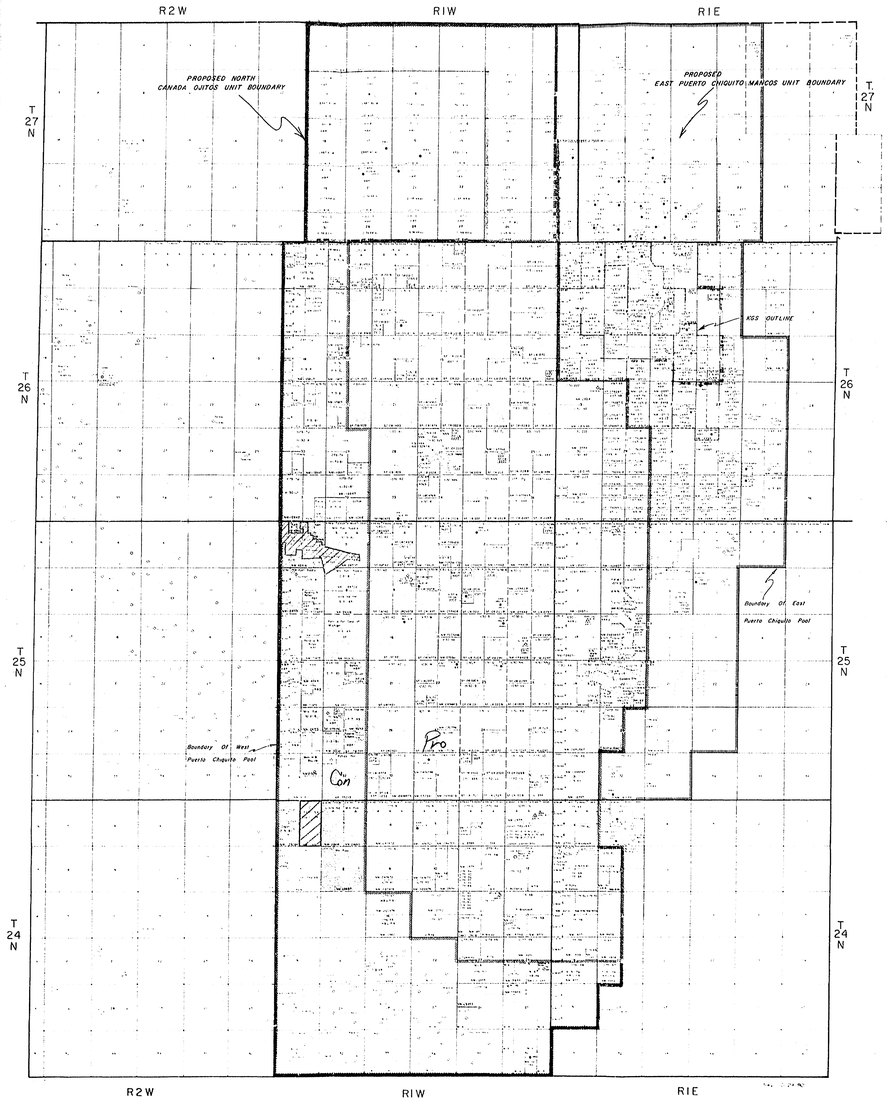
DIVERSION OF WATER BY THE DIVERSION
OF "UNIT" WATER INJECTION
(without consideration of existing)

"CONSISTENT WATERFLOOD UNIT VERSUS CANADA QUITOE UNIT

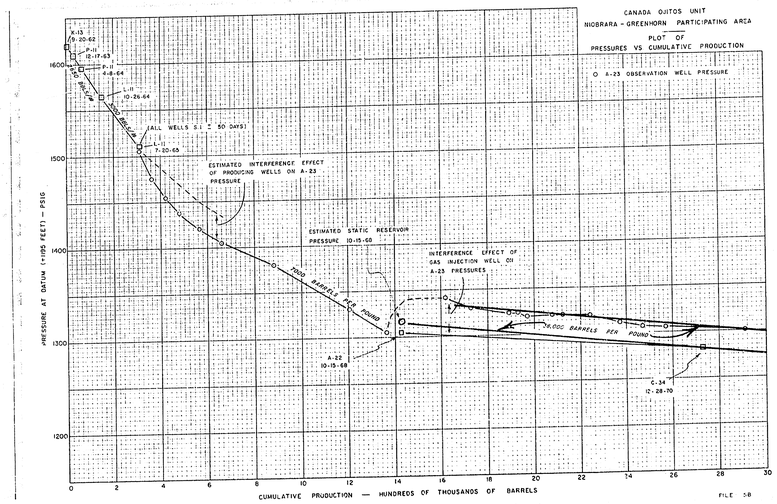
(Assume competitively-drilled well has average production ability of unit wells)

	FUNDAMENTAL STRATEGIC "Conformity" Waterflood Unit	Comparative Canada Quitoe Unit	RATIO OF COMPETITIVELY DRILLED WELL'S SHARE OF PRODUCTION TO ITS SHARE OF "PROVEN" ACREAGE Conformity Waterflood Unit	Comparative Canada Quitoe Unit
1. Reservoir size (omitting gas cap)	4 miles x 12 miles	4 miles x 12 miles		
2. Reservoir area (acres)	30,700	30,700		
3. Approximate spacing of oil recovery wells (acres/well)	40	3,000		
4. Approximate spacing of injection wells (of oil recovery area) (acres/well)	40	7,500		
5. Approximate number of oil recovery wells	768	10		
6. Ratio of competitive well's production to unit prod.	1/768	1/10		
7. Ratio of surface acres of competitive well's spacing unit to unit total for oil recovery wells	1/768	660/30,700 = $\frac{1}{50}$	A. Assume all of competitively drilled wells spacing unit is "proven"	$\frac{1}{768} \div \frac{1}{768}$ = 1	$\frac{1}{10} \div \frac{1}{50}$ = 5
8. Ratio of competitive well's "proven" acreage to unit total proven acreage for well drilled 660' from line	1/1536	1/8 x 660/30,700 = $\frac{1}{800}$	B. Assume competitively drilled well's spacing unit is proven to extent of 660'-0 width of spacing unit side	$\frac{1}{768} \div \frac{1}{1536}$ = 2	$\frac{1}{10} \div \frac{1}{800}$ = 40

W.R.M.R.I. MICROGRAPHICS
BEST AVAILABLE COPY

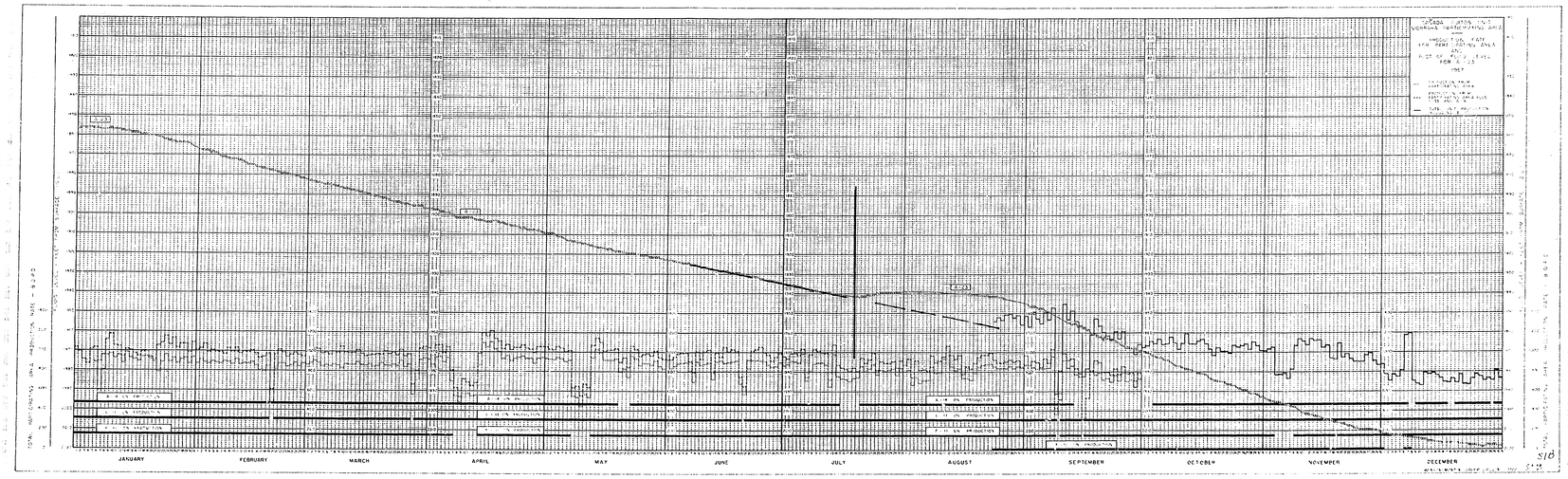

R2W
R1W
R1E
PROPOSED NORTH CANADA OJITOS UNIT BOUNDARY
PROPOSED EAST PUERTO CHIQUITO MANCOS UNIT BOUNDARY
T 27 N
KGS OUTLINE
T 26 N
Boundary Of East Puerto Chiquito Pool
T 25 N
Boundary Of West Puerto Chiquito Pool
T 24 N
R2W
R1W
R1E

CANADA OJITOS UNIT
NIOBRARA - GREENHORN PARTICIPATING AREA
PLOT OF
PRESSURES VS CUMULATIVE PRODUCTION

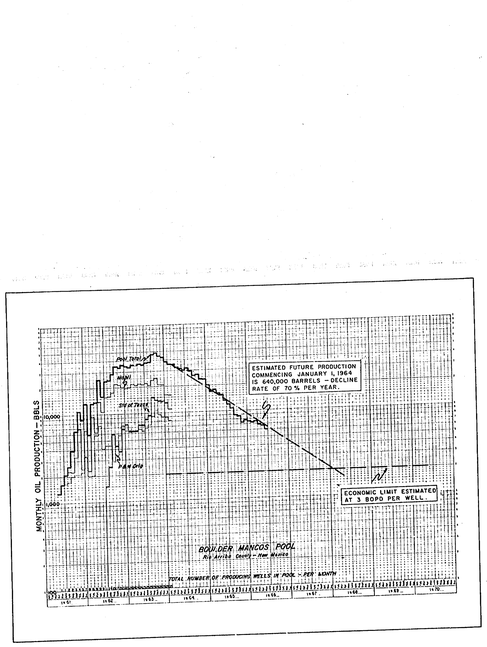


FILE 5-B

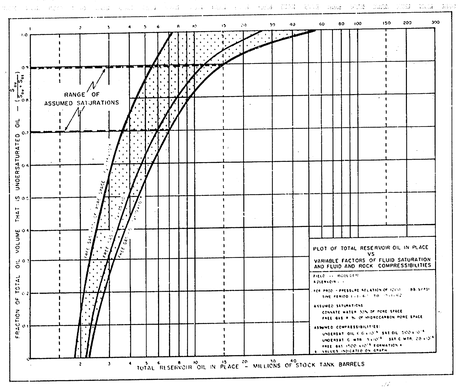
U.S.G.S. MICROGRAPHICS
BEST AVAILABLE COPY



U.S.B.R.C.F. MICROGRAPHICS
BEST AVAILABLE COPY


ESTIMATED FUTURE PRODUCTION COMMENCING JANUARY 1, 1964 IS 640,000 BARRELS - DECLINE RATE OF 70 % PER YEAR.
ECONOMIC LIMIT ESTIMATED AT 3 BOPD PER WELL.
MONTHLY OIL PRODUCTION - BBLS
10,000
1,000
BOULDER MANCOS POOL
TOTAL NUMBER OF PRODUCING WELLS IN POOL - PER MONTH

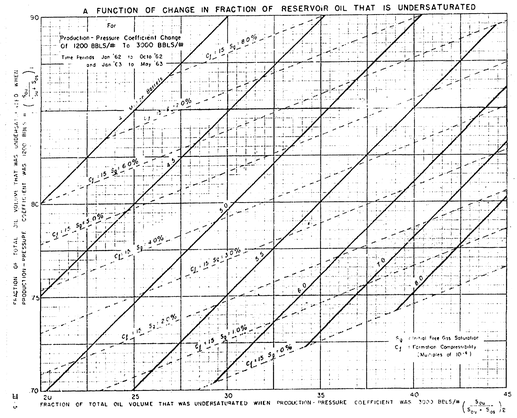
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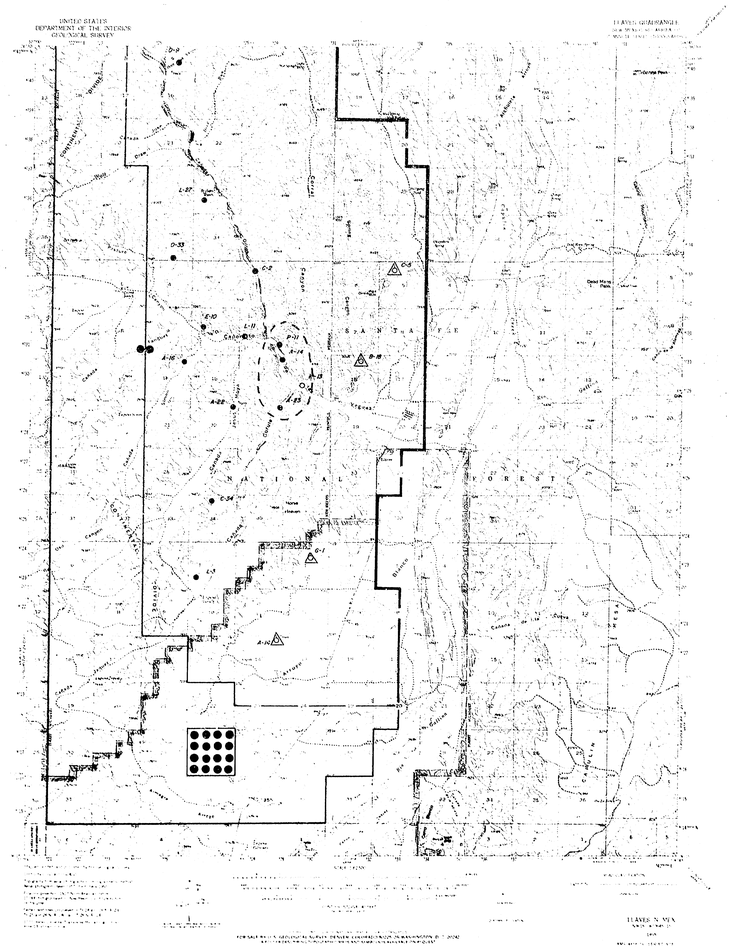
V.P.I.C.F. MICROGRAPHICS

BEST AVAILABLE COPY

BOULDER POOL
NIOBRARA RESERVOIR OIL IN PLACE
AS
A FUNCTION OF CHANGE IN FRACTION OF RESERVOIR OIL THAT IS UNDERSATURATED

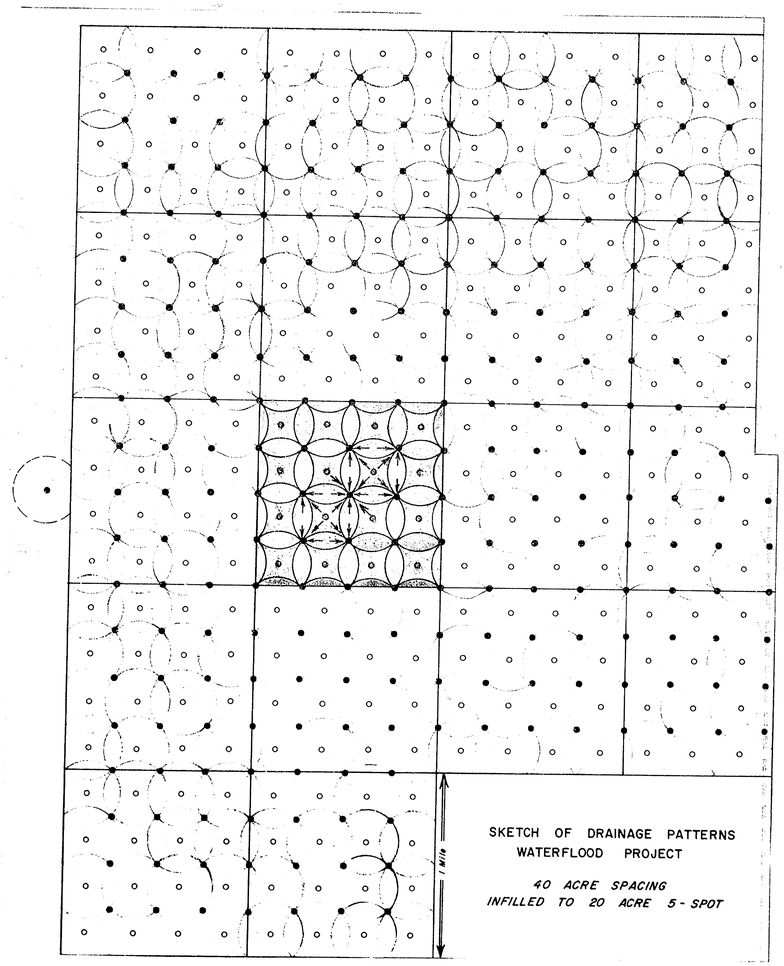


U.S.B.M.C.F. ICONOGRAPHICS
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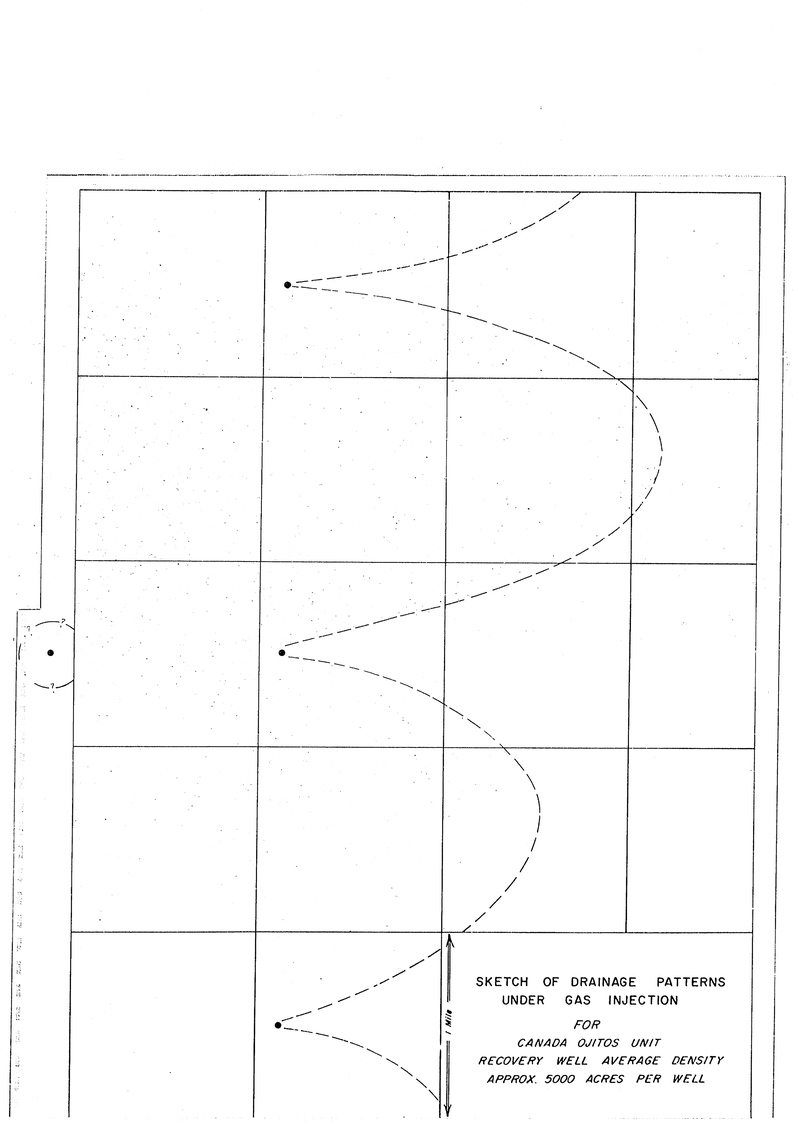
U.S.G.S. TOPOGRAPHICS
BEST AVAILABLE COPY

U.S.G.S. PHOTOGRAPHICS
BEST AVAILABLE COPY



SKETCH OF DRAINAGE PATTERNS
WATERFLOOD PROJECT

40 ACRE SPACING
INFILLED TO 20 ACRE 5-SPOT

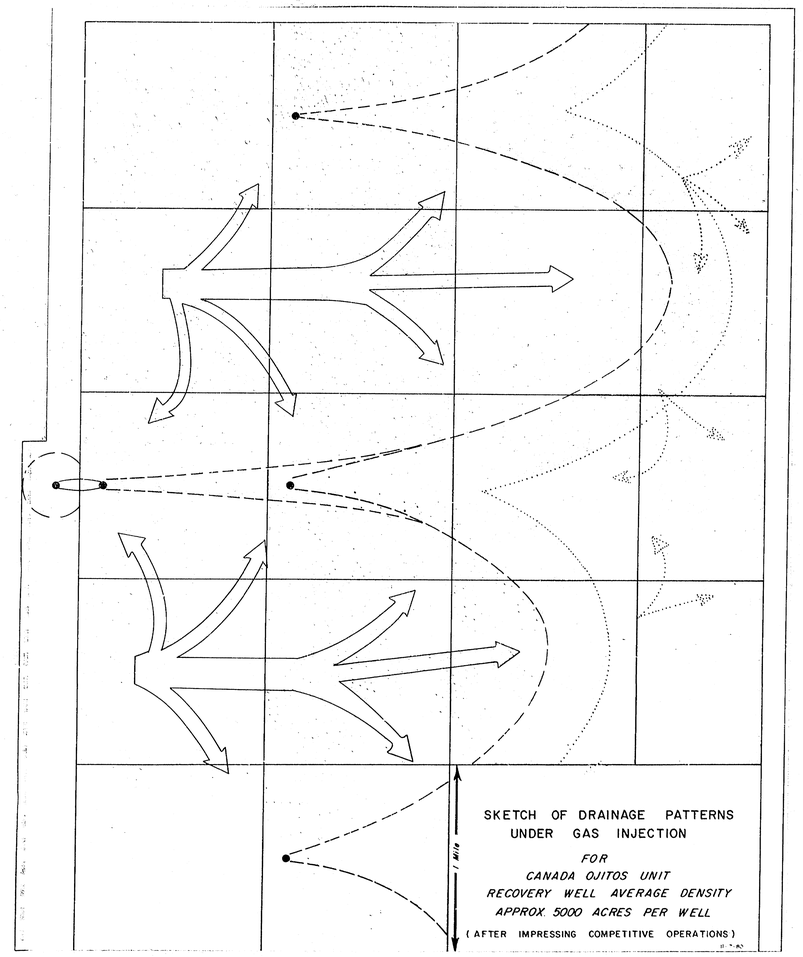


SKETCH OF DRAINAGE PATTERNS
UNDER GAS INJECTION

FOR

CANADA OJITOS UNIT
RECOVERY WELL AVERAGE DENSITY
APPROX. 5000 ACRES PER WELL



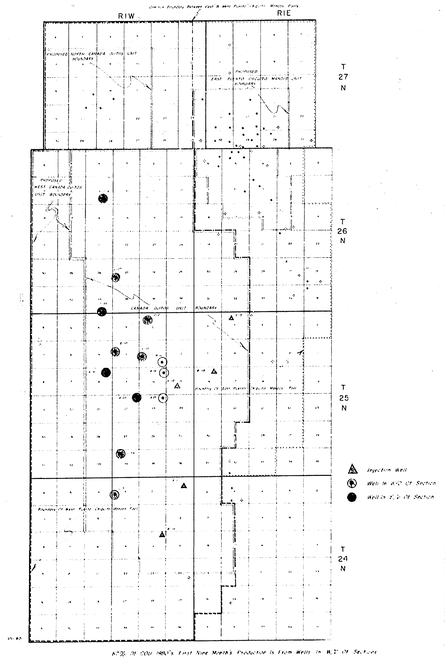


SKETCH OF DRAINAGE PATTERNS
UNDER GAS INJECTION

FOR
CANADA OJITOS UNIT
RECOVERY WELL AVERAGE DENSITY
APPROX. 5000 ACRES PER WELL

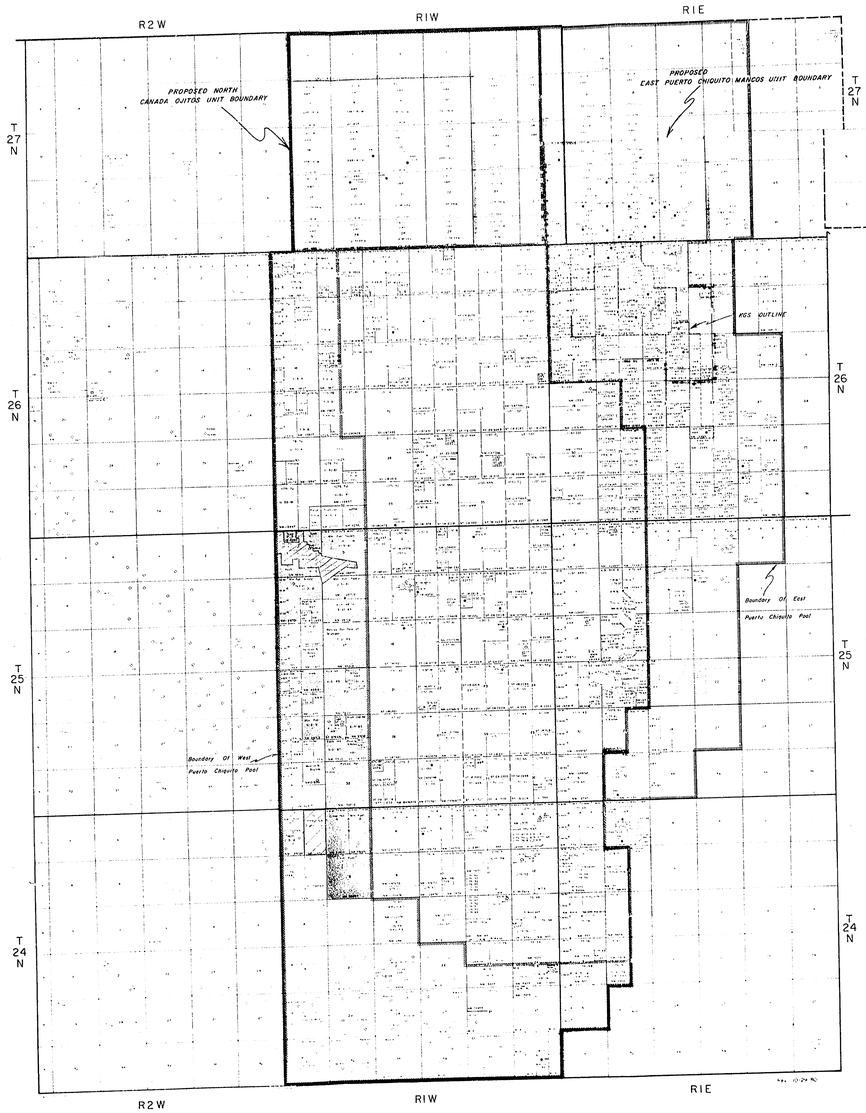
(AFTER IMPRESSING COMPETITIVE OPERATIONS)

EAST - WEST ORIENTATION WITHIN SECTIONS
OF CANADA OJITOS UNIT OIL RECOVERY WELLS



19

BEST AVAILABLE COPY


R2W
R1W
R1E
T 27 N
T 26 N
T 25 N
T 24 N
PROPOSED NORTH CANADA OJITOS UNIT BOUNDARY
PROPOSED EAST PUERTO CHIQUITO MANCOS UNIT BOUNDARY
PDS OUTLINE
Boundary Of East Puerto Chiquito Pool
Boundary Of West Puerto Chiquito Pool