8

SAGA PETROLEUM, LLC

PROPOSED STATUTORY WATER INJECTION UNIT

CROSSROADS SILURO DEVONIAN UNIT

LEA COUNTY, NM

BEFORE THE OIL CONSERVATION DIVISION
Santa Fe, New Mexico
Case No. 12417 & 12418 Exhibit No. 8
Submitted by:
Saga Petrtoleum, L.L.C.
Hearing Date: September 7, 2000

SUMMARY

A geologic and reservoir engineering study has been completed for the existing Crossroads Siluro Devonian Field located in sections 22, 23, 26, 27, 34, and 35 T9S, R36E Lea County, New Mexico as shown in Exhibit 1. This study has indicated that in this area the Devonian has two producing zones that will be referred to in this report as the Main Pay and the New Pay zones. This field produces from a fine to coarse crystalline, white to light gray dolomite with associated milky chert. The dolomite has vugular to fractured porosity. The producing mechanism for the Main Pay zone is a strong active water drive. The New Pay is separated from the Main Pay by a dense dolomitic interval. The purpose of this study is to determine how to best manage the production from both of these intervals to realize maximum recovery.

As a result of this study the following has been determined:

1) Water production in this reservoir can be controlled through the proper use of liquid polymers.
2) Water injection into the tighter intervals is needed to maintain reservoir pressure and productive capacity of each well after being treated with a polymer.
3) Attic oil exists in the New Pay zone in section 27 that can be obtained through recompletions in three existing wells. The New Pay in section 27 is the structurally highest in the Crossroads (Devonian) field as shown by the structure map drawn on of the top of the Devonian porosity as depicted in Exhibit 2. The same procedure recommended for controlling water production in the Main Pay will need to be employed for the New Pay.
4) When this field was discovered in May 1948 the bottom hole pressure for the field was found to be 4885 psi. This pressure was measured by the field discovery well the UD Sawyer No 1 (O-27,9S, 36E) drilled by Mid Continent Oil. VF Petroleum completed the Sawyer No 1 (K-27,9S, 36E) in March 1981 which showed that the field's bottom hole pressure had dropped to 4347 psi for a total pressure drop of 538 psi thus indicating a need to inject water to maintain bottom hole pressure.

RECOMMENDATIONS

1) It is recommended that UD Sawyer 3 be acid stimulated to determine if the productive capacity of this well can be increased and maintained.
2) Rework Texaco Sawyer 4 SWD and place on active injection status. Injection should be into the New Pay section of the Devonian porosity.
3) Convert UD Sawyer 4 to injection status with water injection directed into the upper most or New Pay Devonian porosity.
4) The UD Sawyer injection wells 6 and 11 should be plugged back and perforated in the upper most porosity intervals in the Main Pay to help maintain pressure into these zones.

DISCUSSION

The Siluro-Devonian porosity occurs at different stratigraphic intervals in Crossroads Siluro (Devonian) Field (Exhibit 3). In section 34 of the proposed unit the Devonian porosity occurs directly beneath the base of the overlying Woodford Shale. In the area bounded by the two faults, porosity generally occurs at a depth of 50-60 feet beneath the top of the Devonian. North of the faulted area, the Devonian porosity interval designated as New Pay (Exhibit 4) occurs above the top of the Main Pay. Completions north of the proposed unit in section 22 and section 23 are completed in the New Pay and do not penetrate the Main Pay, which is the traditional completion interval in the field.

Unperforated New Pay occurs above the Main Pay in several wells in the proposed Statutory Unit. Cross sections depicting these wells are presented in Exhibit 5 through 8. Saga Petroleum has three potential recompletions (Exhibit 9) from the New Pay on the north half of section 27. All three of these wells were

originally completed from the deeper Main Pay. New pay potential exists in the following Unit wells:

Lease & Well name	Proposed Completion Interval
U D Sawyer #3	11,970' –11,988'
Santa Fe Pacific RR #3	11,919' –11,946'
Santa Fe Pacific RR #2Y	11,846' –11,976'

Productive potential from the New Pay within the unit outline is illustrated by the following examples:

1. The Mid Continent #1 Dessie Sawyer located 1980 feet from the south and west lines of section 27, was completed from the New Pay in February, 1949 for an initial potential of 657 BOPD and no water (Exhibit 8). The No. 1 Dessie Sawyer produced a total of 1,455,755 barrels of oil from the New Pay horizon.

2. The Mid Continent No. 1-E, now U.D. Sawyer #4 (Exhibit 8), located 660 feet from the north and east lines of section 27, was originally completed from the Main Pay in June 1952 for an initial potential of 504 BOPD and no BW. Completion was from the open hole interval 12,118-12,132 ft. Sun Oil Co. reworked the well in May 1974. The New Pay was perforated from 12,085-12,100 and the well was potentialed for 593 BOPD and 1183 BWPD after being treated with 2000 gallons of acid.

A workover was performed on the UD Sawyer 3 (Exhibit 8) to shut off the high volume of produced water. This workover consisted of pumping a staged polymer job down the tubing. At the time the workover was performed on July 24, 1999 the well was producing 11 BOPD and 1100 BWPD. A retainer was set at 12,010' in the existing perforated interval from 12,000' -12,050'. Tubing was run into the well and set into the retainer. An injection rate was established down the annulus as well as down the tubing. After pumping 45 BW down the casing annulus the well pressured up to 1200 psi and held that pressure throughout the treatment. An injection rate of 0.87 BPM was established down the tubing and was maintained throughout the job. The well was treated as follows:

Stage Volume	Polymer Concentration-ppm
305 bbl	4500
919 bbl	6000
221 bbl	8000

The tubing stayed on a vacuum throughout the treatment. The treatment was preceded with 35 bbl fresh water pad and was flushed with 70 bbl fresh water. The well was left shut in 48 hours before placing it back on production. Following the treatment the well produced 6 BOPD and 27 BWPD. The well's oil cut increased from 1% to 18.2%. A performance curve for this well is shown in Exhibit 10.

As a result of this treatment this well's working fluid level dropped from 2122' from the surface to 6174' from the surface. From the fluid levels taken it is obvious that the producing reservoir pressure has dropped due to the tighter rock that is now open to production. In order to maintain this producing rate it will be necessary to inject water into these tighter zones in the Main Pay as well as injecting water into the New Pay intervals. This indicates that water production can be controlled and greatly reduced through using polymers. This results from the fact that the higher permeability zones in the formation are the first to water out. When the well is treated, the polymer more readily enters these higher permeability streaks and blocks them off. In the UD Sawyer 3, it is planned to stimulate the pay section that is currently open with acid to clean up the perforations and remove near well bore damage. It is hoped this can be accomplished without substantially increasing the total water production and will return the well to its former producing rate of 11 BOPD or greater. Following the successful results of the proposed acid work planned for the UD Sawyer 3, this program will be expanded to all of the producing wells. Polymers will also be used in the injection wells to control the placement of injection water into the formation.

In the proposed Statutory Unit the New Pay can be divided into three porosity regimes as depicted in Exhibit 4. There has been 1,457 MBO produced from the Mid Continent Dessie Sawyer 1 located in the northern most New Pay porosity regime. There has been no production in the unit from the New Pay from any of the proposed unit wells located in the middle porosity regime. However, 490 MBO was produced from the middle porosity regime from the Mobil Santa Pacific well #12 (26L T9S, R36E) one location to the East of the proposed Unit. No completions are planned in the proposed unit for the middle porosity regime due to off lease production and the projected thin net pay. Exhibit 3 shows the depth to the top of the Devonian porosity from the bottom of the Woodford shale. The majority of the wells in the southern-most porosity regime have had casing set just above the top of the Devonian and are completed open hole. In these wells the porosity was located immediately below the base of the Woodford shale. It is not known whether these wells are completed in the New Pay or the Main Pay or possibility both. No recompletions are currently planned for this area.

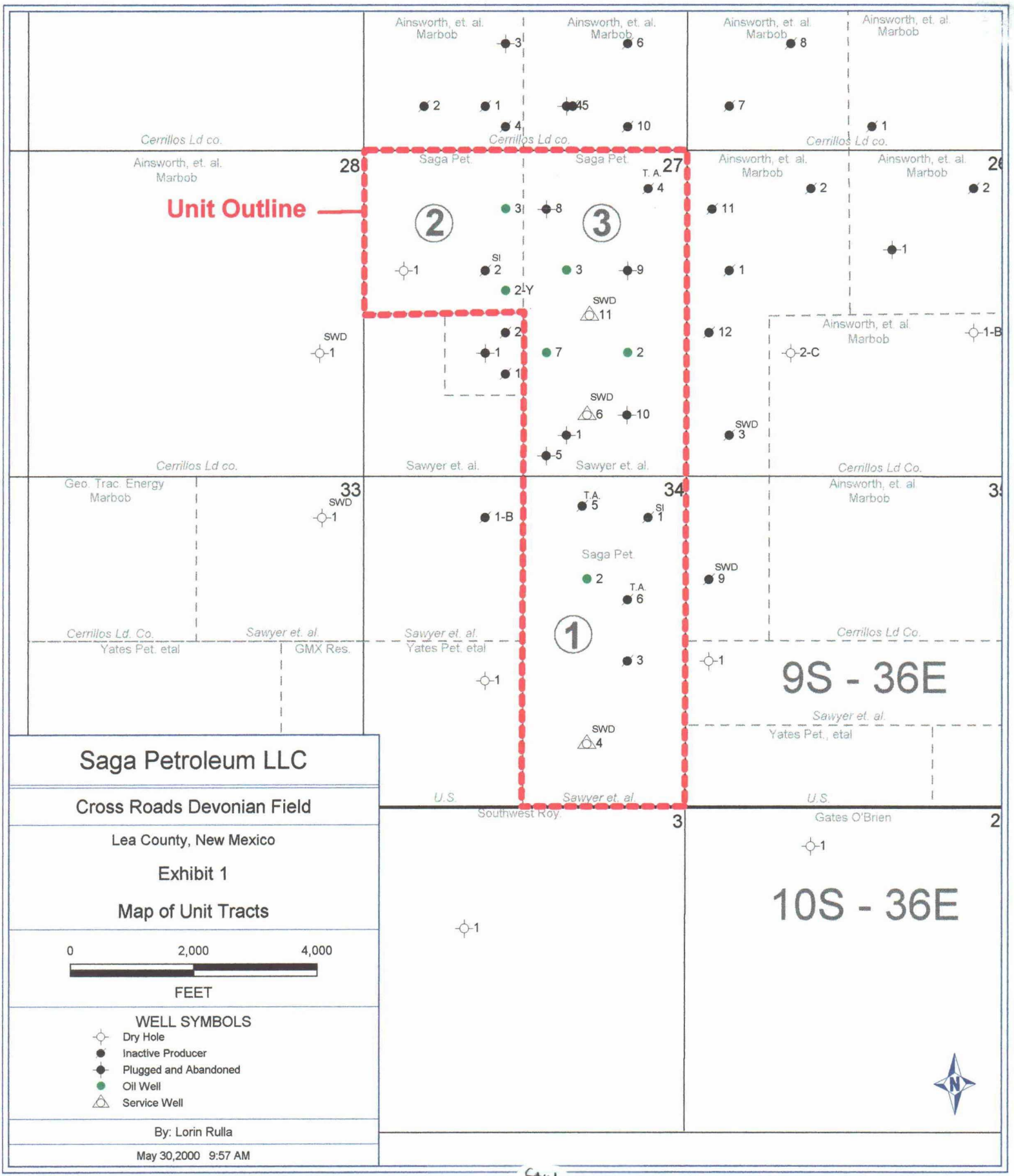
A summary of rock data, fluid data and original oil in place is given in Exhibit 11. This summary shows that the Saga leases in the proposed Unit had original oil in place of 50,701 MBO for the Main Pay while the New Pay has 4,295 MBO of original oil in place. As of August 1, 2000 the Main Pay interval in the proposed unit had produced 20,950 MBO and is currently producing at a rate of 98 BOPD and 1170 BWPD.

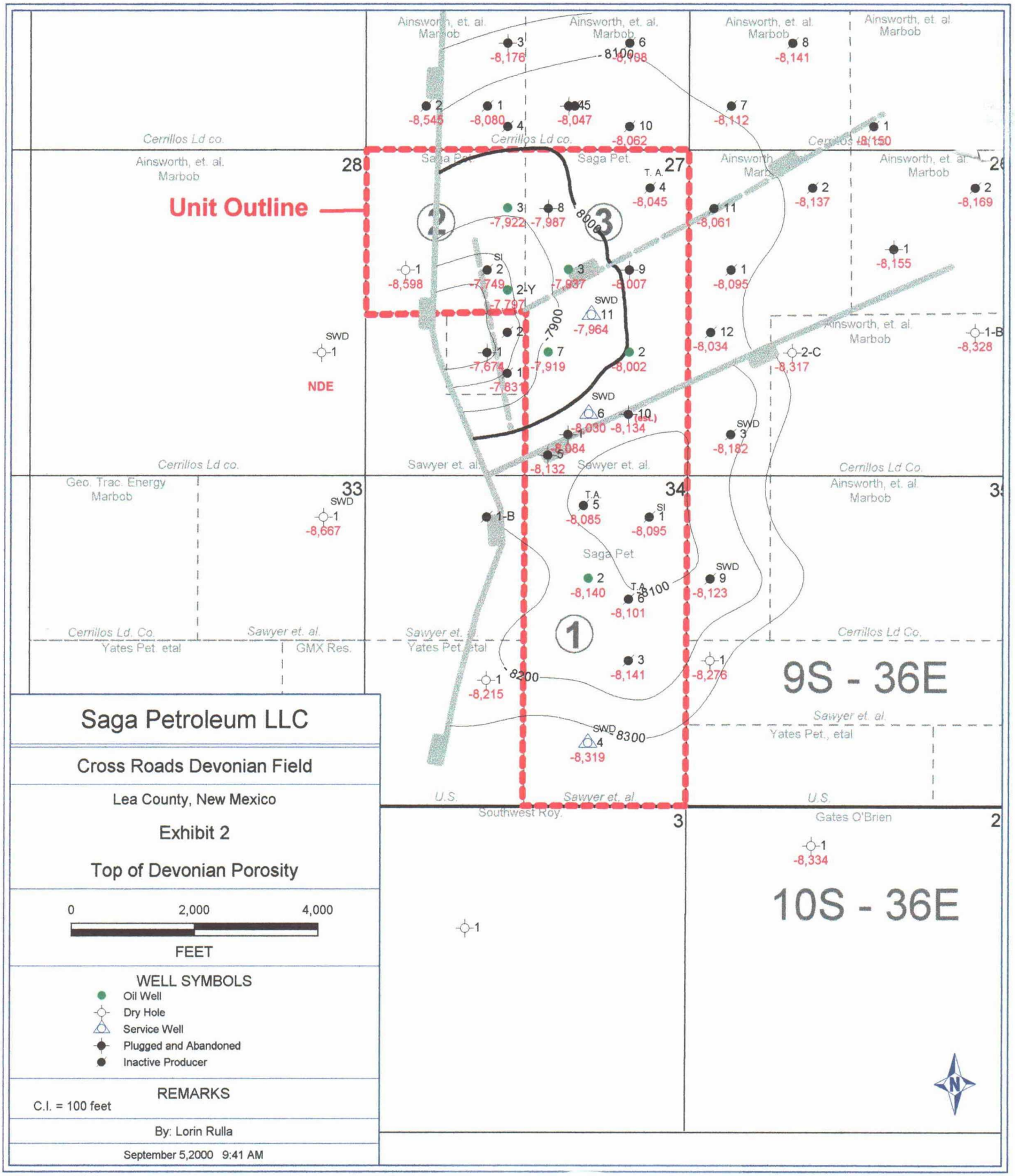
To determine ultimate recoverable reserves a plot of cumulative oil vs percent water cut was made for all the producing wells in the proposed unit area as shown in Exhibit 12. This plot indicates the proposed unit area will realize an ultimate recovery of 21,770 MBO @ 97.0% wtr cut. A plot using actual production data (Exhibit 13) was made of cumulative oil produced vs cumulative barrels of fluid produced. This curve was then used to project future recovery and future producing rates for continued operations for the proposed unit. This projection of continued operations is shown in Exhibit 14. The reservoir volume

and original oil in place was calculated by griding the mapped productive areas for the New Pay porosity regime. An ultimate recovery factor of 43% was calculated. By relating the data presented in Exhibit 14 to the recovery of cumulative barrels oil and cumulative barrels fluid produced per acre-foot to the reservoir volume contained in the New Pay portion of the reservoir a projection of anticipated production performance for the New Pay was made and is presented in Exhibit 15. It was calculated that 1,361 MBO will be produced over the next fifty years of the Crossroads Siluro Devonian Unit life.

LIST OF EXHIBITS

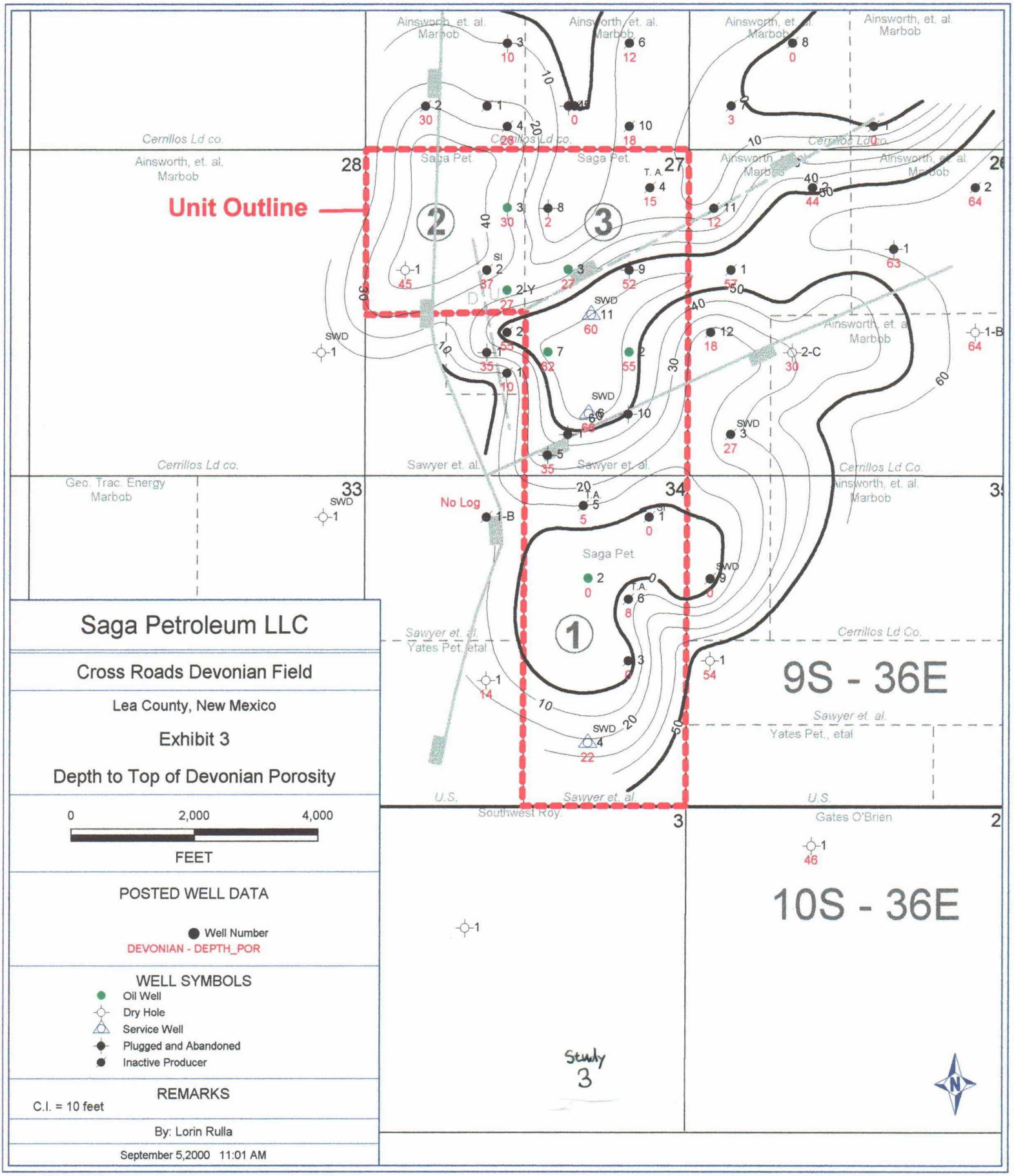
EXHIBIT #


Unit Outline
Ainsworth, et. al.
Marbob
Cerrillos Ld co.
Saga Pet.
Sawyer et. al.
Yates Pet. etal
GMX Res.
Geo. Trac. Energy
Marbob
Cerrillos Ld Co.
Southwest Roy.
Gates O'Brien
28
27
33
34
3
2
1
SWD
SI
T.A.
9S - 36E
10S - 36E
Saga Petroleum LLC
Cross Roads Devonian Field
Lea County, New Mexico
Exhibit 1
Map of Unit Tracts
0
2,000
4,000
FEET
WELL SYMBOLS
Dry Hole
Inactive Producer
Plugged and Abandoned
Oil Well
Service Well
By: Lorin Rulla
May 30,2000 9:57 AM
PETRA 5/30/00 9:57:23 AM
Study
1

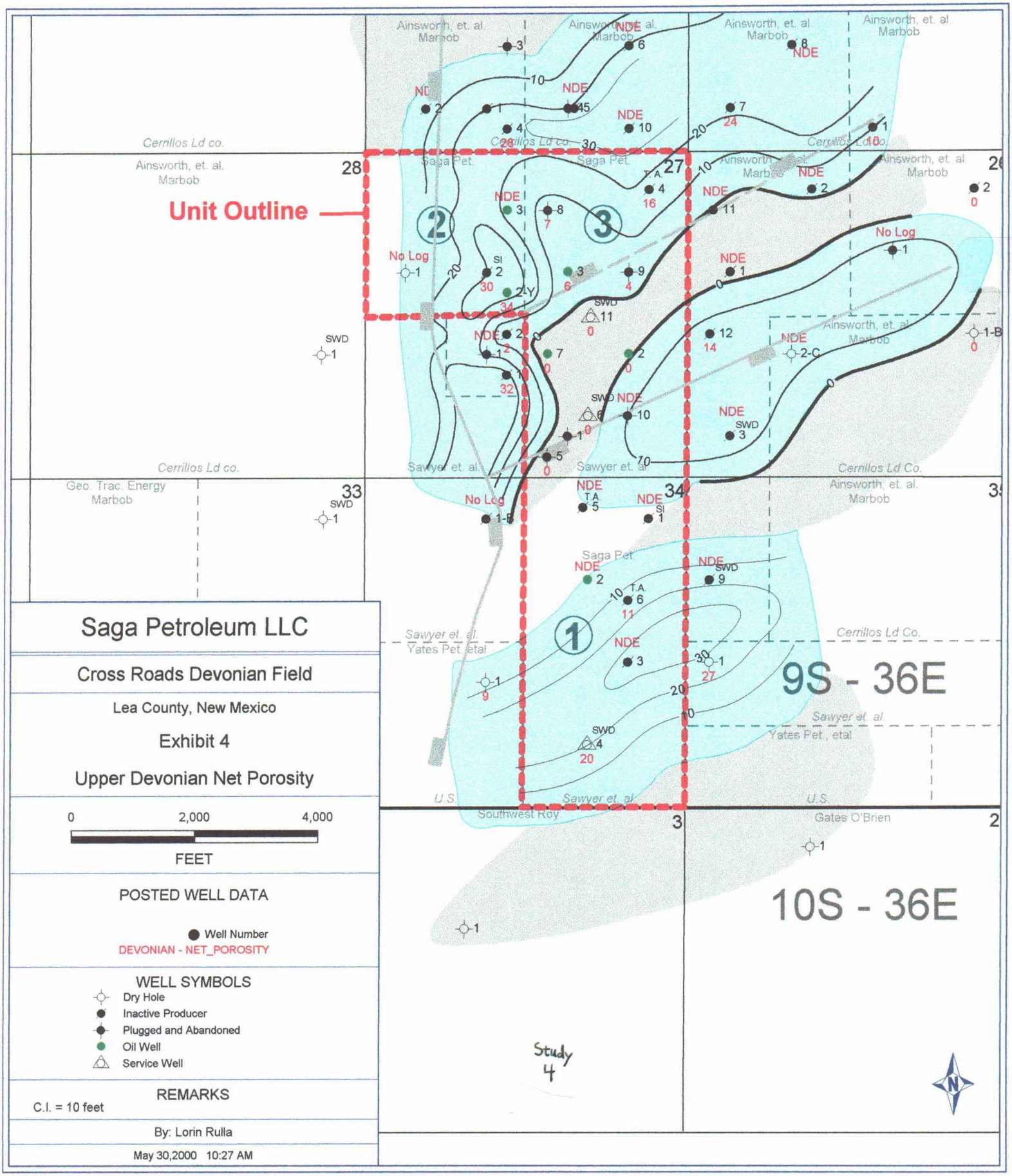


PETRA 9/5/00 9:41:33 AM

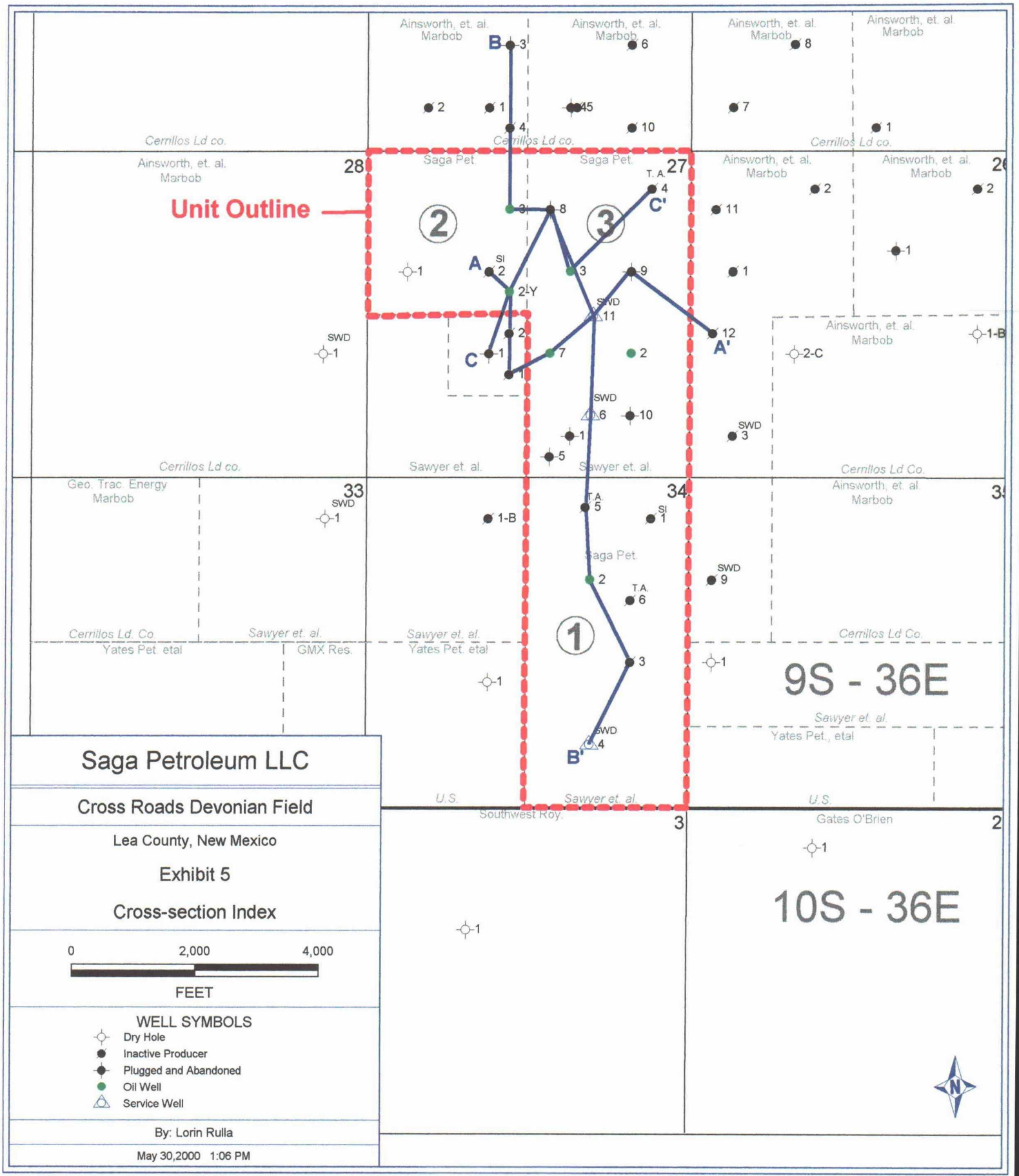
Study 2



PETRA 9/5/00 11:01:34 AM



PETRA 5/30/00 10:27:23 AM



PETRA 5/30/00 1:06:51 PM

Study
5

West

A

East

A'

2

2-Y

1

7

11

9

12

WOODFORD

DEVONIAN

NEW PAY

NEW PAY

MAIN PAY

MAIN

TD 11882
5.5" csg @ 11790
IPF 576 bopd Natural
10-1-50

P/11902 - 11922 A/5500
IPF 648 bopd
10-11-72

dst 11890-932
OP 135" 2000' WB
rec. 15' oil + 2000' sli OCWB
+ 180' O&GCM
sc rec 1CFG + 200cc oil
+ 600cc DF
60" I 4382 FP 922-941
120" F4342

dst 11895-941
OP 255" RO 2000'WB + 49 bo
60" I 4368 FP 1038-1945
30" F 4347

A/OH 11920 - 49
IPP 128 bo + 245 bw
3-9-81

P/11958-971 A/750
IPF 372 bopd
7-9-72

P/12007 - 17 A/1500
IPP 36 bopd+ 3768 bwpd
2-22-85

P/12074 - 84 A/200
S/1 bo + 52 bw/4 hrs.
sqz w/100 sx

P/12120 - 26, 12131 - 41, 12150 -54
A/672
S/2 bo + 82 bsxw/10 hrs.
sqz w/45 sx

TD 12068 PB 12066
7" csg @ 12049
comp. OH 12049 - 66
A/500
IPF 610 bopd
11-16-72

P/12020-23 A/1000
No new Pot.
4-26-77

P/12076 - 82, 12090 - 102
A/500
IPF 545 bopd
2-7-73

Study 6

HS=100

PETRA 5/30/00 12:24:56 PM (xs-a.CSP)

SAGA PETROLEUM LLC

Cross Roads Devonian Field

Lea County, New Mexico

Exhibit 6

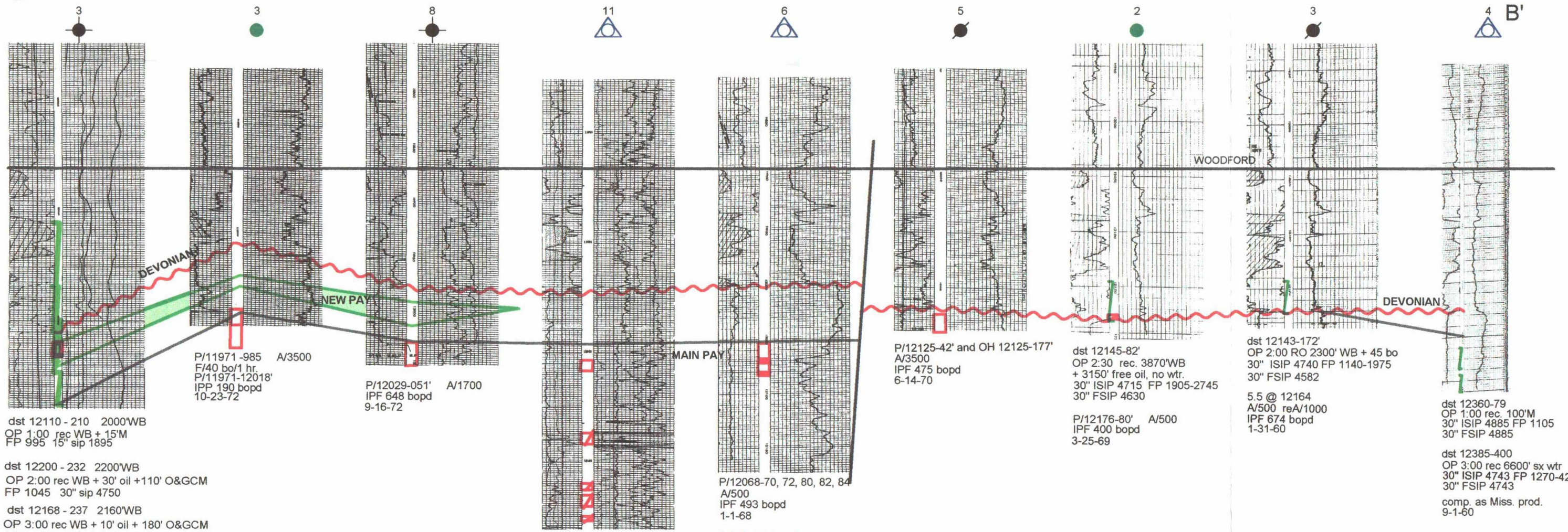
W-E Stratigraphic Cross-section

By: Lorin Rulla

May 30,2000 12:24 PM

North
B

South
B'



dst 12110 - 210 2000'WB
OP 1:00 rec WB + 15'M
FP 995 15" sip 1895

dst 12200 - 232 2200'WB
OP 2:00 rec WB + 30' oil +110' O&GCM
FP 1045 30" sip 4750

dst 12168 - 237 2160'WB
OP 3:00 rec WB + 10' oil + 180' O&GCM
FP 1110 30" sip4625

dst 12225 - 47 1500'WB
OP 3:00 rec WB + 280' oil + 40' O&GCM
FP 805 30" sip 4815

dst 12247 - 77 2000'WB
OP 2:00 rec WB + 6080' SOCSW
FP 880-2810 30" sip 4845

P/12220-32 MA/500
S&F 348 bopd
5-9-58

P/11971 -985 A/3500
F/40 bo/1 hr.
P/11971-12018'
IPP 190 bopd
10-23-72

P/12029-051' A/1700
IPF 648 bopd
9-16-72

P/12120-26, 131-41, 150-54
A/672
S/2 bo + 82 bw/10hrs.
sqz w/ 45sx

P/12074-84 A/200
S/1 bo + 52 bw/4 hrs
sqz w/ 100sx

P/12007-17 A/1500
S/2 bo + 83 blw/4 hrs.
IPP 36 bo + 3768 bw
2-22-85

P/12068-70, 72, 80, 82, 84
A/500
IPF 493 bopd
1-1-68

OWWO 6-17-75
P/12054-84
No new pot.

P/12125-42' and OH 12125-177'
A/3500
IPF 475 bopd
6-14-70

dst 12145-82'
OP 2:30 rec. 3870'WB
+ 3150' free oil, no wtr.
30" ISIP 4715 FP 1905-2745
30" FSIP 4630

P/12176-80' A/500
IPF 400 bopd
3-25-69

dst 12143-172'
OP 2:00 RO 2300' WB + 45 bo
30" ISIP 4740 FP 1140-1975
30" FSIP 4582

5.5 @ 12164
A/500 reA/1000
IPF 674 bopd
1-31-60

dst 12360-79
OP 1:00 rec. 100'M
30" ISIP 4885 FP 1105
30" FSIP 4885

dst 12385-400
OP 3:00 rec 6600' sx wtr
30" ISIP 4743 FP 1270-4217
30" FSIP 4743

comp. as Miss. prod.
9-1-60

HS=100

PETRA 5/30/00 2:25:13 PM (xs-b.CSP)

SAGA PETROLEUM LLC

Cross Roads Devonian Field

Lea County, New Mexico

Exhibit 7

N-S Stratigraphic Cross-section

By: Lorin Rulla

May 30,2000 2:25 PM

C West

C'

East

1

2-Y

8

3

4

WOODFORD

DEVONIAN

NEW PAY

MAIN PAY

dst 11608 - 716 OP :30
rec. 3000' WB + 30' M

dst 11743 -806 OP 2:05
rec. 3000' O&GCWB + 8116' oil + 210' M

dst 11828 - 880 OP :25
rec. 3000' WB + 2880' HO&GCM

P/11750 - 785 A/500
IPF 657 bopd
2-21-49

P/11902 - 922 A/5500
IPF 648 bopd
10-11-72

P/12029-051 A/1700
IPF 648 bopd
9-16-72

dst 12000 - 90 OP 1:10
rec. 3000' WB + 6690' HOCM
IPF 625 bopd
8-24-49

set smt retainer at 12010'. RIH w/tbg & string into retainer
Inject down csg annulus.
Press up to 1200#. Establish IR down tbg of 0.87 BPM
Pump polymer as follows:

BF	Polymer	IR
305	4500 PPM	Vac
919	6000 PPM	Vac
221	8000 PPM	Vac

Test Before: 11 bopd + 1100 bwpd
Test After: 6 bopd + 27 bwpd

TD 12132
5.5" csg @ 12118
IPF 504 bopd Natural
6-9-52

OWWO 5-23-74
sqz OH 12118 - 132 w/150 sx
P/12085 - 100 A/2000
IPP 593 bopd + 1183 bwpd

OWWO 12-22-78
re-comp. to Penn

HS=100

PETRA 5/30/00 11:46:29 AM

SAGA PETROLEUM LLC

Cross Roads Devonian Field

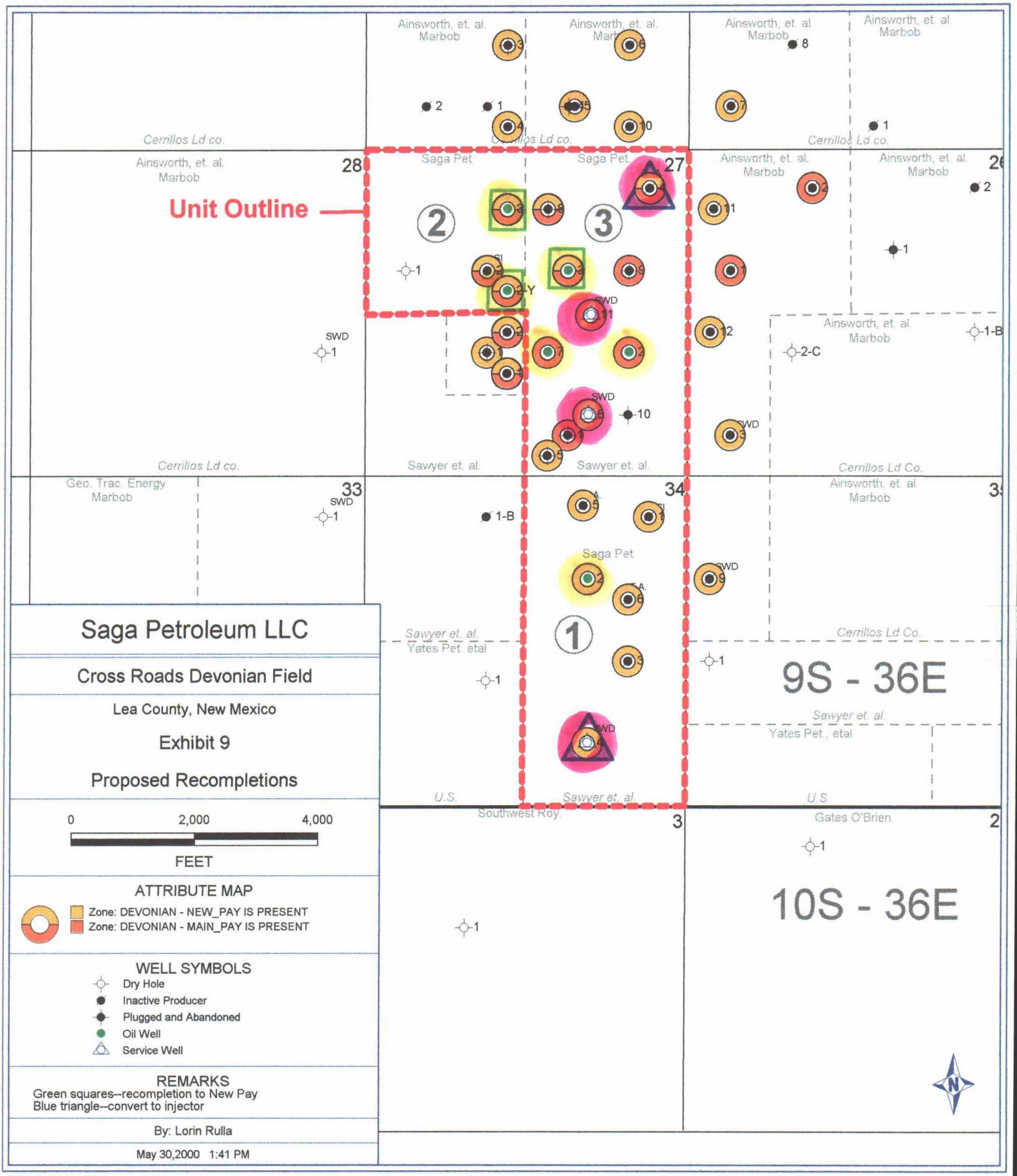
Lea County, New Mexico

Exhibit 8

E-W Stratigraphic Cross-section

By: Lorin Rulla

May 30,2000 11:46 AM



PETRA 5/30/00 1:41:07 PM

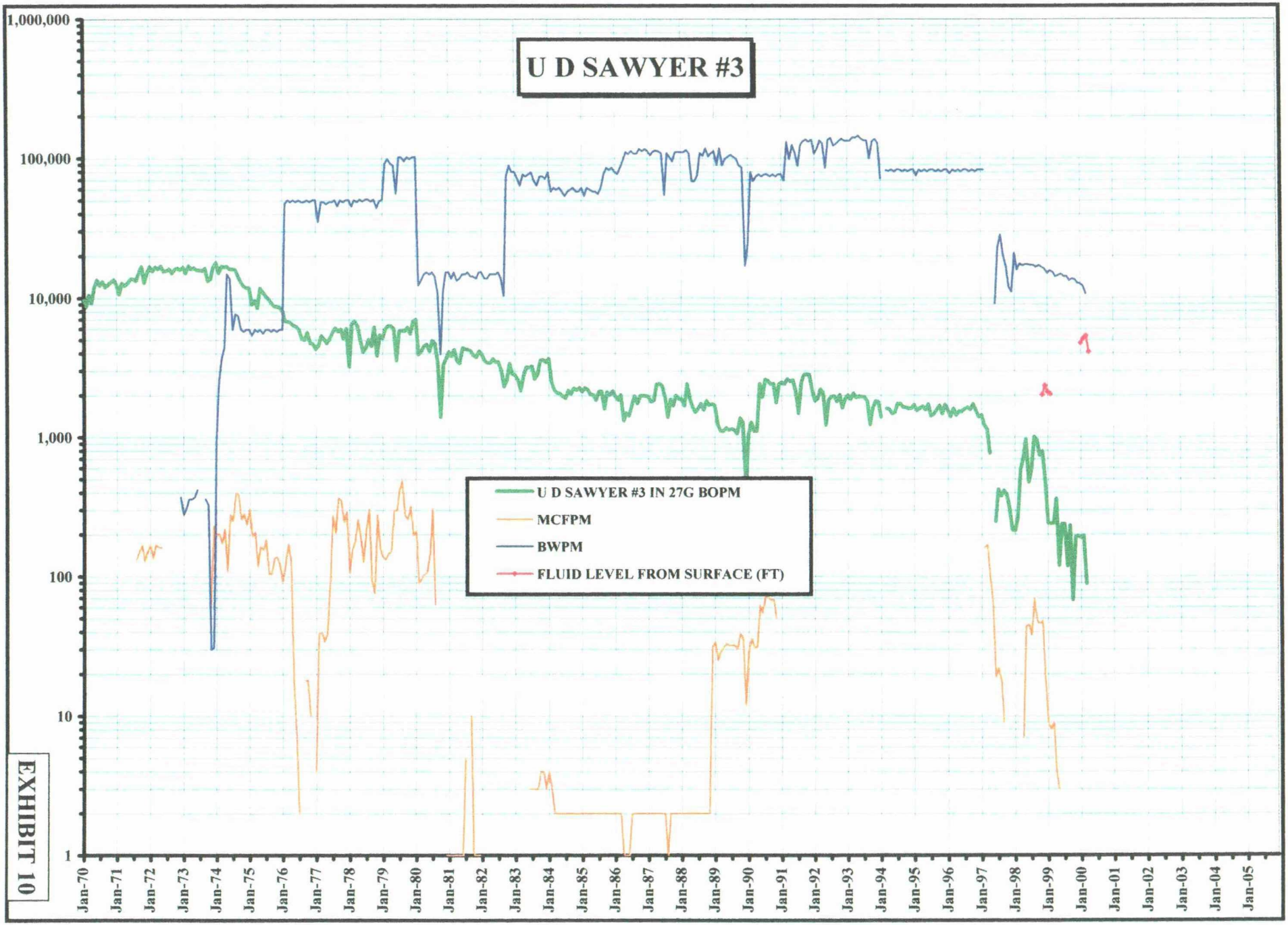

U D SAWYER #3
1,000,000
100,000
10,000
1,000
100
10
1
U D SAWYER #3 IN 27G BOPM
MCFPM
BWPM
FLUID LEVEL FROM SURFACE (FT)
Jan-70
Jan-71
Jan-72
Jan-73
Jan-74
Jan-75
Jan-76
Jan-77
Jan-78
Jan-79
Jan-80
Jan-81
Jan-82
Jan-83
Jan-84
Jan-85
Jan-86
Jan-87
Jan-88
Jan-89
Jan-90
Jan-91
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05

EXHIBIT 10

SAGA PETROLEUM
CROSSROADS (DEVONIAN) FIELD
ROCK AND FLUID DATA

Study 11

1 RESERVOIR TYPE

FORMATION	DEVONIAN
DISCOVERY DATE	MAY 6,1948 MID CONTINENT UD SAWYER "A" NO 1
TYPE OF STRUCTURE / TRAP	FAULTED ANTICLINE FORMING STRUCTURAL & STRAGRAPHIC TRAP
PRODUCING MECHANISM	WATER DRIVE
AVERAGE DEPTH (FT)	11,800' - 12,100'
WELL SPACING (AC)	40 Ac

2 RESERVOIR VOLUMETRICS

	TOTAL FILD DEVONIAN MAIN PAY	SAGA DEVONIAN MAIN PAY	SAGA DEVONIAN NEW PAY
AREA (AC)	1715	800	336
GROSS THICKNESS (FT)	150' - 200'	150' - 200'	58
NET PAY (FT) AVERAGE	69.30	78.07	15.74
VOLUME (AcFt)	118,855	62453	5290

3 ESTIMATED RESERVE REC

	MAIN PAY DEVONIAN TOTAL FIELD MAIN PAY			MAIN PAY DEVONIAN SAGA PORTION MAIN PAY			SAGA UPPER DEVONIAN NEW PAY		
	MBO	BO/AcFt	% of OOIP	MBO	BO/AcFt	% of OOIP	MBO	BO/AcFt	% of OOIP
OOIP	96,490	812	100.0	50,701	812	100.0	4,295	812	100
CUM PROD (MBO) 1/1/00	43,390	365	45.0	20,927	335	41	1,457	0	34
REMAINING MBO	4,747	40	4.9	844	14	1.7	517	98	12
EUR (MBO)	48,137	405	49.9	21,771	349	43	1,844	349	43

4 PRODUCTION SUMMARY

EUR TOTAL PROJECT (MBO)	23,615
TOTAL REC AS OF 1/1/2000 (MBO)	22,384
EST REMAINING SEC (MBO)	1,361
WATER PRODUCED TO DATE (MBW)	126,549

5 RESERVOIR PRESSURE

ORIGINAL BHP (PSIG)	4885	5/24/1948 - UD SAWYER "A" 1
BUBBLE POINT PRESSURE (PSIG)	400	CALCULATED
CURRENT BHP (PSIG)	4300	CALCULATED FROM FLUID LEVELS

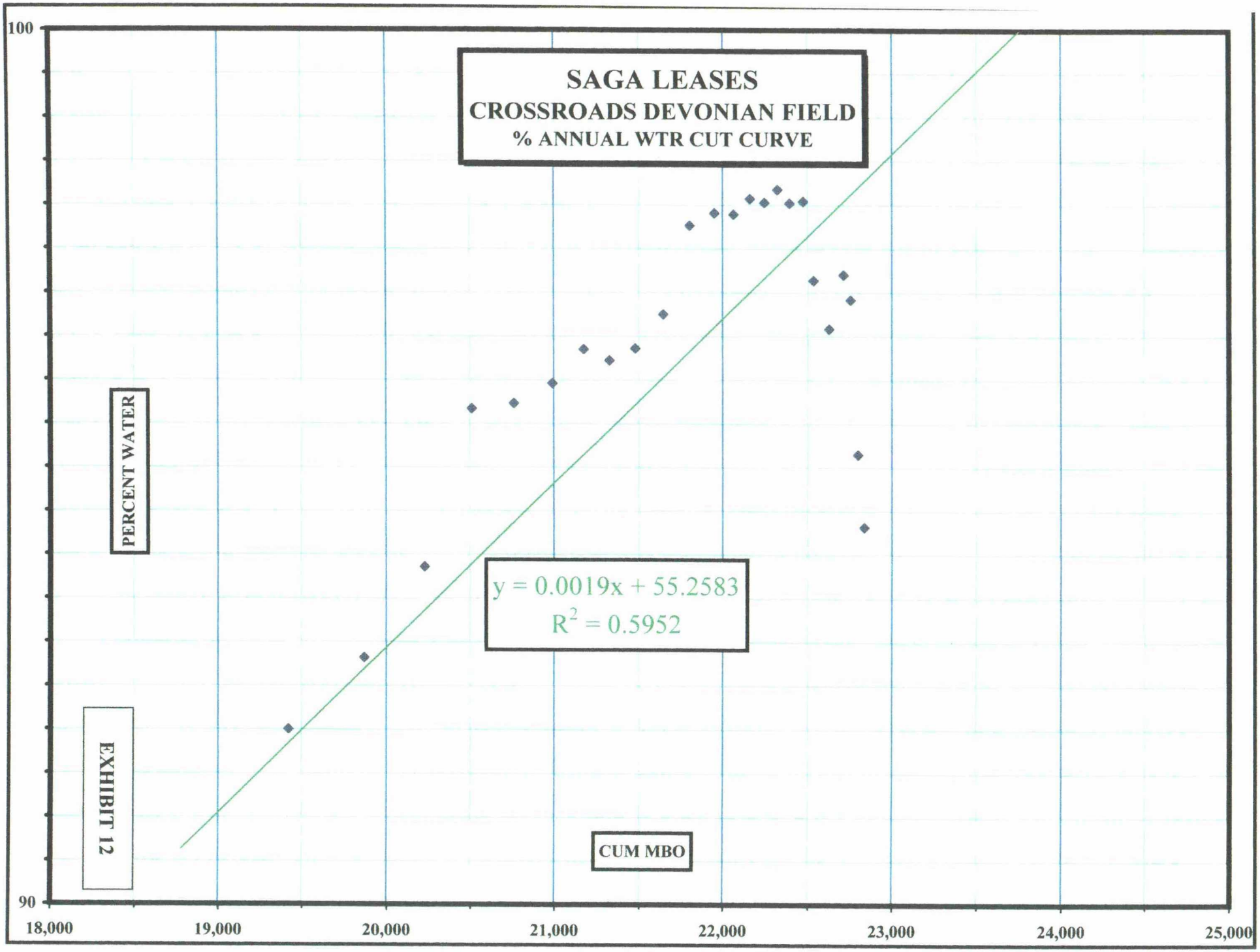
6 ROCK PROPERTIES FROM LOG ANALYSIS

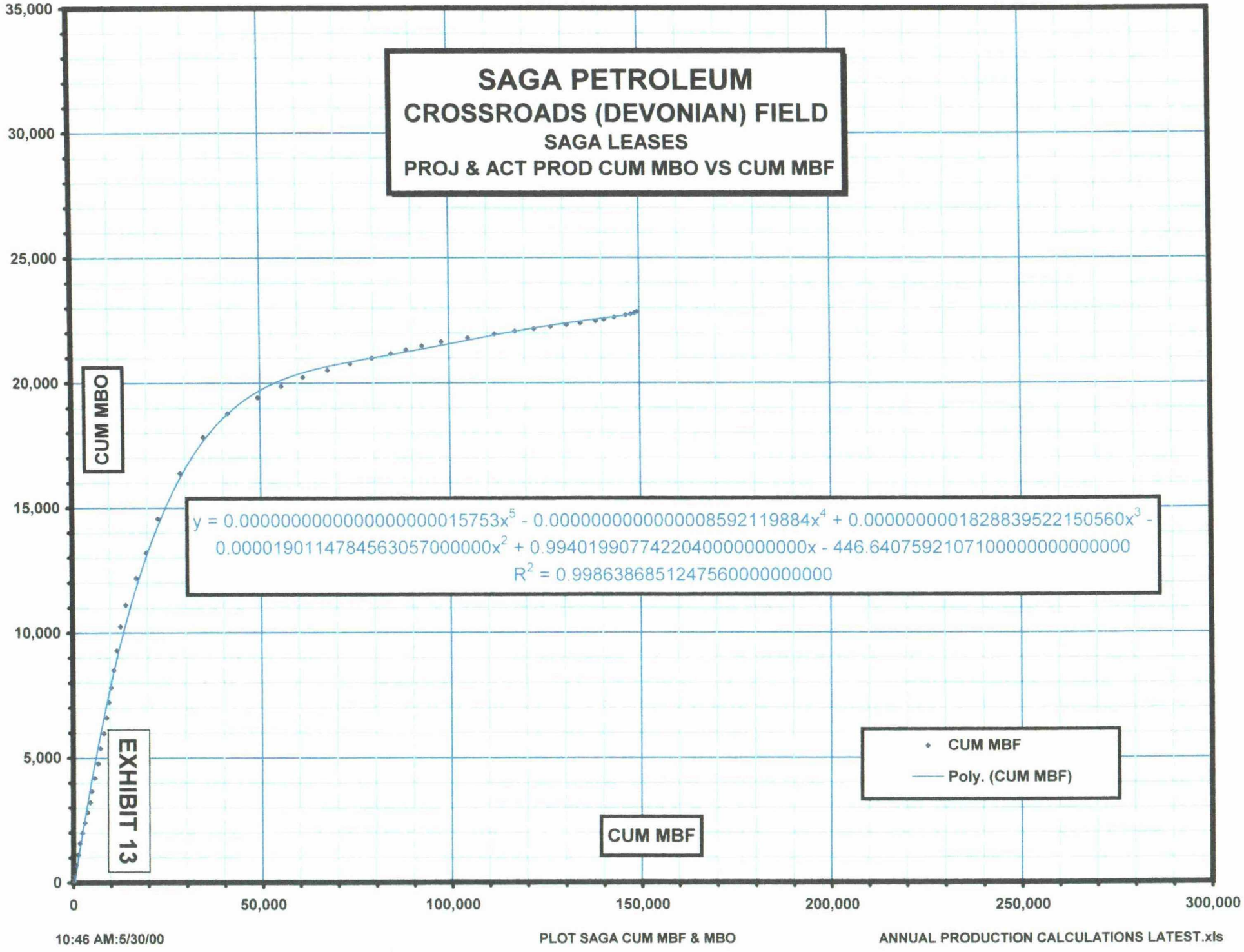
AVERAGE POROSITY (% ϕ)	13.4	LOG DATA
AVERAGE WTR SAT (% S_w)	15	LOG DATA
PERMEABILITY (K-md)	50.0	EST FROM FIELD PERFORMANCE

7 RESERVOIR FLUID PROPERTIES

BOTTOM HOLE TEMP °F	158°	MEASURED
OIL GRAVITY (API)	42.6°	MEASURED
PROD WATER GRAVITY (ρw)	1.075	MEASURED
NaCl - PROD WATER	90,442	MEASURED
PROD WATER RESITIVITY (ohm/meter) @ 158°	0.04	MEASURED
GAS GRAVITY (ρg) CRITICAL GAS SATURATION - 0.1	1.0	ESTIMATED
CONNATE WATER SATURATION - % Sw	15	LOG CALC
OIL VISCOSITY (μo @ 4885# & 158°F)	2.51	CALCULATED
WTR VISCOSITY (μw @ 4885# & 158 °F)	0.45	CALCULATED
ORIGINAL GOR (Rsi)	100	COMP REPORTS
FORMATION VOLUME FACTOR (B_O) CURRENT	1.08845	CALCULATED

EXHIBIT 11


SAGA LEASES
CROSSROADS DEVONIAN FIELD
% ANNUAL WTR CUT CURVE
PERCENT WATER
y = 0.0019x + 55.2583
R2 = 0.5952
CUM MBO
EXHIBIT 12
100
90
18,000
19,000
20,000
21,000
22,000
23,000
24,000
25,000



10:46 AM:5/30/00 PLOT SAGA CUM MBF & MBO ANNUAL PRODUCTION CALCULATIONS LATEST.xls

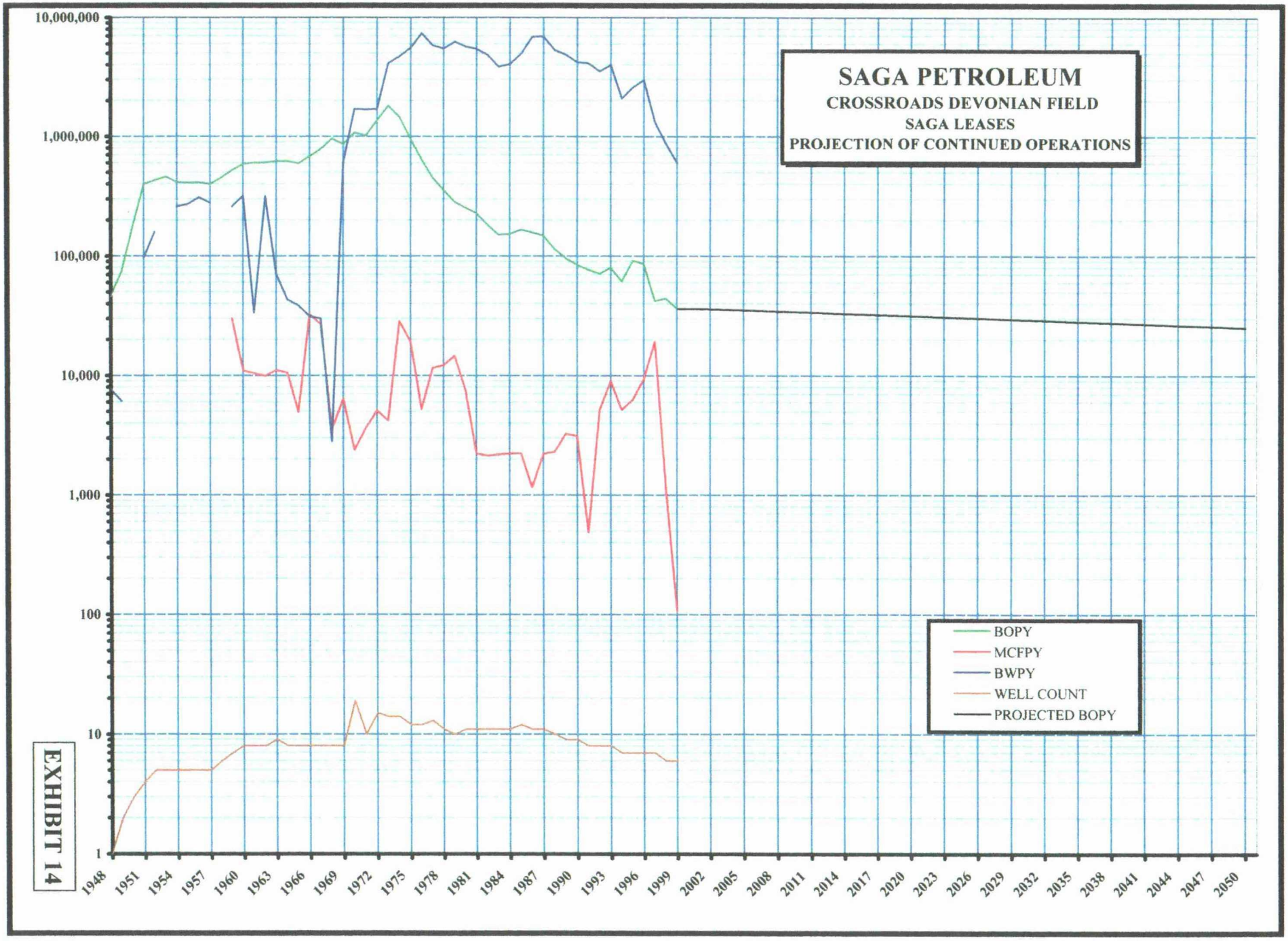
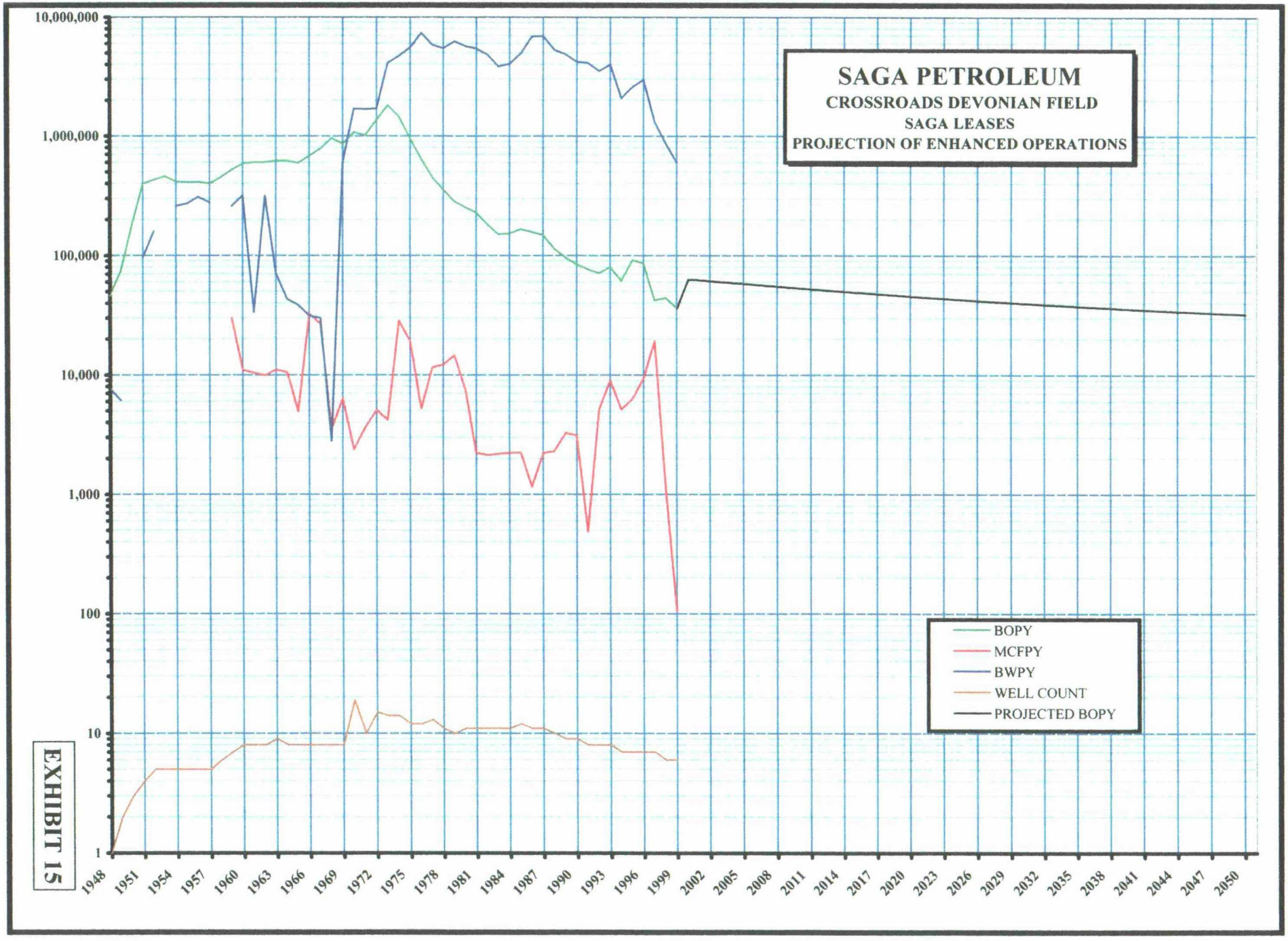

SAGA PETROLEUM
CROSSROADS DEVONIAN FIELD
SAGA LEASES
PROJECTION OF CONTINUED OPERATIONS
10,000,000
1,000,000
100,000
10,000
1,000
100
10
1
BOPY
MCFPY
BWPY
WELL COUNT
PROJECTED BOPY
1948
1951
1954
1957
1960
1963
1966
1969
1972
1975
1978
1981
1984
1987
1990
1993
1996
1999
2002
2005
2008
2011
2014
2017
2020
2023
2026
2029
2032
2035
2038
2041
2044
2047
2050

EXHIBIT 14


SAGA PETROLEUM
CROSSROADS DEVONIAN FIELD
SAGA LEASES
PROJECTION OF ENHANCED OPERATIONS
10,000,000
1,000,000
100,000
10,000
1,000
100
10
1
1948
1951
1954
1957
1960
1963
1966
1969
1972
1975
1978
1981
1984
1987
1990
1993
1996
1999
2002
2005
2008
2011
2014
2017
2020
2023
2026
2029
2032
2035
2038
2041
2044
2047
2050
BOPY
MCFPY
BWPY
WELL COUNT
PROJECTED BOPY
EXHIBIT 15