EXHIBIT 5

PUBLISHED MAP OF PICTURED CLIFFS PRODUCTION, SATURATION AND PERMEABILITY TRENDS

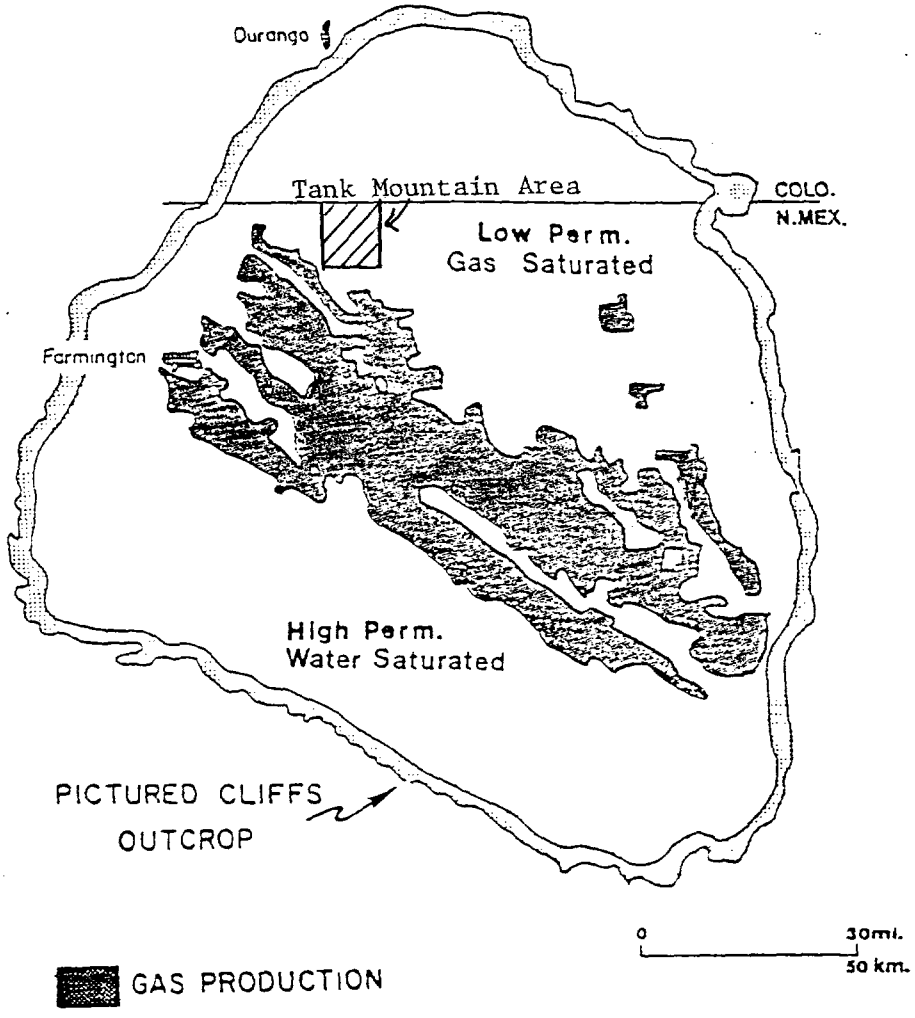


Figure 37. Distribution of producing and non-producing zones of the Pictured Cliffs. To the northeast of the gas-producing zone the sandstones are gas-saturated, but have very low permeability; to the southwest, the sandstones are relatively permeable, but are water saturated. (modified from Brown, 1973)

From: Cumella, S.P., 1981, Sedimentary History and Diagenesis of the Pictured Cliffs Sandstone, San Juan Basin, New Mexico and Colorado. University of Texas at Austin Masters Thesis. Report No. UT 81-1.

EXHIBIT #6

Pretreatment Flow Test

The San Juan Unit 32-9 #106 is located in the SE/4 of Section 17-31N-9W San Juan County, New Mexico. On June 19, 1991 the well was perforated from 3398' to 3420' and 3434'-3450' with 8 shots per foot in an under balanced condition to minimize possible skin damage. The well was then shut in for 27 days. The well was flow tested on July 16, 1991. Initial shut in casing pressure was 340 psi. The well was then flow tested starting with an 8/64 choke to the atmosphere. The gas rate started at 130 mcfd and dropped to 0 in 4 hrs. Gas rates were recorded every 5 minutes. The well had a stabilized production rate of less than 1 Mcf/day. This is below the maximum allowable production rate of 91 Mcf/day.

EXHIBIT #7

Pressure Buildup and Fall Off

The San Juan Unit 106 is located in the SE/4 of Section 17-31N-9W. The well was shut in for 27 days after perforating 38 feet of Pictured Cliffs. A plot of pressure vs. time is attached. After the shut in period an attempt to flow test the well was made. In a period of 4 hrs the well production rate dropped to 0 Mcf/day on an 8/64 choke flowing to the atmosphere. Since a stabilized production rate was unobtainable an order of magnitude estimate of reservoir permeability was calculated using the infinite acting radial flow equation.

$$Q_g = \frac{Kh(P_i^2 - P_{wf}^2) * [Log(KT\phi\mu c_t r_w^2) - 3.23 + .87\ S]^{-1}}{1637\mu\ Z\ T}$$

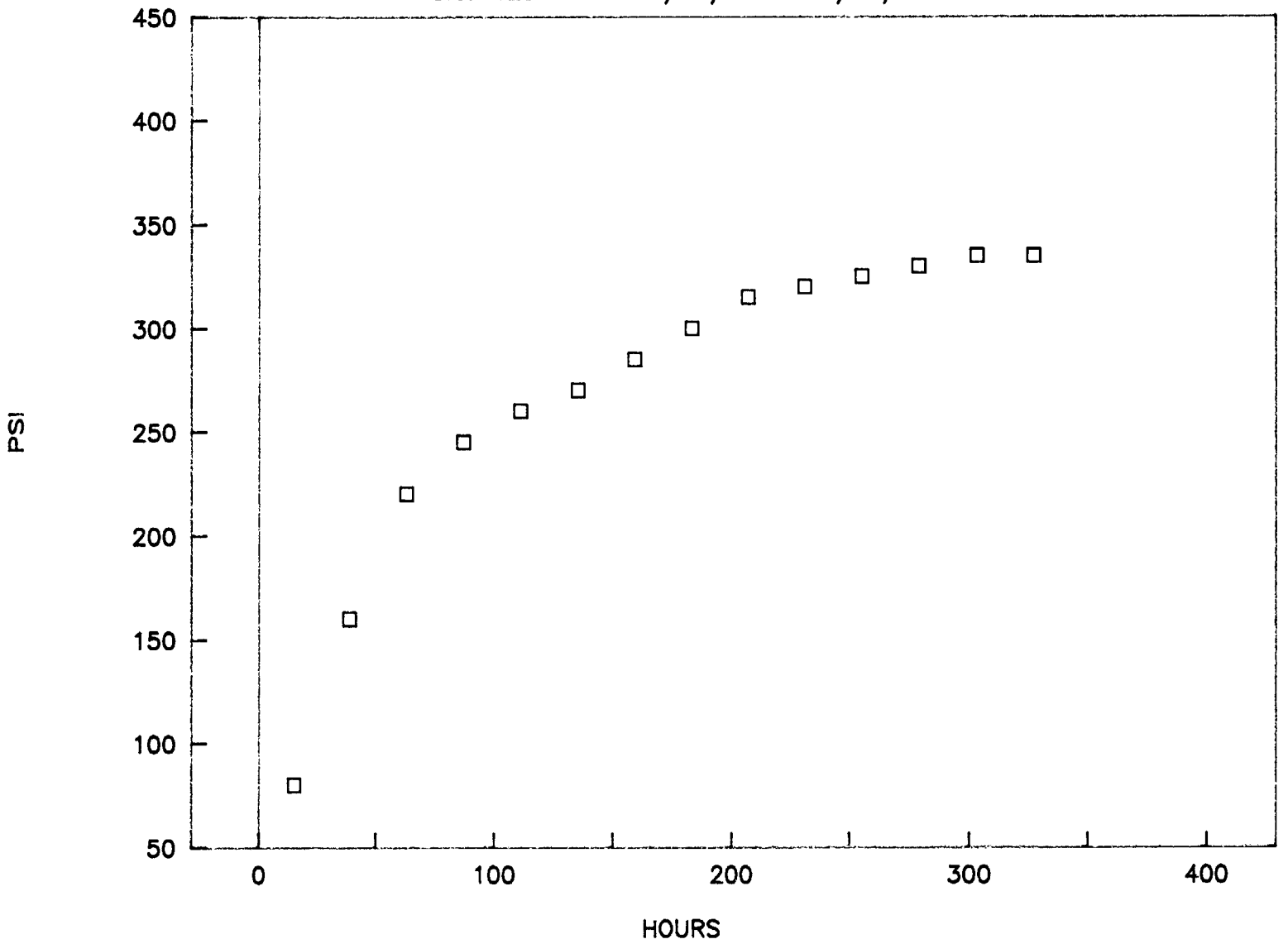
Reservoir Rock and Fluid Properties

T = 560° R
uavg = 0.01135 cp
Zavg = 0.975
P_i = 366 psig
P_{wf} = 16 psig
S = 0
h = 38 feet
c_t = 11.5 * 10-3 psi-l
r_w**2 = 0.293 (6.5" hole size)
T = 4 hrs (time of flow period)

Since the gas rate recorded was less than 1.0 mcf/day a permeability was calculated using the above rock and fluid properties of 0.0035 md assuming a rate of 1.0 mcf/day. In comparison, a rock permeability of 0.1 md using the infinite acting radial flow equation would produce 105 mcf/day.

SAN JUAN 32-9 UNIT #106

SICP TEST FROM 06/19/91 TO 07/02/91



NMOCD CASE #10425

EXHIBIT #8

CORE ANALYSIS

San Juan 32-9 Unit #106
T31N-R9W Sec. 17

San Juan 32-9 Unit #108
T31N-R9W Sec. 10

Dual Induction and Compensated Neutron-Formation Density Logs

Sidewall Core Analysis

10 Cores Measured

Average Permeability at Maximum NOB Pressure = .007

Schlumberger — COMPENSATED NEUTRON-FORMATION DENSITY

SIMULTANEOUS

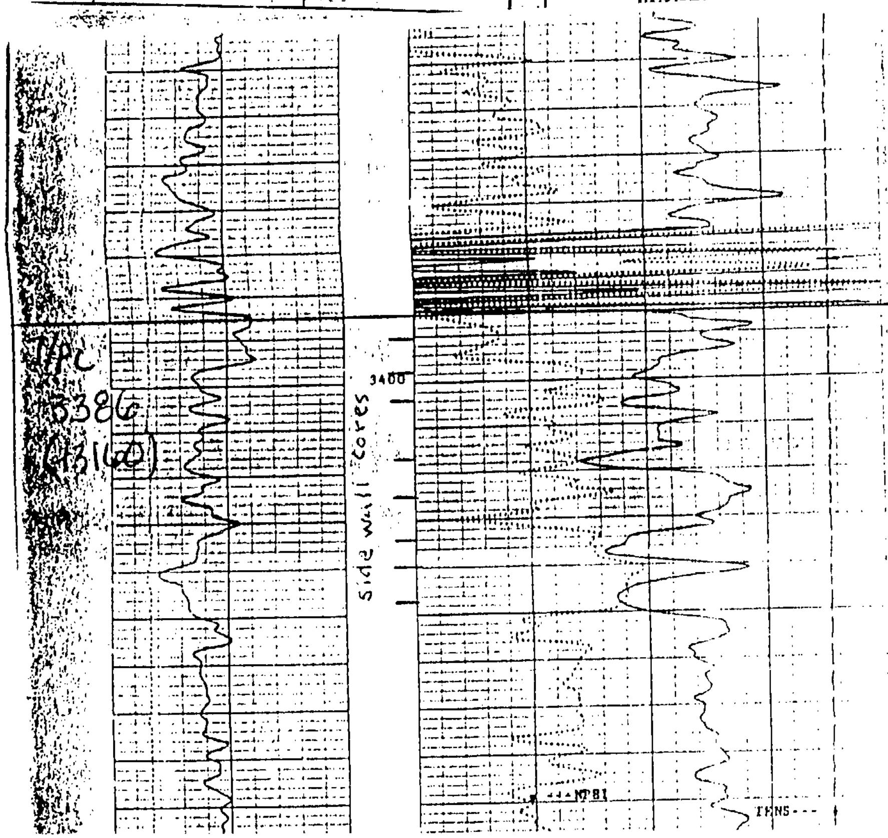
COMPANY	AMOCO PRODUCTION COMPANY (Meridian)
WELL	SAN JUAN 32-9 #106
FIELD	UNDES PICT. CLIFFS (Blanco)
COUNTY	SAN JUAN
STATE	NEW MEXICO
LOCATION	1766' FSL & 806' FEL, NE/SE
API SERIAL NO.	078386
SECT.	17
TWP.	31 N
RANGE	9 W
Other Services	DIT, FDC, CNT, MSCT
Permanent Datum	GL, Elev. 6532.0 F
Log Measured From	KB, 14.5 F above Perm. Datum
Elev.	K.B. 6546.5 F, D.F. 6546.5 F, G.L. 6532.0 F
Date	14-DEC-1990
Run No.	ONE
Depth-Driller	3627.0 F
Depth-Logger	3630.0 F
Bottom Logged Interval	3626.0 F
Top Logged Interval	2986.0 F
Casing-Driller	8 5/8 @ 297.0 F
Casing-Logger	298.0 F
Bit Size	7 7/8
Type Fluid in Hole	L S N D
Dens. / Visc.	8.90 LB/G / 54.0 S
pH / Fluid Loss	7.5 / 10.6 C3
Source of Sample	MUD TANK
Rm @ Meas. Temp.	1.260 OHMM @ 78.0 DEGF
Rmf @ Meas. Temp.	0.938 OHMM @ 78.0 DEGF
Rmc @ Meas. Temp.	1.880 OHMM @ 78.0 DEGF
Source: Rmf / Rmc	MEAS / CALC
Rm @ BHT	.864 OHMM @ 116. DEGF
Circulation Stopped	12-14 0400
Logger on Bottom	12-14 0715
Max. Rec. Temp.	116. DEGF
Equip. / Location	8181 / FARMINGTON
Recorded By	PEPPIN
Witnessed By	QUEVEDO NRK 11 R

RECEIVED DEC 27 1990 OIL CON. DIV. DIST. 3

The well name, location and borehole reference data were furnished by the customer.

All interpretations are opinions based on inferences from electrical or other measurements and we cannot, and do not guarantee the accuracy or correctness of any interpretations, and we shall not, except in the case of gross or wilful negligence on our part, be liable or responsible for any loss, costs, damages or expenses incurred or sustained by anyone resulting from any interpretation made by any of our officers, agents or employees. These interpretations are also subject to Clause 4 of our General Terms and Conditions as set out in our current Price Schedule.

Run No.	ONE
Service Order No.	684286
Max. Recorded Temp.	1300.0 PPM
Rm @ BHT	.848 OHMM @ 116. DEGF
Rmf @ BHT	1.288 OHMM @ 116. DEGF
Logging Speed	1800.0 F/HR
EQUIPMENT DATA	



Schlumberger — DUAL INDUCTION - SFL

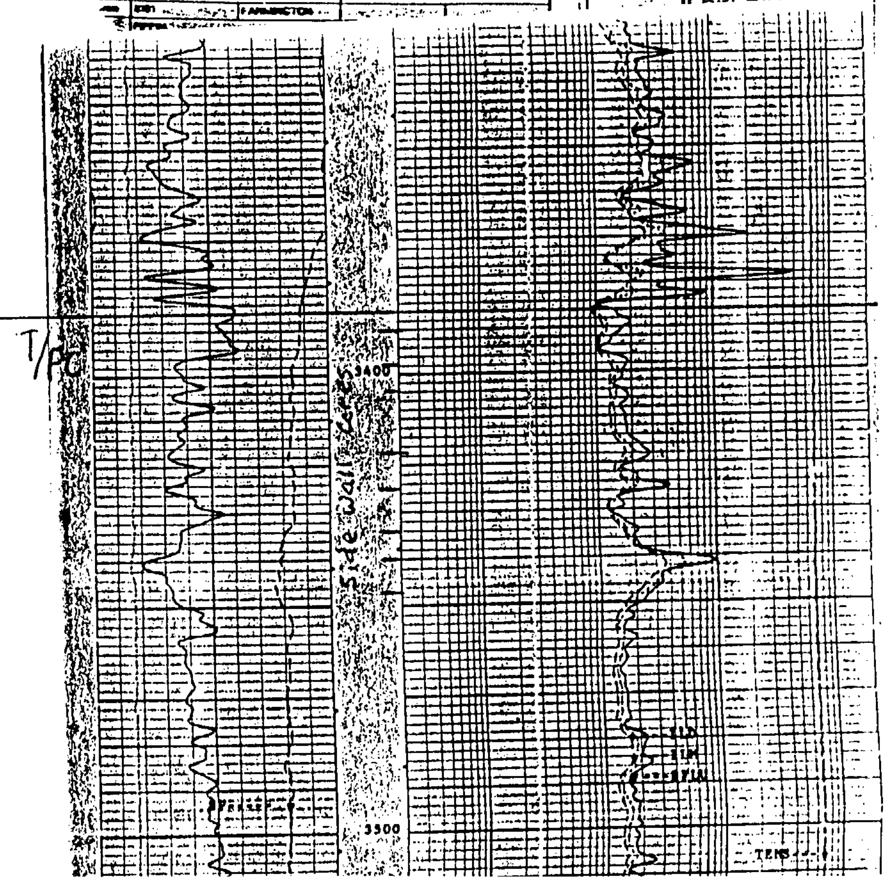
COMPANY	AMOCO PRODUCTION COMPANY (Meridian)
WELL	SAN JUAN 32-9 #106
FIELD	UNDES. PICT. CLIFFS (Blanco)
COUNTY	SAN JUAN
STATE	NEW MEXICO
LOCATION	1766' FSL & 806' FEL, NE/SE
API SERIAL NO.	078386 30-045-28095
SECT.	17
TWP.	31 N
RANGE	9 W
Other Services	DIT, FDC, CNT, MSCT
Permanent Datum	GL, Elev. 6532.0 F
Log Measured From	KB, 14.5 F above Perm. Datum
Elev.	K.B. 6546.5 F, D.F. 6546.5 F, G.L. 6532.0 F
Date	14-DEC-1990
Run No.	ONE
Depth-Driller	3627.0 F
Depth-Logger	3630.0 F
Bottom Logged Interval	3624.0 F
Top Logged Interval	298.0 F
Casing-Driller	8 5/8 @ 297.0 F
Casing-Logger	298.0 F
Bit Size	7 7/8
Type Fluid in Hole	L S N D
Dens. / Visc.	8.90 LB/G / 54.0 S
pH / Fluid Loss	7.5 / 10.6 C3
Source of Sample	MUD TANK
Rm @ Meas. Temp.	1.250 OHMM @ 78.0 DEGF
Rmf @ Meas. Temp.	0.938 OHMM @ 78.0 DEGF
Rmc @ Meas. Temp.	1.880 OHMM @ 78.0 DEGF
Source: Rmf / Rmc	MEAS / CALC
Rm @ BHT	.864 OHMM @ 116. DEGF
Circulation Stopped	12-14 0400
Logger on Bottom	12-14 0715
Max. Rec. Temp.	116. DEGF
Equip. / Location	8181 / FARMINGTON

RECEIVED DEC 27 1990 OIL CON. DIV. DIST. 3

The well name, location and borehole reference data were furnished by the customer.

All interpretations are opinions based on inferences from electrical or other measurements and we cannot, and do not guarantee the accuracy or correctness of any interpretations, and we shall not, except in the case of gross or wilful negligence on our part, be liable or responsible for any loss, costs, damages or expenses incurred or sustained by anyone resulting from any interpretation made by any of our officers, agents or employees. These interpretations are also subject to Clause 4 of our General Terms and Conditions as set out in our current Price Schedule.

Run No.	ONE
Service Order No.	684286
Mud Level	
Salinity	1300.0 PPM
Rm @ BHT	.848 OHMM @ 116. DEGF
Rmf @ BHT	1.288 OHMM @ 116. DEGF
Logging Speed	1800.0 F/HR
EQUIPMENT DATA	
	DIC 418
	DIC 1127
	DRS 2803
	NSC 3868



WELL FILE DOCUMENTS

067699

Schlumberger COMPENSATED NEUTRON FORMATION DENSITY

COMPANY	Amoco Production
WELL	San Juan 32-9 #108
FIELD	Undes. Pict. Cliffs
COUNTY	San Juan
STATE	New Mexico
Location	1142 FSL & 765 FWL, SW SW
Other Services	DI, FDC/CNL, MSCT
API Serial No.	N / A
Sect.	10
Twp.	31 N
Range	9 W
Permanent Datum	GL, Elev. 6573.0 F
Log Measured From	KB, 14.5 F above Perm. Datum
Drilling Measured From	KB
Elev.	KB 6587.5 F; DF; GL 6573.0 F
Date	08-DEC-1990
Run No.	One
Depth Driller	3636.0 F
Depth Logger (Schl.)	3638.0 F
Btm. Log Interval	3504.0 F
Top Log Interval	2000.0 F
Casing Driller	8 5/8 @ 263.0 F
Casing Logger	262.0 F
Bit Size	7 7/8 IN
Type Fluid in Hole	L S N D
Dens. / Visc.	8.90 LB/G / 60.0 S
pH / Fluid Loss	8.0 / 10.2 C3
Source of Sample	MUDTANK
Rm @ Meas. Temp.	4.210 OHMM @ 72.0 DEGF
Rmf @ Meas. Temp.	3.130 OHMM @ 72.0 DEGF
Rmc @ Meas. Temp.	6.390 OHMM @ 72.0 DEGF
Source: Rmf / Rmc	Meas. / Calc.
Rm @ BHT	2.704 OHMM @ 116. DEGF
Circulation Ended	12-8 @ 2000
Logger on Bottom	12-9 @ 0030
Max. Rec. Temp.	116. DEGF
Equip. / Location	8206 / Farmington
Recorded By	Sitton
Witnessed By	D. Hargeneder

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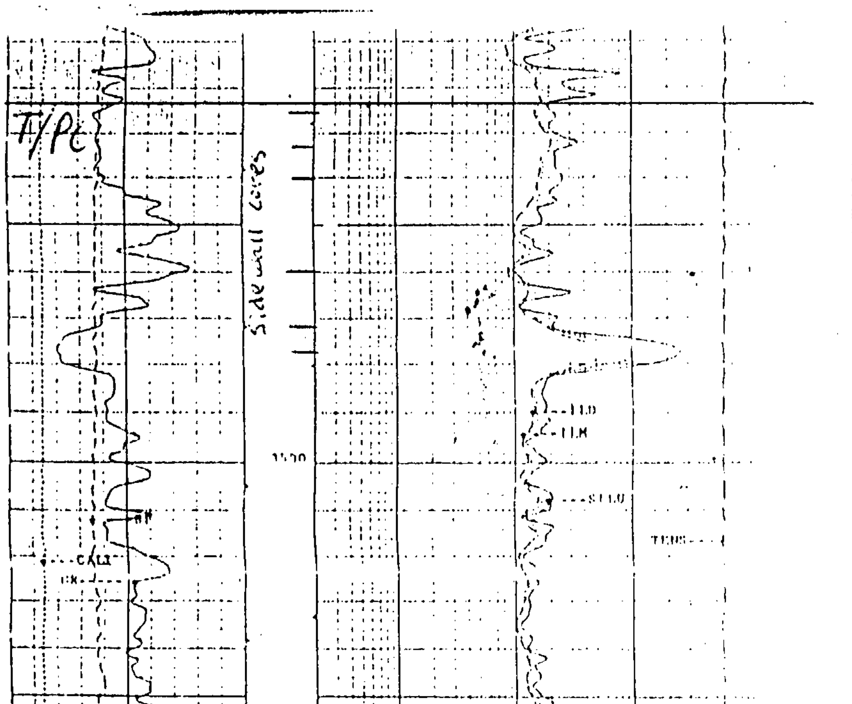
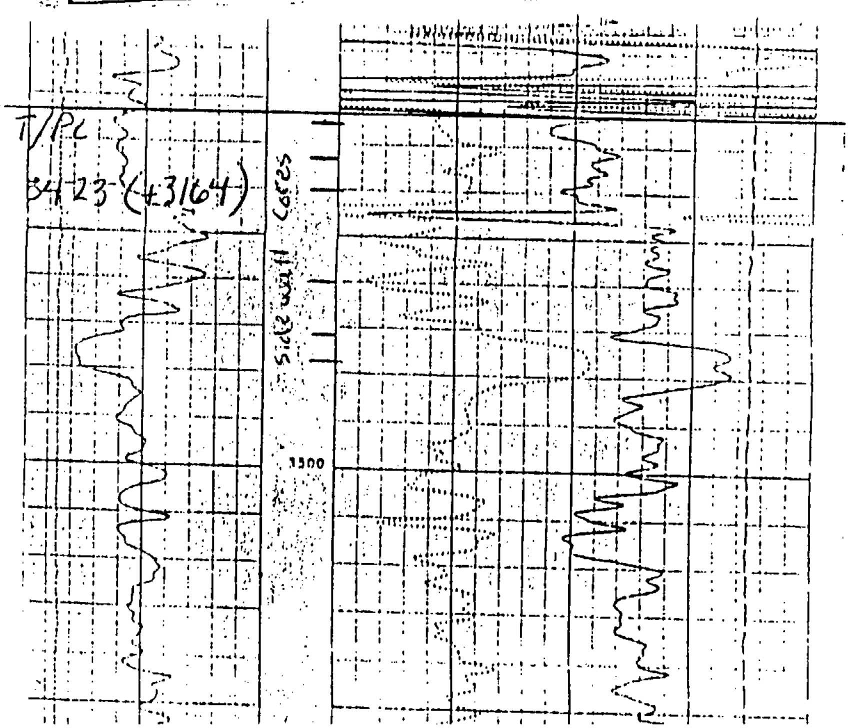
OIL CON. DIV.
DIST. 3



Schlumberger DUAL INDUCTION SFL WITH LINEAR CORRELATION LOG

COMPANY	Amoco Production
WELL	San Juan 32-9 #108
FIELD	Undes. Pict. Cliffs
COUNTY	San Juan
STATE	New Mexico
Location	1142 FSL & 766 FWL, SW SW
Other Services	DIL, FDC/CNL, MSCT
API Serial No.	N / A 30-045-25807
Sect.	10
Twp.	31 N
Range	9 W
Permanent Datum	GL, Elev. 6573.0 F
Log Measured From	KB, 14.5 F above Perm. Datum
Drilling Measured From	KB
Elev.	KB 6587.5 F; DF; GL 6573.0 F
Date	08-DEC-1990
Run No.	One
Depth Driller	3636.0 F
Depth Logger (Schl.)	3638.0 F
Btm. Log Interval	3632.0 F
Top Log Interval	263.0 F
Casing Driller	8 5/8 @ 263.0 F
Casing Logger	262.0 F
Bit Size	7 7/8 IN
Type Fluid in Hole	L S N D
Dens. / Visc.	8.90 LB/G / 60.0 S
pH / Fluid Loss	8.0 / 10.2 C3
Source of Sample	MUDTANK
Rm @ Meas. Temp.	4.210 OHMM @ 72.0 DEGF
Rmf @ Meas. Temp.	3.130 OHMM @ 72.0 DEGF
Rmc @ Meas. Temp.	6.390 OHMM @ 72.0 DEGF
Source: Rmf / Rmc	Meas. / Calc.
Rm @ BHT	2.704 OHMM @ 116. DEGF
Circulation Ended	12-8 @ 2000
Logger on Bottom	12-9 @ 0030
Max. Rec. Temp.	116. DEGF
Equip. / Location	8206 / Farmington
Recorded By	Sitton
Witnessed By	D. Hargeneder

RECEIVED
MAY 3 0 1991
OIL CON. DIV.
DIST. 3



CORE LABORATORIES

Company : Amoco Production Company
Well : San Juan No. 32-9 Unit Nos. 106 & 108
Location :
Co,State :

Field :
Formation :
Coring Fluid :
Elevation :

File No.:
Date : 1-Apr-1991
API No. :
Analysts:

C O R E A N A L Y S I S R E S U L T S

SAMPLE NUMBER	DEPTH ft	POROSITY (HELIUM) %	SATURATION (PORE VOLUME) OIL %	SATURATION (PORE VOLUME) WATER %	GRAIN DENSITY gm/cc	DESCRIPTION
			San Juan No. 32-9 Unit No. 106			Sidewall Samples 1-8
1	3390.0	4.0	0.0	47.5	2.66	Sltst dk gry-gry sli arg lam
2	3398.0	7.8	0.0	14.2	2.80	Dol brn vf xln w/ Sst gry f-vf gr arg sli calc
3	3404.0	5.8	0.0	25.6	2.65	Sst gry f-vf gr arg lam
4	3417.0	8.2	0.0	16.5	2.67	Sst gry f-vf gr arg glauc
5	3425.0	3.9	0.0	46.7	2.70	Sst gry f-vf gr arg glauc pyr calc
6	3434.0	10.6	0.0	11.8	2.69	Sst gry f-vf gr arg glauc pyr sli calc
7	3440.0	7.3	0.0	12.4	2.71	Sst gry f-vf gr arg glauc pyr calc
8	3447.0	11.9	0.0	12.0	2.69	Sst gry f-vf gr arg glauc sli calc
			San Juan No. 32-9 Unit No. 108			Sidewall Samples 9-14
9	3425.0	12.2	0.0	29.0	2.67	Sst gry f-vf gr arg glauc
10	3433.0	7.1	0.0	16.6	2.69	Sst gry f-vf gr arg calc glauc
11	3440.0	13.3	0.0	12.0	2.65	Sst gry f-vf gr arg sli calc glauc
12	3460.0	4.0	0.0	54.7	2.63	Sltst dk gry v arg
13	3472.0	9.0	0.0	12.5	2.70	Sst gry f-vf gr arg calc glauc pyr
14	3477.0	2.4	0.0	10.1	2.71	Sst gry f-vf gr arg calc glauc pyr

CORE LABORATORIES

Company : Amoco Production Company
Well : San Juan No. 32-9 Unit Nos. 106 & 108
Field :
Formation :
File No.:
Date : 1-Apr-1991

C M S - 2 0 0 T E S T D A T A

SAMPLE NUMBER	DEPTH ft	NOB PRESSURE psi	PORE VOLUME cc	POROSITY %	K∞ md	Kair(est) md	b (He) psi	BETA ft(-1)	ALPHA microns
11	3440.0	800.0	1.69	11.6	0.027	0.052	67.13	2.8406E14	2.39047E4
11	3440.0	1100.0	1.68	11.5	0.018	0.043	99.72	3.4834E13	1.96485E3
11	3440.0	1500.0	1.66	11.4	0.016	0.039	105.77	3.1730E13	1.56449E3
11	3440.0	1750.0	1.65	11.4	0.015	0.037	107.71	3.6176E13	1.67325E3
8	3447.0	800.0	1.55	12.2	0.029	0.058	68.66	1.9586E14	1.78531E4
8	3447.0	1100.0	1.52	12.0	0.020	0.048	97.34	5.2212E13	3.37734E3
8	3447.0	1500.0	1.50	11.8	0.017	0.042	109.44	1.3979E13	7.51692E2
8	3447.0	1750.0	1.49	11.7	0.016	0.040	110.51	2.4133E13	1.21819E3
13	3472.0	800.0	0.94	8.8	0.011	0.022	75.60	1.2336E15	4.25643E4
13	3472.0	1100.0	0.92	8.6	0.006	0.016	124.58	6.5181E14	1.22081E4
13	3472.0	1500.0	0.90	8.5	0.004	0.012	145.46	1.1501E15	1.51985E4
13	3472.0	1750.0	0.89	8.4	0.004	0.011	129.05	3.5587E15	4.69691E4

CORE LABORATORIES

Company : Amoco Production Company
Well : San Juan No. 32-9 Unit Nos. 106 & 108
Location :
Co,State :

Field :
Formation :
Coring Fluid :
Elevation :

File No.:
Date : 1-Apr-1991
API No. :
Analysts:

C M S - 2 0 0 T E S T D A T A

SAMPLE NUMBER	DEPTH ft	NOB PRESSURE psi	PORE VOLUME cc	POROSITY %	K∞ md	Kair(est) md	b (He) psi	BETA ft(-1)	ALPHA microns
1	3390.0	800.0	0.57	4.6	0.005	0.008	44.02	1.3765E15	2.18156E4
1	3390.0	1100.0	0.55	4.5	0.003	0.005	50.11	7.8549E15	7.77880E4
2	3398.0	800.0	0.94	7.4	0.002	0.004	92.19	2.1079E15	1.18327E4
2	3398.0	1100.0	0.94	7.4	0.001	0.002	124.17	1.8538E15	5.93962E3
3	3404.0	800.0	0.79	6.1	0.055	0.078	28.38	5.6644E12	9.69929E2
3	3404.0	1100.0	0.74	5.8	0.035	0.053	35.97	2.5800E12	2.83112E2
3	3404.0	1500.0	0.72	5.6	0.024	0.037	38.12	2.9545E13	2.23047E3
3	3404.0	1750.0	0.71	5.5	0.018	0.030	41.12	2.9543E13	1.73229E3
5	3425.0	800.0	0.71	5.1	0.005	0.009	58.89	1.4145E16	2.28520E5
5	3425.0	1100.0	0.67	4.8	0.006	0.008	27.73	5.3801E16	9.84928E5
10	3433.0	800.0	1.01	7.4	0.012	0.025	74.56	1.1004E15	4.25966E4
10	3433.0	1100.0	1.00	7.4	0.006	0.017	131.86	8.5048E13	1.65231E3
10	3433.0	1500.0	0.99	7.3	0.004	0.012	157.01	9.7550E12	1.28430E2
10	3433.0	1750.0	0.97	7.2	0.004	0.011	157.20	1.1053E15	1.28030E4
6	3434.0	800.0	1.60	11.6	0.010	0.019	70.41	3.1126E15	9.60152E4
6	3434.0	1100.0	1.57	11.4	0.005	0.013	139.55	2.6848E14	4.04118E3
6	3434.0	1500.0	1.53	11.2	0.004	0.011	161.13	1.8075E14	2.05098E3
6	3434.0	1750.0	1.51	11.1	0.003	0.010	168.75	2.1572E14	2.12422E3
7	3440.0	800.0	1.09	7.6	0.005	0.010	79.74	1.5495E16	2.34255E5
7	3440.0	1100.0	1.07	7.5	0.003	0.007	151.09	9.7376E15	7.99395E4
7	3440.0	1500.0	1.07	7.5	0.003	0.007	104.68	3.1413E16	3.27346E5

NMOCD CASE 10425

EXHIBIT #9

CORE ANALYSIS

Ealum Gas Com B #1
T32N-R10W Sec. 33

Scout Ticket

Induction and Compensated Density
Log Core Analysis

44 Permeability Measurements

Average Permeability (1800 PSI) = .028

T32N R10W WELLS

API NBR: 3004522177000 STATE: NMEX COUNTY: SAN JUAN
MERIDIAN: NEW MEXICO MERIDN CODE: 21
PROVINCE: SAN JUAN BASIN PROV CODE: 202

OPER: ANOCO PROD Ealum Gas Com B #1 OPER CODE: 065005
LEASE: ~~CAIN GAS COM~~ WELL: ~~2~~ LEASE CODE:
FIELD: NT MEBO FIELD CODE: 060555

T032N R010W SEC 33 SPOT: NE SW NW
FOOTAGES: 1510FNL 800FWL F/SEC LN

OPER ELEV: 6010GR LOG TO:
COMM ELEV: GR FORM@TD: 604PCCF

OTHER DEPTHS: ORLR 2946 WSTD PBTD OLOTD
PERMIT: PROJ DEPTH: 3050 PROJ FORM: 604PCCF

STATUS: D&A SPUD DATE: 11 03 1976
NUMERIC CLASS: INL-6 FNL-0 COMP DATE: 12 10 1976
ALPHA CLASS: INL-D FNL-D
PROD FORM:

LATITUDE: 36.94483 LONGITUDE: 107.89325

CASING:
8 5/8 @ 275 W/ 250SX
4 1/2 @ 2946 W/ 680SX

TUBING INFO: 2 3/8" @ 2805

CONTR: SIGNAL TOOLS: ROTARY RIG NBR:

INITIAL POTENTIAL TESTS:

PRODUCTION TESTS:

PCCF
~~604FRLD~~ PERF 2/FT 2824-2902 GROSS
PERF 2824-2857 2890-2902 - -
SFFR 2824-2902 660000 GALS 60000 LBS SAND FBRKP
RATE: 21 B/HIN ADDTV:NTGN STAGES: 630 SCF/BBL
N FPCAOF: MCFD ATP: 1550 ISP: 1450
NARRATIVE: 1% KCL-WTR-FOAM, 12000# 20/40,
48000# 10/20 SD
GAUGE NOT RPTD
SPTD HOLE 500 GALS(15% HCL)

604FRLD PERF 2/FT 2782-2800
NARRATIVE: GAUGE NOT RPTD
SPTD HOLE W/250 GALS(7 1/2% HCL)

DRILL STEM TESTS:

CORE DESCRIPTIONS:
CORE 1 2782-2802 RCVRY 18.00FT CONV D
CORE 2 ~~604FRLD~~ 2819-2874 RCVRY 55.00FT CONV D
PCCF

OTHER WELL INFO:

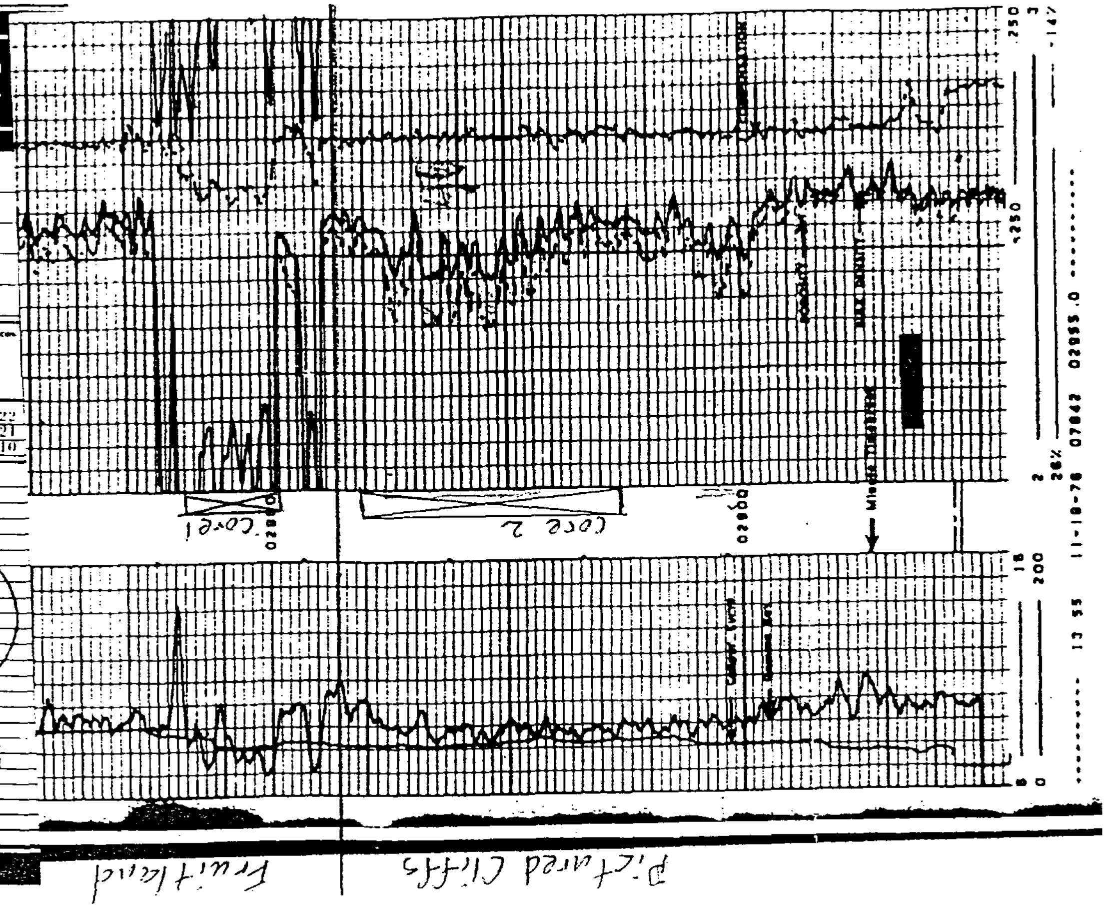
DRILLING SHOWS:
2782-2802 # COAL -

COMPENSATED DENSITY LOG

COMPANY	AMOCO PRODUCTION COMPANY
WELL	[illegible] Gas Com B No 1
FIELD	Blanco Pictured Cliffs
COUNTY	San Juan
STATE	New Mexico
Location	1510'FNL & 800'FWL
Sec.	33
Twp.	32N
Rge.	10W
Other Services	IEL
Datum	Ground Level
Elev.	6010
Measured From	KB, 12 Ft. Above Perm. Datum
Elev. KB	6022
Elev. D.F.	6021
Elev. G.L.	6010

Date	11-18-76
Run No.	One
Type Log	Gamma-Gamma
Depth – Driller	2946
Depth – Logger	2946
Btm. logged interval	2945
Top logged interval	2200
Type fluid in hole	Low solid - non-dispersed
	5.0 @ 51
	12.0
	Full
Max. rec. temp., deg F	99
	1 1/2 Hours
	Denton-Peters-Briscoe
	Smith-Bloom

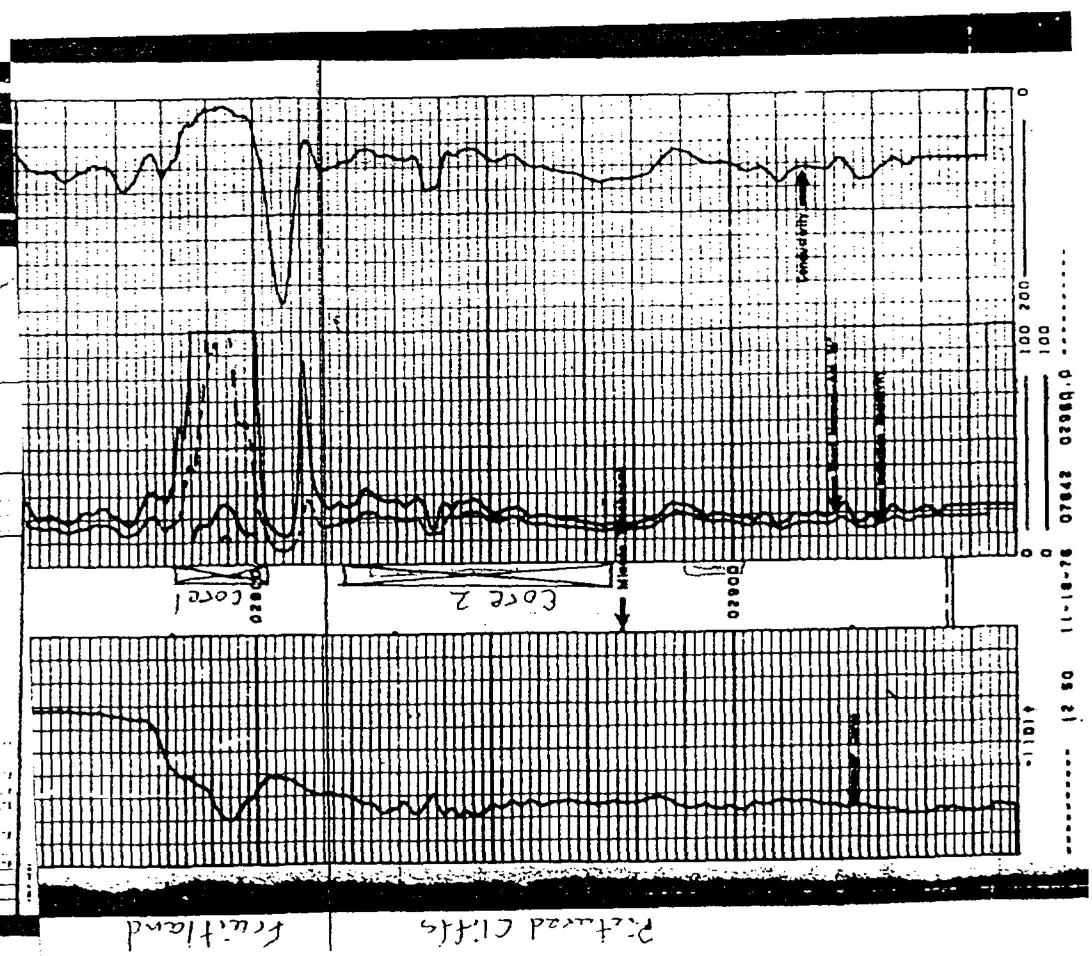
Bore-Hole Record Bit	From	To	Casing Record Size	Wgt.	From	To
14	Surface	273	8 5/8		Surface	273
7 7/8	273	2946				



INDUCTION ELECTRICAL LOG

COMPANY	AMOCO PRODUCTION COMPANY
WELL	[illegible] Gas Com B No 1
FIELD	Blanco Pictured Cliffs
COUNTY	San Juan
STATE	New Mexico
LOCATION	1510'FNL & 800'FWL
SEC	33
TWP	32N
RGE	10W
Other Services	CDL, GR
Datum	Ground Level
Elev.	6010
Measured From	KB, 12 Ft. Above Permanent Datum
Elevations KB	6022
DF	6021
GL	6010

Date	11-18-76
Run No.	One
Depth – Driller	2946
Depth – Logger	2946
Btm. logged interval	2945
Type fluid in hole	Low Solid - Non-Dispersed
Density and Viscosity	12.0 / 60
pH and Fluid loss	8.5 / 18.8 cc
Source of Sample	Flowline
Max. rec. temp.	99
Location	5512 Farmington
Recorded by	Denton-Peters-Briscoe
Witnessed by	Smith-Bloom



CORE LABORATORIES

Company : Amoco Production Compny
Well : Ealum No.1
Location :
Co,State :

Field :
Formation : Picture Cliffs
Coring Fluid :
Elevation :

File No.:
Date : ~~13~~-Dec-1991
API No. : 17
Analysts:

CORE ANALYSIS RESULTS

(HYDROSTATIC CONFINEMENT)

SAMPLE NUMBER	DEPTH	NET OVERBURDEN (800 psi)			NET OVERBURDEN (1300 psi)			NET OVERBURDEN (1800 psi)			POROSITY (HELIUM)	GRAIN DENSITY	DESCRIPTION
		K∞	Kair	ϕ	K∞	Kair	ϕ	K∞	Kair	ϕ			
	ft	md	md	%	md	md	%	md	md	%	%	gm/cc	
					Plug Samples for Porosity and Permeability								
1	2814.0- 15.0										5.8	2.67	
2	2815.0- 16.0	0.008	0.016	4.5	0.002	0.002	4.2	<.001	0.002	4.0	4.9	2.67	
3	2816.0- 17.0										7.5	2.67	
4	2817.0- 18.0										4.6	2.67	
5	2818.0- 19.0										4.5	2.67	
6	2819.0- 20.0										6.4	2.66	
7	2820.0- 21.0										6.4	2.66	
8	2821.0- 22.0	0.055	0.081	9.8	0.035	0.058	9.6	0.025	0.043	9.5	9.8	2.67	
9	2822.0- 23.0	0.008	0.014	5.8	0.003	0.007	5.7	0.002	0.005	5.7	6.1	2.68	
10	2823.0- 24.0	0.024	0.032	4.1	0.007	0.012	3.9	0.003	0.006	3.8	4.2	2.65	
11	2824.0- 25.0	0.034	0.060	9.3	0.017	0.034	9.1	0.011	0.024	8.9	9.6	2.65	
12	2825.0- 26.0	0.058	0.098	11.2	0.033	0.061	11.0	0.024	0.046	10.9	11.9	2.66	
13	2826.0- 27.0	0.051	0.084	9.2	0.023	0.043	9.0	0.013	0.028	8.9	9.8	2.66	
14	2827.0- 28.0	0.031	0.049	6.7	0.013	0.025	6.4	0.008	0.016	6.3	7.0	2.69	
15	2828.0- 29.0	0.042	0.070	9.9	0.026	0.046	9.7	0.019	0.035	9.6	13.6	2.78	
16	2829.0- 30.0										10.9	2.66	
17	2830.0- 31.0	0.012	0.018	5.5	0.003	0.007	5.3	0.002	0.004	5.2	5.7	2.67	
18	2831.0- 32.0	0.098	0.170	11.7	0.066	0.126	11.5	0.053	0.105	11.4	12.0	2.66	
19	2832.0- 33.0	0.068	0.126	10.6	0.051	0.099	10.4	0.041	0.083	10.3	~~10.6~~ 10.9	2.66	
20	2833.0- 34.0	0.124	0.203	11.6	0.086	0.155	11.5	0.074	0.136	11.4	12.0	2.67	
21	2834.0- 35.0	0.147	0.238	12.0	0.120	0.201	11.8	0.106	0.180	11.7	12.1	2.66	
22	2835.0- 36.0	0.066	0.120	10.2	0.045	0.087	10.1	0.034	0.070	10.0	10.8	2.67	

CORE LABORATORIES

Company : Amoco Production Compny
Well : Ealum No.1

Field :
Formation : Picture Cliffs

File No.:
Date : 18-Dec-1991
17

CORE ANALYSIS RESULTS

(HYDROSTATIC CONFINEMENT)

SAMPLE NUMBER	DEPTH	NET OVERBURDEN (800 psi)			NET OVERBURDEN (1300 psi)			NET OVERBURDEN (1800 psi)			POROSITY (HELIUM)	GRAIN DENSITY	DESCRIPTION
		K∞	Kair	ϕ	K∞	Kair	ϕ	K∞	Kair	ϕ			
	ft	md	md	%	md	md	%	md	md	%	%	gm/cc	
23	2836.0- 37.0	0.046	0.085	10.7	0.029	0.058	10.5	0.021	0.045	10.4	11.1	2.69	
24	2837.0- 38.0	0.074	0.129	10.9	0.057	0.105	10.8	0.047	0.091	10.7	11.2	2.68	
25	2838.0- 39.0	0.199	0.307	12.1	0.172	0.271	12.0	0.158	0.251	11.9	12.5	2.67	
26	2839.0- 40.0	0.051	0.096	10.0	0.033	0.066	9.8	0.024	0.052	9.7	10.3	2.68	
27	2840.0- 41.0	0.025	0.045	7.6	0.015	0.028	7.4	0.010	0.020	7.2	7.8	2.69	
28	2841.0- 42.0	0.162	0.254	12.4	0.124	0.204	12.2	0.108	0.182	12.1	13.1	2.68	
29	2842.0- 43.0	0.176	0.274	13.1	0.156	0.249	13.0	0.147	0.234	12.9	13.2	2.68	
30	2843.0- 44.0	0.093	0.164	12.2	0.062	0.117	12.0	0.047	0.095	11.9	12.6	2.68	
31	2844.0- 45.0	0.103	0.173	12.3	0.082	0.144	12.1	0.073	0.131	12.0	12.2	2.67	
32	2845.0- 46.0	0.099	0.167	12.6	0.079	0.140	12.4	0.071	0.127	12.3	13.6	2.68	
33	2846.0- 47.0	0.036	0.069	9.7	0.020	0.045	9.6	0.015	0.034	9.4	9.9	2.68	
34	2847.0- 48.0	0.053	0.100	12.0	0.032	0.068	11.8	0.025	0.055	11.7	12.6	2.69	
35	2848.0- 49.0	0.029	0.054	9.4	0.015	0.030	9.2	0.010	0.022	9.1	9.4	2.69	
36	2849.0- 50.0	0.037	0.063	8.9	0.013	0.029	8.6	0.008	0.019	8.4	8.4	2.70	
37	2850.0- 51.0	0.041	0.063	9.1	0.018	0.030	8.9	0.011	0.019	8.7	9.4	2.70	
38	2851.0- 52.0	0.036	0.061	10.3	0.019	0.037	10.1	0.014	0.026	10.0	10.7	2.68	
39	2852.0- 53.0	0.020	0.032	8.7	0.008	0.015	8.4	0.005	0.011	8.3	8.9	2.69	
40	2853.0- 54.0	0.006	0.010	4.3	0.002	0.004	4.1	<.001	0.003	3.9	4.3	2.70	
41	2854.0- 55.0	0.019	0.035	9.9	0.010	0.019	9.7	0.007	0.014	9.6	10.2	2.70	
42	2855.0- 56.0	0.015	0.029	10.4							10.6	2.68	
43	2856.0- 57.0	0.074	0.100	10.5	0.033	0.055	10.3	0.020	0.035	10.1	10.8	2.68	
44	2857.0- 58.0										9.5	2.67	
45	2858.0- 59.0	0.021	0.027	5.5	0.004	0.009	5.2	0.002	0.005	5.1	5.7	2.70	
46	2859.0- 60.0										10.0	2.70	
47	2860.0- 61.0	0.018	0.028	9.1	0.006	0.013	8.9	0.004	0.008	8.8	9.5	2.71	
48	2861.0- 62.0										4.9	2.73	
49	2862.0- 63.0	0.014	0.020	8.8	0.005	0.009	8.5	0.004	0.006	3.4	9.1	2.69	
50	2863.0- 64.0	0.022	0.032	9.0	0.008	0.013	8.8	0.005	0.009	8.6	9.4	2.68	

Preliminary Data 1 - 2

CORE LABORATORIES

Company : Amoco Production Compny
Well : Ealum No.1

Field :
Formation : Picture Cliffs

File No.:
Date : ~~13~~ 17-Dec-1991

CORE ANALYSIS RESULTS

(HYDROSTATIC CONFINEMENT)

SAMPLE NUMBER	DEPTH	NET OVERBURDEN (800 psi)			NET OVERBURDEN (1300 psi)			NET OVERBURDEN (1800 psi)			POROSITY (HELIUM)	GRAIN DENSITY	DESCRIPTION
		K_∞	Kair	ϕ	K_∞	Kair	ϕ	K_∞	Kair	ϕ			
	ft	md	md	%	md	md	%	md	md	%	%	gm/cc	
51	2864.0- 65.0	0.020	0.027	8.2	0.006	0.011	7.9	0.004	0.007	7.7	8.5	2.69	
52	2865.0- 66.0	0.013	0.019	7.5	0.004	0.008	7.3	0.003	0.005	7.2	7.8	2.70	
53	2866.0- 67.0	0.013	0.016	7.4	0.004	0.006	7.1	0.002	0.004	7.0	7.7	2.71	
54	2867.0- 68.0	0.013	0.019	7.9	0.005	0.008	7.6	0.003	0.005	7.5	8.2	2.69	
55	2868.0- 69.0	0.015	0.019	7.6	0.004	0.008	7.3	0.003	0.005	7.2	7.9	2.70	

Preliminary Data 1 - 3

NMOCD CASE #10425

EXHIBIT #10

CORE ANALYSIS

Vandewart B #3
T29N-R8W Sec. 11

Scout Ticket

Dual Laterlog

Log

Core Analysis

72 Permeability Measurements

Average Permeability to air = .014

WRS COMPLETION REPORT

PI# 30-T-0012 05/23/85 SEC 11 TWP 29N RGE 8W PAGE 1

NMEX (STATE) SAN JUAN (COUNTY) 870FSL 1600FWL SEC (FOOTAGE) NW SE SW (SPOT)

TENNECO OIL (OPERATOR) D (WELL CLASS INIT) DG (FIN)

3 (WELL NO.) VANDEWART B (LEASE NAME)

6313KB (OPER ELEV) BASIN (FIELD POOL AREA)

API 30-045-26148-0000 (LEASE TYPE NO) (PERMIT OR WELL I.D NO.)

03/03/1985 (SPUD DATE) 04/22/1985 (COMP DATE) ROTARY (TYPE TOOL) GAS (STATUS)

7560 (PROJ. DEPTH) DAKOTA (PROJ. FORM) FOUR CORNERS DRLG (CONTRACTOR) 7

DTD 7550 (DRILLERS T.D.) FM/TD DAKOTA (LOG T.D.) (PLUG BACK TO) (OLD T.D.) (FORM T.D.)

WELL IDENTIFICATION/CHANGES

WHCS CODE # 30N029W00811371184

CASING/LINER DATA

CSG 9 5/8 @ 303 W/ 250 SACKS 01
CSG 7 @ 3619 W/ 325 SACKS 06
LNR 4 1/2 3428- 7547 W/ 445S007

INITIAL POTENTIAL

IPF 1284 MCFD 48/64CK
DAKOTA PERF 7296- 7515 GROSS 008
PERF 7296- 7312 7425- 7431 7451- 7454 7474- 7478
PERF 7512- 7515
ACID 7296- 7515 1300GALS
15% HCL
SWFR 7296- 7515 86000GALS 148000LBS SAND
ADDTVGELA
30#
TP 84 CP 422
SPTD HOLE W/500 GALS(7 1/2% HCL)

TYPE	FORMATION	DEPTH	SUBSEA	FORMATION	DEPTH	SUBSEA
LOG	OJO ALMO	2076	4237	KIRTLAND	2196	4117
LOG	FRUITLND	2743	3570	PIC CLIF	3008	3305
LOG	LEWIS	3145	3168	CLIF HSE	4720	1593
LOG	MENEFEE	4840	1473	PT LKOUT	5250	1063
LOG	MANCOS	5508	805	GALLUP	6446	-133

CONTINUED IC# 300457036084

TENNECO OIL D DG
3 VANDEWART B

TYPE	FORMATION	DEPTH	SUBSEA	FORMATION	DEPTH	SUBSEA
LOG	GREENHRN	7193	-880	GRANEROS	7252	-939
LOG	DAKOTA	7294	-981			

CORES

CORE 1 2959- 2968 REC 8.00FT FRUITLND CONV D002
NO DESCRIPTION AVAILABLE

CORE 2 2968- 2995 REC 26.00FT FRUITLND CONV D003
NO DESCRIPTION AVAILABLE

CORE 3 2995- 3055 REC 60.00FT FRUITLND CONV D004
NO DESCRIPTION AVAILABLE
OVERLAPS PIC CLIF

CORE 4 3055- 3105 REC 50.00FT PIC CLIF CONV D005
NO DESCRIPTION AVAILABLE

LOGS AND SURVEYS /INTERVAL,TYPE/

LOGS 295- 3584 DILL 1950- 3596 CDL 293- 3582 BHC
LOGS 293- 3582 SONL 293- 3582 CALP 3942- 7550 DILL
LOGS 3942- 7550 GRL 3942- 7550 CDL

HOLE DEVIATION /DEPTH,DIRECTION,ANGLE/

158	.8D	282	.5D	810	1.0D
1345	1.8D	1844	1.8D	2220	1.8D
2719	1.5D	2937	.8D	3437	1.0D
3590	.8D	4096	.8D	4589	.8D
5132	.8D	5649	1.3D	5901	1.8D
6152	2.5D	6340	1.8D	6598	1.8D
6849	1.5D	7097	1.5D	7277	1.8D
7532	1.8D				

MISCELLANEOUS

ACRES 1840

DRILLING PROGRESS DETAILS

TENNECO OIL

GEARHART

DUAL LATEROLOG

COMPANY

WELL VANDEWART B #3

FIELD

COUNTY STATE

LOCATION 870 FSL 1600 FWL

SEC 11 TWP 29N RGE 8W

Other Services

Permanent Datum Elev. K.B.

Log Measured From D.F.

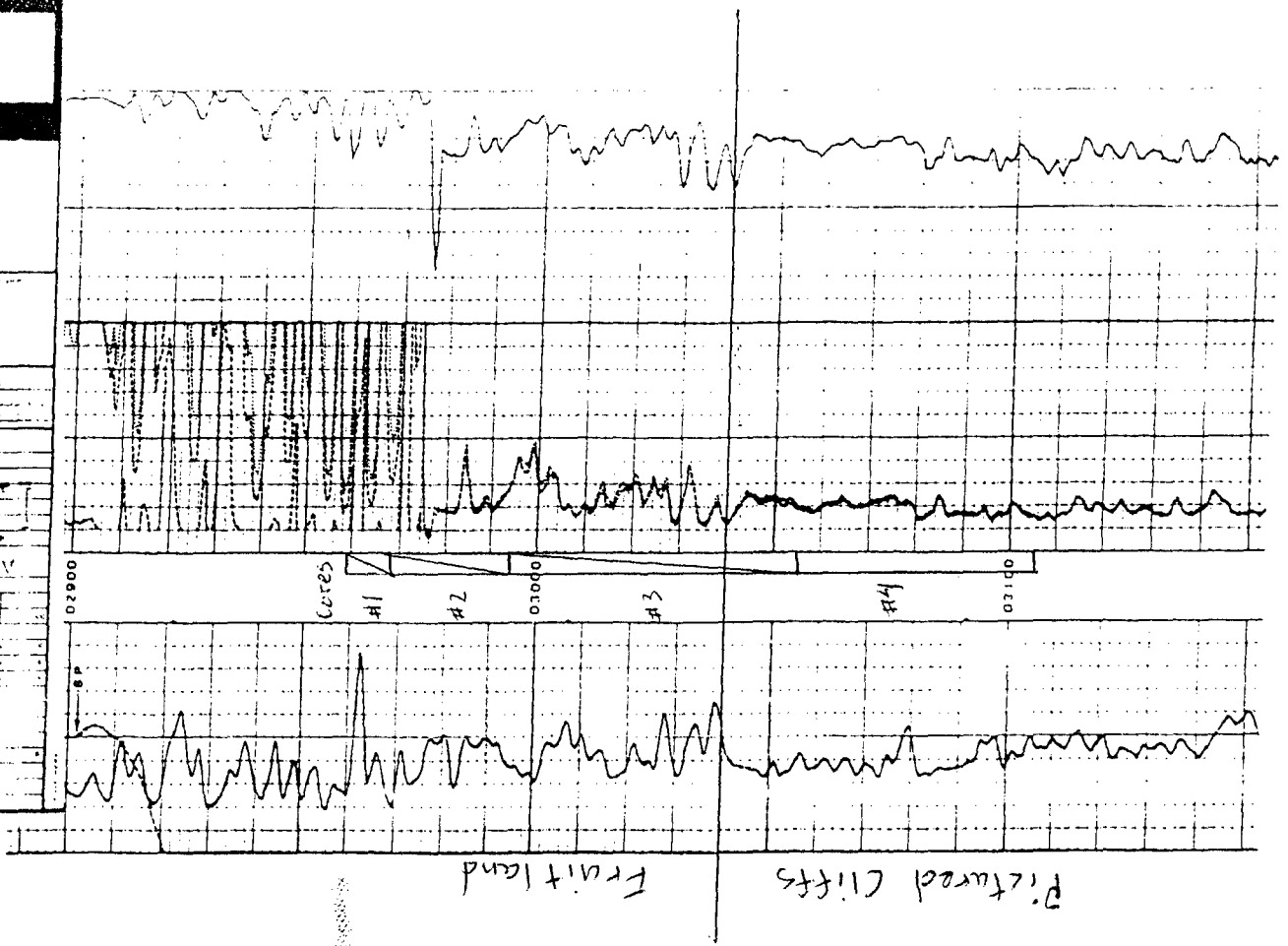
Drilling Measured From G.L.

RECEIVED

MAR 25

OIL CON. DIV.

DIST. 3



CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

TENNECO OIL COMPANY
VANDEWART B # 3
BLANCO PICTURED CLIFFS
SAN JUAN,NEW MEXICO

DATE : 14-MAR-1985
FORMATION : PICTURED CLIFFS
DRLG. FLUID: WBM
LOCATION : SE,SW SEC. 11-T29N-R8W

FILE NO : 3803-003378
ANALYSTS : DS;EV
ELEVATION: 6313 GL

CONVENTIONAL ANALYSIS-BOYLE'S LAW POROSITY

SAMPLE NUMBER	DEPTH	PERM. TO AIR (MD) MAXIMUM	PERM. TO AIR (MD) 90 DEG	POR. He	FLUID SATS. OIL	FLUID SATS. WTR	GRAIN DEN	DESCRIPTION
	FRUITLAND FORMATION CORE # 1 2959-2969							
	2959.0-68.0							SHALE & COAL - SLT/SD -- NO ANALYSIS
	2968.0-69.0							CORE LOSS
	FRUITLAND FORMATION CORE # 2 2969-2995							
	2969.0-95.0							SHALE & COAL - SLT/SD -- NO ANALYSIS
	PICTURED CLIFFS FORMATION CORE # 3 2995-3055							
	2995.0-98.0							SD SL/SLTY SL/SHY -- NO ANALYSIS
1	2998.0-99.0	<0.01		1.1	5.5	87.2	2.73	SD GRY FNGRN CALC/PYR
2	2999.0-00.0	<0.01		1.3	3.0	88.5	2.72	SD GRY FNGRN CALC/PYR
3	3000.0-01.0	<0.01		2.0	50.1	40.1	2.64	SD GRY FNGRN CALC/PYR SL/SHY
4	3001.0-02.0	<0.01		4.9	28.8	57.6	2.65	SD GRY FNGRN CALC/PYR
	3002.0-19.0							SD SL/SLTY SL/SHY -- NO ANALYSIS
5	3019.0-20.0	<0.01		4.9	0.0	75.9	2.63	SD GRY FNGRN PYR SL/SHY
6	3020.0-21.0	0.01		2.6	0.0	66.9	2.63	SD GRY FNGRN PYR SL/SHY
7	3021.0-22.0	<0.01		4.4	13.5	60.7	2.64	SD GRY FNGRN PYR SL/SHY
8	3022.0-23.0	<0.01		3.8	0.0	85.8	2.64	SD GRY FNGRN PYR SL/SHY
9	3023.0-24.0	<0.01		2.3	0.0	88.2	2.67	SD GRY FNGRN PYR/CALC
	3024.0-25.0							SHALE SL/SD -- NO ANALYSIS
10	3025.0-26.0	<0.01		2.2	0.0	87.9	2.62	SD GRY FNGRN PYR SL/SHY
11	3026.0-27.0	<0.01		2.4	0.0	78.9	2.63	SD GRY FNGRN PYR SL/SHY
12	3027.0-28.0	<0.01		3.4	0.0	76.6	2.64	SD GRY FNGRN PYR SL/SHY
13	3028.0-29.0	0.01		2.2	0.0	77.1	2.63	SD GRN FNGRN PYR SL/SHY

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

TENNECO OIL COMPANY
VANDEWART B # 3

DATE : 14-MAR-1985
FORMATION : PICTURED CLIFFS

FILE NO : 3803-003378
ANALYSTS : DS;EV

CONVENTIONAL ANALYSIS-BOYLE'S LAW POROSITY

SAMPLE NUMBER	DEPTH	PERM. TO AIR (MD) MAXIMUM 90 DEG	POR. He	FLUID SATS. OIL	WTR	GRAIN DEN	DESCRIPTION
14	3029.0-30.0	0.01	2.6	0.0	79.2	2.65	SD GRY FNGRN PYR SL/SHY
	3030.0-32.0						SHALE -- NO ANALYSIS
15	3032.0-33.0	0.01	2.4	17.0	75.5	2.62	SD GRY FNGRN PYR SL/SHY
16	3033.0-34.0	0.02	2.5	11.7	73.8	2.63	SD GRY FNGRN PYR SL/SHY
17	3034.0-35.0	<0.01	2.0	63.7	31.8	2.66	SD GRY FNGRN CALC/PYR
Top PC —	3035.0-43.0						SHALE & SANDSTONE -- NO ANALYSIS
18	3043.0-44.0	<0.01	2.2	2.0	83.0	2.65	SD GRY FNGRN PYR SL/CALC
19	3044.0-45.0	0.01	3.7	0.0	87.0	2.64	SD GRY FNGRN PYR SL/CALC
20	3045.0-46.0	0.01	7.7	1.9	41.7	2.65	SD GRY FNGRN PYR SL/CALC
21	3046.0-47.0	0.01	5.5	0.0	44.3	2.65	SD GRY FN-MDGRN PYR SL/CALC
22	3047.0-48.0	<0.01	5.4	1.6	64.6	2.71	SD GRY FN-MDGRN CALC/PYR
23	3048.0-49.0	0.01	7.7	1.3	51.3	2.66	SD GRY FN-MDGRN CALC/PYR
24	3049.0-50.0	0.01	8.2	0.0	51.5	2.66	SD GRY FN-MDGRN CALC/PYR
25	3050.0-51.0	<0.01	9.2	0.0	26.9	2.66	SD GRY FN-MDGRN CALC/PYR
26	3051.0-52.0	0.02	9.7	1.2	49.1	2.68	SD GRY FN-MDGRN CALC/PYR
27	3052.0-53.0	0.01	8.6	0.0	58.0	2.67	SD GRY FN-MDGRN CALC/PYR
28	3053.0-54.0	0.01	9.2	0.0	73.2	2.68	SD GRY FN-MDGRN CALC/PYR
29	3054.0-55.0	0.01	5.9	0.0	76.1	2.68	SD GRY FG-MDGRN CALC/PYR
	PICTURED CLIFFS FORMATION CORE # 4 3055-3106						
30	3055.0-56.0	0.01	7.3	1.9	77.3	2.70	SD GRY FN-MDGRN CALC/PYR
31	3056.0-57.0	0.01	5.7	0.0	76.2	2.69	SD GRY FN-MDGRN CALC/PYR
32	3057.0-58.0	0.01	5.6	0.0	69.8	2.68	SD GRY FN-MDGRN CALC/PYR
33	3058.0-59.0	<0.01	6.6	0.0	82.2	2.68	SD GRY FN-MDGRN CALC/PYR
34	3059.0-60.0	0.06	6.3	0.0	79.0	2.68	SD GRY FN-MDGRN CALC/PYR
35	3060.0-61.0	0.01	5.2	0.0	72.9	2.68	SD GRY FN-MDGRN CALC/PYR
36	3061.0-62.0	0.01	5.7	0.0	80.0	2.68	SD GRY FN-MDGRN CALC/PYR
37	3062.0-63.0	0.06	6.7	1.5	72.9	2.67	SD GRY FN-MDGRN CALC/PYR
38	3063.0-64.0	0.01	8.9	0.0	60.1	2.67	SD GRY FN-MDGRN CALC/PYR

CORE LABORATORIES, INC.

Petroleum Reservoir Engineering

DALLAS, TEXAS

TENNECO OIL COMPANY
VANDEWART B # 3

DATE : 14-MAR-1985
FORMATION : PICTURED CLIFFS

FILE NO : 3803-003378
ANALYSTS : DS;EV

CONVENTIONAL ANALYSIS-BOYLE'S LAW POROSITY

SAMPLE NUMBER	DEPTH	PERM. TO AIR (MD) MAXIMUM 90 DEG	POR. He	FLUID SATS. OIL	WTR	GRAIN DEN	DESCRIPTION
39	3064.0-65.0	0.02	8.5	0.0	71.6	2.67	SD GRY FN-MDGRN CALC/PYR
40	3065.0-66.0	0.01	8.0	0.8	41.7	2.68	SD GRY FN-MDGRN CALC/PYR
41	3066.0-67.0	0.03	10.1	0.9	46.7	2.68	SD GRY FN-MDGRN CALC/PYR
42	3067.0-68.0	0.01	9.2	0.0	65.0	2.68	SD GRY FN-MDGRN CALC/PYR
43	3068.0-69.0	0.01	7.4	3.2	70.8	2.68	SD GRY FN-MDGRN CALC/PYR
44	3069.0-70.0	0.02	8.8	0.0	69.9	2.67	SD GRY FN-MDGRN CALC/PYR
45	3070.0-71.0	0.01	7.9	0.0	65.4	2.67	SD GRY FN-MDGRN CALC/PYR
46	3071.0-72.0	0.01	8.6	0.0	70.5	2.68	SD GRY FN-MDGRN CALC/PYR
47	3072.0-73.0	0.02	10.1	0.0	61.9	2.68	SD GRY FN-MDGRN CALC/PYR
48	3073.0-74.0	0.02	9.7	0.0	64.0	2.67	SD GRY FN-MDGRN CALC/PYR
49	3074.0-75.0	0.02	10.0	1.1	46.5	2.68	SD GRY FN-MDGRN CALC/PYR
50	3075.0-76.0	0.02	10.6	2.1	48.2	2.68	SD GRY FN-MDGRN CALC/PYR
51	3076.0-77.0	0.03	10.5	1.6	36.8	2.67	SD GRY FN-MDGRN CALC/PYR
52	3077.0-78.0	0.03	10.4	1.8	44.4	2.67	SD GRY FN-MDGRN CALC/PYR
53	3078.0-79.0	0.02	9.4	1.1	46.3	2.67	SD GRY FN-MDGRN CALC/PYR
54	3079.0-80.0	0.02	10.4	0.9	50.9	2.67	SD GRY FN-MDGRN CALC/PYR
55	3080.0-81.0	0.03	11.4	2.5	25.1	2.68	SD GRY FN-MDGRN CALC/PYR
56	3081.0-82.0	0.02	9.6	2.0	77.1	2.71	SD GRY FN-MDGRN CALC/PYR
57	3082.0-83.0	<0.01	9.7	0.0	75.7	2.70	SD GRY FN-MDGRN CALC/PYR
	3083.0-84.0						SD SL/SLTY SL/SHY -- NO ANALYSIS
58	3084.0-85.0	<0.01	7.9	0.0	73.2	2.68	SD GRY FN-MDGRN CALC/PYR
59	3085.0-86.0	0.01	8.8	0.0	66.1	2.68	SD GRY FN-MDGRN CALC/PYR
60	3086.0-87.0	<0.01	2.8	0.0	71.3	2.68	SD GRY FN-MDGRN CALC/PYR
61	3087.0-88.0	<0.01	3.1	0.0	74.9	2.69	SD GRY FN-MDGRN CALC/PYR
62	3088.0-89.0	0.01	8.3	0.0	67.3	2.67	SD GRY FN-MDGRN CALC/PYR
63	3089.0-90.0	0.02	7.4	0.0	75.8	2.67	SD GRY FN-MDGRN CALC/PYR
64	3090.0-91.0	<0.01	7.1	0.0	72.5	2.67	SD GRY FN-MDGRN CALC/PYR
65	3091.0-92.0	<0.01	7.8	0.0	81.8	2.67	SD GRY FN-MDGRN CALC/PYR
66	3092.0-93.0	0.01	6.5	0.0	82.1	2.67	SD GRY FN-MDGRN CALC/PYR
67	3093.0-94.0	0.01	7.1	0.0	82.6	2.67	SD GRY FN-MDGRN CALC/PYR

CORE LABORATORIES, INC.

Petroleum Reservoir Engineering

DALLAS, TEXAS

TENNECO OIL COMPANY
VANDEWART B # 3

DATE : 14-MAR-1985
FORMATION : PICTURED CLIFFS

FILE NO : 3803-003378
ANALYSTS : DS;EV

CONVENTIONAL ANALYSIS-BOYLE'S LAW POROSITY

SAMPLE NUMBER	DEPTH	PERM. TO AIR (MD) MAXIMUM	90 DEG	POR. He	FLUID SATS. OIL	WTR	GRAIN DEN	DESCRIPTION
68	3094.0-95.0	<0.01		6.9	0.0	78.1	2.67	SD GRY FN-MDGRN CALC/PYR
69	3095.0-96.0	<0.01		6.0	0.0	77.8	2.67	SD GRY FN-MDGRN CALC/PYR
70	3096.0-97.0	<0.01		3.7	0.0	86.2	2.68	SD GRY FN-MDGRN CALC/PYR
71	3097.0-98.0	0.01		4.4	0.0	78.5	2.67	SD GRY FN-MDGRN CALC/PYR
	3098.0-02.0							SANDSTONE SLT/SHY -- NO ANALYSIS
72	3102.0-03.0	<0.01		4.1	0.0	82.9	2.69	SD GRY FN-MDGRN CALC/PYR
73	3103.0-04.0	<0.01		4.1	0.0	84.6	2.69	SD GRY FN-MDGRN CALC/PYR
	3104.0-06.0							SANDSTONE SLT/SHY -- NO ANALYSIS

NMOCD CASE #10425

EXHIBIT #11

Scout Tickets from non-commercial wells
in the northern Tank Mountain Area

Well Name	Location	Status
San Juan 32-9 Unit #80	T32N-R10W Sec. 23	D&A
Compton Gas Com #1	T32N-R10W Sec. 33	D&A
Schneider Gas Com B #1	T32N-R10W Sec. 28	D&A
Scott #18	T32N-R10W Sec. 39	SI-no production reported
Ealum Gas Com B #1	T32N-R10W Sec. 33	D&A
Keys Gas Com F #1	T32N-R10W Sec. 27	SI-no production reported
Leeper Gas Com-B	T32N-R10W Sec. 34	TA-no production reported

T32N R10W WELLS

API NBR: 3004521281000 STATE: NMEX COUNTY: SAN JUAN
MERIDIAN: NEW MEXICO MERIDN CODE: 21
PROVINCE: SAN JUAN BASIN PROV CODE: 202

OPER: EL PASO NATURAL GAS OPER CODE: 025685
LEASE: SAN JUAN 32-9 UNIT WELL: 90 LEASE CODE:
FIELD: WF MESA FIELD CODE: 060555

T32N R10W SEC 23 SPOT: NE SW SW
FOOTAGES: 800FSL 850FWL F/SEC LN

OPER ELEV: 6976GR LOG TD:
DRKM ELEV: GR FORM@TD: 604PCCF

OTHER DEPTHS: GALL 3894 WSTG PBTD OLDTD
UNIT: PROJ DEPTH: 3900 PROJ FORM: 604FRLD

STATUS: D&A SPUD DATE: 05 22 1973
GEOLOGIC CLASS: INL-6 FNL-0 COMP DATE: 04 15 1978
ALPHA CLASS: INL-0 FNL-0
ADD FORM:

LATITUDE: 36.96513 LONGITUDE: 107.85638

CASING:
8 5/8 @ 139 W/ 166SX
2 7/8 @ 3894 W/ 565SX

CONTR: YOUNG TOOLS: ROTARY RIG NBR:

FORMATION TOPS: (SOURCE,NAMES,DEPTHS,SHOWS)
STUDY: INTERPRETER: PI

FORMATION DEPTHS AND SHOW CODES
LOG 604FRLD 3375 0 604PCCF 3790 0

INITIAL POTENTIAL TESTS:

PRODUCTION TESTS:

604FRLD PERF 2/FT 3480-3718 GROSS
SAND 3480-3718 14420 GALS 11000 LBS SAND FBRKP 2150
N FPDADF: MCFD ATP: 3000 ISP: 1650
GOOD 3480-3718 - - PBTD 4
NARRATIVE: 60ZB W/300 SX

604PCCF PERF 1/FT 3790-3860 GROSS
PERF 3790-3802 3812-3822 3830-3836 3852-3860
SNFR 3790-3860 43120 GALS 44000 LBS SAND FBRKP
RATE: B/MIN ADDTV: STAGES: 10/20

T32N R10W WELLS

API NBR: 3004523098000 STATE: NMEX COUNTY: SAN JUAN
MERIDIAN: NEW MEXICO MERION CODE: 21
PROVINCE: SAN JUAN BASIN PROV CODE: 202

OPER: AMOCO PROD OPER CODE: 065005
LEASE: COMPTON GAS COM WELL: 1 LEASE CODE:
FIELD: BLANCO FIELD CODE: 008500

T032N R010W SEC 33 SPOT: SW NW SW
FOOTAGES: 1860FSL 660FWL F/SEC LN

OPER ELEV: 5997KB 5986GR LOG TD:
COMM ELEV: GR FORM@TD: 604PCCF

OTHER DEPTHS: DRLR 3000 WSTD PBTD OLOTD
PERMIT: PROJ DEPTH: 2986 PROJ FORM: 604PCCF

STATUS: D&A SPUD DATE: 02 04 1979
NUMERIC CLASS: INL-6 FNL-0 COMP DATE: 05 10 1979
ALPHA CLASS: INL-0 FNL-0
PROD FORM:

LATITUDE: 36.79963 LONGITUDE: 107.89379

CASING:
8 5/8 @ 283 W/ 300SX
4 1/2 @ 3000 W/ 763SX

CONTR: BRINKERHOFF DRLG TOOLS: ROTARY RIG NBR:

FORMATION TOPS: (SOURCE,NAMES,DEPTHS,SHOWS)
STUDY: INTERPRETER: PI

FORMATION DEPTHS AND SHOW CODES
LOG 604FRLD 2380 604PCCF 2797 0

INITIAL POTENTIAL TESTS:

PRODUCTION TESTS:

/ 604PCCF PERF JET 2/FT 2802-2876 GROSS
PERF 2802-2804 2818-2840 2856-2876
ACID 2802-2876 500 GALS FBRKP
RATE: B/MIN ADDTV: STAGES: 15% HCL
SWFR 2802-2876 54440 GALS 107800 LBS SAND FBRKP
N FFCACF: MCFD ATP: 1650 ISP:

DRILL STEM TESTS:

OTHER WELL INFO:

T32N R10W WELLS

00003 90-10-30 ********** 80 OF 160 WELLS ********** 11:29:13

API NBR: 30045221780000 STATE: NMEX COUNTY: SAN JUAN
MERIDIAN: NEW MEXICO MERIDN CODE: 21
PROVINCE: SAN JUAN BASIN PROV CODE: 202

OPER: AMOCO PROD OPER CODE: 065005
LEASE: SCHNEIDER GAS COM-B WELL: 1 LEASE CODE:
FIELD: BLANCO FIELD CODE: 009500

T032N R010W SEC 28 SPOT: NE SW SW
FOOTAGES: 1110FSL 1185FWL F/SEC LN

OPER ELEV: 6070K8 6059GR LOG TD: 3053
COMM ELEV: GR FORM@TD: 604PCCF

OTHER DEPTHS: DRLR 3050 WSTD PBTD CLDTD
PERMIT: PROJ DEPTH: 3053 PROJ FORM: 604PCCF

STATUS: D&A SPUD DATE: 12 31 1976
NUMERIC CLASS: INL-6 FNL-0 COMP DATE: 09 14 1977
ALPHA CLASS: INL-0 FNL-0
PROD FORM:

LATITUDE: 36.95202 LONGITUDE: 107.89200

CASING:
8 5/8 @ 257 W/ 200SX
4 1/2 @ 3050 W/ 930SX

TUBING INFO: 2 3/8" @ 2860

CONTR: SIGNAL TOOLS: ROTARY RIG NBR:

FORMATION TOPS: (SOURCE,NAMES,DEPTHS,SHOWS)
STUDY: INTERPRETER: PI

FORMATION DEPTHS AND SHOW CODES
LOG 604FRLD 2826 0

INITIAL POTENTIAL TESTS:

PRODUCTION TESTS: PCCF Test

PERF JET 1/FT 2878-2969 GROSS
PERF 2878-2889 2893-2969 - -
ACID 2878-2969 500 GALS FBRKP
RATE: B/MIN ADDTV:HCL STAGES: 15%
SEFR 2878-2969 30000 GALS 60000 LBS SAND FBRKP
RATE: B/MIN ADDTV: STAGES: 3000 GALS PAD
BHP: @ 3053 FT BHT: 110F TUBING SIZE: " @ FT REF DATUM
N CPCADF: MCFD ATP: 1400 ISP: 1300
SQZD 2878-2969 - - PBTD #

T32N R10W WELLS

00003 90-10-30 ********** 142 OF 160 WELLS ********** 11:30:56

API NBR: 3004522074000 STATE: NMEX COUNTY: SAN JUAN
MERIDIAN: NEW MEXICO MERION CODE: 21
PROVINCE: SAN JUAN BASIN PROV CODE: 202

OPER: EL PASO NATURAL GAS OPER CODE: 025685
LEASE: SCOTT WELL: 18 LEASE CODE:
FIELD: BLANCO FIELD CODE: 008500

T32N R10W SEC 24 SPOT: SE NW NE
FOOTAGES: 1160FNL 1520FEL F/SEC LN

OPER ELEV: 6187GR LOG TO:
CONN ELEV: GR FORM@TD: 604PCCF

OTHER DEPTHS: DRLR 3154 WSTD PBTD 3142 OLDTD
PERMIT: PROJ DEPTH: 3000 PROJ FORM: 604PCCF

STATUS: GAS SPUD DATE: 10 11 1977
NUMERIC CLASS: INL-6 FNL-2 COMP DATE: 10 20 1977
ALPHA CLASS: INL-D FNL-DG
PROD FORM: 604PCCF

LATITUDE: 36.94559 LONGITUDE: 107.86536

CASING:
8 5/8 @ 136 W/ 106SX
2 7/8 @ 3154 W/ 807SX

CONTR: AZTEC TOOLS: ROTARY RIG NBR:

FORMATION TOPS: (SOURCE,NAMES,DEPTHS,SHOWS)
STUDY: INTERPRETER: PI

FORMATION DEPTHS AND SHOW CODES
LOG 604PCCF 3006 7

INITIAL POTENTIAL TESTS:

604PCCF PERF / 3012-3105 GROSS
IPF TUB CUT % /64CK HRS
PERF 3012-3012 3019-3019 3030-3030 3040-3040
PERF 3066-3066 3078-3078 3095-3095 3105-3105
SWFR 3012-3105 63800 GALS 62000 LBS SAND FBRKP
NARRATIVE: SHUT IN
IP NOT AVAILABLE

PRODUCTION TESTS:

DRILL STEM TESTS:

OTHER WELL INFO:

T32N R10W WELLS

00002 90-10-30 ********** 128 OF 160 WELLS ********** 11:30:32

API NBR: 3004522177000 STATE: NMEX COUNTY: SAN JUAN
MERIDIAN: NEW MEXICO MERIDN CODE: 21
PROVINCE: SAN JUAN BASIN PROV CODE: 202

OPER: AMOCO PROD Ealum Gas Com B #1 OPER CODE: 005005
LEASE: ~~CAIN GAS COM~~ WELL: ~~2~~ LEASE CODE:
FIELD: MT MEBO FIELD CODE: 060555

T032N R010W SEC 33 SPOT: NE SW NW
FOOTAGES: 1510FNL 800FWL F/SEC LN

OPER ELEV: 6010GR LOG TO:
COMM ELEV: GR FORM@TD: 604PCCF

OTHER DEPTHS: DRLR 2946 WSTD PBTD OLDTD
PERMIT: PROJ DEPTH: 3050 PROJ FORM: 604PCCF

STATUS: D&A SPUD DATE: 11 03 1976
NUMERIC CLASS: INL-6 FNL-0 COMP DATE: 12 10 1976
ALPHA CLASS: INL-0 FNL-0
PROD FORM:

LATITUDE: 36.94483 LONGITUDE: 107.89325

CASING:
8 5/8 @ 275 W/ 250SX
4 1/2 @ 2946 W/ 680SX

TUBING INFO: 2 3/8" @ 2805

CONTR: SIGNAL TOOLS: ROTARY RIG NBR:

INITIAL POTENTIAL TESTS:

PRODUCTION TESTS:

PCCF
~~604FRLD~~ PERF 2/FT 2824-2902 GROSS
PERF 2824-2857 2890-2902 - ~
SFFR 2824-2902 660000 GALS 60000 LBS SAND FBRKP
RATE: 21 B/HIN ADDTV:NTGN STAGES: 630 SCF/BBL
N FPCAOF: MCFD ATP: 1550 ISP: 1450
NARRATIVE: 1% KCL-WTR-FOAM, 12000# 20/40,
48000# 10/20 SD
GAUGE NOT RPTD
SPTD HOLE 500 GALS(15% HCL)

604FRLD PERF 2/FT 2782-2800
NARRATIVE: GAUGE NOT RPTD
SPTD HOLE W/250 GALS(7 1/2% HCL)

DRILL STEM TESTS:

CORE DESCRIPTIONS:
CORE 1 2782-2802 RCVRY 18.00FT CONV 0
CORE 2 ~~604FRLD~~ PCCF 2819-2874 RCVRY 55.00FT CONV 0

OTHER WELL INFO:

DRILLING SHOWS:
2782-2802 # COAL -

API NBR: 3004523097000 STATE: NMEX COUNTY: SAN JUAN
MERIDIAN: NEW MEXICO MERIDN CODE: 21
PROVINCE: SAN JUAN BASIN PROV CODE: 202

OPER: AMOCO PROD OPER CODE: 065005
LEASE: GARDNER GAS COM WELL: 1 LEASE CODE:
FIELD: BLANCO FIELD CODE: 008500

T32N R10W SEC 33 SPOT: SW NE SE
FOOTAGES: 1470FSL 1290FEL F/SEC LN

GR ELEV: 5874KB 5863GR LOG TO:
DRM ELEV: LS GR FORM@TD: 604PCCF

OTHER DEPTHS: BRLR 2926 WSTD PBTD OLOTD
PERMIT: PROJ DEPTH: 3000 PROJ FORM: 604PCCF

STATUS: GAS SPUD DATE: 02 13 1979
NUMERIC CLASS: INL-6 FNL-2 COMP DATE: 06 05 1979
ALPHA CLASS: INL-D FNL-DG
PROD FORM: 604PCCF

LATITUDE: 36.93856 LONGITUDE: 107.88214

CASING:
8 5/8 @ 285 W/ 300SX
4 1/2 @ 2926 W/ 620SX

TUBING INFO: 2 3/8" @ 2731

CONTR: BRINKERHOFF TOOLS: ROTARY RIG NBR:

FORMATION TOPS: (SOURCE,NAMES,DEPTHS,SHOWS)
STUDY: INTERPRETER: PI

FORMATION DEPTHS AND SHOW CODES
LOG 604FRLD 2090 604PCCF 2690 7

INITIAL POTENTIAL TESTS:

604PCCF PERF 2/FT 2709-2727
IFP 214MCFD CUT % 48/64CK 24HRS
ACID 2709-2727 FBRKP
SFFR 2709-2727 FBRKP
TP: 6 CP: 126 SIPT: SICP: CAOF: 219 MCFD

PRODUCTION TESTS:

604PCCF PERF 2/FT 2709-2727
FOTF 52MCFD 28W CUT % 17/64CK 24HRS
ACID 2709-2727 500 GALS FBRKP

RATE: B/MIN ADDTV:HCL STAGES: 15%
SFFR 2709-2727 27000 GALS 54000 LBS SAND FBRKP
TP: 285 CP: SIPT: SICP: CAOF: MCFD
N FPCAOF: MCFD ATP: 1600 ISP:

DRILL STEM TESTS:

OTHER WELL INFO:

LOG SURVEYS:
00000-02905 GRL # 00000-02905 NEUT #

API NBR: 30045213120000 STATE: NMEX COUNTY: SAN JUAN
MERIDIAN: NEW MEXICO MERIDN CODE: 21
PROVINCE: SAN JUAN BASIN PROV CODE: 202

OPER: AMOCO PRODUCTION OPER CODE: 065005
LEASE: KEYS GAS COM F WELL: 1 LEASE CODE:
FIELD: CEDAR HILL FIELD CODE: 012290

T032N R010W SEC 27 SPOT: SW NE SW
FOOTAGES: 1510FSL 1685FWL F/SEC LN

OPER ELEV: 5938KB 5926GR LOG TD:
COMM ELEV: GR FORM@TD: 604PCCF

OTHER DEPTHS: DRLR 2900 WSTD PBTD 2720 OLDTD
PERMIT: PROJ DEPTH: 2950 PROJ FORM: 604FRLD

STATUS: GAS SPUD DATE: 10 03 1973
NUMERIC CLASS: INL-6 FNL-2 COMP DATE: 11 26 1973
ALPHA CLASS: INL-O FNL-OG
PROD FORM: 609CRCS

LATITUDE: 36.95291 LONGITUDE: 107.87211

CASING:
8 5/8 @ 250 W/ 200SX
4 1/2 @ 2886 W/ 750SX

TUBING INFO: 1 1/4" @ 2442

CONTR: ARAPAHOE TOOLS: ROTARY RIG NBR:

FORMATION TOPS: (SOURCE,NAMES,DEPTHS,SHOWS)
STUDY: INTERPRETER: PI

FORMATION DEPTHS AND SHOW CODES
LOG 6040JAM 1098 609CRCS 1670 7 604PCCF 2772 0

STUDY: INTERPRETER: PI

INITIAL POTENTIAL TESTS:

609CRCS PERF 2/FT 2451-2676 GROSS
SWFR 2451-2676 41916 GALS 40000 LBS SAND FBRKP
TP: 15 CP: 232 SIPT: SICP: CAOF: 337 MCFD
NARRATIVE: PROD ZONE - KIRTLAND /FRUITLAND
SHUT IN

PRODUCTION TESTS:
SWFR 2451-2676 41916 GALS 40000 LBS SAND FBRKP
SWFR 2780-2836 39000 GALS 40000 LBS SAND FBRKP

SQZD 2780-2836 - - PBTD ‡
NARRATIVE: SQZD W/100 SXS

Got PCCF

[redacted] 2/FT 2780-2836 GROSS
SWFR 2451-2676 41916 GALS 40000 LBS SAND FBRKP
SWFR 2780-2836 39000 GALS 40000 LBS SAND FBRKP
SQZD 2780-2836 - - PBTD ‡
NARRATIVE: SQZD W/100 SXS
SWFR 2451-2676 41916 GALS 40000 LBS SAND FBRKP
SWFR 2780-2836 39000 GALS 40000 LBS SAND FBRKP
SQZD 2780-2836 - - PBTD ‡
NARRATIVE: SQZD W/100 SXS

DRILL STEM TESTS:

OTHER WELL INFO:

LOG SURVEYS:
‡ IES ‡ ‡ GRL ‡
‡ DENL ‡

API NBR: 30045221900000 STATE: NMEX COUNTY: SAN JUAN
MERIDIAN: NEW MEXICO MERIDN CODE: 21
PROVINCE: SAN JUAN BASIN PROV CODE: 202

OPER: AMOCO PROD OPER CODE: 065005
LEASE: LEEPER GAS COM-B WELL: 1 LEASE CODE:
FIELD: BLANCO FIELD CODE: 008500

T032N R010W SEC 34 SPOT: SW NE NW
FOOTAGES: 1110FNL 1450FWL F/SEC LN

OPER ELEV: 5893KB 5882GR LOG TD: 2794
COMM ELEV: GR FORM@TD: 604PCCF

OTHER DEPTHS: DRLR 2853 WSTD PBTD 2812 OLDTD
PERMIT: PROJ DEPTH: 3050 PROJ FORM: 604PCCF

STATUS: TA SPUD DATE: 12 12 1976
NUMERIC CLASS: INL-6 FNL-0 COMP DATE: 06 17 1977
ALPHA CLASS: INL-0 FNL-0
PROD FORM:

LATITUDE: 36.94573 LONGITUDE: 107.87285

CASING:
8 5/8 @ 257 W/ 250SX
4 1/2 @ 2853 W/ 770SX

TUBING INFO: 2 3/8" @ 2719

CONTR: SIGNAL TOOLS: ROTARY RIG NBR:

FORMATION TOPS: (SOURCE,NAMES,DEPTHS,SHOWS)
STUDY: INTERPRETER: PI

FORMATION DEPTHS AND SHOW CODES
LOG 604FRLD 2418 0 604PCCF 2704 0

INITIAL POTENTIAL TESTS:

PRODUCTION TESTS:

604FRLD PERF 6/FT 2418-2690 GROSS
PERF 2418-2432 2444-2453 2660-2690 -
ACID 2418-2690 500 GALS FBRKP
RATE: B/MIN ADDTV:HCL STAGES: 15%
SEFR 2418-2690 90820 GALS 86000 LBS SAND FBRKP
N FPCAOF: MCFD ATP: ISP: 1700

604PCCF PERF 1/FT 2704-2727 GROSS
PERF 2704-2714 2718-2720 2723-2727 -

SEFR 2704-2727 15000 GALS 30000 LBS SAND FBRKP 2300
RATE: 24 B/MIN ADDTV: STAGES: 1500 GAL PAD

604FRLD PERF JET 2/FT 2660-2690
ACID 2660-2690 200 GALS FBRKP
RATE: B/MIN ADDTV:HCL STAGES:
SEFR 2660-2690 42000 GALS 40000 LBS SAND FBRKP

604FRLD PERF JET 2/FT 2418-2453 GROSS
PERF 2418-2432 2444-2453 - -
ACID 2418-2453 200 GALS FBRKP
RATE: B/MIN ADDTV:HCL STAGES:
SEFR 2418-2453 44000 GALS 40000 LBS SAND FBRKP
N FPCAOF: MCFD ATP: 2400 ISP: 2000

DRILL STEM TESTS:

OTHER WELL INFO:

LOG SURVEYS:
IES # # CDL
DRILLING FLUIDS
TYPE DEPTH FWTR 2800
BIT RECORD
BIT NO 01 10 3/4" FTGE 257 MIN WT MAX WT RPM
BIT NO 02 7 7/8" FTGE MIN WT MAX WT RPM

San Juan #32-9 Tight Gas Sand Credit Analysis

EXHIBIT #12

Southern Ute 13-1
NE 13-32N-9W
La Plata Co., CO

An evaluation of the reservoir permeability was made for the nearest Pictured Cliffs production North of the area proposed for qualification. Based upon initial reservoir conditions and calculated Reservoir Rock and Fluid Properties an order of magnitude estimate of reservoir permeability was made using the equation for infinite acting radial flow. The equation, data input, and results are listed below. The first month's production average was used to compute the daily rate expected from the parameters used in the equation. The well analysis resulted in a permeability magnitude less than 0.1 millidarcy (md).

INFINITE ACTING RADIAL FLOW EQUATION

$$Q_g = \frac{k_g h(P_i^2 - P_{wf}^2) * [\log(k_g t/\phi\mu c_t r_w^2) - 3.23 + .87\ S]^{-1}}{1638\mu\ T\ Z}$$

Reservoir Rock and Fluid Properties

	S. UTE 13-1
Sp Gr	.60
T (R)	580
μavg (cp)	.014
Zavg	.86
Pi (psig)	1350
Pwf (psig)	300
S (Stimulated Skin)	-3
h (feet)	74
ct (psi-1)	$.9277 \times 10^{-3}$
rw (ft)	17.5
Based upon Fracture length	
t (hrs)	360
Ist month	385
avg rate (mcfd) State Report	

CALCULATION RESULTS

Permeability (Md)	.069

EXHIBIT 12

Assumptions used to determine physical parameters used in the infinite acting radial flow equation. To determine an effective wellbore radius for a hydraulic fractured well the following correlation was used.

$L = 2R_e e^{-s}$

L = Fracture half length

R_e = Effective wellbore radius

S = Skin

The skin was assumed to be -3.0 since the well had been stimulated. The fracture length was estimated from data obtained from scout ticket data. From the fracture half length and skin an effective wellbore radius was calculated.

---------- 14 OF 17 WELLS ---------- 10:25:53

API Nbr: 0506706174000 State: COLO County: LA PLATA
Oper: ATLANTIC RICHFIELD Oper Code: 002505
Lease: SOUTHERN UTE Well: 13-1 Lease Code:
Meridian: NEW MEXICO Meridn Code: 21
Province: SAN JUAN BASIN Prov Code: 203
Prop Source Code: PI
Field: IGNACIO-BLANCO Field Code: 038300

T032N R007W SEC13 Spot: SW NE NE
Footages: 1000FNL 1000FEL F/SEC LN
Source: USGS Latitude: 37.02211 Longitude: 107.77090
City Code: # Sub Div: # Blk/Lot: # #

Oper Elev: 7177KB 7165GR Rig Mt: Log TD:
Comm Elev: LS 7193DF 7183GR Form@TD: 604FCCF
Oldest Age Fm: CRETACEOUS

Other Depths: DRLR 4100 WSTD FBTD 4055 DLDTD

Status: GAS Spud Date: 02 27 1978
Hole Dir: Comp Date: 05 25 1978
Numeric Class: INL-6 FNL-2
Alpha Class: INL-D FNL-DG
Prod Form: 604FCCF

Contr: NOT REPORTED Tools: ROTARY Rig Nbr:

CASING:
8 5/8 @ 277 W/ 275SX
4 1/2 @ 4100 W/ 425SX

TUBING INFO: 2 3/8" @ 3938

FORMATION TOPS:

STUDY: INTERPRETER: OPERATOR

Src Formation	MD	TVD Show Subsea	Src Formation	MD	TVD Show Subsea
LOG 604FCCF	3962	7 3231			

INITIAL POTENTIAL TESTS:

IPF	2930MCFD		CUT %	64/64Ck	24HRS
604FCCF PERF	JET	1/IT	3972-4037	GROSS	
PERF 3972-3972	3976-3976	3979-3979	3984-3984		
PERF 3987-3987	3990-3990	3994-3994	3997-3997		
PERF 4002-4002	4007-4007	4009-4009	4011-4011		
PERF 4027-4027	4032-4032	4037-4037	-		

ACID 3972-4037 500 GALS PERFS
RATE: 48/MIN ADDTV: HCL STAGES: @ 1500 PSI
SWFR 3972-4037 92500 GALS 89000 LBS SAND PERFS
RATE: 308/MIN ADDTV: STAGES: @ 1250 PSI
TP: 35 CP: SITP: SICP: CAOF: mCFD
FRCAOF: MCFD ATP: ISP: 450
NARRATIVE: SHUT IN

PRODUCTION TESTS:
PERF 2/FT 3956-3957
SQZD 3956-3957 - -
NARRATIVE: SQZD W/150 SKS
PM NOT RPTD

FORMATION TESTS:

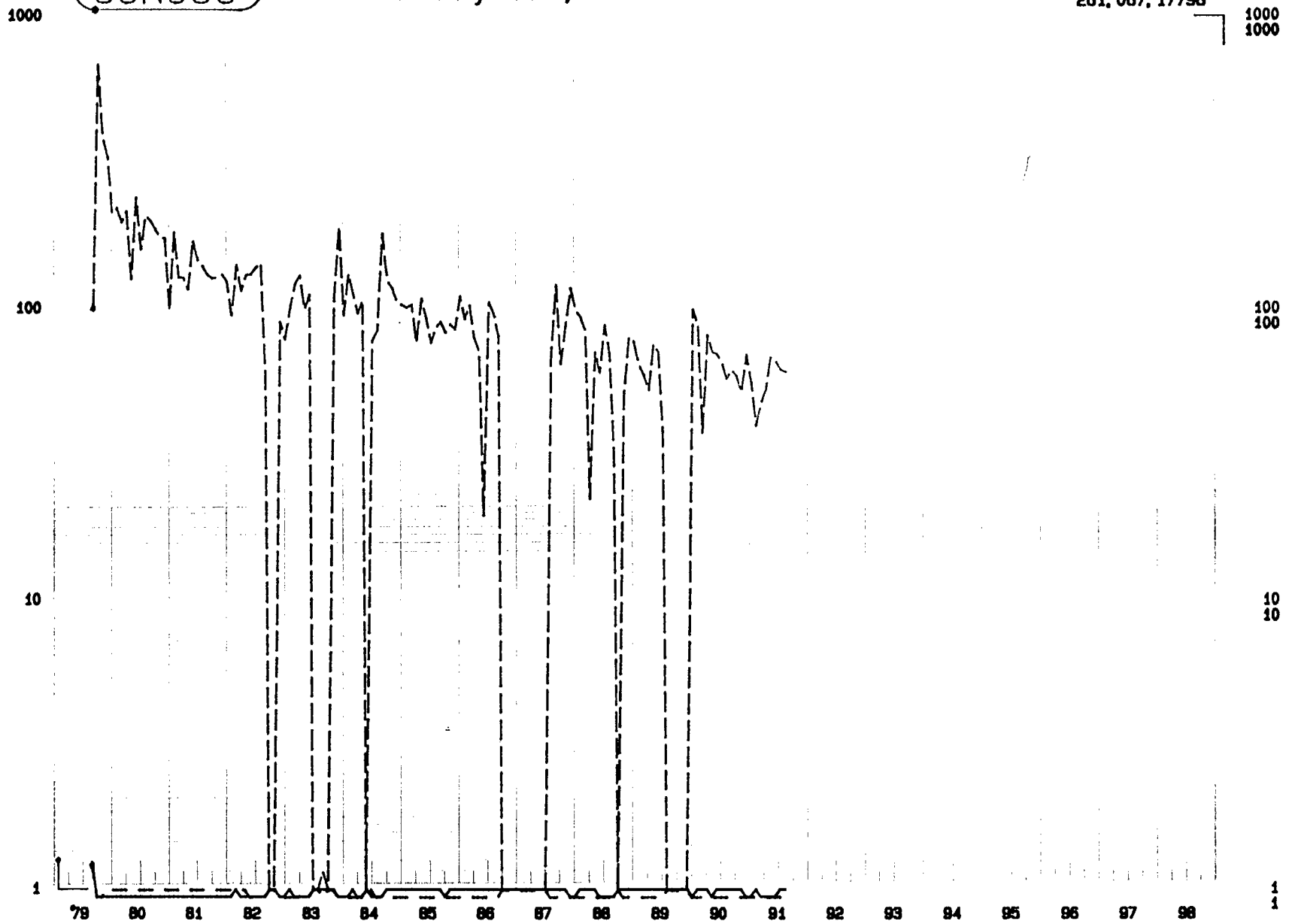
CORE DESCRIPTIONS:

LOG SURVEYS:
00253-04047 IL # 00253-04047 BL #
DNC # # GR
MEAS # # CP
DRILLING FLUIDS:
DEPTH,WT: 4100 9.2

CONOCO

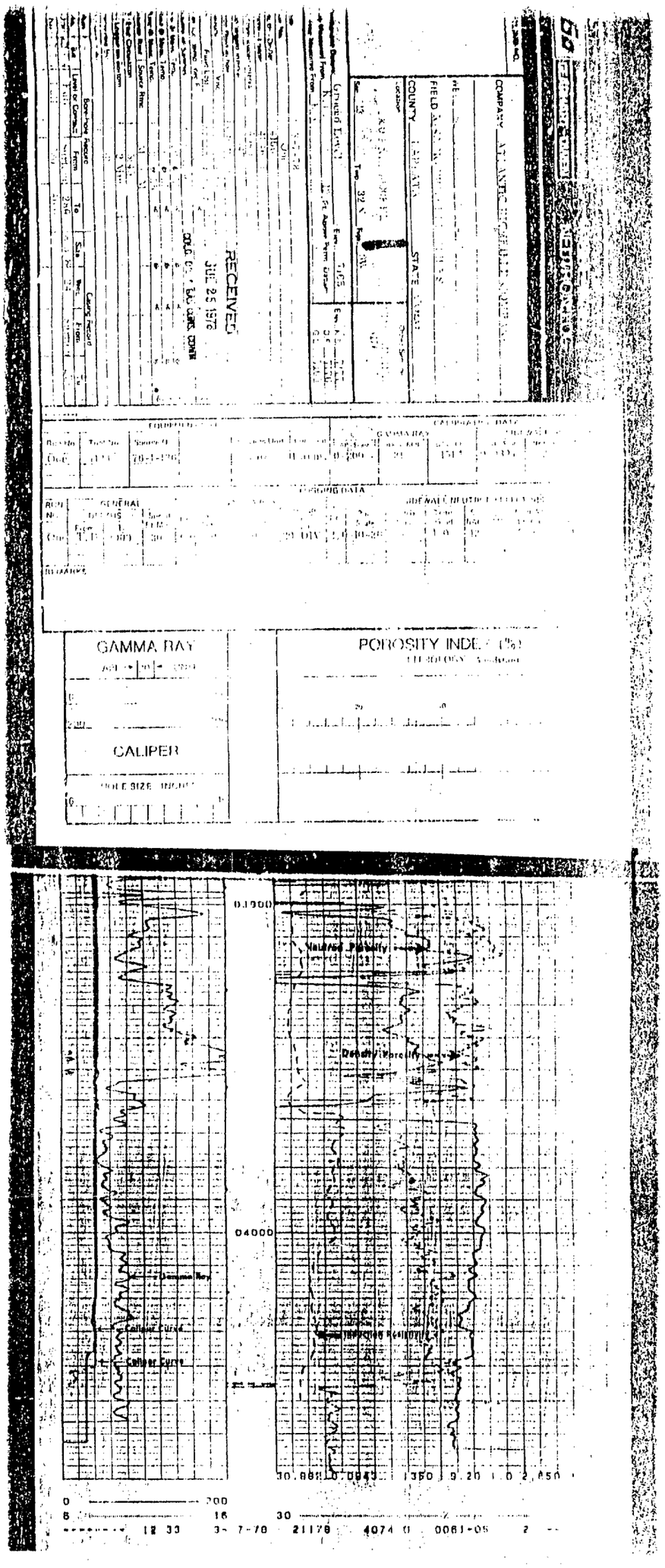
Daily Oil, Gas & Water Production

261.067.17798



Operator:	ARCO OIL & GAS CO	Location:	13 32N 9W
Lease:	SO UTE 32-9 13-1	County:	LA PLATA
Well #		State:	CO
Field:	IGNACIO BLANCO (PICTURED CLIFFS)	Unit:	661
Reservoir:	PICTURED CLIFFS	Cum. Gas:	412633

12-09-91


RECEIVED
JUL 25 1978
GAMMA RAY
CALIPER
POROSITY INDEX (%)
03900
04000
Caliper Curve
Caliper Curve

NMOCD CASE #10425

San Juan #32-9 Tight Gas Sand Credit Analysis

EXHIBIT #13

Southern Ute 24-2
NW 24-32N-9W
La Plata Co., CO

An evaluation of the reservoir permeability was made for the nearest Pictured Cliffs production North of the area proposed for qualification. Based upon initial reservoir conditions and calculated Reservoir Rock and Fluid Properties an order of magnitude estimate of reservoir permeability was made using the equation for infinite acting radial flow. The equation, data input, and results are listed below. The first month's production average was used to compute the daily rate expected from the parameters used in the equation. The well analysis resulted in a permeability magnitude less than 0.1 millidarcy (md).

INFINITE ACTING RADIAL FLOW EQUATION

$$Q_g = \frac{k_g h(P_i^2 - P_{wf}^2) * [\log(k_g t/\phi\mu c_t r_w^2) - 3.23 + .87\ S]^{-1}}{1638\mu\ T\ Z}$$

Reservoir Rock and Fluid Properties

	S. UTE 24-2
Sp Gr	.60
T (R)	580
μavg (cp)	.014
Zavg	.86
Pi (psig)	1300
Pwf (psig)	300
S (Stimulated Skin)	-3
h (feet)	50
ct (psi-1)	$.9277x.0^{-3}$
rw (ft)	18.6
Based upon Fracture length	
t (hrs)	360
lst month	262
avg rate (mcfd)	

CALCULATION RESULTS

Permeability (Md)	.083

EXHIBIT 13

Assumptions used to determine physical parameters used in the infinite acting radial flow equation. To determine an effective wellbore radius for a hydraulic fractured well the following correlation was used.

$L = 2R_e e^{-s}$

L = Fracture half length

R_e = Effective wellbore radius

S = Skin

The skin was assumed to be -3.0 since the well had been stimulated. The fracture length was estimated from data obtained from scout ticket data. From the fracture half length and skin an effective wellbore radius was calculated.

------------- 17 OF 17 WELLS --------------- 10:25:54

API Nbr: 05067063510001 State: COLO County: LA PLATA
Oper: APCO O&G Oper Code: 002905
Lease: SOUTHERN UTE Well: 24-2,32-9 Lease Code:
Meridian: NEW MEXICO Meridn Code: 21
Province: SAN JUAN BASIN Prov Code: 202
Prop Source Code: PI
Field: IGNACIO-BLANCO Field Code: 038300

T032N R009W SEC24 Spot: NE SE NW
Footages: 1850FNL 2300FWL F/SEC LN
Source: USS27 Latitude: 37.00554 Longitude: 107.77752
City Code: # Sub Div: # Blk/Lot: # #

Oper Elev: 6979GR Rig Ht: Log Td:
Comm Elev: Form@TD: 603MNCS
Oldest Age Pen: CRETACEOUS

Other Depths: DRLR 6514 WOTD PBTD 5850 OLDTD 6514

Status: GAS-WO RECOMPL Spud Date: 10 31 1989
Hole Dir: Comp Date: 12 02 1987
Haterit Class: INL-6 FNL-2
Alpha Class: INL-D X FNL-DG
Prod Form: 604PCCF

TUBING INFO: 2 3/8" @ 3720

OTHER FORMATION AND SHOW CODE INFO:
603MNCS 7 604MVRD 9 604PCCF

INITIAL POTENTIAL TESTS:
IPF 2408MCFD 38W CUT % /64CK HRS
604PCCF PERF / 3772-3820
SWFR 3772-3920 74592 GALS 59000 LBS SAND FERKF

PRODUCTION TESTS:
604MVRD PERF / 5927-6254 GROSS
GRPG 5927-6254 - -

FORMATION TESTS:

CORE DESCRIPTIONS:

DRILLING PROGRESS DETAILS:

Operator Address: BOX 1610

MIDLAND TX 79702

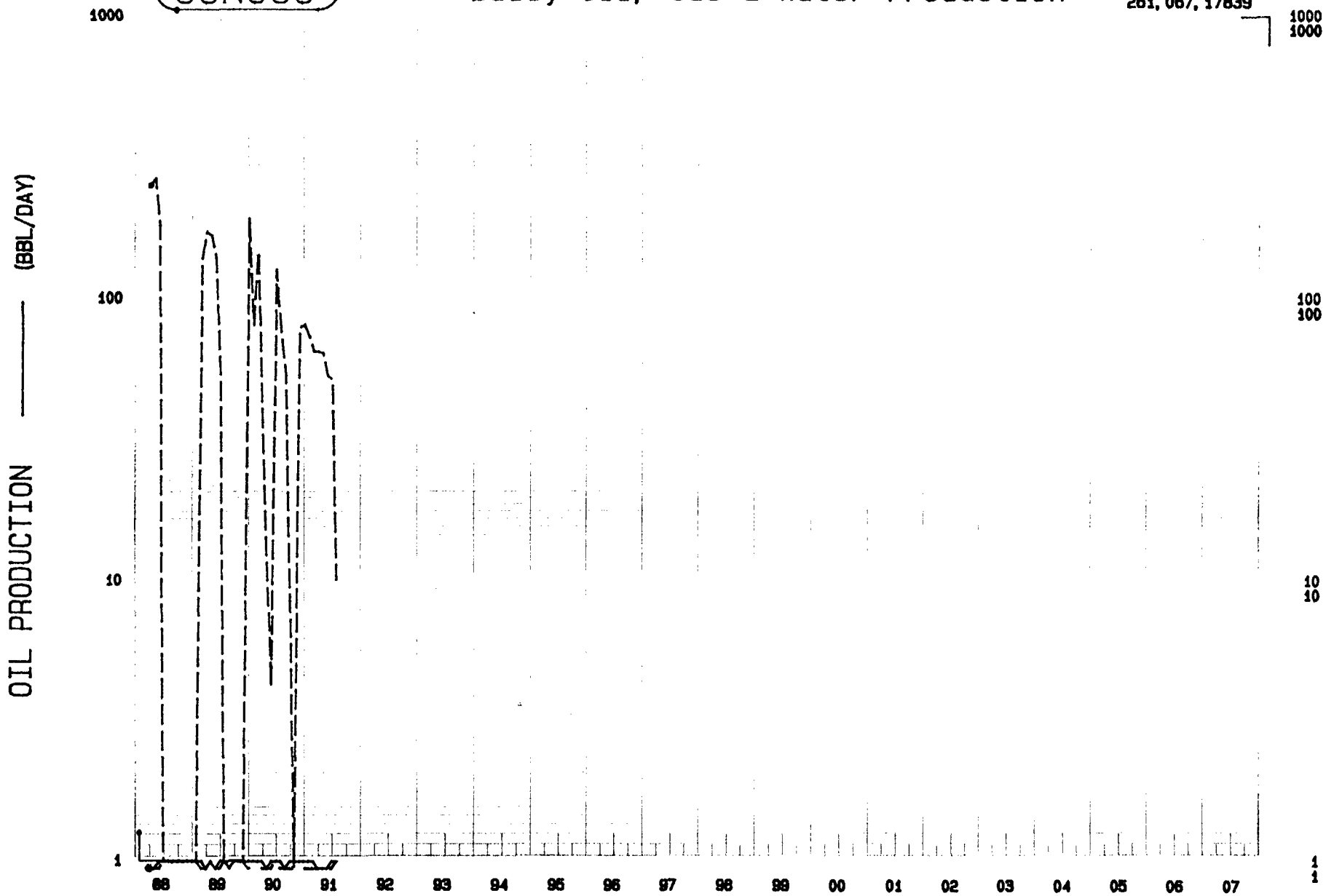
Base/Lease Maps
FI CO-23
POMCO C-139

08/06/89 4514 OTD, FR 5850.
COMP 12/2/87, IPF 2468 MCFGPD, 3 BW.
PROD ZONE - PICTURED CLIFFS 3772-3802.
NO CORES OR DSTS.
FIRST REPORT & COMPLETION

CONOCO

Daily Oil, Gas & Water Production

261, 067, 17839



Operator:	ARCO OIL & GAS CO	Location:	24 32N 9W
Lease:	SO UTE 32-9 24-2	County:	LA PLATA
Well #		State:	CO
Field:	IGNACIO BLANCO (PICTURED [illegible])	[illegible]:	112
Reservoir:	PICTURED CLIFFS	Cum. Gas:	80681

12-09-91

Dresser Atlas

Combination Logging Systems

Compensated **Densilog**
Compensated **Neutron**

FILE NO. FM-6255

COMPANY ARCO OIL AND GAS COMPANY
WELL SOUTHERN UTE 24-2, 32-9
FIELD IGNACIO BLANCO
COUNTY LA PLATA STATE COLORADO
LOCATION 1350' FSL, 2350' FWL
SEC 24 TWP 32N RGE 9W

Other Services: IEL/IL/GR

G.L. Elev. 6979
K.B. 12 Ft. Above Permanent Datum
K.B.

Elevations: KB 6991, DF 6990, GL 6979

	9/1/80	9/5/80
	ONE	TWO
	23152	23139
	4154	6511
	4154	6514
	4152	6512
	2154	4500
	9 5/8 @ 272	7" @ 4154
	NOT LOGGED	NOT LOGGED
	8 3/4	6 1/4
	CHEM GEL	GAS DRILL
	9.4 52	- -
	9.3 6.0 cc	- - cc
	FLOWLINE	-
	4.50 @ 80 °F	- °F
	3.39 @ 80 °F	- °F
	5.63 @ 80 °F	- °F
	CALCULATED	- -
	3.00 @ 120 °F	- °F
	2 HRS.	6 HRS.
	122 °F	176 °F
	4057 FARM	6103 FARM
	MCKELVIE	MITCHNER
	RATHMANN	ROYCE

RECEIVED

U.S. GEOLOGICAL SURVEY

DURANGO, COLO.

FOLD HERE

Remarks RUN 2: REPEAT SECTION RECORDED 10' SHALLOW.
CALIPER = 6 3/4 IN 7" PIPE.

EQUIPMENT DATA

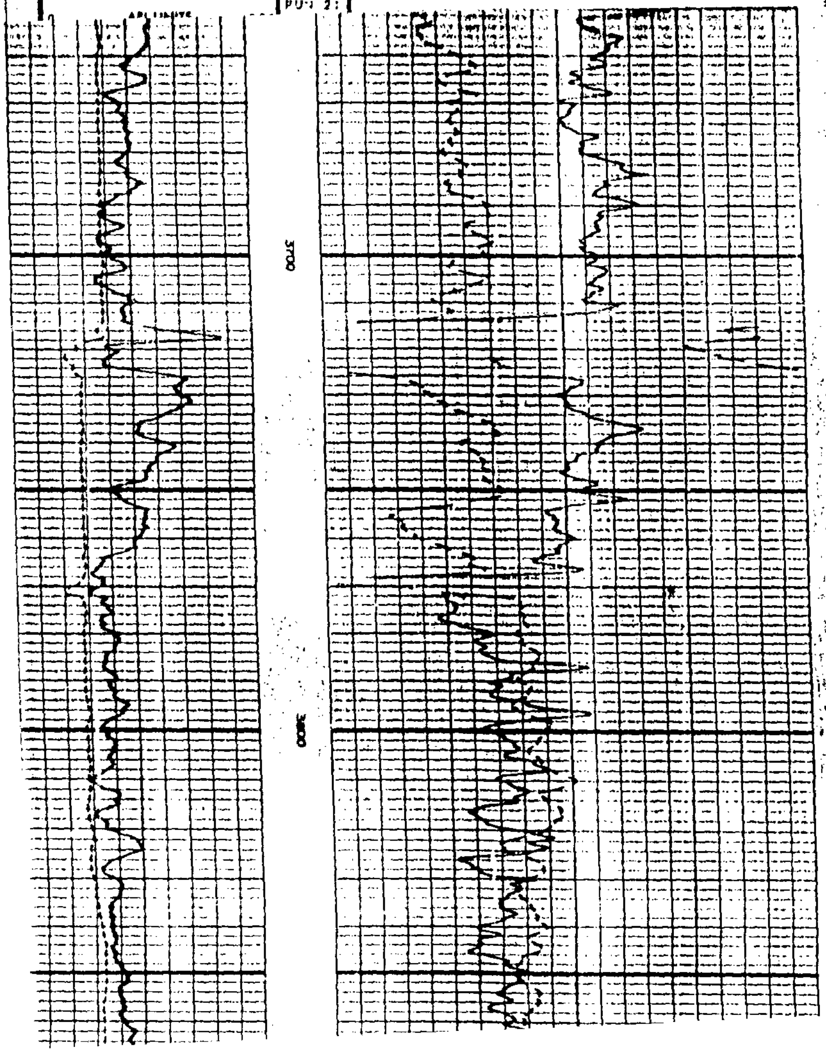
	RUN NO. 1 CDL	RUN NO. 1 CNL	RUN NO. 1 GR	RUN NO. 2 CDL	RUN NO. 2 CNL	RUN NO. 2 GR	RUN NO. 3 CDL	RUN NO. 3 CNL	RUN NO. 3 GR
Series No.	2210	2413	1306	2210	2413	1309			
Serial No.	34603	37665	35969	34603	44909	45601			
Diameter	5 1/4	3 5/8	3 5/8	5 1/4	3 5/8	3 5/8			
Elec. No.	34603	37665	35969	34603	44909	45601			
Detect. Model No.	1G10X	D6N3	D6G4	D6G4	D6N4	D2G2			
Type	GEIGER	SCINT	SCINT	GEIGER	SCINT	SCINT			
Dist. to Source			12'			6'			
Source Model No.	S3720	S17520		S3720	S17R5				
Serial No.	583	33360		583	27555				
Computer No.	3457	3457	3457	3457	3457	3457			
Serial No.	34893	34893	34893	45784	45784	45784			

Logging Data

Run No.	Depths From	Depths To	Speed Ft./Min.	T.C. Sec.	Density Scale	Correction Scale	Porosity Scale Data	Gamma Ray T.C. Sec.	Sens. Settings	Zero Div. L or R	API G.R. Units/Div.
1	4154	2154	REC	ATC	2.0-3.0	±0.5	0-30%	3	204	0	20
2	6514	4500	REC	ATC	2.0-3.0	±0.5	0-30%	2	349	0	20

Run No.	Depths From	Depths To	Speed Ft./Min.	T.C. SS	T.C. LS	Sens. SS	Sens. LS	Porosity Zero	Porosity Units/Div.	Porosity Scale	Caliper Scale
1	4154	2154	REC	3	3	130	135	0	2	0-30	6"-16"
2	6514	4500	REC	3	-	157	-	R15	2	0-30	6"-16"

GAMMA RAY & CALIPER	DEPTH	BULK DENSITY GRAMS/CC
	RUN 1: TLI @ 2154' RUN 2:	CORRECTION -0.5 0 +0.5



San Juan #32-9 Tight Gas Sand Credit Analysis

EXHIBIT #14

Southern Ute 15-4
SE 15-32N-9W
La Plata Co., CO

An evaluation of the reservoir permeability was made for the nearest Pictured Cliffs production North of the area proposed for qualification. Based upon initial reservoir conditions and calculated Reservoir Rock and Fluid Properties an order of magnitude estimate of reservoir permeability was made using the equation for infinite acting radial flow. The equation, data input, and results are listed below. The first month's production average was used to compute the daily rate expected from the parameters used in the equation. The well analysis resulted in a permeability magnitude less than 0.1 millidarcy (md).

INFINITE ACTING RADIAL FLOW EQUATION

$$Q_g = \frac{k_g h(P_i^2 - P_{wf}^2) * [\log(k_g t/\phi\mu c_t r_w^2) - 3.23 + .87\ S]^{-1}}{1638\mu\ T\ Z}$$

Reservoir Rock and Fluid Properties

	S. UTE 15-4
Sp Gr	.60
T (R)	580
μavg (cp)	.014
Zavg	.86
Pi (psig)	1250
Pwf (psig)	300
S (Stimulated Skin)	-3
h (feet)	29
ct (psi-1)	$.9277 \times 10^{-3}$
rw (ft)	23
Based upon Fracture length	
t (hrs)	360
lst month	98
avg rate (mcfd)	
CALCULATION RESULTS	
Permeability (Md)	.05

EXHIBIT 14

Assumptions used to determine physical parameters used in the infinite acting radial flow equation. To determine an effective wellbore radius for a hydraulic fractured well the following correlation was used.

$L = 2R_e e^{-s}$

L = Fracture half length

R_e = Effective wellbore radius

S = Skin

The skin was assumed to be -3.0 since the well had been stimulated. The fracture length was estimated from data obtained from scout ticket data. From the fracture half length and skin an effective wellbore radius was calculated.

FULL WELL
COPYRIGHT 1991 BY PETROLEUM INFORMATION, CORP.
OMA5E0 **************** DEC 09, 1991 10:25:29 **************** PAGE 33

------------- 16 OF 17 WELLS --------------- 10:25:54

API Nbr: 05067063520000 State: COLO County: LA PLATA
Oper: ARCO O&G Oper Code: 002595
Lease: SOUTHERN UTE Well: 15-4 Lease Code:
Meridian: NEW MEXICO Meridn Code: 21
Province: SAN JUAN BASIN Prov Code: 202
Prop Source Code: PI
Field: IGNACIO-BLANCO Field Code: 035300

T032N R009W SEC15 Spot: SW NE SE
Footages: 1540FSL 990FEL F/SEC LN
Source: USGS7 Latitude: 37.01455 Longitude: 107.80682
City Code: # Sub Div: # Blk/Lot: # #

Oper Elev: 6560KB 6549GR Rig Ht: Log Td:
Comm Elev: P 6565DF 6555GR Form@TD: 603MNCS
Oldest Age Pen: CRETACEOUS

Other Depths: DRLR 6017 WGTD PBTD OLDTD

Status: 2 GAS Spud Date: 07 10 1980
Hole Dir: Comp Date: 09 10 1980
Numeric Class: INL-6 FNL-5
Alpha Class: INL-D FNL-DG
Prod Form: 604FCCF 604MVRD

Contr: BRINKERHOFF-SIGNAL Tools: ROTARY Rig Nbr: 63

CASING:
9 5/8 @ 263 W/ 250SX SET PKR @ 5256
7 @ 3692 W/ 300SX

LINER: 4 1/2" BLANK 3480- 6016 W/ 220 S

FORMATION TOPS:

STUDY: INTERPRETER: OPERATOR

Src	Formation	MD	TVD	Show	Subsea	Src	Formation	MD	TVD	Show	Subsea
LOG	604FCCF	3302		7	3263	LOG	604LWIS	3512			3053
LOG	604CLFH	4931			1634	LOG	604MENF	5340			1225
LOG	604PNLK	5658			907						

OTHER FORMATION AND SHOW CODE INFO:
603MNCS 7 604MVRD 9

INITIAL POTENTIAL TESTS:
IPF 2135MCFD CUT X 48/64CK 3HRS

604PCCF PERF / 3303-3332 GROSS
PERF 3303-3303 3305-3305 3307-3307 3309-3309
PERF 3315-3315 3317-3317 3330-3330 3332-3332
ACID 3303-3332 500 GALS FERKP
RATE: 69/MIN ADDTV: MCL STAGES:
SWFR 3303-3332 30000 GALS 52500 LBS SAND FERKP
TP: 212 CP: 430 SITP: SICP: CAOF: 2297 MCFD
FRCAOF: MCFD ATF: ISF: 2200

IPF 3390MCFD OIL % 48/64CK 3HRS
604PKRC PERF / 5355-5749 GROSS
PERF 5355-5355 5357-5357 5359-5359 5362-5362
PERF 5364-5364 5366-5366 5405-5405 5407-5407
PERF 5411-5411 5422-5422 5426-5426 5429-5429
PERF 5430-5430 5476-5476 5478-5478 5485-5485
PERF 5487-5487 5489-5489 5508-5508 5510-5510
PERF 5512-5512 5514-5514 5516-5516 5518-5518
PERF 5534-5534 5536-5536 5538-5538 5542-5542
PERF 5544-5544 5569-5569 5572-5572 5575-5575
PERF 5661-5661 5666-5666 5683-5683 5685-5685
PERF 5687-5687 5704-5704 5708-5708 5725-5725
PERF 5727-5727 5729-5729 5743-5743 5745-5745
PERF 5748-5748 - - -
ACID 5355-5749 3000 GALS FERKP
RATE: B/MIN ADDTV: MCL STAGES:
SWFR 5355-5749 270875 GALS 260000 LBS SAND FERKP
RATE: 659/MIN ADDTV: STAGES: @ 2200
TP: 340 CP: SITP: SICP: CAOF: 4396 MCFD
FRCAOF: MCFD ATF: ISF: 340

PRODUCTION TESTS:

FORMATION TESTS:

CORE DESCRIPTIONS:

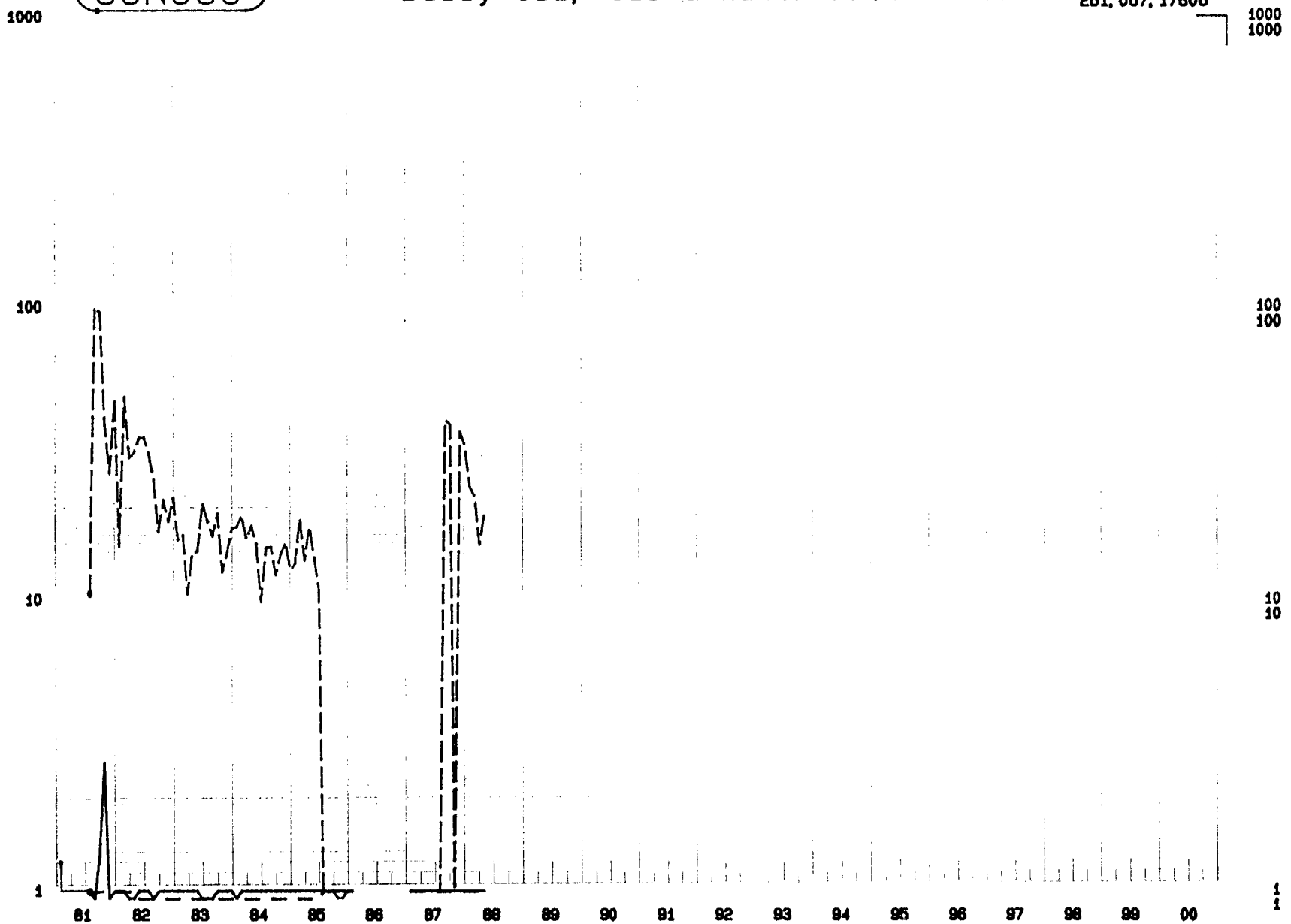
LOG SURVEYS:

#	IL	#	#	GR	#
#	ILSF	#	#	NEC	#
#	DN	#	#	NEES	#

CONOCO

Daily Oil, Gas & Water Production

261, 067, 17806



Operator:	ARCO OIL & GAS CO	Location:	15 32N 9W
Lease:	SO UTE 32-9 15-4	County:	LA PLATA
Well #		State:	CO
Field:	IGNACIO BLANCO (PICTURED CLIFFS)	Unit:	185
Reservoir:	PICTURED CLIFFS	Cum. Gas:	41527

12-09-91

Schlumberger

COMPENSATED NEUTRON-FORMATION DENSITY

COUNTY	LA PLATA, CO.
FIELD	IGNACIO BLANCO
LOCATION	
WELL	SOUTHERN UTE 15-4 #32-9
COMPANY	ARCO OIL & GAS CO

COMPANY ARCO OIL AND GAS COMPANY

API# 05-067-6352 /4-20-151-24

WELL SOUTHERN UTE 15-4 #32-9

FIELD IGNACIO BLANCO

COUNTY LA PLATA STATE COLORADO

LOCATION 1545' FSL & 990' FEL

Other Services: IGR/ISFL

API Serial No.	Sec	Twp	Range
	15	32-N	9-W

Permanent Datum: G.L. Elev. 6549

Log Measured From: K.B. 11 Ft. Above Perm. Datum

Drilling Measured From: K.B.

Elev.: K.B. 6560 D.F. 6559 G.L. 6549

Date	7-17-80	7-21-80		
Run No.	ONE (CNL-FDC)	TWO (FDC)		
[illegible]	3694	6020		
[illegible]	3692	6017		
[illegible]	3688	6014		
[illegible]	1600	4000		
[illegible]	9 5/8 @ 262	7" @ 3692	@	@
[illegible]	257	3690		
[illegible]	8 3/4	6 1/4		
[illegible] Fluid in Hole	X	GAS-AIR		
Dens. | Visc.	10 | 60			
pH | Fluid Loss	10 | 7 ml	ml	ml	ml
Source of Sample	SHAKER			
[illegible] @ Meas. Temp.	2.10 @ 74 °F	@ °F	@ °F	@ °F
[illegible] @ Meas. Temp.	1.72 @ 74 °F	@ °F	@ °F	@ °F
[illegible] @ Meas. Temp.	2.56 @ 74 °F	@ °F	@ °F	@ °F
[illegible]	M | C			
[illegible] @ BHT	1.20 @ 129 °F	@ °F	@ °F	@ °F
[illegible]		0800		
[illegible]	1830	1600		
[illegible] Temp.	129 °F	167 °F	°F	°F
[illegible] Location	8174 | FARM	8171 | FARM		
Recorded By	MILLNER	THORN		
Witnessed By	THOMAS	APPLEDORN		

FOLD HERE The well name, location and borehole reference data were furnished by the customer.

RUN NO.	1(CNL/FDC)2-(FDC)			
Service Order No.	113752			
Fluid Level	FULL			
Salinity, PPM CL.	100			
Speed - F.P.M.	30	30		
EQUIPMENT DATA				
Dens. Panel	655	353		
Dens. Cart.	422	245		
Dens. Skid.	447	287		
Dens. Sonde	348	244		
Dens. Source	5677	4233		
Dens. Calibrator	321	182		
Neut. Panel	653			
Neut. Cart.	1199			
Neut. Source	1201			
Neut. Calibrator	1184			
GR Cart.	1094	284		
Memorizer Panel	8174	CSU		
Tape Recorder (TTR)		CSU		
Depth Encoder (DRE)		CSU		
Pressure Wheel (CPW)		CSU		
Centralizers: Enter Spring, Standoffs, In-line, or None — Type				
No.				
S. O. — Inches				
CALIBRATION DATA				
BKG. CPS	SEE CAL	SEE CAL		
Source CPS	FILM	FILM		
OR Sens. - Cal				
T.C. - Cal				
CNL Short Spacing - Before Log				
CNL Long Spacing - Before Log				
CNL Short Spacing - After Log				
CNL Long Spacing - After Log				
FDC P¹ — Before Log				
FDC P² — Before Log				
FDC P¹ — After Log				
FDC P² — After Log				

Type Log	Depth	

REMARKS:

RUN-ONE 1. TYPE FLUID IN HOLE: FRESH-GEL-BARITE

FDC RUN SEPERATELY FROM CNL/GR AND MERGED IN.

LOGGING DATA

DEPTH Top	DEPTH Bottom	CNP Porosity Scale	CNP Matrix	CNP Auto Corr. or Hole Size Setting	FDC Porosity Scale	FDC Grain Density	FDC Liquid Density	FDC Hole Fluid	GR Sens Logged	GR T.C.	GR Zero Div. Left	GR Scale Per 100 Divs.
1600	3688	30 -10	SAND	AUTO	30 -10	2.65	1.0	WATER	200		0	200
RUN TWO	(FDC)				30 -10	2.65		AIR	200	AUTO	0	200

PARAMETERS

NAME	UNIT	VALUE	NAME	UNIT	VALUE	NAME	UNIT	VALUE
RHEM	G/C3	2.650	FD	G/C3	1.000	BS	INCH	6.250
DHF		AIR						
DO		0.0	DHS		OPEN	FPHI		PHIX

FDC Run 2

CALI(IN) 5.000 15.00

GR (GAPI) 0.0 200.0

DRHO(G/C3) -0.250 0.2500

DPHI( ) 0.3000 -0.100

RHOB(G/C3) 2.000 3.000

FILE

3300

NMOCD CASE #10425

EXHIBIT #15

Summary of all measured and calculated reservoir permeabilities presented in this application

	Average Permeability (md)
Ealum B #1 Section 33-T32N-R10W San Juan Co., NM	.028
San Juan 32-9 #106 Section 17-T31N-R9W San Juan Co., NM	.007
San Juan 32-9 #108 Section 10-T31N-R9W San juan Co., NM	.008
Vandewart E #3 Section 11-T29N-R8W San Juan Co., NM	.014
Southern Ute 13-1 Section 13-T32N-R9W La Plata Co., CO	.069
Southern Ute 24-2 Section 24-T32N-R9W La Plata Co., CO	.083
Southern Ute 15-4 Section 15-T32N-R9W La Plata Co., CO	.051

NMOCD CASE #10425

EXHIBIT #16

Protection of Fresh Water Aquifers

Oil and gas well operators in the San Juan Basin are required by federal and state regulations to protect all fresh water zones from contamination. In the Tank Mountain area these rules pertain mainly to the cementing of casing across the Ojo Alamo Formation which is found at an average depth of 1900 feet. Conoco believes that compliance with the existing rules and regulations adequately protects the fresh water aquifers. Drilling of gas wells in the Tank Mountain Area will not adversely affect any aquifers that are being used or expected to be used in the foreseeable future for domestic or agricultural supplies.

RHM\075.WPD\mel

Amoco Production Company

Southern Rockies Business Unit
Amoco Building
1670 Broadway
Post Office Box 800
Denver, Colorado 80201
303-830-4040

December 19, 1991

William J. LeMay, Director
New Mexico Oil Conservation Division
P. O. Box 2088
Santa Fe, New Mexico 87504

File: CAW-393-986.511

NMOCD Case 10425
Conoco's Application for Tight Formation Designation
Pictured Cliffs Formation
Tank Mountain Area
San Juan and Rio Arriba Counties, New Mexico

Amoco Production Company is an owner of leasehold interests in the application area and an affected party in this case. We have reviewed the application by Conoco and are in agreement with their assessment of the reservoir characteristics of the Pictured Cliffs formation. We recognize that there is only limited data to determine in situ permeability and pre-stimulation flow rates. This is primarily due to the tight formation characteristics of the Pictured Cliffs. Many of these wells are marginally economic. Almost without exception, they must be fracture stimulated to achieve commercial production. In many cases the stimulation costs are equal to the drilling costs of the well. For precisely this reason, most operators forego pre-stimulation testing and proceed with fracture stimulation in the most timely and cost effective manner possible.

Amoco supports the application for Tight Formation designation for the following reasons:

1. The available Picture Cliffs reservoir data in this area meets the guideline criteria from the FERC for tight formations.

2. The regional geology indicates that as you progress northward in the San Juan Basin, the Picture Cliffs reservoir permeability and productivity deteriorates.

3. The Pictured Cliffs wells in this general area exhibit low permeability characteristics requiring significant fracture stimulation to achieve commercial production.

Sincerely,

J. W. Hawkins

JWH/jmc

cc: Tom Lapinski
Mike Cuba
Sandy Braun
Eric Nitcher

NMOCD
Case 10425
Exhibit "D"
Order No. R-9643
Conoco Inc. - Tank Mountain TF Area

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RECEIVED
JAN 10 1991
OIL CONSERVATION DIVISION

January 10, 1991

Mr. Michael E. Stogner
Hearing Examiner
Oil Conservation Division
310 Old Santa Fe Trail, Room 206
State Land Office Building
Santa Fe, New Mexico 87501

HAND DELIVERED

Mr. Alan Buckingham
Bureau of Land Management
435 Montano NE
Albuquerque, New Mexico 87107

FEDERAL EXPRESS

Re: Application of Conoco, Inc. for Designation of a Tight Formation
San Juan County, N.M.
NMOCD Case 10425

Gentlemen:

On behalf of Conoco Inc., I respectfully request permission to amend our application to reduce the area for which Conoco seeks approval of a tight formation designation. In support of that request, I submit:

(1) Initial Application Area:

The area of our original request was based upon conclusive core data evidence of 0.1 MD of permeability or less for the San Juan 32-9 Unit Wells #106 and #108 around which we scribed a rectangle with an approximate radius of six miles from the control wells to the side boundaries of the initial application area.

(2) Informal Review:

That area was the subject of our informal meeting with the OCD and the BLM in Albuquerque on

December 6, 1991. For purposes of clarity, the area can be divided into the southwest area and the northeast area. Because of the substantial number of Pictured Cliff wells drilled in the Southwest Area, none of which could produce without stimulation, we characterized that to be substantial evidence of low permeability. In addition, Conoco did a technical literature search which supports the widely held conclusion that the Pictured Cliffs formation is a low permeability reservoir. In contrast, the Northeast area had very few wells and we characterized that as an area with little data. We left that meeting with the belief that the initial requested area boundaries were reasonably acceptable to the OCD and BLM. In addition, as a result of the informal meeting, we had the understanding that we should focus our technical efforts on the northeast area and it was that area for which we provided testimony at the hearing held on December 20, 1991.

(3) Hearing:

At the hearing, it was apparent that we had misunderstood the type of data both the BLM and OCD considered substantial evidence of permeability to qualify the southwest area. Accordingly, at our request, you provided us an opportunity to review the southwest area and to submit post hearing supplemental evidence of permeability.

(4) Post Hearing Data Request:

It is my recollection that Conoco was to re-examine the southwest area to: (1) again search for any existing core data or pressure build up data to conclusively establish the required permeability and (2) submit to the BLM and OCD a list of "type" wells within each of the contour lines of the Southwest area which would be used to estimate the magnitude of reservoir permeability using the infinite acting radial flow equation.

(5) Supplemental Data Results:

I have been advised by Mr. Ben Sargent, Conoco's petroleum engineer who testified at the hearing, of the following:

(a) Further search fails to find any additional core data or pressure build up data other than already submitted for this area at the hearing;

(b) There are 35 Pictured Cliffs wells in the southwest area and Conoco operates none of them and has no ownership interest in them. Conoco would be asking those operators to shut in production during the months of highest gas price and least amount of curtailment. While Conoco is willing to seek the cooperation of other operators to shut in their wells and run the tests, there is insufficient time now remaining for drilling wells in a qualified tight formation area to allow for obtaining this type of data;

(c) The application of the infinite acting radial flow equation to wells in the southwest area with significant cumulative production results in a calculated reservoir permeability in excess of the 0.1 md permeability limitation. While one cannot assume that high cumulative production means permeability in excess of 0.1 md, the result of applying this calculation to those wells does not provide the necessary data to estimate permeability within the permitted limitation so as to qualify the southwest area by this analysis.

(6) Request to reduce requested area:

As a result of the foregoing, I have enclosed a revised map showing a reduced area of application which has excluded those areas for which we do not yet have the required substantial evidence of low permeability.

The revised area now contains acreage as follows:

Federal:	38,089.09 acres
State:	5,766.48 acres
Fee:	4,299.50 acres
	48,155.07 acres

(7) Additional procedural matters:

(a) It is my opinion that the OCD has the authority to allow the application area to be reduced after the hearing but before an order is entered. This is analogous to unit cases which are reduced is size; unorthodox location cases that are moved to more standard locations; and creation of pools with special rules that are ordered for only part of an initially requested area.

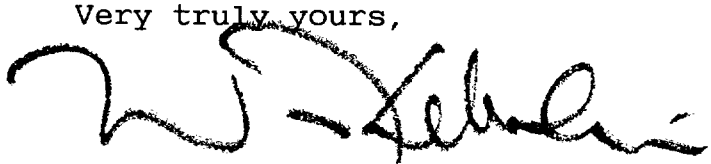
(b) It is my opinion that there is no need to reopen the hearing and require that it be placed upon another hearing docket. The purpose of doing so would be to provide notice. However, because the area is reduced and not expanded, there are no parties that would benefit by new notice which have not already been notified.

(c) It is my opinion that the OCD has the authority to allow the amendment or in the alternative, to approve in part and deny in part any OCD case including this one. There is nothing in the OCD rules, the FERC rules, the Oil & Gas Act or Division Order R-6388-A which limits the Division to only approving or denying the entire area of initial application. Such a limitation unreasonably restricts the ability of the Division to issue orders certifying appropriate areas for tight formation designation.

Conclusion:

Please advise me of the concurrence of the OCD and BLM to this request, and I will submit to you a proposed draft order and the necessary exhibits for final action.

Very truly yours,



W. Thomas Kellahin

WTK/jcl
cc: Gregory Gazda (Conoco-Oklahoma City)
Robert G. Stovall, Esq. - OCD

ltrt110.089

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
ALBUQUERQUE DISTRICT OFFICE
435 MONTANO N.E.
ALBUQUERQUE, NEW MEXICO 87107

TAKE PRIDE IN AMERICA

NMOCD
Case 10425
Conoco Inc. - Tank Mountain TF Area

Exhibit "E"
Order No. R-9643

3160 (015)

March 6, 1992

Marilyn L. Rand, Director
Division of Producer Regulation
Federal Energy Regulatory Comm.
825 North Capitol Street NE
Washington, DC 20426

Michael E. Stogner
Chief Hearing Officer
New Mex. Oil Conservation Div
P. O. Box 2088
Santa Fe, NM 87504-2088

Dear Ms. Rand and Mr. Stogner:

This letter is to be included with the submission to the FERC of the New Mexico Oil Conservation Division (NMOCD) Case No. 10425, Order No. R-9643, which designates a tight formation in New Mexico. The formation referred to is the Pictured Cliffs formation designated as the Tank Mountain Tight Gas Area consisting of 48,155.07 acres.

A copy of the BLM geologic review and engineering reports are enclosed.

This jurisdictional agency concurs with the NMOCD designation and hereby designates the area in NMOCD Case No. 10425, Order No. R-9643, and BLM Docket No. NM-583-91 as a tight formation.

Any persons objecting to this determination may file a protest directly with the Federal Energy Regulatory Commission, in accordance with 18 CFR Part 275.203 and 275.204, within 20 days after the notice is published in the Federal Register by the FERC.

If you have any questions contact Allen F. Buckingham at FTS 479-8765 or (505) 761-8765.

Sincerely yours,

Allen F. Buckingham

for Assistant District Manager
Mineral Resources

Enclosures

cc:
FERC Advance Cy (Marilyn L. Rand)
W. Thomas Kellahin (Conoco's Attorney)
Gregory Gazda, Conoco Inc
WO-610 (Donnie Shaw)
NM-922 (Joe Chesser)
NM-015 (ADM, Mineral Resources)

Bureau of Land Management
Minerals Division
435 Montano NE
Albuquerque, NM 87107

NGPA 107 Tight Formation Application
Tps. 31-32 N., Rs. 9-10 W., San Juan Co., N.M.
Pictured Cliffs Formation, Tank Mt. Area
NMOCD Case # 10425
Conoco, Oklahoma City Division

Geologic Review:

On December 20, 1991, Conoco came before the NMOCD in application for the designation of Tight Formation classification of the Pictured Cliffs (PC) Formations.

In summary, examination of the geologic data indicates that the Pictured Cliffs Formation in the area of the application, as revised by Jan. 10, 1992 letter, meets the NGPA classification criteria for a Tight Formation.

The principal exhibits in support of the designation are: type Log, cross sections, cores, isopleth map of cumulative production and map of PC permeability, saturation and production trends.

Pictured Cliffs production occurs in NW oriented shore-face deposits. As the intercontinental sea regressed to the northeast, periods of stable sea level occurred in which accumulations of shore-face sand deposits were created. A coarsening upward of grain size is typical of this type deposit indicating that better reservoir conditions will occur in the upper most section. The permeability values supplied in the application are derived from the upper, production portion of the PC. Seaward of the shore-face sand, texture becomes finer and less permeable. This is shown in Cross section A-A' by increasing clay/shale content from south to north.

This depositional environment, as it relates to the PC has been extensively studied and is fairly well understood. The absence of direct data in much of the application area, has caused Conoco to rely largely on this depositional model as support for designation.

Information from four cores was available in the study area which show the permeability is less than .1 md. at atmospheric pressure. Consequently, no corrections were made for in-situ conditions. The cores are from wells located along the north eastern extent of the major PC productive trend. Applying the depositional model, reservoir conditions are expected to deteriorate on the seaward side of the shore-face deposition. There are nine wells offsetting the currently defined productive limits. These wells, indicated on exhibit 1-B as "non-commercial", support the depositional interpretation. Although there are numerous reasons why a well may be unsuccessful, Exh. 5 (Pictured Cliffs Production, Saturation an Permeability

Trends) locates Tank Mountain in a gas saturated, low permeable area.

In view of Exh. 5, (from Cumella, S.P. 1981 Master's Thesis, Univer. of TX @ Austin) and as supported by the core data, it is reasonable to assume that reservoir conditions, specifically permeability, have deteriorated in the application area.

Further northeast, beyond the undeveloped strip containing the application area, are two small pods of PC production (Exh. 1-B). Whether these are part of another productive shore face or isolated sands is not certain. However, calculated permeabilities of three wells in the larger pod indicate values of less than .1 md along the northern boundary of the proposed area.

Since the application area was contracted by letter dated January 10, 1992 an estimate of average PC depth in the revised area was determined from office records. It was found that the original value of 3,500 is still valid.

Fresh water formations will be protected in accordance with State and Federal regulations.

The data submitted supports the interpretation that the application area lies between two productive PC trends. Permeability values along the edges of the trends are less than .1 md and indicate low permeabilities across the application area. The presence of non-commercial wells, the interpretation of the cross sections and the trends and characteristics defined in Exh. 5, geologically support approval of the proposed Tank Mountain Tight Formation area.

Jane Clancy

1/15/92

Bureau of Land Management
Minerals Division
435 Montano NE
Albuquerque, NM 87107

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Engineering Report- Application of Conoco, Inc. For Designation Of The Pictured Cliffs Formation In The Tank Mountain Area As A Tight Formation

Conoco's original application requested that the area in Sec. 7-36, T.32 N., R.9 W., Sec. 9-16, 21-28, 33-36, T.32 N., R.10 W., all of T.31 N., R.9 W., Sec. 1-4, 9-16, 25-28, 33-36, T.31 N., R.10 W., Sec. 1-6, T.30 N., R.9 W., Sec. 1-4, T.30 N., R.10 W. containing 71,192 acres, be designated as a Tight Formation in the Pictured Cliffs formation. An NMOCD hearing was held in Albuquerque on December 20, 1991. Following the presentation of the direct testimony by the applicants, numerous questions were asked by the BLM and NMOCD representatives and additional information was requested. By a letter dated January 10, 1992, Conoco amended their application to eliminate the lands in T.30 & 31 N., R.10 W., and certain lands in T.30 & 31 N., R.9 W. The amended area now contains approximately 48,155 acres. The area eliminated is roughly the SW\4 of the original area. This area is almost completely developed and contains only a few undeveloped spacing units.

Core data exists for three wells in the amended proposed area. Two wells near the center (SJ 32-9 #106 and #108) and one well on the upper western edge (EALUM #1). Analysis of the laboratory core reports shows an uncorrected (uncorrected for water saturation and over burden pressure) permeability of .013md, .011md, .028md for the wells respectively. Because the Pictured Cliffs formation in this area requires stimulation to produce in paying quantities and coring is expensive, cores are seldom taken on these wells. There is no other data available in the proposed area. Three wells were completed in the Pictured Cliffs formation just north of the proposed area. No cores were available for these wells either, but an estimated permeability was calculated using the Infinite Acting Radial Flow Equation. Initial reservoir parameters were used and some assumptions had to be made. The calculations yielded permeabilities of .069md, .083md, .051md. These values are about twice the values that were measured in the lab, but they are still less than .1md. A possible explanation is their higher value may be due to the assumptions that had to be made in order to do the calculations. All of the available data indicates that the in situ permeability for the area is expected to be less than .1md.

As mentioned earlier, all of the wells in the area require stimulation to establish production at commercial rates. There are no DST's or pre-stimulation pressure build up tests for any of the existing wells in the area except for one. The SJ 32-9 #106 was completed in the SE\4 of section 17, T.31 N., R.9 W., on June 19, 1991. The well was perforated and then shut in for 27 days. The SICP reached 340 psi. The well was flow tested using an 8\64 choke to the atmosphere. The rate went from 130 mcfpd to 0 in four hours. This would indicate a stabilized pre-stimulation rate of less than 1 mcfpd. This information along with a pressure and rate graph are presented in exhibit #6.

The wells in the area produce dry gas with no oil or water. The wells in the area produce an average of less than one barrel of condensate per month.

Although there is not alot of information available for the proposed area, based on the information presented in the application and other additional published information, this area appears to meet the requirements for designation as a Tight Formation. It is recommended that this application be forwarded to FERC for designation.

Robert Kent
12 Feb 92

Bureau of Land Management
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