TENNECO OIL COMPANY

DOWNHOLE COMMINGLING APPLICATION

OTERO CHACRA - BLANCO MESAVERDE POOLS

T27N R8W; T28N R9W

CASE # 8845 & 8846

Tenneco Oil
Exploration and Production
A Tenneco Company

6162 South Willow Drive
P.O. Box 3249
Englewood, Colorado 80155
(303) 740-4800

Western Rocky Mountain Division

March 13, 1986

New Mexico Oil Conservation Commission
Box 2088
Santa Fe, NM 87501

Attention: David R. Catanach

Re: Chacra/Mesaverde Comingling

Schwerdtfeger A LS #14A	NW/4 Sec. 8,	T27N-R8W
Schwerdtfeger A LS #15A	NW/4 Sec. 21,	T27N-R8W
Florance D LS #14A	SE/4 Sec. 21,	T27N-R8W
Bolack C LS #11A	NW/4 Sec. 28,	T27N-R9W
Florance D LS #11A	SE/4 Sec. 18,	T27N-R8W
Florance D LS #13A	NW/4 Sec. 20,	T27N-R8W
Lackey B LS #4A	NW/4 Sec. 29,	T28N-R9W

Gentlemen:

The attached documentation demonstrates that the subject wells satisfy all of the requirements as stipulated by the NMOCC for downhole commingling. This data will be presented at an examiner hearing on March 19, 1986.

Very truly yours,

TENNECO OIL COMPANY

Harry F. Hufft
Division Production Manager

HFH:SMS:pe:4133R

Attachment

CHACRA/MESAVERDE COMMINGLING APPLICATION

WELL NAME: SCHWERDTFEGER A LS #14A
LOCATION: NW/4 SEC. 8 T27N, R8W

Tenneco Oil Company currently plans to drill the captioned well during the third or fourth quarter of 1986. The well is anticipated to encounter productive sands in both the Mesaverde and Chacra formations. Tenneco Oil Company seeks to obtain the Commission's approval to down-hole commingle production from the Chacra and Mesaverde formations. The attached documentation indicates that the two zones proposed for commingling will satisfy all requirements as stipulated by the Commission (303C(b)(1-6).

The Mesaverde formation is the primary target of the captioned well. In light of current market conditions estimated reserves associated with a Chacra completion at the above location are considered to be insufficient to justify the capital expenditure required to separately produce these reserves. In the event that approval to commingle production is not granted, the Chacra interval would not be completed.

Estimated bottom hole pressures for the two zones were extrapolated statistically from offset Mesaverde and Chacra wells (Exhibits 1 & 2). The anticipated pressure of the lower pressured zone (Mesaverde) is estimated to be 87.07% of the pressure anticipated in the higher pressured zone (Chacra), when adjusted to a common datum. Therefore, rules 303C(b)(2) and 303C(b)(6) are satisfied.

A compatibility test was performed using the produced Chacra water from a nearby offset (Dryden LS #1A; SE/4 Sec. 28 T28N, R8W) and the produced Mesaverde water from another nearby offset (Schwerdtfeger A LS #14; SW/4 Sec. 8 T27N, R8W). The test indicated that no scale or precipitate problems should result when production streams from these two horizons are commingled. Water analyses also indicated that corresponding salinities are similar, and no formation damage should occur due to the presence of produced water from another zone. Therefore, rules 303C(b)(3) and 303C(b)(4) are satisfied.

Common ownership exists between the Chacra and Mesaverde zones, satisfying rule 303C(b)(5). A detailed ownership breakdown is attached.

It is recommended that production be allocated on a strict percentage basis according to the fraction of total reserves contributed by each zone. Chacra reserves were estimated from the attached iso-reserve map (Exhibit 3). Mesaverde reserves were estimated from the attached net pay

isopach map (Exhibit 4) and a linear correlation of reserves versus net pay (Exhibit 5). Exhibit 5 was obtained by plotting estimated ultimate recoveries (decline curve derived) from recent (1980+) Mesaverde wells against the amount of net perforated pay as determined from log analysis and completion reports. Chacra reserves are estimated to be 175 MMCF, while Mesaverde reserves are estimated to be 600 MMCF. Production allocated to the Chacra should be 22.58% of total, and the production allocated to the Mesaverde should be 77.42% of total.

Both Chacra and Mesaverde wells in this area exhibit similarly shaped decline curves. Exhibits 6 and 7 are representative type decline curves for local Mesaverde and Chacra wells.

Despite the large disparity in estimated reserves, both formations have very similar reserve lives. Exhibit 8 shows initial rate versus reserves for the type decline scenario used. The following table compares reserve lives from each of the two zones assuming a 10 MCF/D economic limit. An average reserve ratio was taken for this example:

FORMATION	RESERVES (MMCF)	INITIAL RATE (MCF/D)	ECONOMIC* LIMIT (MCF/D)	RESERVE LIFE (YRS)
Mesaverde	1150	735	8	31.7
Chacra	235	160	2	31.2
			10	

Produced Chacra gas is extremely dry. Chacra wells in the vicinity of the subject well produce less than 1 BBL/MMCF of water and condensate (combined) on an average basis. Local Mesaverde wells produce considerably more liquids than do the Chacra wells. Average condensate and water yields are approximately 5 BBL/MMCF and 2 BBL/MMCF, respectively, for the Mesaverde producers. As the production capacity of the Mesaverde zone decreases with time, its ability to unload produced fluids also decreases. The increased

*The economic limit was allocated roughly according to the reserve ratio: 83% Mesaverde / 17% Chacra

volume of commingled dry Chacra gas through the tubing will help to lift the produced Mesaverde liquids. Over the life of the well, the commingled Chacra production will definitely improve the flow efficiency of the Mesaverde zone. Early in the life of the well, while both zones are producing at maximum rates, there will be a slight increase in friction loss (tubing) due to the additional volume of Chacra gas. Exhibit 9 shows that the flowing bottom hole pressure goes from 390 psi for a well producing 750 mcf/d, to 405 psi for a well producing at 1250 mcf/d. An increased pressure drop of 15 psi is insignificant, and would represent a maximum considering the initial rate of the Chacra production will be much closer to 200 mcf/d rather than 500 mcf/d.

All operators of offset wells have been notified in writing of the proposed commingling within the time limits provided under rule #1207.

S. M. Struna
Petroleum Engineer

SMS:pe:3/13/86
4131R

Attachment

CHACRA/MESAVERDE COMMINGLING APPLICATION

WELL: Schwerdtfeger A LS #14A
LOCATION: NW/4 Sec. 8 T27N, R8W

Estimated Chacra completed interval midpoint:	3279 ft.
Estimated Mesaverde completed interval midpoint:	4670 ft.
Average surrounding Chacra ISIP's (surface)	1002 psi
Average surrounding Mesaverde ISIP's (surface)	867 psi
Average Surrounding Chacra Completed Interval Midpoint:	3244 ft.
Average surrounding Mesaverde Completed Interval Midpoint:	4616 ft.
Chacra Pressure Gradient	.3382 psi/ft.
Mesaverde Pressure Gradient	.2143 psi/ft.
Anticipated Chacra shut in pressure (bottom hole):	1109 psi
Anticipated Mesaverde shut in pressure (bottom hole):	1001 psi

Anticipated pressures adjusted to 4000 ft. datum:

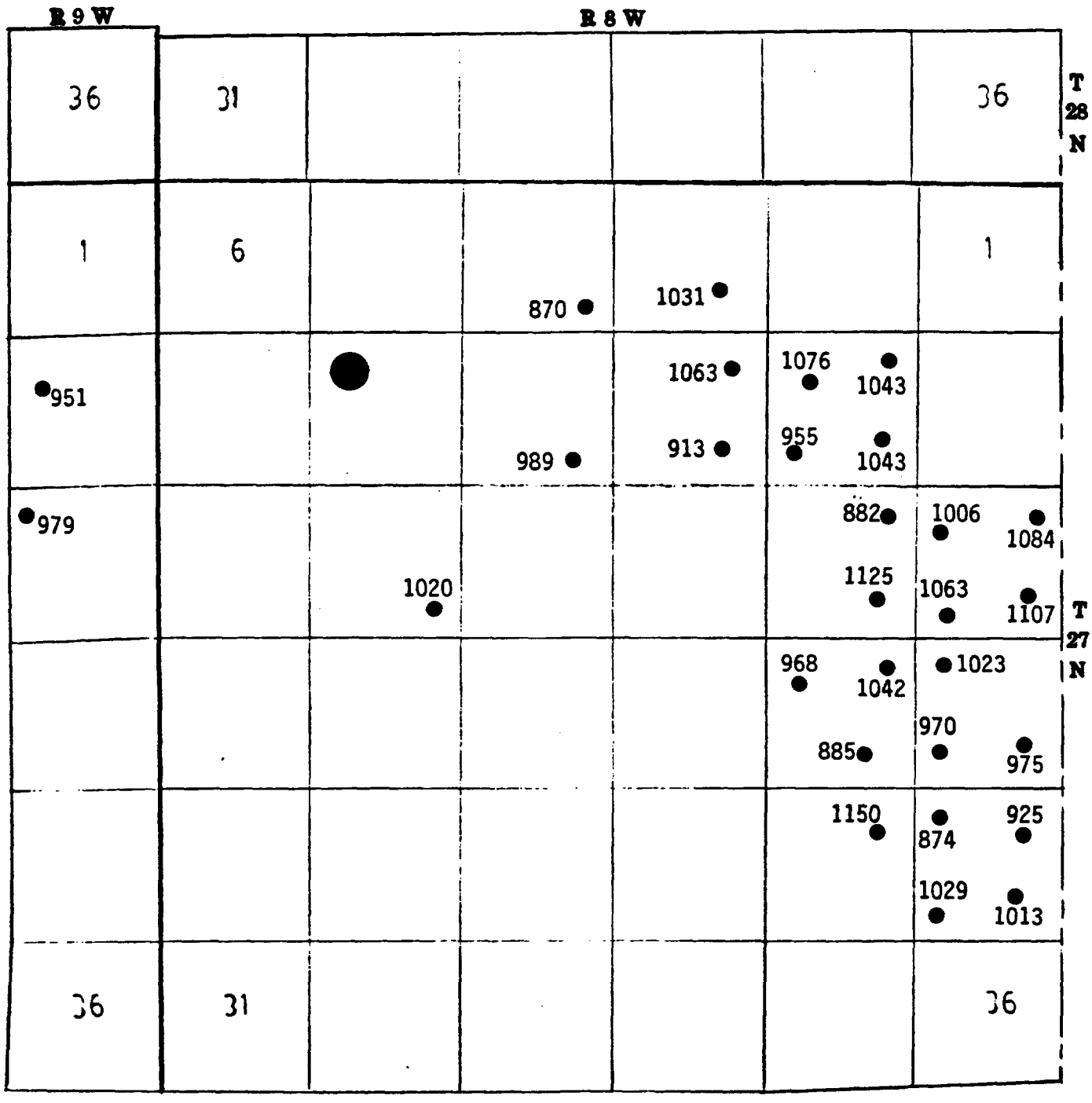
Chacra	1129 psi
Mesaverde	983 psi

Ratio 983/1129 = .8707

Satisfies 50% pressure requirement

SMS:pe:2/24/86
4086R-6

CHARCA



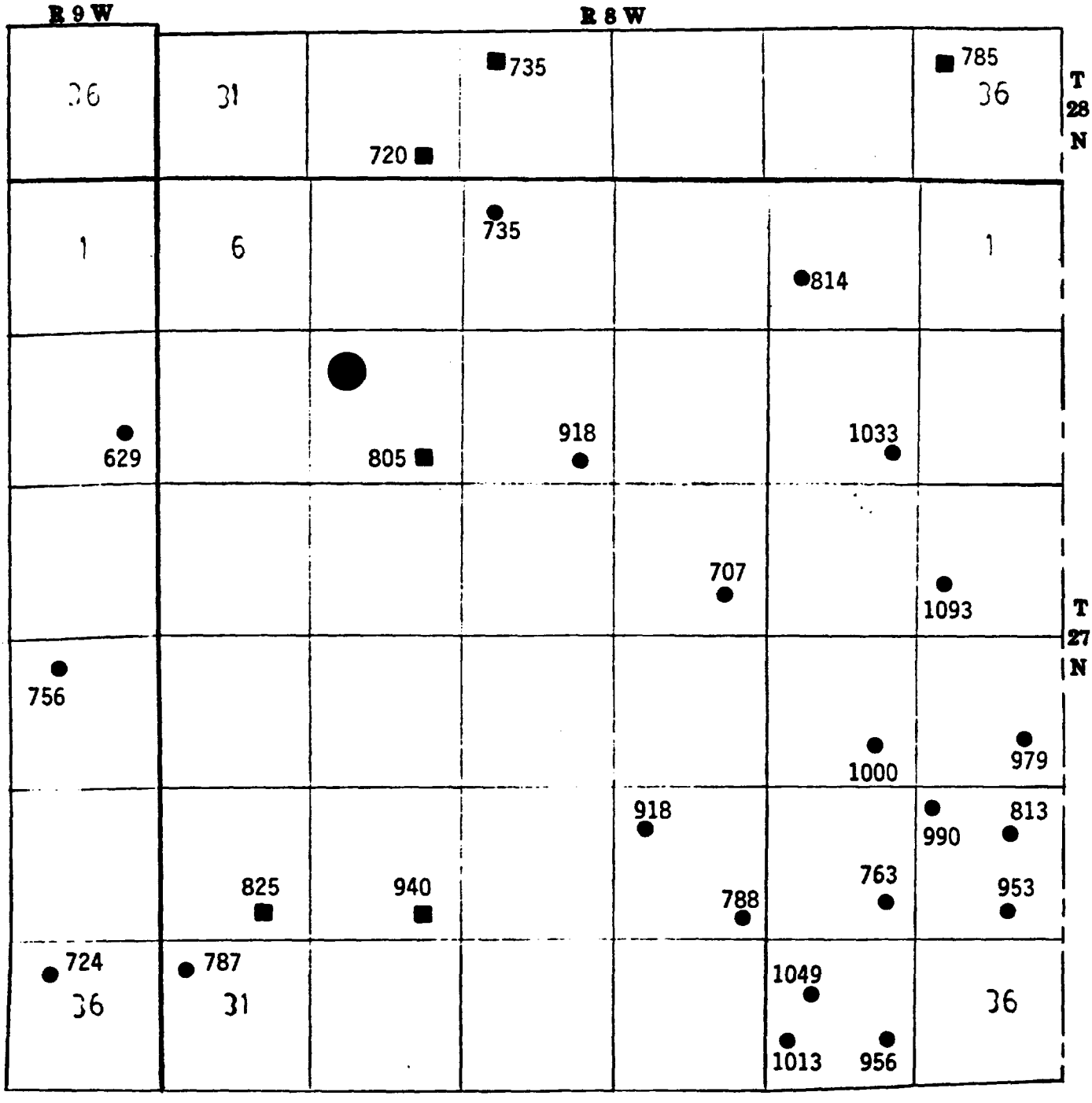
Initial Shut-In Pressure (PSI)

● **Producing Well**

● **Schwerdtfeger A LS #14A**

EXHIBIT 1

MESAVERDE



Initial Shut-In Pressure (PSI)

- ● Recent Infill (post 1978)
- ■ 1985 Tenneco Completion
- ● Schwerdtfeger A LS #14A

EXHIBIT 2

CHACRA/MESAVERDE COMMINGLING APPLICATION

Assumptions Used in Pressure Calculations

Chacra	Gravity = .665*
	P_c = 670.4 psia
	T_c = 378.6°R
Mesaverde	Gravity = .701*
	P_c = 669.1 psia
	T_c = 389.7°R
Local Temperature Gradient	.0139°F/ft.
Ambient Temperature	60°F

Pressures were calculated using a modified Cullender & Smith method.

*Gas gravities estimated from chromatographic analyses of local Chacra and Mesaverde gas samples.

SMS:pe:2/24/86
4086R

CHACRA/MESAVERDE COMMINGLING APPLICATION

INITIAL SHUT-IN PRESSURE DATA

RECENT MESAVERDE INFILL WELLS (POST 1978)

WELL NAME	LOCATION		OPERATOR	DOFP	INITIAL SHUT-IN PRESSURE
State Com #47	SW/2	27N 8W	Mesa	2/79	814
Dawson A #1M	NW/4	27N 8W	TOC	3/81	735
Graham C WN Fed Com #1A	SE/9	27N 8W	Arco	3/78	918
Federal J #1A	SE/11	27W 8W	AAA Oper. Co. Inc.	4/80	1133
Federal E #3A	SW/13	27N 8W	AAA Oper. Co. Inc.	4/80	1193
Federal R #1A	SE/15	27N 8W	AAA Oper. Co. Inc.	3/84	707
Federal E #2A	SE/23	27N 8W	AAA Oper. Co. Inc.	10/79	1000
Marron WN Fed Com #6A	SE/24	27N 8W	Arco	4/78	979
Hammond #41R	NE/25	27N 8W	Russell WM. C.	2/78	813
Federal E #1A	NW/25	27N 8W	AAA Oper. Co. Inc.	10/79	990
Federal E #1	SE/25	27N 8W	AAA Oper. Co. Inc.	6/72	953
Hammond #55A	SE/26	27N 8W	Great Lakes Chem.	3/79	763
Marron WN Fed Com #1A	NW/27	27N 8W	Arco	1/78	918
Marron #5A	SE/27	27N 8W	Western Oil & Min.	7/79	788
Linda #1A	NW/31	27N 8W	Consolidated O & G	6/79	787
Hammond #5	NW/35	27N 8W	Great Lakes Chem.	2/78	1049
Hammond WN Fed #7A	SE/35	27N 8W	Arco	4/79	956
Hammond #47R	SW/35	27N 8W	R & G Drilling Co.	4/78	1013
Blanco #2A	SE/12	27N 9W	NWPL	5/82	629
Huerfanito Unit #77A	NW/24	27N 9W	EPNG	3/83	756
Huerfanito Unit #86A	NW/36	27N 9W	EPNG	1/80	724

1985 TENNECO MESAVERDE INFILL WELLS

WELL NAME	LOCATION		OPERATOR	DOFP	INITIAL SHUT-IN PRESSURE
Riddle F LS #5A	SE/32	28N 8W			720
Bolack B LS #1A	NW/33	28N 8W			735
Blanco LS #12A	NW/36	28N 8W			785
Schwertdfeger A LS #20M	SE/8	27N 8W			805
Bolack C LS #12A	SE/29	27N 8W			940
Bolack C LS #14A	SE/30	27N 8W			825

OTERO CHACRA OFFSET WELLS

WELL NAME	LOCATION		OPERATOR	DOFP	INITIAL SHUT-IN PRESSURE
Graham #3	SE/3	27N 8W	Great Lakes Chem.	8/77	1031
Graham #1A	SE/4	27N 8W	Great Lakes Chem.	7/76	870
Graham C WN Fed Com #1A	SE/9	27N 8W	Arco	3/78	989
Graham #51	NE/10	27N 8W	Russell William C.	10/72	1063
Graham #96	SE/10	27N 8W	Russell William C.	12/83	913
Federal J #1	NE/11	27N 8W	AAA Oper. Co. Inc.	7/72	1043
Largo Fed. #4	NW/11	27N 8W	AAA Oper. Co. Inc.	12/73	1076
Largo Fed. #1	SW/11	27N 8W	AAA Oper. Co. Inc.	7/72	955
Federal J #2	SE/11	27N 8W	AAA Oper. Co. Inc.	4/80	1043
Largo Fed #5	NE/13	27N 8W	AAA Oper. Co. Inc.	12/73	1084
Federal E #3	NW/13	27N 8W	AAA Oper. Co. Inc.	7/72	1006
Largo Federal #2	SE/13	27N 8W	AAA Oper. Co. Inc.	5/73	1107
Federal E #6	SW/13	27N 8W	AAA Oper. Co. Inc.	4/80	1063
Largo Federal #3	NE/14	27N 8W	AAA Oper. Co. Inc.	5/73	882
Largo Federal #6	SE/14	27N 8W	AAA Oper. Co. Inc.	12/73	1125
Florance D LS #17	SE/17	27N 8W	TOC	10/72	1020
Marron #94	NW/23	27N 8W	Russell William C.	1/80	968
Federal E #2	NE/23	27N 8W	AAA Oper. Co. Inc.	6/72	1042
Federal E #5	SE/23	27N 8W	AAA Oper. Co. Inc.	9/79	885
Marron #6A	NW/24	27N 8W	Western Oil & Min.	2/76	1023
Marron WN Fed. Com #6A	SE/24	27N 8W	Arco	4/78	975
Snodgrass #1	SW/24	27N 8W	Western Oil & Min.	4/78	970
Federal E #4	NW/25	27N 8W	AAA Oper. Co. Inc.	9/79	874
Hammond #91	NE/25	27N 8W	Russell William C.	12/77	925
Federal E #1	SW/25	27N 8W	AAA Oper. Co. Inc.	7/72	1029
Hammond #92	SE/25	27N 8W	Russell William C.	1/80	1013
Hammond #52	NE/26	27N 8W	Russell William C.	12/74	1150
Blanco #25	NW/12	27N 9W	NWPL	6/75	951
John Charles #7E	NW/13	27N 9W	Getty	5/81	979

CHACRA/MESAVERDE COMMINGLING APPLICATION

RESERVE ESTIMATION AND PRODUCTION ALLOCATION

WELL: Schwerdtfeger A LS #14A
LOCATION: NW/4 Sec. 8 T27N, R8W

Chacra Reserves

Total Estimated Reserves (Exhibit 3)	=	175 MMCF

Mesaverde Reserves

Net Pay Thickness (Exhibit 4)	=	10 ft.
Total Estimated Reserves (Exhibit 5)	=	600 MMCF

Production Allocation

Chacra: (175)/(175 + 600) = .2258 = 22.58%

Mesaverde: (600)/(175 + 600) = .7742 = 77.42%

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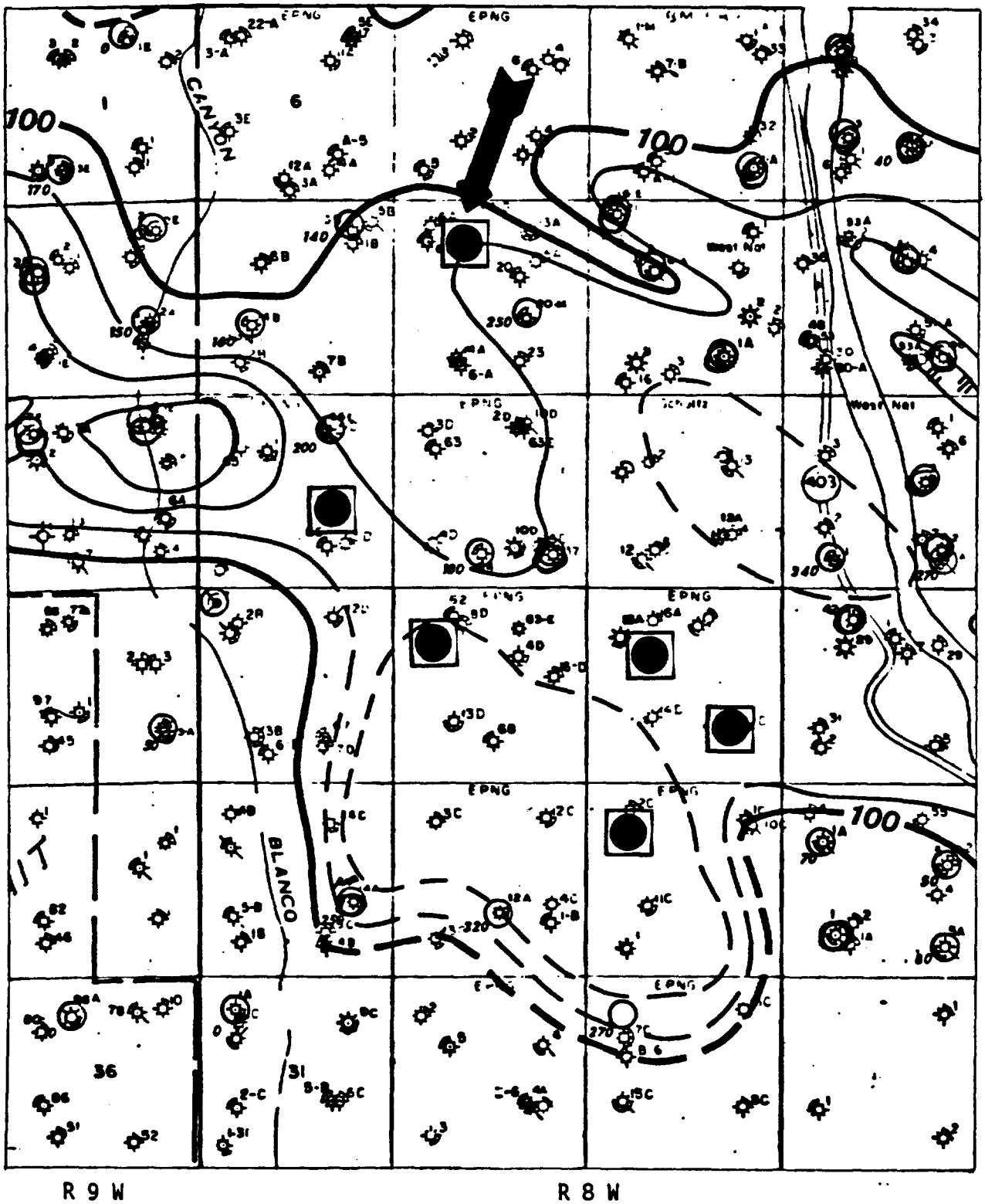
4129R-4

EXHIBIT 3

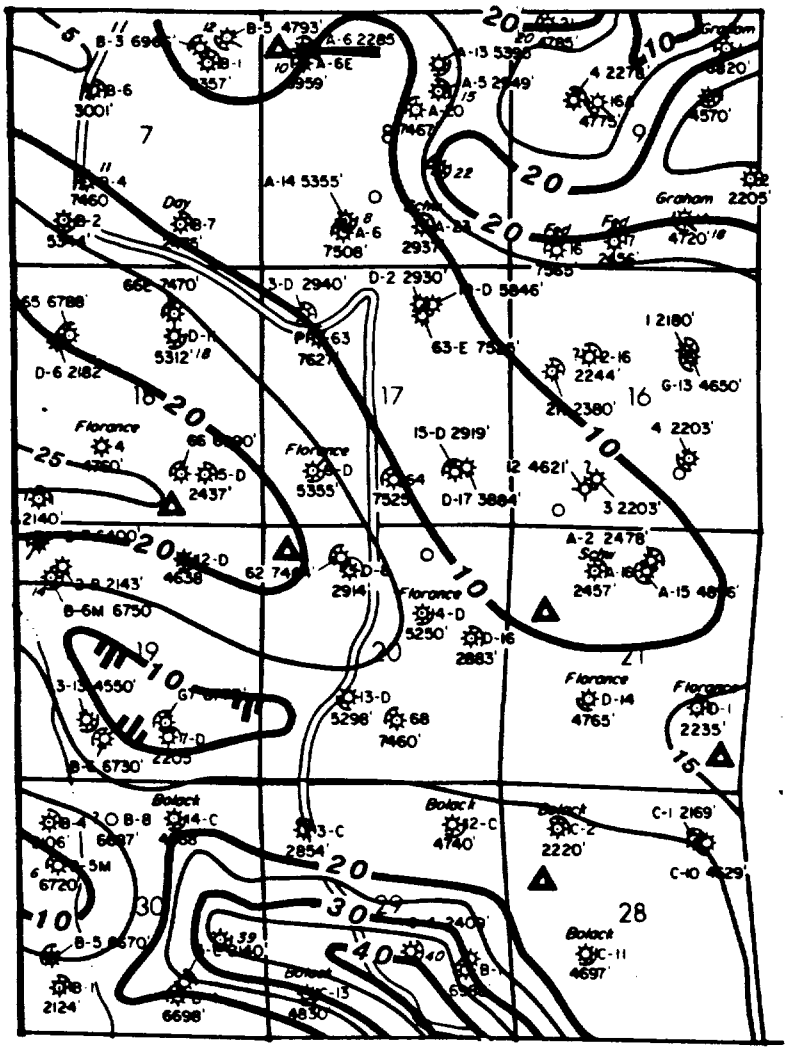
CHACRA ISO-RESERVE MAP (MMCF)



Schwerdtfeger A LS #14A 175 MMCF

EXHIBIT 4

R 8 W



R 8 W

LEGEND

- PICTURED CLIFFS PENETRATION
- CHACRA PENETRATION
- MESA VERDE PENETRATION
- GALLUP PENETRATION
- DAKOTA PENETRATION
- PROPOSED LOCATION

Tenneco Oil
Exploration and Production
WESTERN ROCKY MOUNTAIN DIVISION

TENNECO

San Juan Basin

CLIFFHOUSE & POINT LOOKOUT COMPOSITE NET PAY ISOPACH

MKD 3/4/86

C.I. = 10'
1:4000

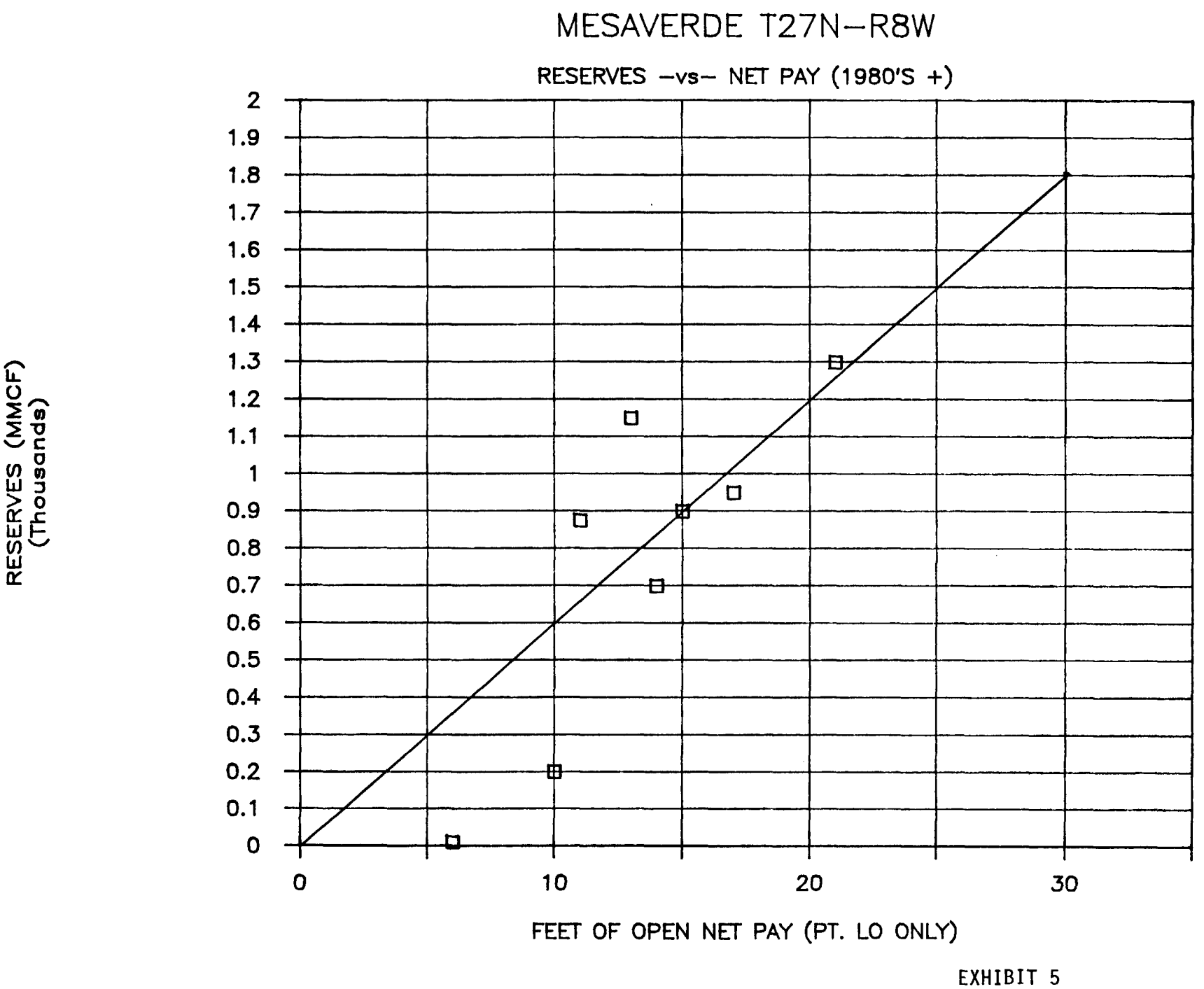

MESAVERDE T27N-R8W
RESERVES -vs- NET PAY (1980'S +)
RESERVES (MMCF)
(Thousands)
2
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
10
20
30
FEET OF OPEN NET PAY (PT. LO ONLY)

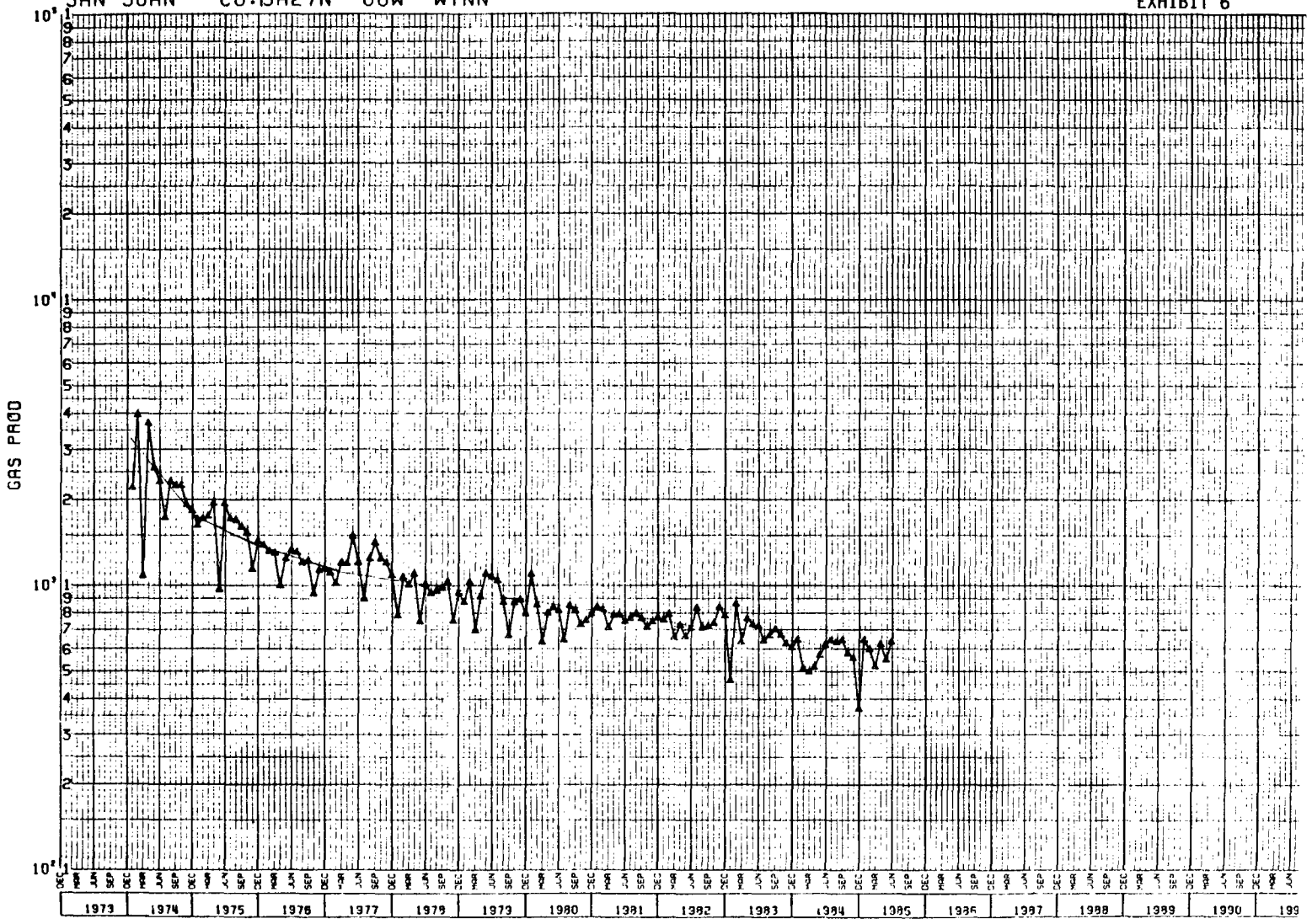
EXHIBIT 5

LARGO FEDERAL 000005 OTERO CHACRA (GAS)

SAN JUAN CO.13A27N 08W WYNN

LEGEND ▲ MCF/MO

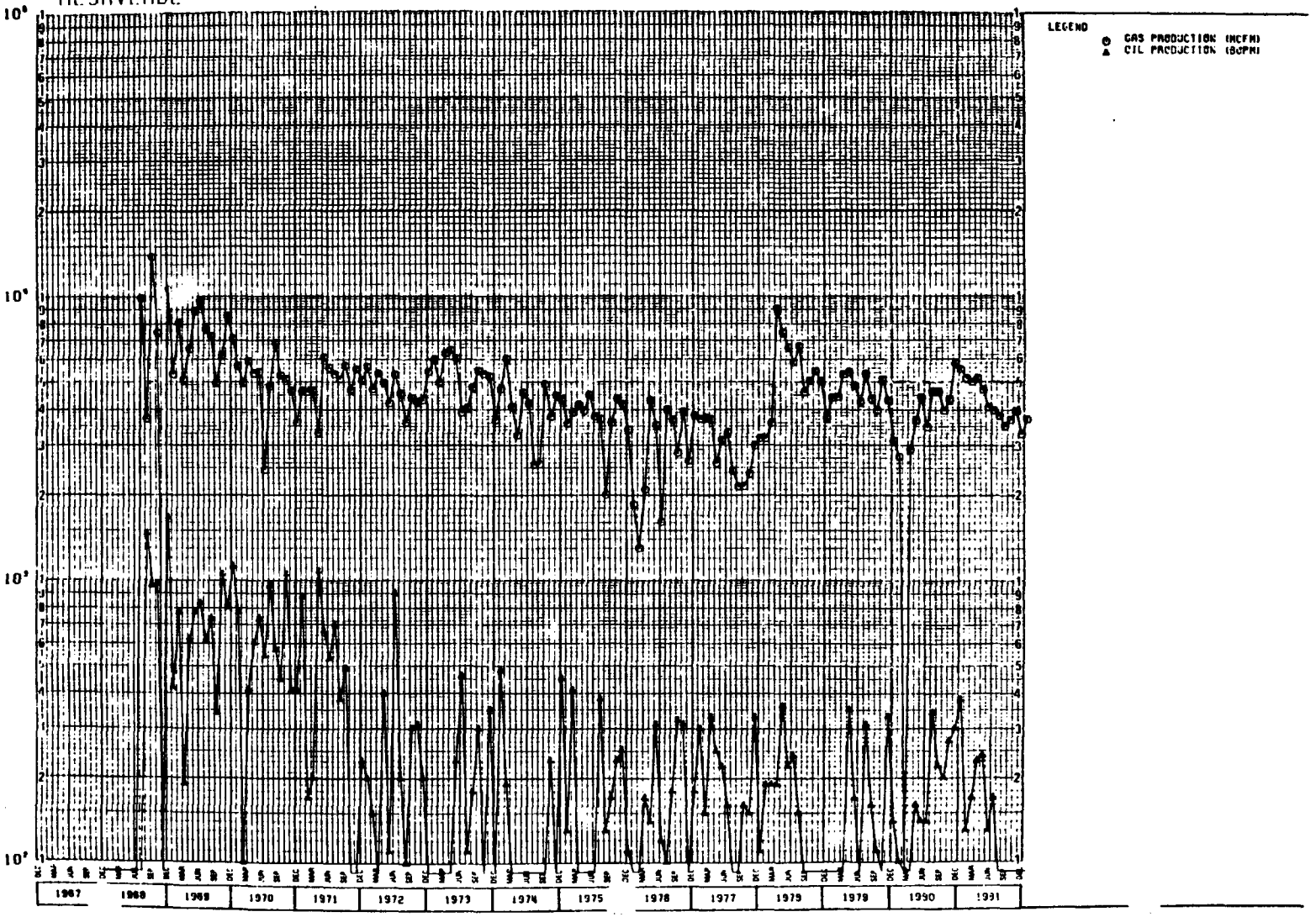
EXHIBIT 6



PLO

DAWSON FEDERAL 1
027N008W26D
MESAVERDE

EXHIBIT 7



PLOT-ID (MH001)

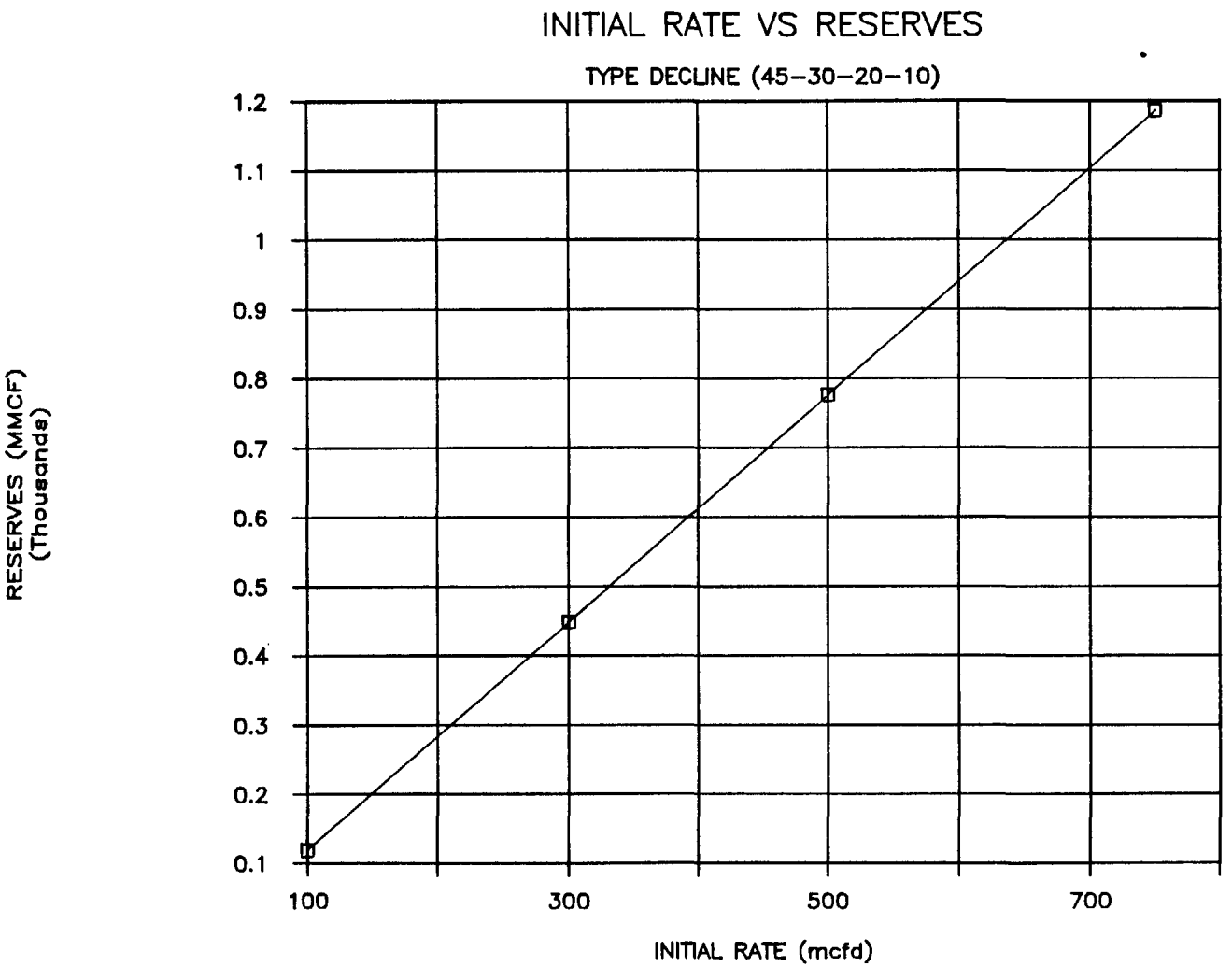

INITIAL RATE VS RESERVES
TYPE DECLINE (45-30-20-10)
RESERVES (MMCF)
(Thousands)
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
100
300
500
700
INITIAL RATE (mcfd)

EXHIBIT 8

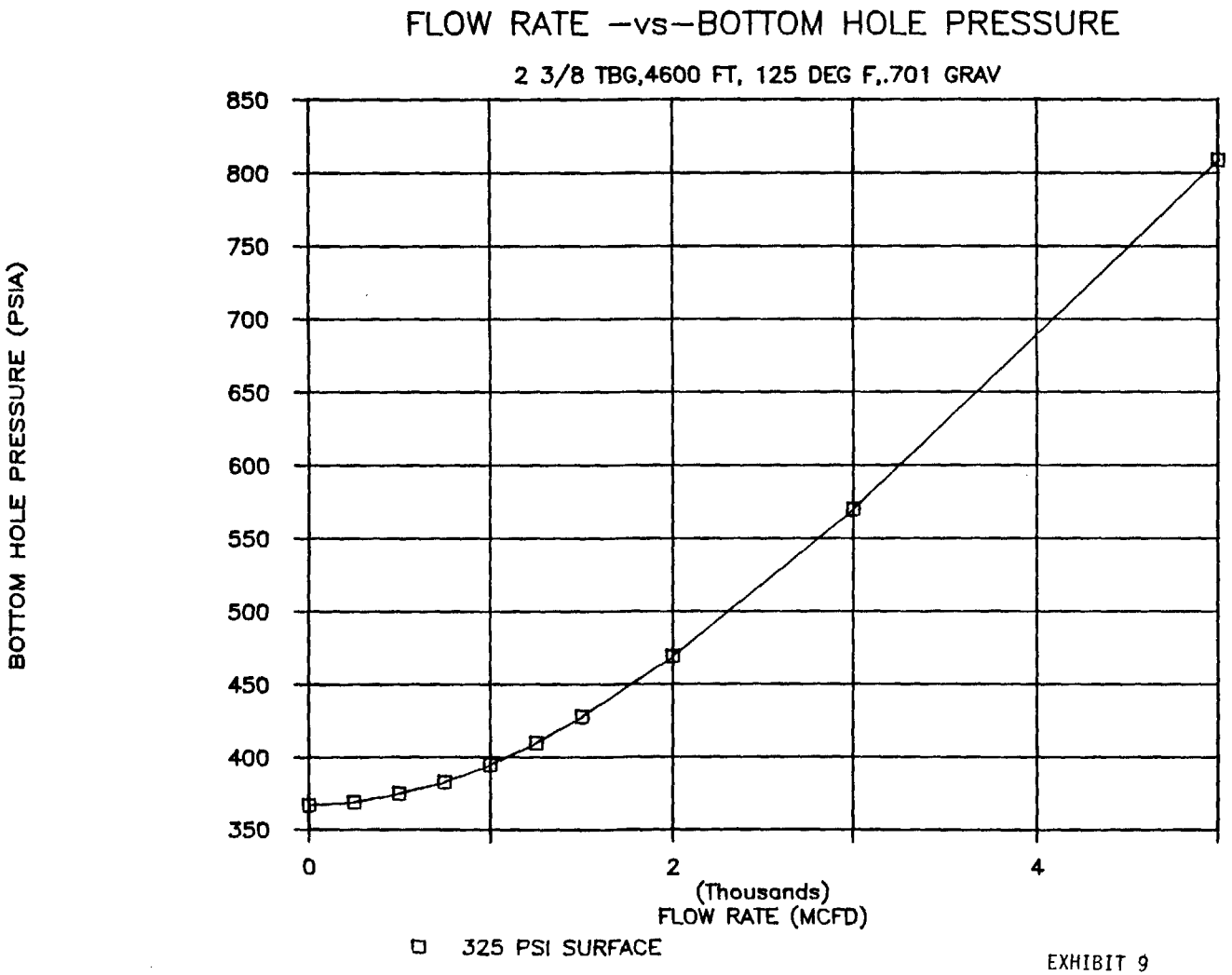

FLOW RATE –vs–BOTTOM HOLE PRESSURE
2 3/8 TBG,4600 FT, 125 DEG F,.701 GRAV
BOTTOM HOLE PRESSURE (PSIA)
850
800
750
700
650
600
550
500
450
400
350
0
2
4
(Thousands)
FLOW RATE (MCFD)
325 PSI SURFACE

EXHIBIT 9

COMMINGLING CAPITAL SAVINGS

Dual Wellhead	$ 5,000	
Separators	$ 5,500	
1 1/4" Tubing	$17,000	
PKR	$ 3,500	
Blast Jts/Pup Jts	$ 5,000	
Miscellaneous Plugs, Etc.	$ 2,000	
Casing	$ 5,000	(Less 7", More 4 1/2")
Drilling Miscellaneous	$ 2,500	(Deeper 8 1/4" hole)
Completion Miscellaneous	$10,500	(Rig time, nitrogen)
Taxes - Misc. Contingency (3%)	$ 2,000	
	$57,000	

The above total represents the additional capital required to produce the Chacra reserves separately. In light of current gas market trends (gas price estimate $1.50 - 2.00/MCF), estimated demand (50-70% takes), hook-up delay, and associated risk, Chacra reserves are insufficient to justify the above incremental investment. To prevent the waste of these Chacra reserves it is necessary to obtain commingling approval. Correlative rights will be protected. The commingled wellbore will more efficiently recover Mesaverde reserves and extend the economic life of the well.

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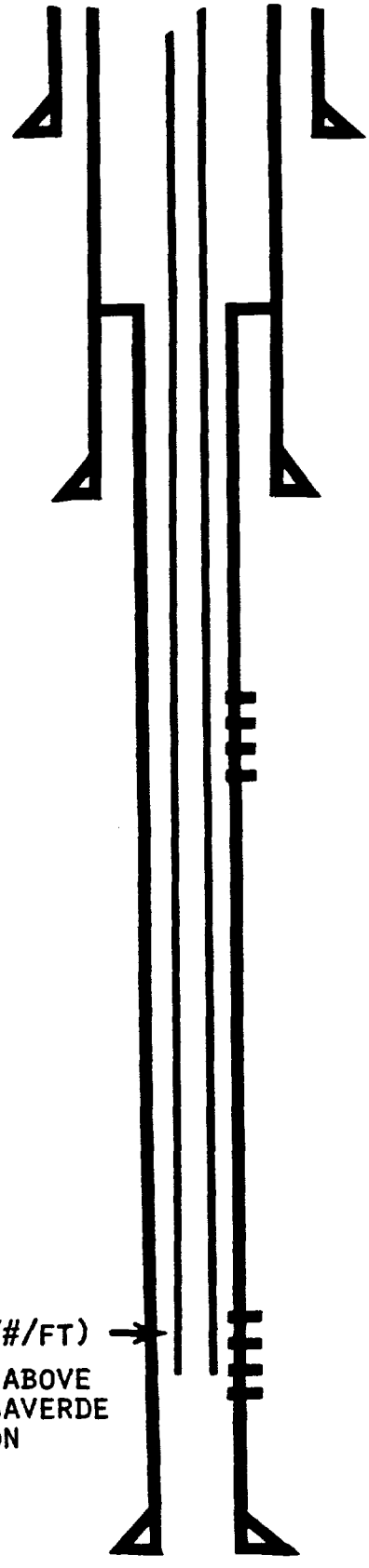
4135R

CHACRA/MESAVERDE COMMINGLING APPLICATION
SCHWERDTFEGER A LS #14A WELL BORE DIAGRAM



CASING: SURFACE
9-5/8" (36#/FT) @ 280 FEET

CASING: INTERMEDIATE
7" (23#/FT)
250 FEET INTO LEWIS SHALE

CHACRA PERFORATIONS @ 3279 FEET

TUBING:
2-3/8" (4.7#/FT)
ONE JOINT ABOVE BOTTOM MESAVERDE PERFORATION

MESAVERDE PERFORATIONS @ 4670 FEET

LINER:
4-1/2" (10.5#/FT) TO T.D. 4820 FEET

CHACRA/MESAVERDE COMMINGLING APPLICATION

WELL NAME: SCHWERDTFEGER A LS #15A
LOCATION: NW/4 SEC. 21 T27N, R8W

Tenneco Oil Company currently plans to drill the captioned well during the third or fourth quarter of 1986. The well is anticipated to encounter productive sands in both the Mesaverde and Chacra formations. Tenneco Oil Company seeks to obtain the Commission's approval to down-hole commingle production from the Chacra and Mesaverde formations. The attached documentation indicates that the two zones proposed for commingling will satisfy all requirements as stipulated by the Commission (303C(b)(1-6).

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A compatibility test was performed using the produced Chacra water from a nearby offset (Dryden LS #1A; SE/4 Sec. 28 T28N, R8W) and the produced Mesaverde water from another nearby offset (Schwerdtfeger A LS #14; SW/4 Sec. 8 T27N, R8W). The test indicated that no scale or precipitate problems should result when production streams from these two horizons are commingled. Water analyses also indicated that corresponding salinities are similar, and no formation damage should occur due to the presence of produced water from another zone. Therefore, rules 303C(b)(3) and 303C(b)(4) are satisfied.

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Both Chacra and Mesaverde wells in this area exhibit similarly shaped decline curves. Exhibits 6 and 7 are representative type decline curves for local Mesaverde and Chacra wells.

Despite the large disparity in estimated reserves, both formations have very similar reserve lives. Exhibit 8 shows initial rate versus reserves for the type decline scenario used. The following table compares reserve lives from each of the two zones assuming a 10 MCF/D economic limit. An average reserve ratio was taken for this example:

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S. M. Struna
Petroleum Engineer

SMS:pe:3/13/86
4131R

Attachment

CHACRA/MESAVERDE COMMINGLING APPLICATION

WELL: Schwerdtfeger A LS #15A
LOCATION: NW/4 Sec. 21 T27N, R8W

Estimated Chacra completed interval midpoint:	3462 ft.
Estimated Mesaverde completed interval midpoint:	4834 ft.
Average surrounding Chacra ISIP's (surface)	1002 psi
Average surrounding Mesaverde ISIP's (surface)	867 psi
Average Surrounding Chacra Completed Interval Midpoint:	3244 ft.
Average surrounding Mesaverde Completed Interval Midpoint:	4616 ft.
Chacra Pressure Gradient	.3382 psi/ft.
Mesaverde Pressure Gradient	.2143 psi/ft.
Anticipated Chacra shut in pressure (bottom hole):	1171 psi
Anticipated Mesaverde shut in pressure (bottom hole):	1036 psi

Anticipated pressures adjusted to 4000 ft. datum:

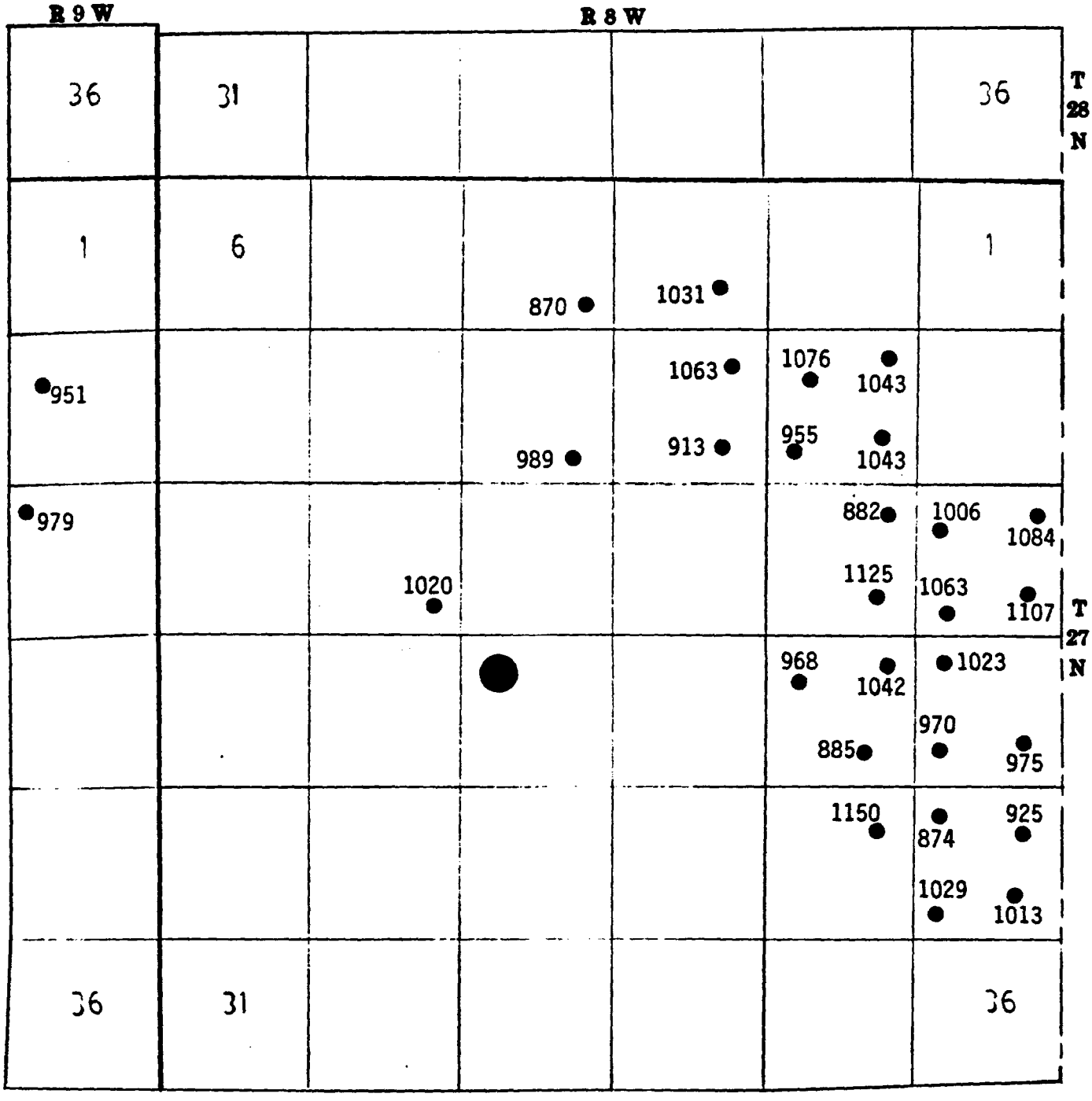
Chacra	1187 psi
Mesaverde	1013 psi

Ratio 1013/1187 = .8537

Satisfies 50% pressure requirement

SMS:pe:2/24/86
4086R-7

CHARCA



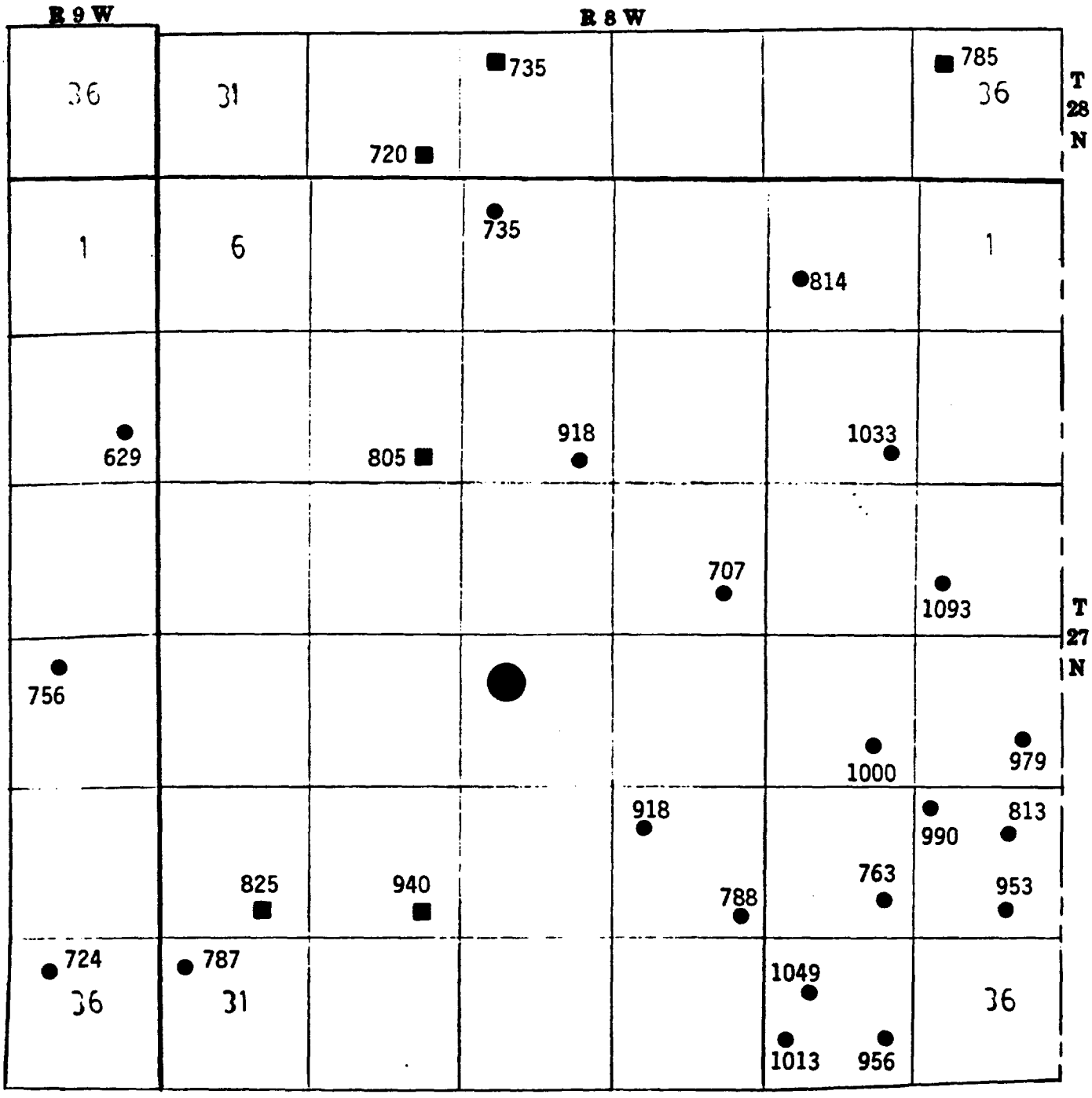
Initial Shut-In Pressure (PSI)

● **Producing Well**

● **Schwerdtfeger A LS #15A**

exhibit 1

MESAVERDE



Initial Shut-In Pressure (PSI)

- ● Recent Infill (post 1978)
- ■ 1985 Tenneco Completion
- ● Schwerdtfeger A LS #15A

EXHIBIT 2

CHACRA/MESAVERDE COMMINGLING APPLICATION

Assumptions Used in Pressure Calculations

Chacra	Gravity = .665*
	P_c = 670.4 psia
	T_c = 378.6°R
Mesaverde	Gravity = .701*
	P_c = 669.1 psia
	T_c = 389.7°R
Local Temperature Gradient	.0139°F/ft.
Ambient Temperature	60°F

Pressures were calculated using a modified Cullender & Smith method.

*Gas gravities estimated from chromatographic analyses of local Chacra and Mesaverde gas samples.

SMS:pe:2/24/86
4086R

CHACRA/MESAVERDE COMMINGLING APPLICATION

INITIAL SHUT-IN PRESSURE DATA

RECENT MESAVERDE INFILL WELLS (POST 1978)

WELL NAME	LOCATION		OPERATOR	DOFP	INITIAL SHUT-IN PRESSURE
State Com #47	SW/2	27N 8W	Mesa	2/79	814
Dawson A #1M	NW/4	27N 8W	TOC	3/81	735
Graham C WN Fed Com #1A	SE/9	27N 8W	Arco	3/78	918
Federal J #1A	SE/11	27W 8W	AAA Oper. Co. Inc.	4/80	1133
Federal E #3A	SW/13	27N 8W	AAA Oper. Co. Inc.	4/80	1193
Federal R #1A	SE/15	27N 8W	AAA Oper. Co. Inc.	3/84	707
Federal E #2A	SE/23	27N 8W	AAA Oper. Co. Inc.	10/79	1000
Marron WN Fed Com #6A	SE/24	27N 8W	Arco	4/78	979
Hammond #41R	NE/25	27N 8W	Russell WM. C.	2/78	813
Federal E #1A	NW/25	27N 8W	AAA Oper. Co. Inc.	10/79	990
Federal E #1	SE/25	27N 8W	AAA Oper. Co. Inc.	6/72	953
Hammond #55A	SE/26	27N 8W	Great Lakes Chem.	3/79	763
Marron WN Fed Com #1A	NW/27	27N 8W	Arco	1/78	918
Marron #5A	SE/27	27N 8W	Western Oil & Min.	7/79	788
Linda #1A	NW/31	27N 8W	Consolidated O & G	6/79	787
Hammond #5	NW/35	27N 8W	Great Lakes Chem.	2/78	1049
Hammond WN Fed #7A	SE/35	27N 8W	Arco	4/79	956
Hammond #47R	SW/35	27N 8W	R & G Drilling Co.	4/78	1013
Blanco #2A	SE/12	27N 9W	NWPL	5/82	629
Huerfanito Unit #77A	NW/24	27N 9W	EPNG	3/83	756
Huerfanito Unit #86A	NW/36	27N 9W	EPNG	1/80	724

1985 TENNECO MESAVERDE INFILL WELLS

WELL NAME	LOCATION		OPERATOR	DOFP	INITIAL SHUT-IN PRESSURE
Riddle F LS #5A	SE/32	28N 8W			720
Bolack B LS #1A	NW/33	28N 8W			735
Blanco LS #12A	NW/36	28N 8W			785
Schwertdfeger A LS #20M	SE/8	27N 8W			805
Bolack C LS #12A	SE/29	27N 8W			940
Bolack C LS #14A	SE/30	27N 8W			825

Chacra/Mesaverde Commingling Application
Initial Shut-in Pressure Data
Page 2

OTERO CHACRA OFFSET WELLS

WELL NAME	LOCATION		OPERATOR	DOFP	INITIAL SHUT-IN PRESSURE
Graham #3	SE/3	27N 8W	Great Lakes Chem.	8/77	1031
Graham #1A	SE/4	27N 8W	Great Lakes Chem.	7/76	870
Graham C WN Fed Com #1A	SE/9	27N 8W	Arco	3/78	989
Graham #51	NE/10	27N 8W	Russell William C.	10/72	1063
Graham #96	SE/10	27N 8W	Russell William C.	12/83	913
Federal J #1	NE/11	27N 8W	AAA Oper. Co. Inc.	7/72	1043
Largo Fed. #4	NW/11	27N 8W	AAA Oper. Co. Inc.	12/73	1076
Largo Fed. #1	SW/11	27N 8W	AAA Oper. Co. Inc.	7/72	955
Federal J #2	SE/11	27N 8W	AAA Oper. Co. Inc.	4/80	1043
Largo Fed #5	NE/13	27N 8W	AAA Oper. Co. Inc.	12/73	1084
Federal E #3	NW/13	27N 8W	AAA Oper. Co. Inc.	7/72	1006
Largo Federal #2	SE/13	27N 8W	AAA Oper. Co. Inc.	5/73	1107
Federal E #6	SW/13	27N 8W	AAA Oper. Co. Inc.	4/80	1063
Largo Federal #3	NE/14	27N 8W	AAA Oper. Co. Inc.	5/73	882
Largo Federal #6	SE/14	27N 8W	AAA Oper. Co. Inc.	12/73	1125
Florance D LS #17	SE/17	27N 8W	TOC	10/72	1020
Marron #94	NW/23	27N 8W	Russell William C.	1/80	968
Federal E #2	NE/23	27N 8W	AAA Oper. Co. Inc.	6/72	1042
Federal E #5	SE/23	27N 8W	AAA Oper. Co. Inc.	9/79	885
Marron #6A	NW/24	27N 8W	Western Oil & Min.	2/76	1023
Marron WN Fed. Com #6A	SE/24	27N 8W	Arco	4/78	975
Snodgrass #1	SW/24	27N 8W	Western Oil & Min.	4/78	970
Federal E #4	NW/25	27N 8W	AAA Oper. Co. Inc.	9/79	874
Hammond #91	NE/25	27N 8W	Russell William C.	12/77	925
Federal E #1	SW/25	27N 8W	AAA Oper. Co. Inc.	7/72	1029
Hammond #92	SE/25	27N 8W	Russell William C.	1/80	1013
Hammond #52	NE/26	27N 8W	Russell William C.	12/74	1150
Blanco #25	NW/12	27N 9W	NWPL	6/75	951
John Charles #7E	NW/13	27N 9W	Getty	5/81	979

CHACRA/MESAVERDE COMMINGLING APPLICATION

RESERVE ESTIMATION AND PRODUCTION ALLOCATION

WELL: Schwerdtfeger A LS #15A
LOCATION: NW/4 Sec. 21 T27N, R8W

Chacra Reserves

Total Estimated Reserves (Exhibit 3) = 250 MMCF

Mesaverde Reserves

Net Pay Thickness (Exhibit 4) = 10 ft.
Total Estimated Reserves (Exhibit 5) = 600 MMCF

Production Allocation

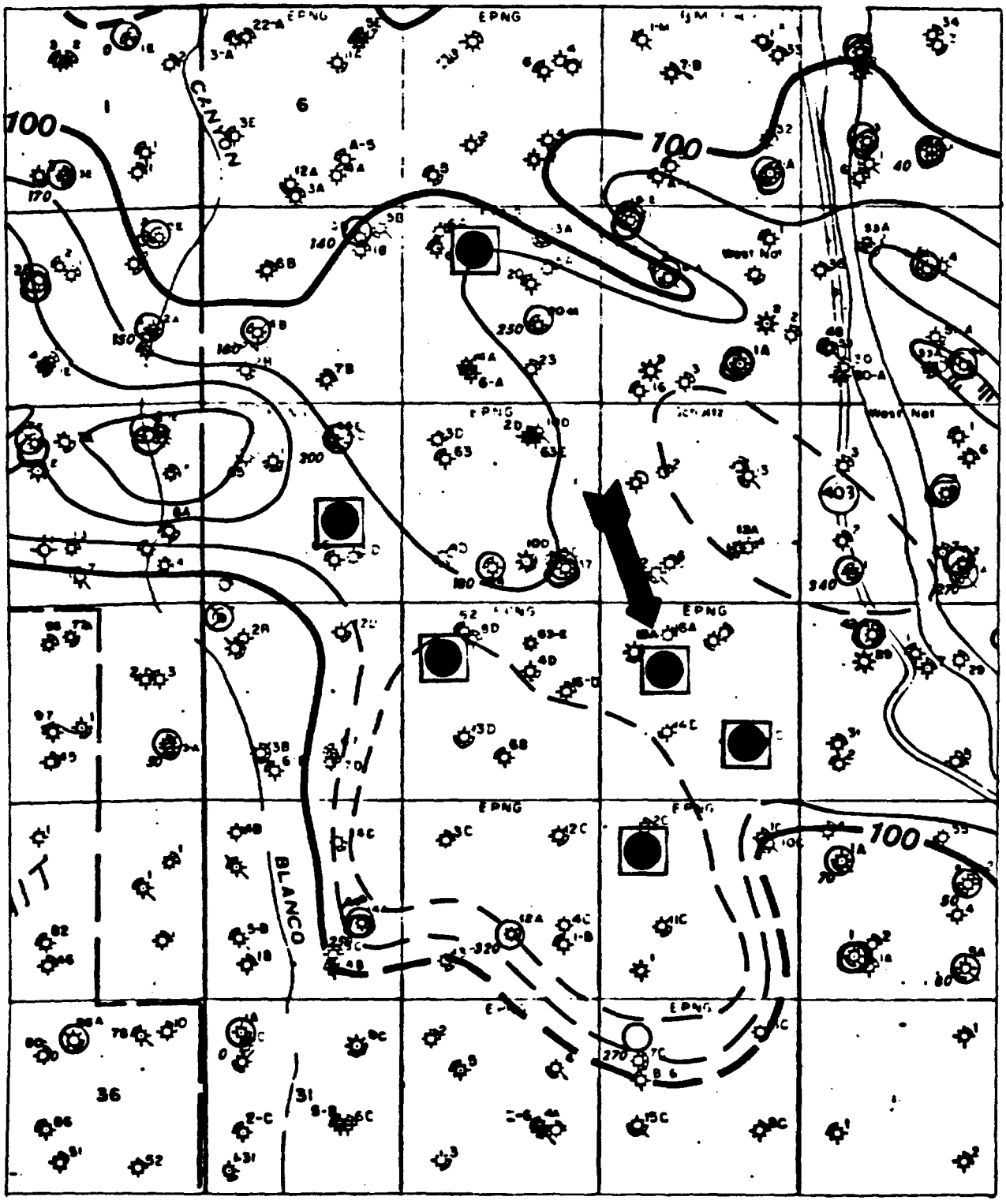
Chacra: (250)/(250 + 600) = .2941 = 29.41%

Mesaverde: (600)/(250 + 600) = .7059 = 70.59%

SMS:pe:3/11/86
4129R-3

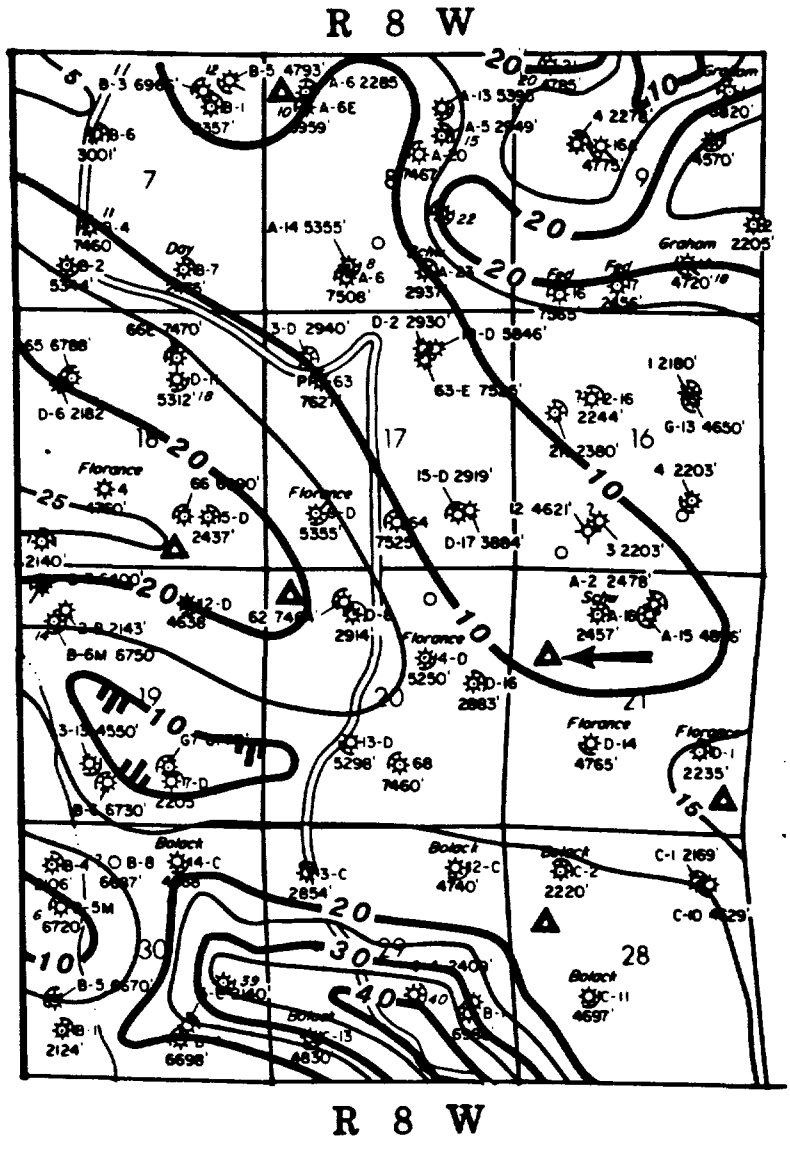
CHACRA ISO-RESERVE MAP (MMCF)

EXHIBIT 3



Schwerdtfeger A LS #15A 250 MMCF

EXHIBIT 4



LEGEND

- PICTURED CLIFFS PENETRATION
- CHACRA PENETRATION
- MESA VERDE PENETRATION
- GALLUP PENETRATION
- DAKOTA PENETRATION
- PROPOSED LOCATION

Tenneco Oil
Exploration and Production
WESTERN ROCKY MOUNTAIN DIVISION

TENNECO

San Juan Basin

CLIFFHOUSE & POINT LOOKOUT COMPOSITE NET PAY ISOPACH

MKD 3/4/86

C.I. = 10'
1:4000

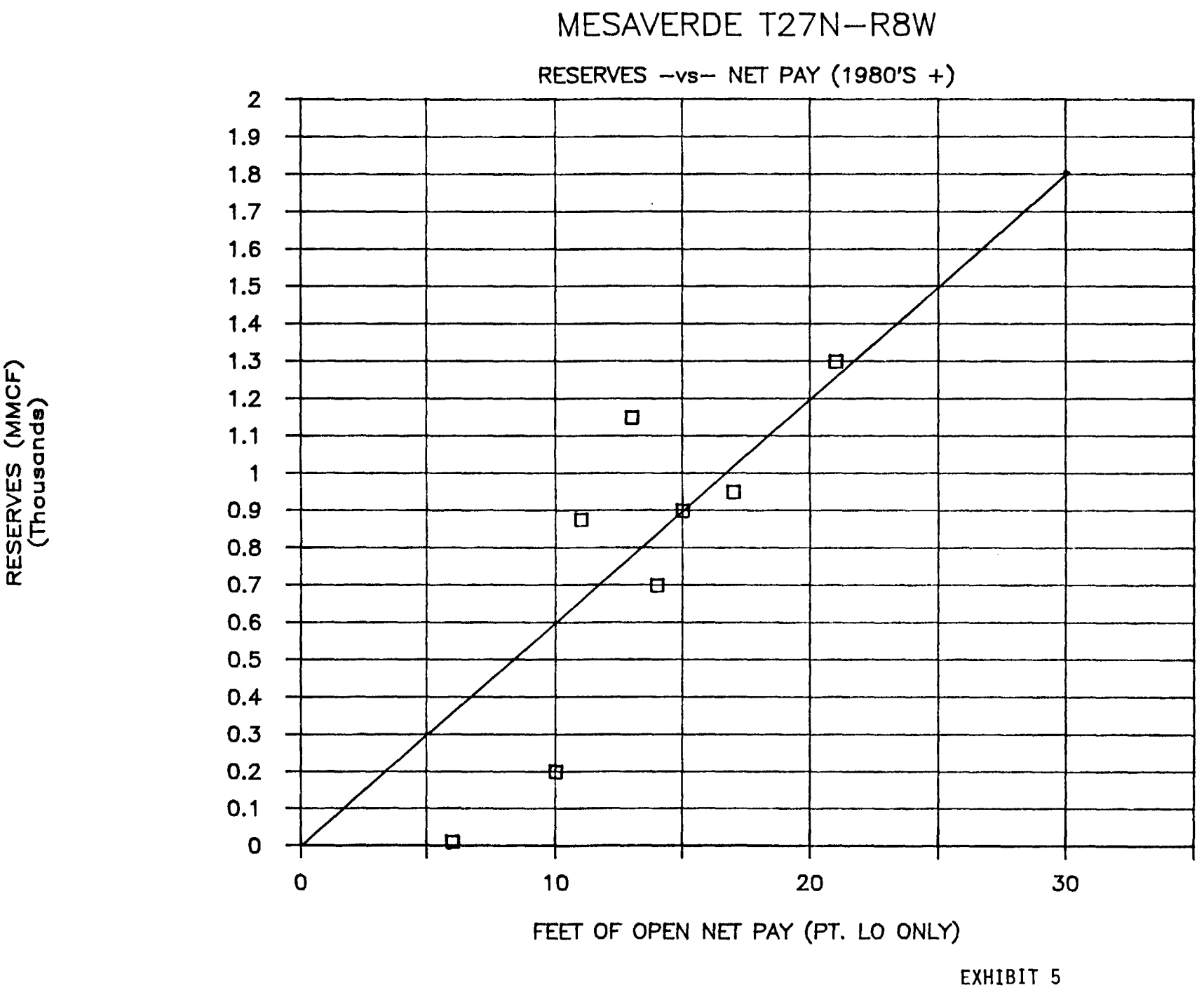

MESAVERDE T27N-R8W
RESERVES -vs- NET PAY (1980'S +)
RESERVES (MMCF)
(Thousands)
2
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
10
20
30
FEET OF OPEN NET PAY (PT. LO ONLY)

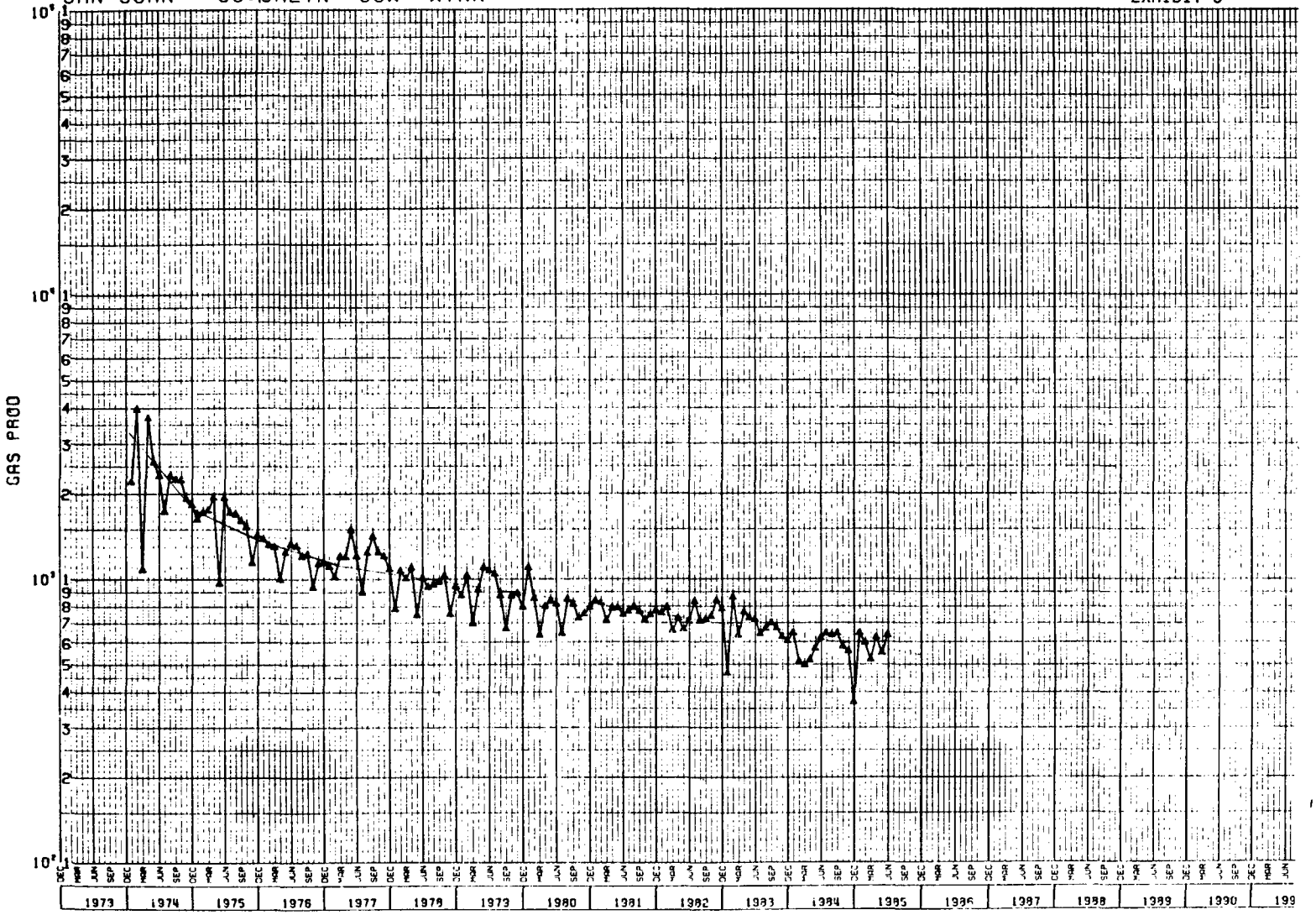
EXHIBIT 5

LARGO FEDERAL 000005 OTERO CHACRA (GAS)

SAN JUAN CO.13A27N 08W WYNN

LEGEND ▲ MCF/MO

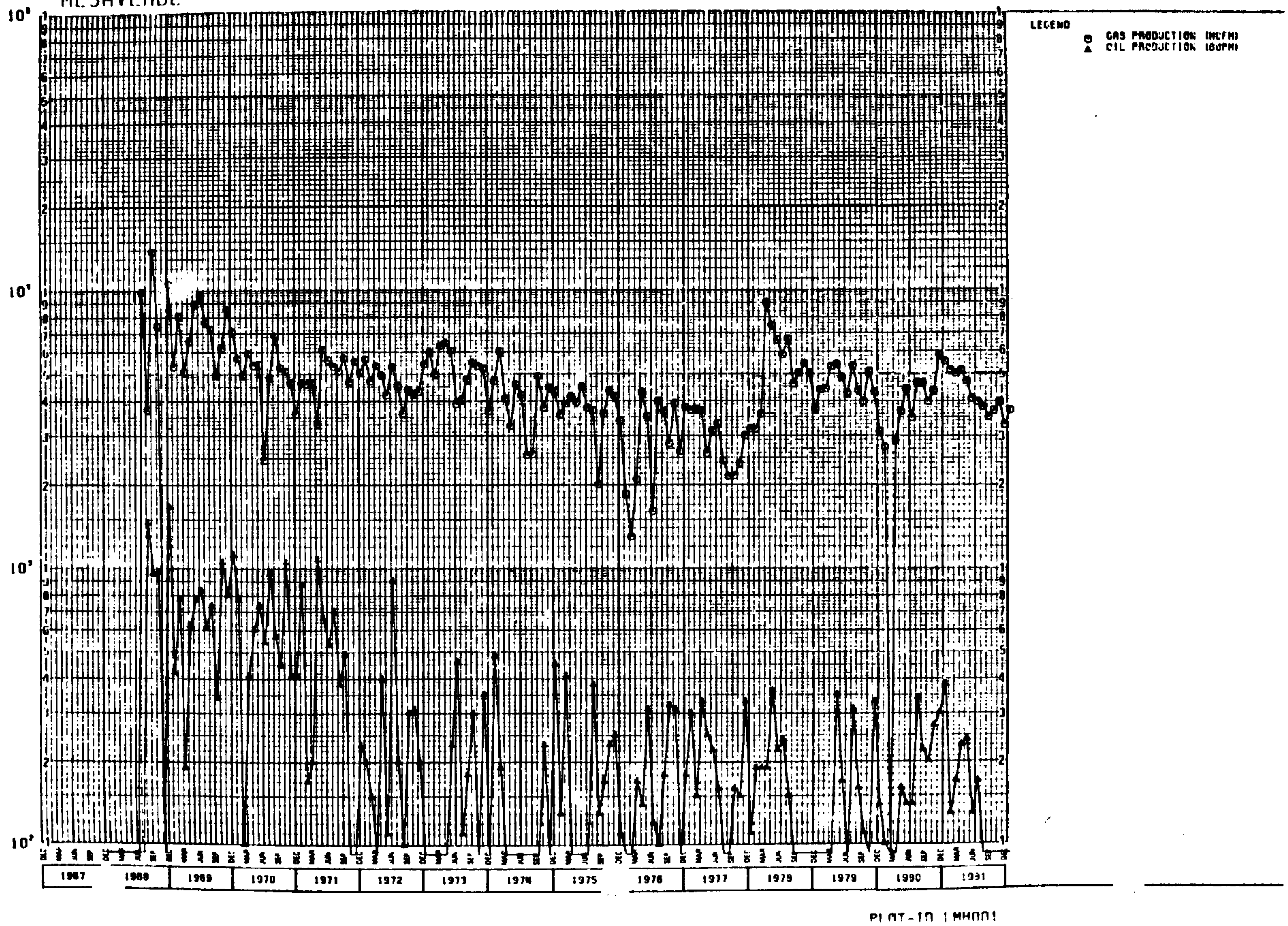
EXHIBIT 6



PLO

DAWSON FEDERAL 1
027N008W26D
MESAVERDE

EXHIBIT 7



INITIAL RATE VS RESERVES

TYPE DECLINE (45–30–20–10)

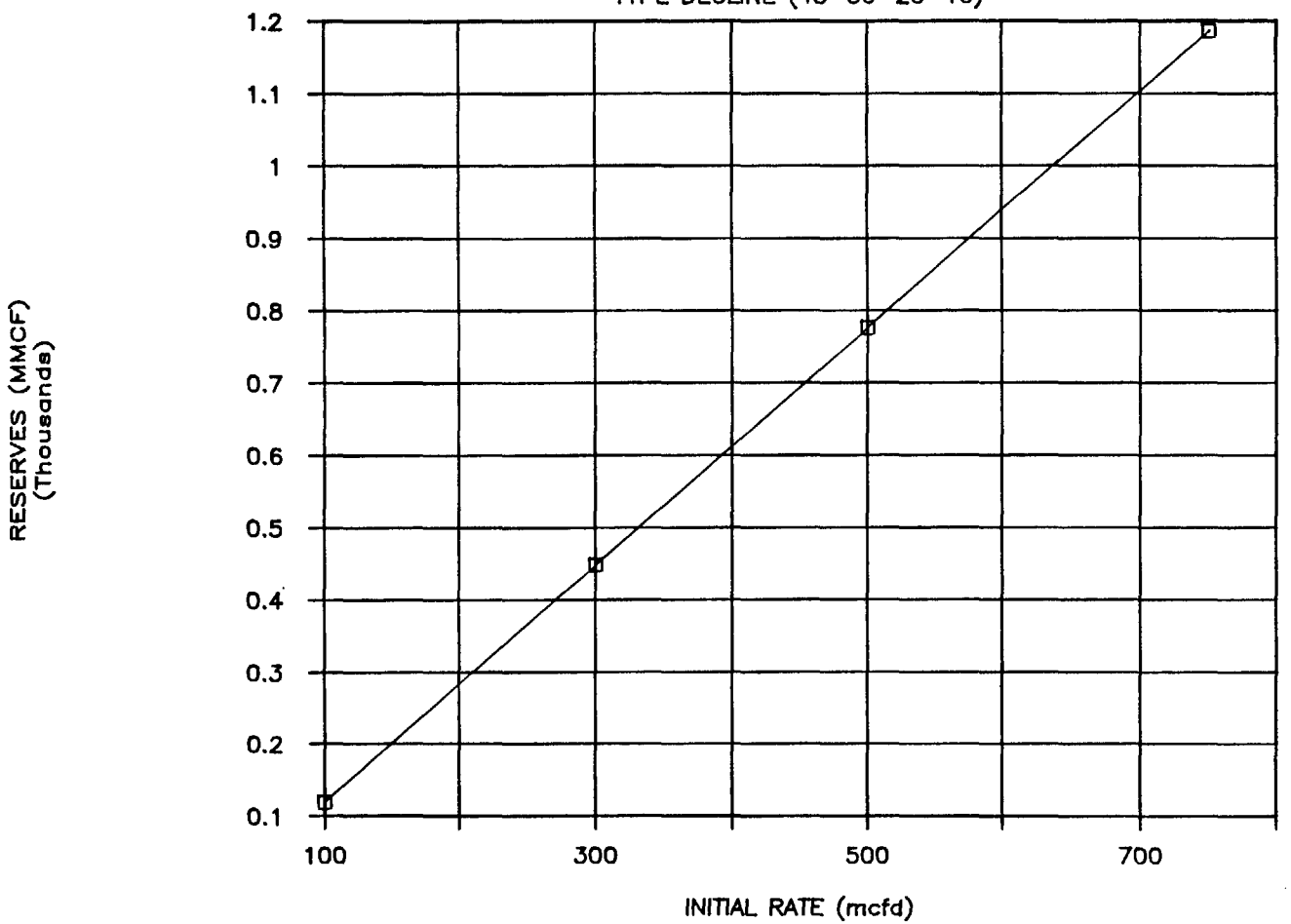


EXHIBIT 8

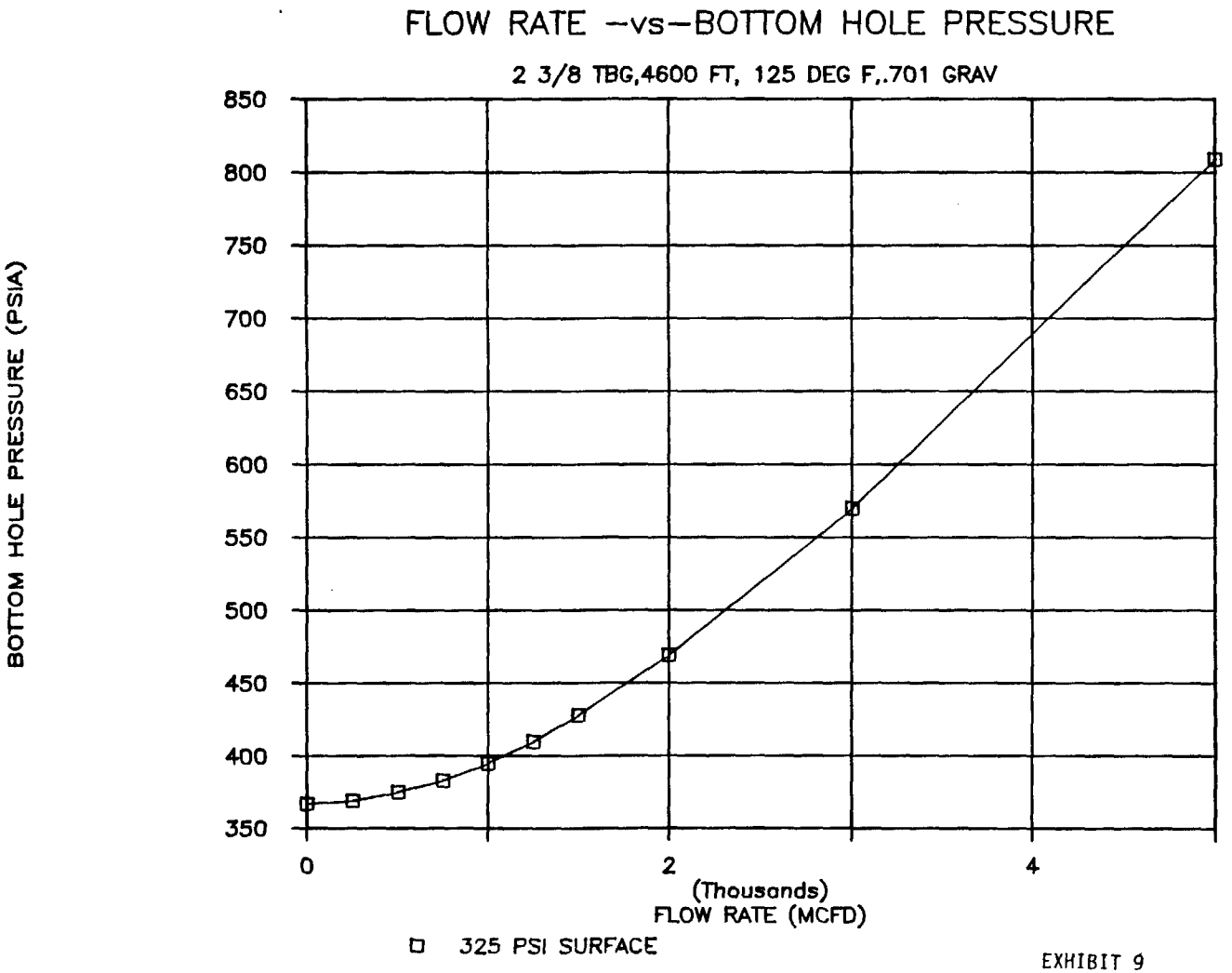

FLOW RATE –vs– BOTTOM HOLE PRESSURE
2 3/8 TBG,4600 FT, 125 DEG F,.701 GRAV
BOTTOM HOLE PRESSURE (PSIA)
850
800
750
700
650
600
550
500
450
400
350
0
2
4
(Thousands)
FLOW RATE (MCFD)
325 PSI SURFACE

EXHIBIT 9

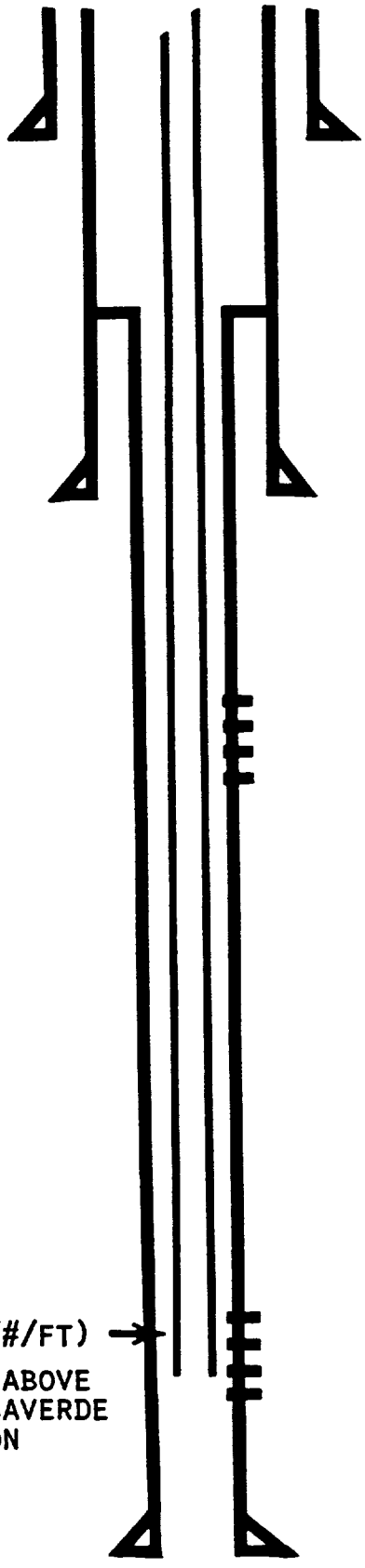
COMMINGLING CAPITAL SAVINGS

Dual Wellhead	$ 5,000	
Separators	$ 5,500	
1 1/4" Tubing	$17,000	
PKR	$ 3,500	
Blast Jts/Pup Jts	$ 5,000	
Miscellaneous Plugs, Etc.	$ 2,000	
Casing	$ 5,000	(Less 7", More 4 1/2")
Drilling Miscellaneous	$ 2,500	(Deeper 8 1/4" hole)
Completion Miscellaneous	$10,500	(Rig time, nitrogen)
Taxes - Misc. Contingency (3%)	$ 2,000	
	$57,000	

The above total represents the additional capital required to produce the Chacra reserves separately. In light of current gas market trends (gas price estimate $1.50 - 2.00/MCF), estimated demand (50-70% takes), hook-up delay, and associated risk, Chacra reserves are insufficient to justify the above incremental investment. To prevent the waste of these Chacra reserves it is necessary to obtain commingling approval. Correlative rights will be protected. The commingled wellbore will more efficiently recover Mesaverde reserves and extend the economic life of the well.

SMS:pe:3/17/86
4135R

CHACRA/MESAVERDE COMMINGLING APPLICATION
SCHWERDTFEGER A LS #15A WELL BORE DIAGRAM



CASING: SURFACE
9-5/8" (36#/FT) @ 280 FEET

CASING: INTERMEDIATE
7" (23#/FT)
250 FEET INTO LEWIS SHALE

CHACRA PERFORATIONS @ 3462 FEET

TUBING:
2-3/8" (4.7#/FT)
ONE JOINT ABOVE BOTTOM MESAVERDE PERFORATION

MESAVERDE PERFORATIONS @ 4834 FEET

LINER:
4-1/2" (10.5#/FT) TO T.D. 4984 FEET

CHACRA/MESAVERDE COMMINGLING APPLICATION

WELL NAME: FLORANCE D LS #14A
LOCATION: SE/4 SEC. 21 T27N, R8W

Tenneco Oil Company currently plans to drill the captioned well during the third or fourth quarter of 1986. The well is anticipated to encounter productive sands in both the Mesaverde and Chacra formations. Tenneco Oil Company seeks to obtain the Commission's approval to down-hole commingle production from the Chacra and Mesaverde formations. The attached documentation indicates that the two zones proposed for commingling will satisfy all requirements as stipulated by the Commission (303C(b)(1-6).

The Mesaverde formation is the primary target of the captioned well. In light of current market conditions estimated reserves associated with a Chacra completion at the above location are considered to be insufficient to justify the capital expenditure required to separately produce these reserves. In the event that approval to commingle production is not granted, the Chacra interval would not be completed.

Estimated bottom hole pressures for the two zones were extrapolated statistically from offset Mesaverde and Chacra wells (Exhibits 1 & 2). The anticipated pressure of the lower pressured zone (Mesaverde) is estimated to be 86.02% of the pressure anticipated in the higher pressured zone (Chacra), when adjusted to a common datum. Therefore, rules 303C(b)(2) and 303C(b)(6) are satisfied.

A compatibility test was performed using the produced Chacra water from a nearby offset (Dryden LS #1A; SE/4 Sec. 28 T28N, R8W) and the produced Mesaverde water from another nearby offset (Schwerdtfeger A LS #14; SW/4 Sec. 8 T27N, R8W). The test indicated that no scale or precipitate problems should result when production streams from these two horizons are commingled. Water analyses also indicated that corresponding salinities are similar, and no formation damage should occur due to the presence of produced water from another zone. Therefore, rules 303C(b)(3) and 303C(b)(4) are satisfied.

Common ownership exists between the Chacra and Mesaverde zones, satisfying rule 303C(b)(5). A detailed ownership breakdown is attached.

It is recommended that production be allocated on a strict percentage basis according to the fraction of total reserves contributed by each zone. Chacra reserves were estimated from the attached iso-reserve map (Exhibit 3). Mesaverde reserves were estimated from the attached net pay

isopach map (Exhibit 4) and a linear correlation of reserves versus net pay (Exhibit 5). Exhibit 5 was obtained by plotting estimated ultimate recoveries (decline curve derived) from recent (1980+) Mesaverde wells against the amount of net perforated pay as determined from log analysis and completion reports. Chacra reserves are estimated to be 250 MMCF, while Mesaverde reserves are estimated to be 950 MMCF. Production allocated to the Chacra should be 20.83% of total, and the production allocated to the Mesaverde should be 79.17% of total.

Both Chacra and Mesaverde wells in this area exhibit similarly shaped decline curves. Exhibits 6 and 7 are representative type decline curves for local Mesaverde and Chacra wells.

Despite the large disparity in estimated reserves, both formations have very similar reserve lives. Exhibit 8 shows initial rate versus reserves for the type decline scenario used. The following table compares reserve lives from each of the two zones assuming a 10 MCF/D economic limit. An average reserve ratio was taken for this example:

FORMATION	RESERVES (MMCF)	INITIAL RATE (MCF/D)	ECONOMIC* LIMIT (MCF/D)	RESERVE LIFE (YRS)
Mesaverde	1150	735	8	31.7
Chacra	235	160	2	31.2
			10	

Produced Chacra gas is extremely dry. Chacra wells in the vicinity of the subject well produce less than 1 BBL/MMCF of water and condensate (combined) on an average basis. Local Mesaverde wells produce considerably more liquids than do the Chacra wells. Average condensate and water yields are approximately 5 BBL/MMCF and 2 BBL/MMCF, respectively, for the Mesaverde producers. As the production capacity of the Mesaverde zone decreases with time, its ability to unload produced fluids also decreases. The increased

*The economic limit was allocated roughly according to the reserve ratio: 83% Mesaverde / 17% Chacra

volume of commingled dry Chacra gas through the tubing will help to lift the produced Mesaverde liquids. Over the life of the well, the commingled Chacra production will definitely improve the flow efficiency of the Mesaverde zone. Early in the life of the well, while both zones are producing at maximum rates, there will be a slight increase in friction loss (tubing) due to the additional volume of Chacra gas. Exhibit 9 shows that the flowing bottom hole pressure goes from 390 psi for a well producing 750 mcf/d, to 405 psi for a well producing at 1250 mcf/d. An increased pressure drop of 15 psi is insignificant, and would represent a maximum considering the initial rate of the Chacra production will be much closer to 200 mcf/d rather than 500 mcf/d.

All operators of offset wells have been notified in writing of the proposed commingling within the time limits provided under rule #1207.

S. M. Struna
Petroleum Engineer

SMS:pe:3/13/86
4131R

Attachment

CHACRA/MESAVERDE COMMINGLING APPLICATION

WELL: Florance D LS #14A
LOCATION: SE/4 Sec. 21 T27N, R8W

Estimated Chacra completed interval midpoint:	3356 ft.
Estimated Mesaverde completed interval midpoint:	4727 ft.
Average surrounding Chacra ISIP's (surface)	1002 psi
Average surrounding Mesaverde ISIP's (surface)	867 psi
Average Surrounding Chacra Completed Interval Midpoint:	3244 ft.
Average surrounding Mesaverde Completed Interval Midpoint:	4616 ft.
Chacra Pressure Gradient	.3382 psi/ft.
Mesaverde Pressure Gradient	.2143 psi/ft.
Anticipated Chacra shut in pressure (bottom hole):	1135 psi
Anticipated Mesaverde shut in pressure (bottom hole):	1012 psi

Anticipated pressures adjusted to 4000 ft. datum:

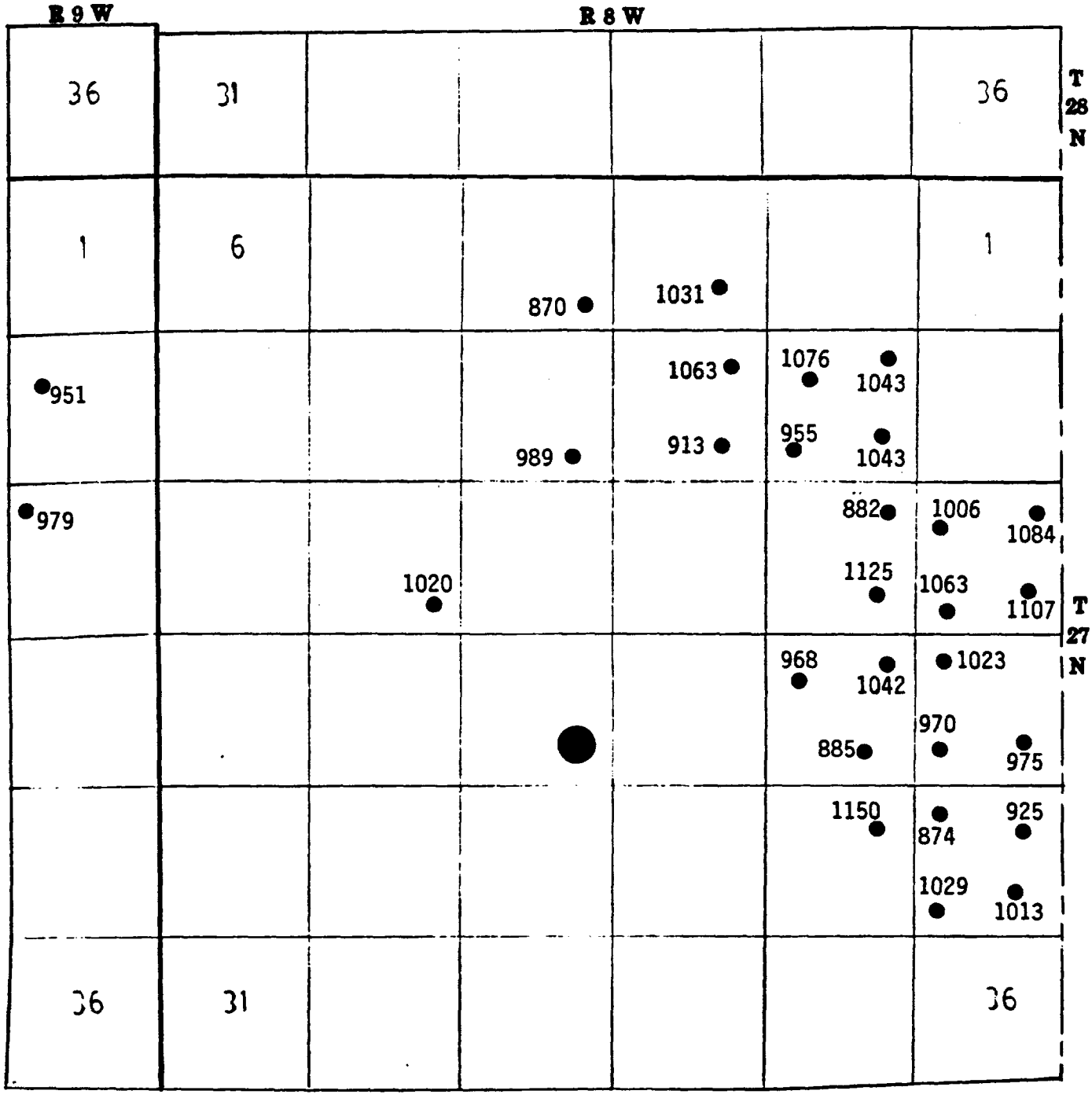
Chacra	1154 psi
Mesaverde	992 psi

Ratio 992/1154 = .8602

Satisfies 50% pressure requirement

SMS:pe:2/24/86
4086R-5

CHARCA



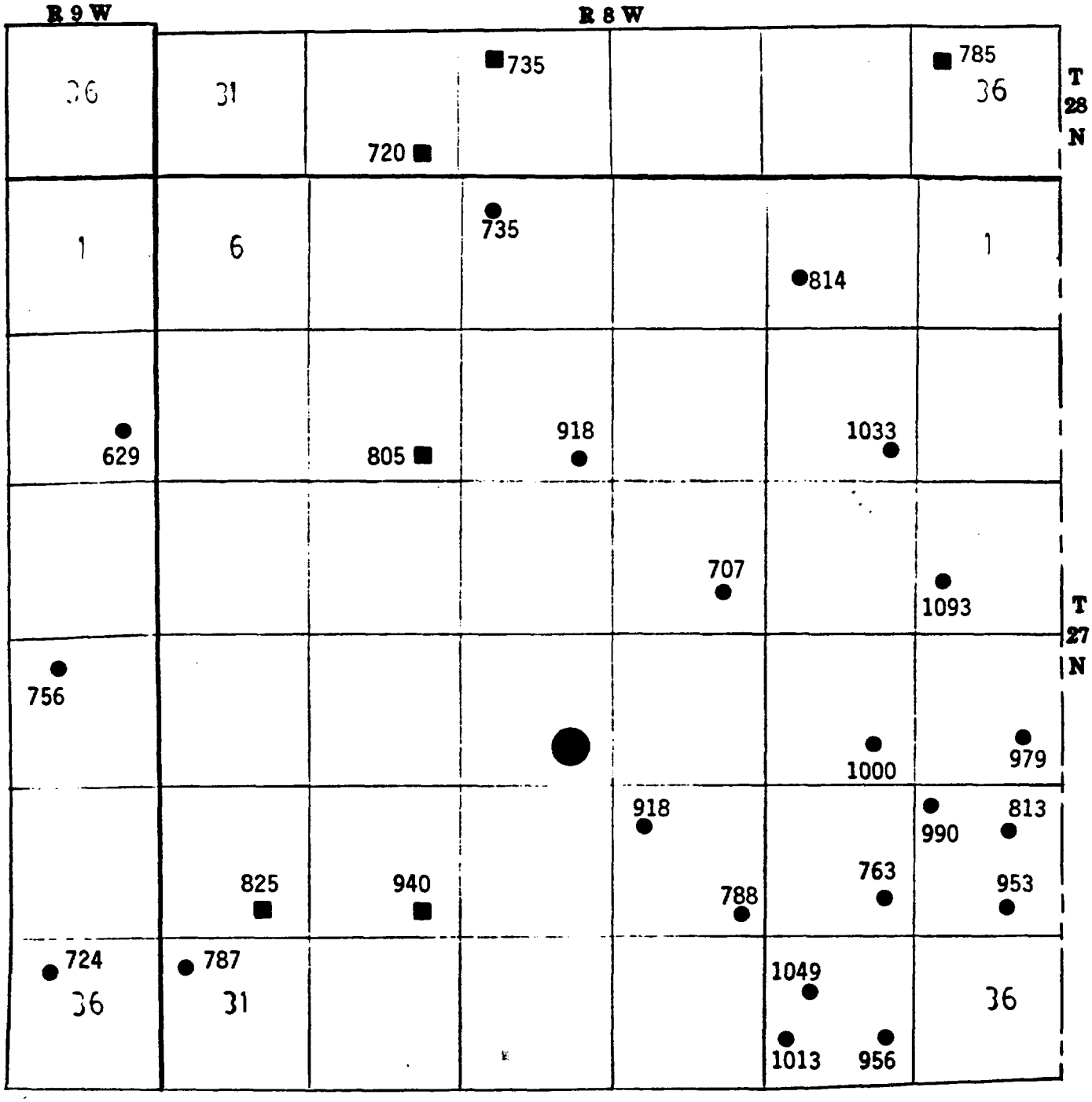
Initial Shut-In Pressure (PSI)

● **Producing Well**

● **Florance D LS #14A**

EXHIBIT 1

MESAVERDE



Initial Shut-In Pressure (PSI)

- ● Recent Infill (post 1978)
- ■ 1985 Tenneco Completion
- ● Florance D LS #14A

EXHIBIT 2

CHACRA/MESAVERDE COMMINGLING APPLICATION

Assumptions Used in Pressure Calculations

Chacra	Gravity = .665*
	P_c = 670.4 psia
	T_c = 378.6°R
Mesaverde	Gravity = .701*
	P_c = 669.1 psia
	T_c = 389.7°R
Local Temperature Gradient	.0139°F/ft.
Ambient Temperature	60°F

Pressures were calculated using a modified Cullender & Smith method.

*Gas gravities estimated from chromatographic analyses of local Chacra and Mesaverde gas samples.

SMS:pe:2/24/86
4086R

CHACRA/MESAVERDE COMMINGLING APPLICATION

INITIAL SHUT-IN PRESSURE DATA

RECENT MESAVERDE INFILL WELLS (POST 1978)

WELL NAME	LOCATION		OPERATOR	DOFP	INITIAL SHUT-IN PRESSURE
State Com #47	SW/2	27N 8W	Mesa	2/79	814
Dawson A #1M	NW/4	27N 8W	TOC	3/81	735
Graham C WN Fed Com #1A	SE/9	27N 8W	Arco	3/78	918
Federal J #1A	SE/11	27W 8W	AAA Oper. Co. Inc.	4/80	1133
Federal E #3A	SW/13	27N 8W	AAA Oper. Co. Inc.	4/80	1193
Federal R #1A	SE/15	27N 8W	AAA Oper. Co. Inc.	3/84	707
Federal E #2A	SE/23	27N 8W	AAA Oper. Co. Inc.	10/79	1000
Marron WN Fed Com #6A	SE/24	27N 8W	Arco	4/78	979
Hammond #41R	NE/25	27N 8W	Russell WM. C.	2/78	813
Federal E #1A	NW/25	27N 8W	AAA Oper. Co. Inc.	10/79	990
Federal E #1	SE/25	27N 8W	AAA Oper. Co. Inc.	6/72	953
Hammond #55A	SE/26	27N 8W	Great Lakes Chem.	3/79	763
Marron WN Fed Com #1A	NW/27	27N 8W	Arco	1/78	918
Marron #5A	SE/27	27N 8W	Western Oil & Min.	7/79	788
Linda #1A	NW/31	27N 8W	Consolidated O & G	6/79	787
Hammond #5	NW/35	27N 8W	Great Lakes Chem.	2/78	1049
Hammond WN Fed #7A	SE/35	27N 8W	Arco	4/79	956
Hammond #47R	SW/35	27N 8W	R & G Drilling Co.	4/78	1013
Blanco #2A	SE/12	27N 9W	NWPL	5/82	629
Huerfanito Unit #77A	NW/24	27N 9W	EPNG	3/83	756
Huerfanito Unit #86A	NW/36	27N 9W	EPNG	1/80	724

1985 TENNECO MESAVERDE INFILL WELLS

WELL NAME	LOCATION		OPERATOR	DOFP	INITIAL SHUT-IN PRESSURE
Riddle F LS #5A	SE/32	28N 8W			720
Bolack B LS #1A	NW/33	28N 8W			735
Blanco LS #12A	NW/36	28N 8W			785
Schwertdfeger A LS #20M	SE/8	27N 8W			805
Bolack C LS #12A	SE/29	27N 8W			940
Bolack C LS #14A	SE/30	27N 8W			825

Chacra/Mesaverde Commingling Application
Initial Shut-in Pressure Data
Page 2

OTERO CHACRA OFFSET WELLS

WELL NAME	LOCATION		OPERATOR	DOFP	INITIAL SHUT-IN PRESSURE
Graham #3	SE/3	27N 8W	Great Lakes Chem.	8/77	1031
Graham #1A	SE/4	27N 8W	Great Lakes Chem.	7/76	870
Graham C WN Fed Com #1A	SE/9	27N 8W	Arco	3/78	989
Graham #51	NE/10	27N 8W	Russell William C.	10/72	1063
Graham #96	SE/10	27N 8W	Russell William C.	12/83	913
Federal J #1	NE/11	27N 8W	AAA Oper. Co. Inc.	7/72	1043
Largo Fed. #4	NW/11	27N 8W	AAA Oper. Co. Inc.	12/73	1076
Largo Fed. #1	SW/11	27N 8W	AAA Oper. Co. Inc.	7/72	955
Federal J #2	SE/11	27N 8W	AAA Oper. Co. Inc.	4/80	1043
Largo Fed #5	NE/13	27N 8W	AAA Oper. Co. Inc.	12/73	1084
Federal E #3	NW/13	27N 8W	AAA Oper. Co. Inc.	7/72	1006
Largo Federal #2	SE/13	27N 8W	AAA Oper. Co. Inc.	5/73	1107
Federal E #6	SW/13	27N 8W	AAA Oper. Co. Inc.	4/80	1063
Largo Federal #3	NE/14	27N 8W	AAA Oper. Co. Inc.	5/73	882
Largo Federal #6	SE/14	27N 8W	AAA Oper. Co. Inc.	12/73	1125
Florance D LS #17	SE/17	27N 8W	TOC	10/72	1020
Marron #94	NW/23	27N 8W	Russell William C.	1/80	968
Federal E #2	NE/23	27N 8W	AAA Oper. Co. Inc.	6/72	1042
Federal E #5	SE/23	27N 8W	AAA Oper. Co. Inc.	9/79	885
Marron #6A	NW/24	27N 8W	Western Oil & Min.	2/76	1023
Marron WN Fed. Com #6A	SE/24	27N 8W	Arco	4/78	975
Snodgrass #1	SW/24	27N 8W	Western Oil & Min.	4/78	970
Federal E #4	NW/25	27N 8W	AAA Oper. Co. Inc.	9/79	874
Hammond #91	NE/25	27N 8W	Russell William C.	12/77	925
Federal E #1	SW/25	27N 8W	AAA Oper. Co. Inc.	7/72	1029
Hammond #92	SE/25	27N 8W	Russell William C.	1/80	1013
Hammond #52	NE/26	27N 8W	Russell William C.	12/74	1150
Blanco #25	NW/12	27N 9W	NWPL	6/75	951
John Charles #7E	NW/13	27N 9W	Getty	5/81	979

CHACRA/MESAVERDE COMMINGLING APPLICATION

RESERVE ESTIMATION AND PRODUCTION ALLOCATION

WELL: Florance D LS #14A
LOCATION: SE/4 Sec. 21 T27N, R8W

Chacra Reserves

Total Estimated Reserves (Exhibit 3) = 250 MMCF

Mesaverde Reserves

Net Pay Thickness (Exhibit 4) = 16 ft.
Total Estimated Reserves (Exhibit 5) = 950 MMCF

Production Allocation

Chacra: (250)/(250 + 950) = .2083 = 20.83%

Mesaverde: (950)/(250 + 950) = .7917 = 79.17%

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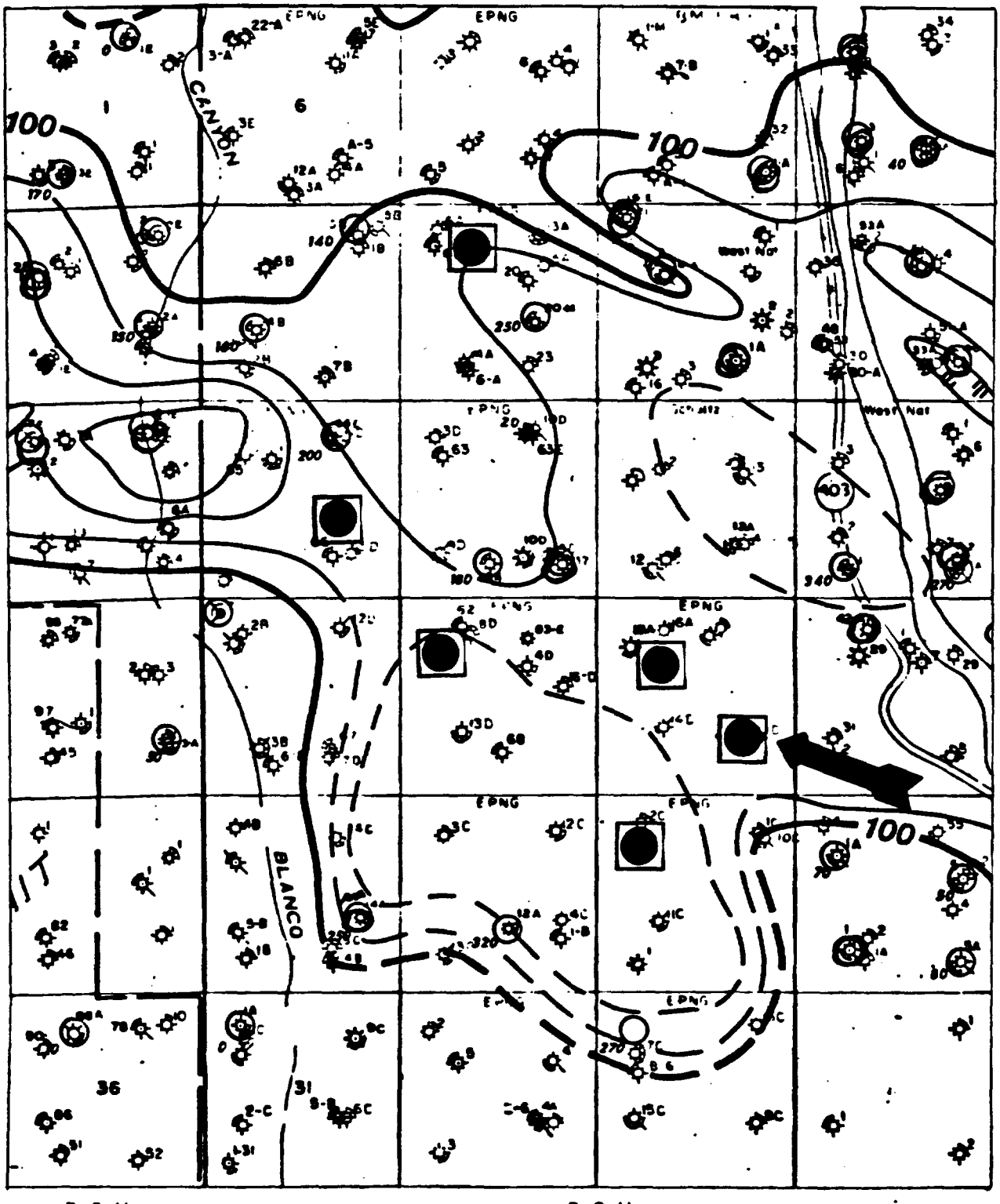
4129R-1

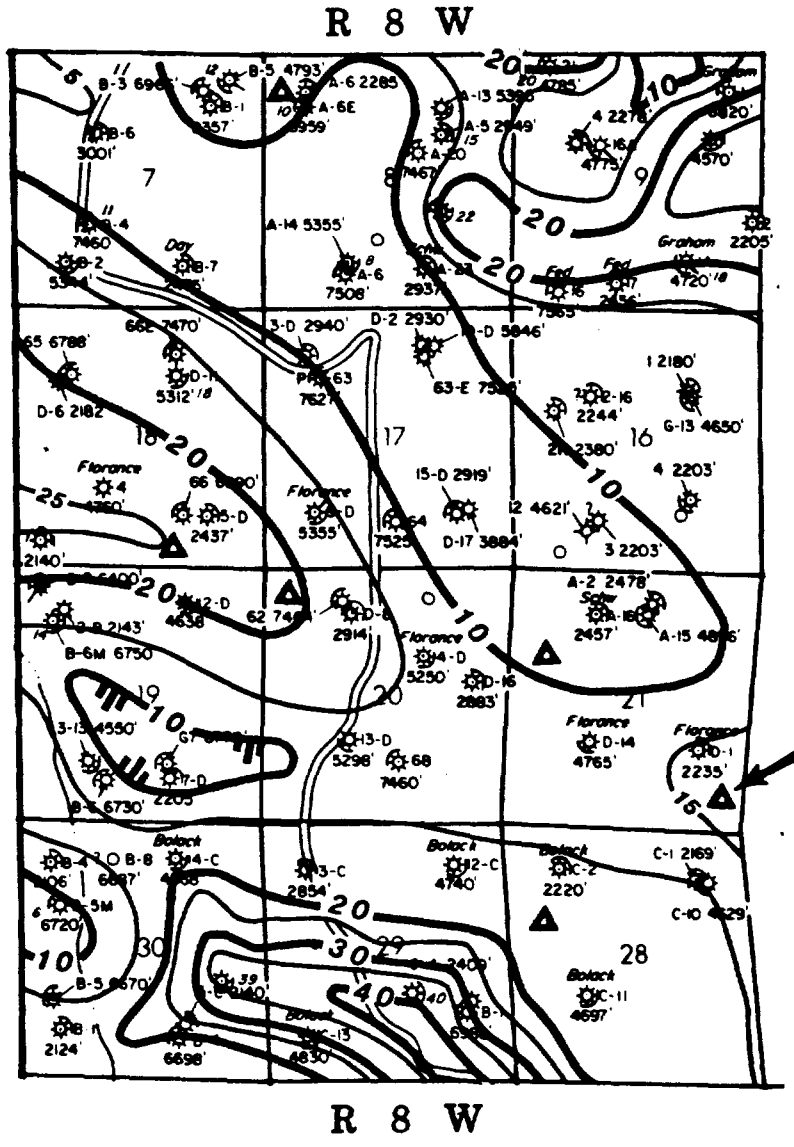
CHACRA ISO-RESERVE MAP (MMCF)



Florance D LS #14A 250 MMCF

EXHIBIT 3

EXHIBIT 4



LEGEND

- PICTURED CLIFFS PENETRATION
- CHACRA PENETRATION
- MESA VERDE PENETRATION
- GALLUP PENETRATION
- DAKOTA PENETRATION
- PROPOSED LOCATION

Tenneco Oil
Exploration and Production
WESTERN ROCKY MOUNTAIN DIVISION

San Juan Basin

CLIFFHOUSE & POINT LOOKOUT
COMPOSITE NET PAY ISOPACH

MKD 3/4/86

C.I. = 10'
1:4000

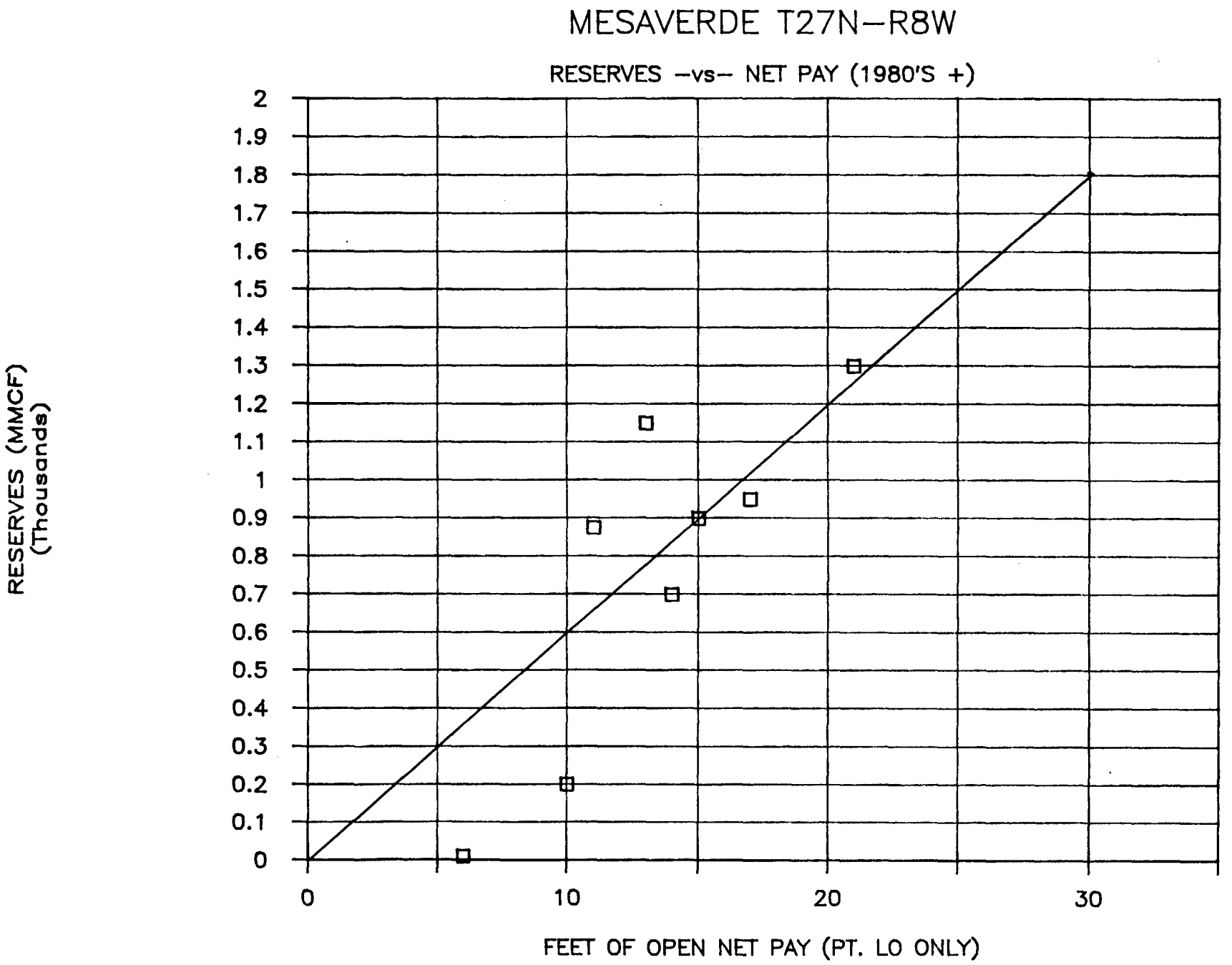

MESAVERDE T27N-R8W
RESERVES -vs- NET PAY (1980'S +)
RESERVES (MMCF)
(Thousands)
2
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
10
20
30
FEET OF OPEN NET PAY (PT. LO ONLY)

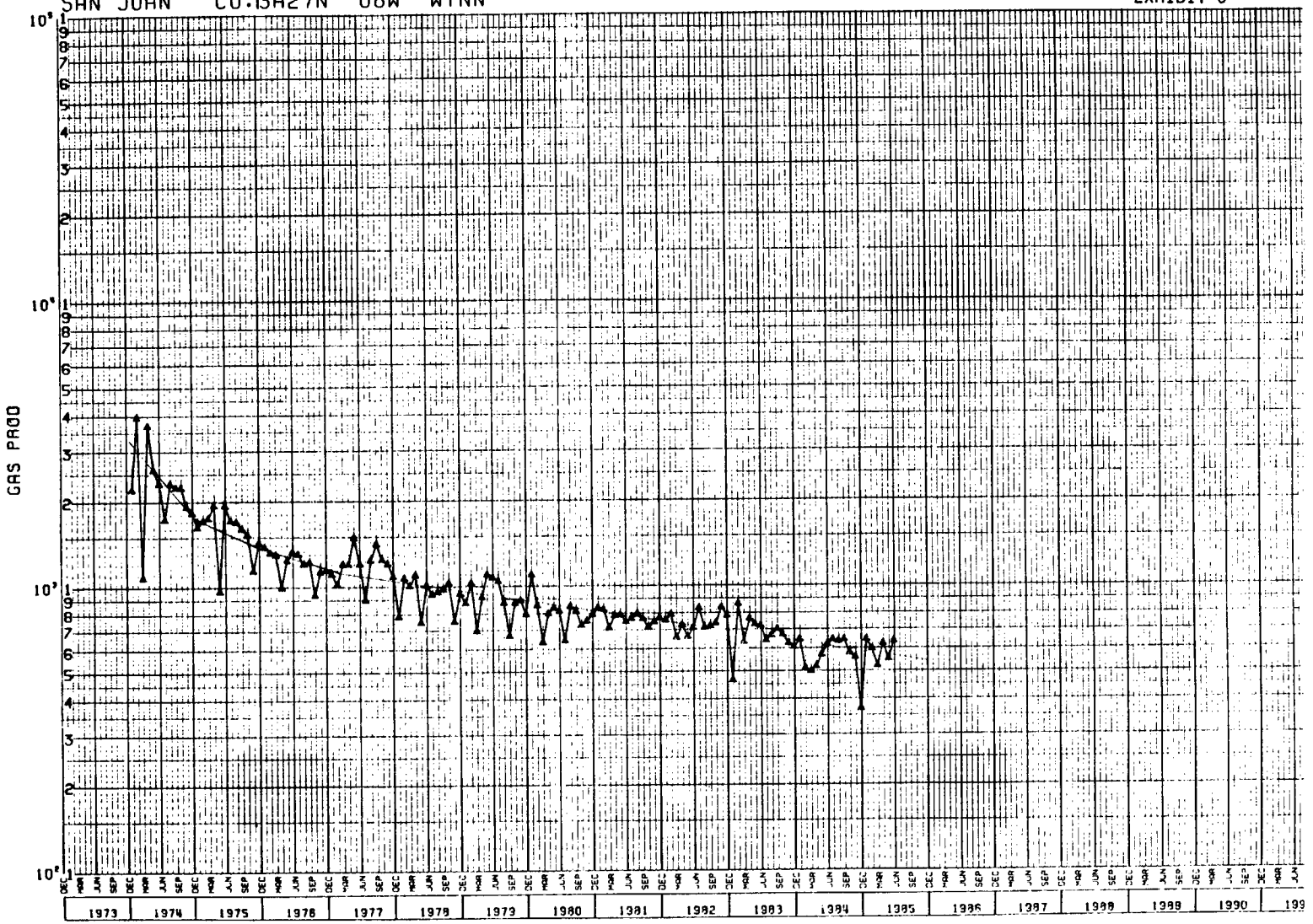
EXHIBIT 5

LARGO FEDERAL 000005 OTERO CHACRA (GAS)

SAN JUAN CO.13A27N 08W WYNN

LEGEND ▲ MCF/MO

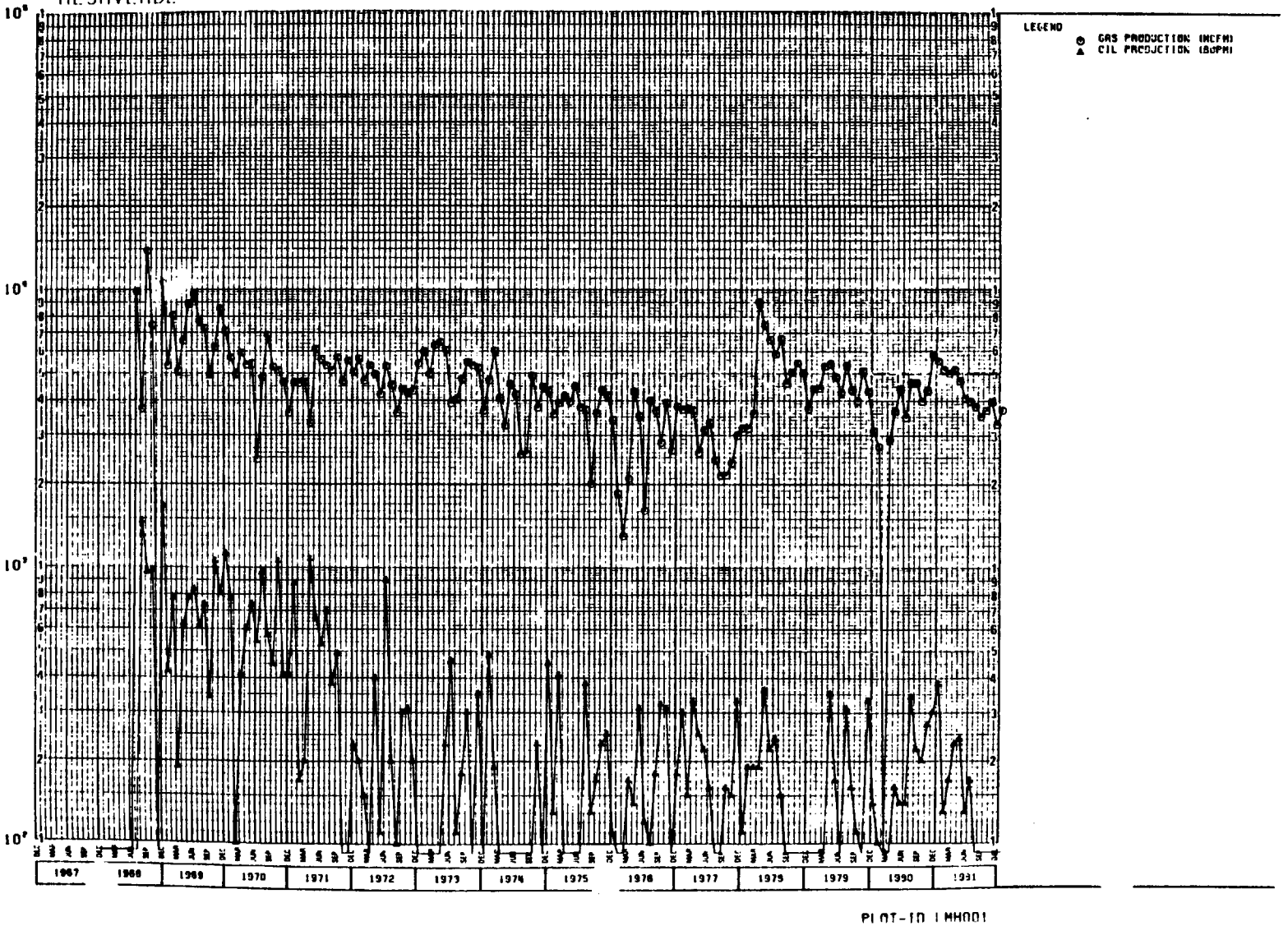
EXHIBIT 6



PLO

DAWSON FEDERAL 1
027N008W26D
MESAVERDE

EXHIBIT 7



PLOT-ID : MH001

INITIAL RATE VS RESERVES

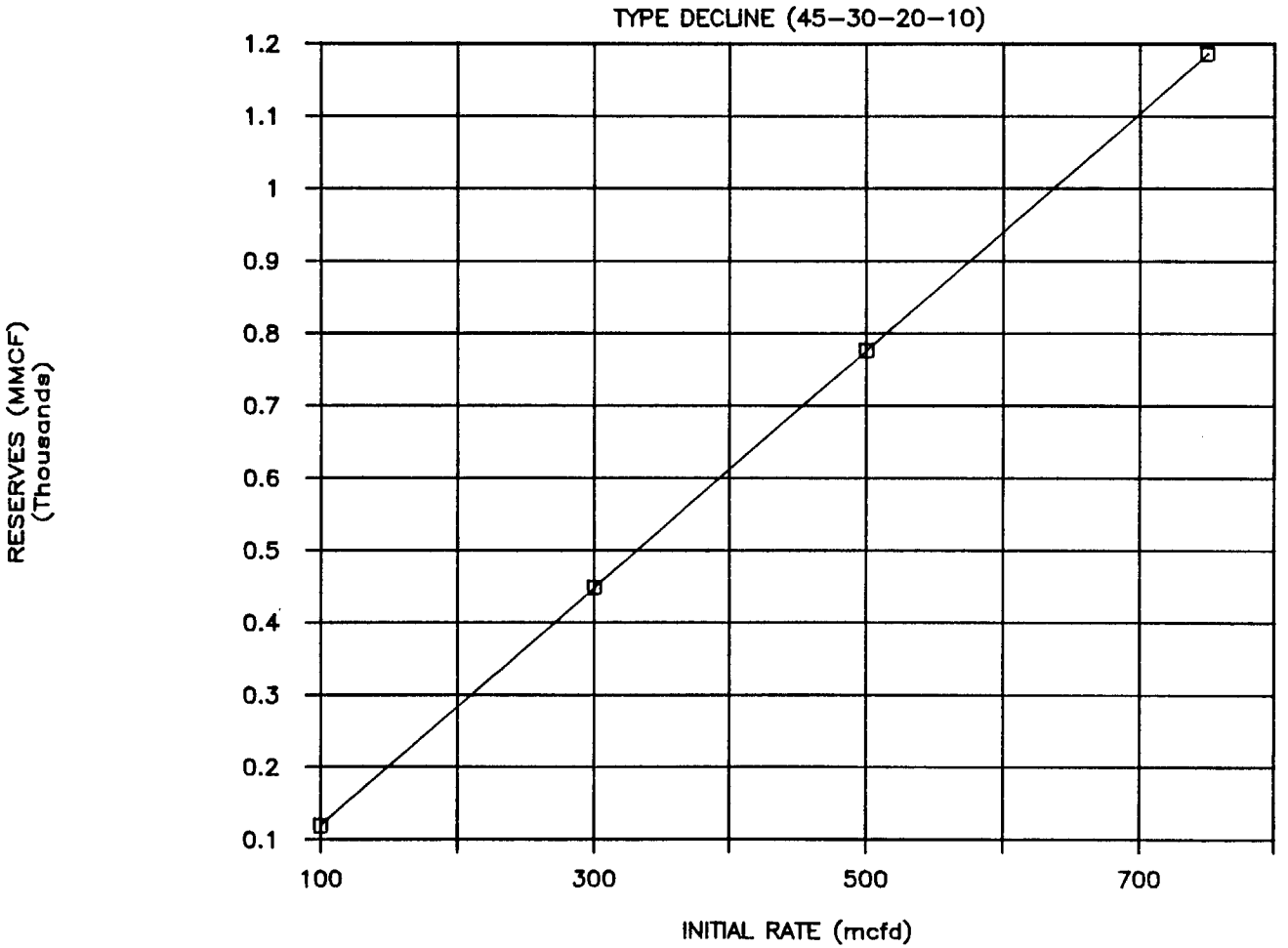


EXHIBIT 8

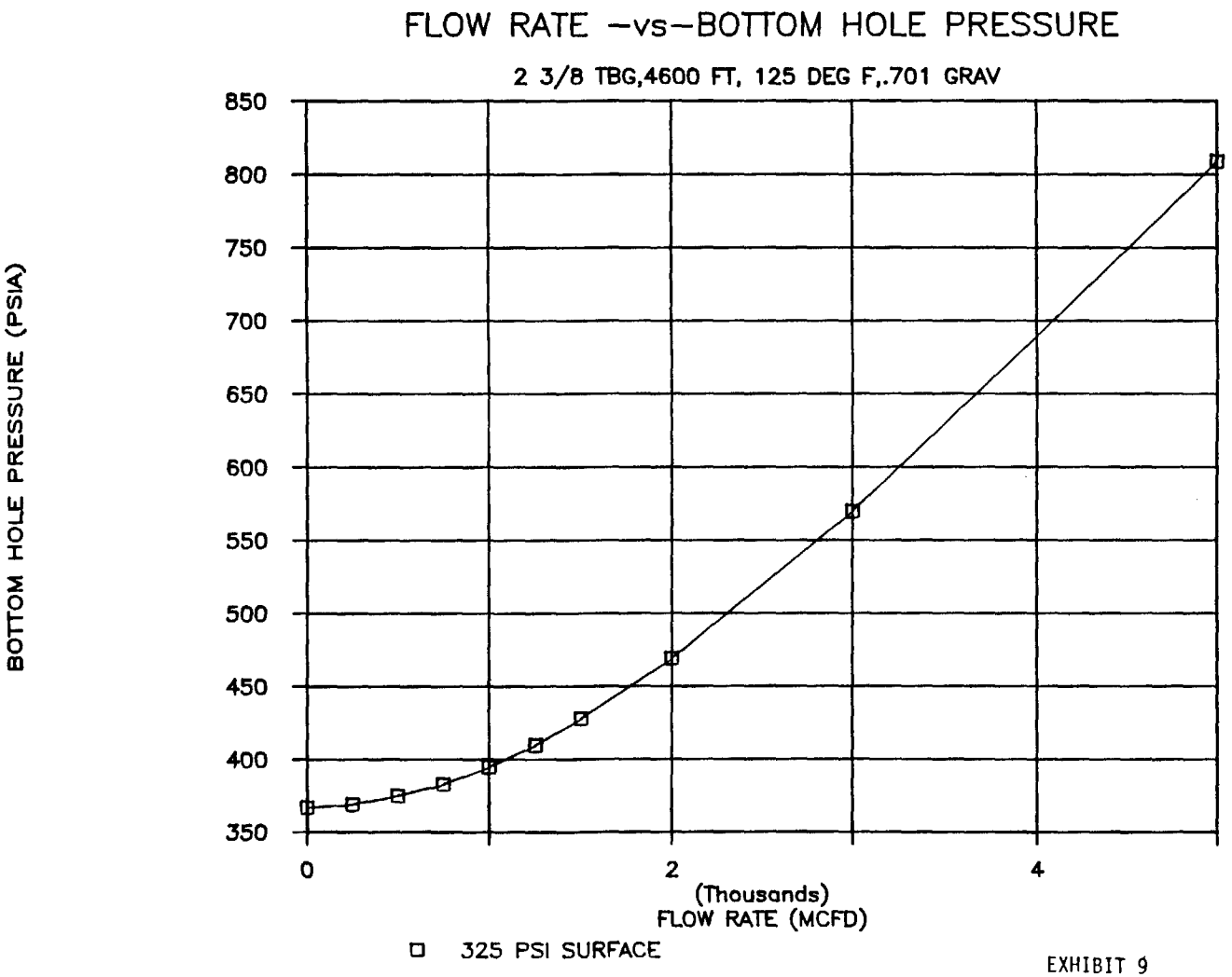

FLOW RATE –vs– BOTTOM HOLE PRESSURE
2 3/8 TBG,4600 FT, 125 DEG F,.701 GRAV
BOTTOM HOLE PRESSURE (PSIA)
850
800
750
700
650
600
550
500
450
400
350
0
2
4
(Thousands)
FLOW RATE (MCFD)
325 PSI SURFACE

EXHIBIT 9

COMMINGLING CAPITAL SAVINGS

Dual Wellhead	$ 5,000	
Separators	$ 5,500	
1 1/4" Tubing	$17,000	
PKR	$ 3,500	
Blast Jts/Pup Jts	$ 5,000	
Miscellaneous Plugs, Etc.	$ 2,000	
Casing	$ 5,000	(Less 7", More 4 1/2")
Drilling Miscellaneous	$ 2,500	(Deeper 8 1/4" hole)
Completion Miscellaneous	$10,500	(Rig time, nitrogen)
Taxes - Misc. Contingency (3%)	$ 2,000	
	$57,000	

The above total represents the additional capital required to produce the Chacra reserves separately. In light of current gas market trends (gas price estimate $1.50 - 2.00/MCF), estimated demand (50-70% takes), hook-up delay, and associated risk, Chacra reserves are insufficient to justify the above incremental investment. To prevent the waste of these Chacra reserves it is necessary to obtain commingling approval. Correlative rights will be protected. The commingled wellbore will more efficiently recover Mesaverde reserves and extend the economic life of the well.

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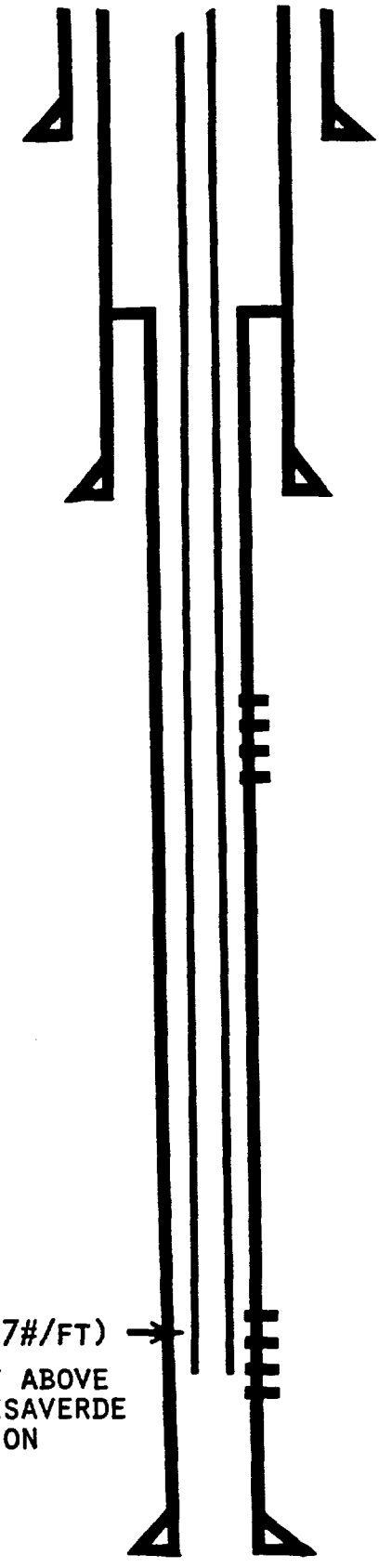
4135R

CHACRA/MESAVERDE COMMINGLING APPLICATION
FLORANCE D LS #14A WELL BORE DIAGRAM



CASING: SURFACE
9-5/8" (36#/FT) @ 280 FEET

CASING: INTERMEDIATE
7" (23#/FT)
250 FEET INTO LEWIS SHALE

CHACRA PERFORATIONS @ 3356 FEET

TUBING:
2-3/8" (4.7#/FT)
ONE JOINT ABOVE BOTTOM MESAVERDE PERFORATION

MESAVERDE PERFORATIONS @ 4727 FEET

LINER:
4-1/2" (10.5#/FT) TO T.D. 4877 FEET

CHACRA/MESAVERDE COMMINGLING APPLICATION

WELL NAME: BOLACK C LS #11A
LOCATION: NW/4 SEC. 28 T27N, R8W

Tenneco Oil Company currently plans to drill the captioned well during the third or fourth quarter of 1986. The well is anticipated to encounter productive sands in both the Mesaverde and Chacra formations. Tenneco Oil Company seeks to obtain the Commission's approval to down-hole commingle production from the Chacra and Mesaverde formations. The attached documentation indicates that the two zones proposed for commingling will satisfy all requirements as stipulated by the Commission (303C(b)(1-6).

The Mesaverde formation is the primary target of the captioned well. In light of current market conditions estimated reserves associated with a Chacra completion at the above location are considered to be insufficient to justify the capital expenditure required to separately produce these reserves. In the event that approval to commingle production is not granted, the Chacra interval would not be completed.

Estimated bottom hole pressures for the two zones were extrapolated statistically from offset Mesaverde and Chacra wells (Exhibits 1 & 2). The anticipated pressure of the lower pressured zone (Mesaverde) is estimated to be 87.68% of the pressure anticipated in the higher pressured zone (Chacra), when adjusted to a common datum. Therefore, rules 303C(b)(2) and 303C(b)(6) are satisfied.

A compatibility test was performed using the produced Chacra water from a nearby offset (Dryden LS #1A; SE/4 Sec. 28 T28N, R8W) and the produced Mesaverde water from another nearby offset (Schwerdtfeger A LS #14; SW/4 Sec. 8 T27N, R8W). The test indicated that no scale or precipitate problems should result when production streams from these two horizons are commingled. Water analyses also indicated that corresponding salinities are similar, and no formation damage should occur due to the presence of produced water from another zone. Therefore, rules 303C(b)(3) and 303C(b)(4) are satisfied.

Common ownership exists between the Chacra and Mesaverde zones, satisfying rule 303C(b)(5). A detailed ownership breakdown is attached.

It is recommended that production be allocated on a strict percentage basis according to the fraction of total reserves contributed by each zone. Chacra reserves were estimated from the attached iso-reserve map (Exhibit 3). Mesaverde reserves were estimated from the attached net pay

isopach map (Exhibit 4) and a linear correlation of reserves versus net pay (Exhibit 5). Exhibit 5 was obtained by plotting estimated ultimate recoveries (decline curve derived) from recent (1980+) Mesaverde wells against the amount of net perforated pay as determined from log analysis and completion reports. Chacra reserves are estimated to be 300 MMCF, while Mesaverde reserves are estimated to be 1025 MMCF. Production allocated to the Chacra should be 22.64% of total, and the production allocated to the Mesaverde should be 77.36% of total.

Both Chacra and Mesaverde wells in this area exhibit similarly shaped decline curves. Exhibits 6 and 7 are representative type decline curves for local Mesaverde and Chacra wells.

Despite the large disparity in estimated reserves, both formations have very similar reserve lives. Exhibit 8 shows initial rate versus reserves for the type decline scenario used. The following table compares reserve lives from each of the two zones assuming a 10 MCF/D economic limit. An average reserve ratio was taken for this example:

FORMATION	RESERVES (MMCF)	INITIAL RATE (MCF/D)	ECONOMIC* LIMIT (MCF/D)	RESERVE LIFE (YRS)
Mesaverde	1150	735	8	31.7
Chacra	235	160	2	31.2
			10	

Produced Chacra gas is extremely dry. Chacra wells in the vicinity of the subject well produce less than 1 BBL/MMCF of water and condensate (combined) on an average basis. Local Mesaverde wells produce considerably more liquids than do the Chacra wells. Average condensate and water yields are approximately 5 BBL/MMCF and 2 BBL/MMCF, respectively, for the Mesaverde producers. As the production capacity of the Mesaverde zone decreases with time, its ability to unload produced fluids also decreases. The increased

*The economic limit was allocated roughly according to the reserve ratio: 83% Mesaverde / 17% Chacra

volume of commingled dry Chacra gas through the tubing will help to lift the produced Mesaverde liquids. Over the life of the well, the commingled Chacra production will definitely improve the flow efficiency of the Mesaverde zone. Early in the life of the well, while both zones are producing at maximum rates, there will be a slight increase in friction loss (tubing) due to the additional volume of Chacra gas. Exhibit 9 shows that the flowing bottom hole pressure goes from 390 psi for a well producing 750 mcf/d, to 405 psi for a well producing at 1250 mcf/d. An increased pressure drop of 15 psi is insignificant, and would represent a maximum considering the initial rate of the Chacra production will be much closer to 200 mcf/d rather than 500 mcf/d.

All operators of offset wells have been notified in writing of the proposed commingling within the time limits provided under rule #1207.

S. M. Struna
Petroleum Engineer

SMS:pe:3/13/86
4131R

Attachment

CHACRA/MESAVERDE COMMINGLING APPLICATION

WELL: Bolack C LS #11A
LOCATION: NW/4 Sec. 28 T27N, R8W

Estimated Chacra completed interval midpoint:	3160 ft.
Estimated Mesaverde completed interval midpoint:	4531 ft.
Average surrounding Chacra ISIP's (surface)	1002 psi
Average surrounding Mesaverde ISIP's (surface)	867 psi
Average Surrounding Chacra Completed Interval Midpoint:	3244 ft.
Average surrounding Mesaverde Completed Interval Midpoint:	4616 ft.
Chacra Pressure Gradient	.3382 psi/ft.
Mesaverde Pressure Gradient	.2143 psi/ft.
Anticipated Chacra shut in pressure (bottom hole):	1069 psi
Anticipated Mesaverde shut in pressure (bottom hole):	971 psi

Anticipated pressures adjusted to 4000 ft. datum:

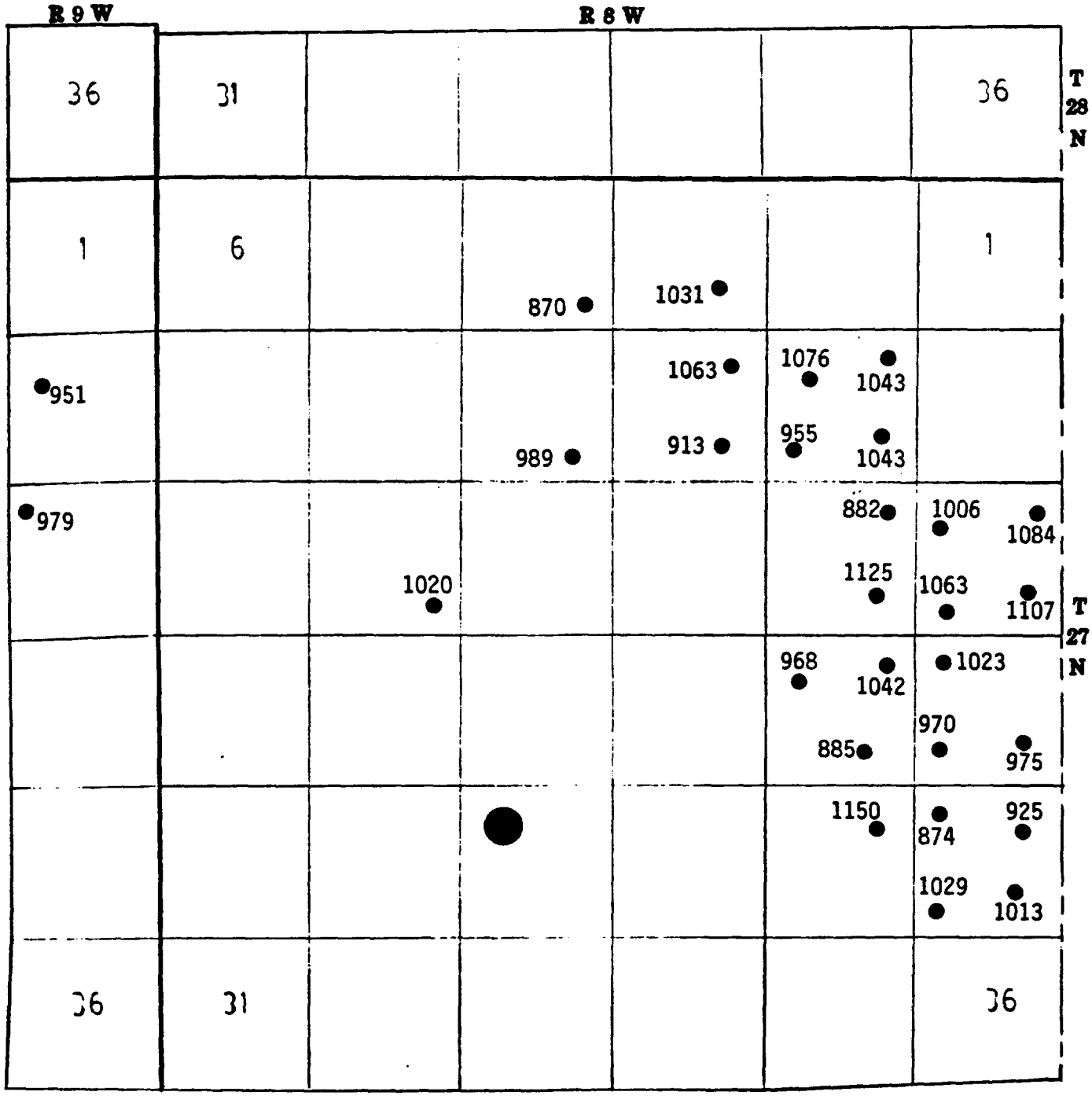
Chacra	1092 psi
Mesaverde	957 psi

Ratio 957/1092 = .8768

Satisfies 50% pressure requirement

SMS:pe:2/24/86
4086R-4

CHARCA



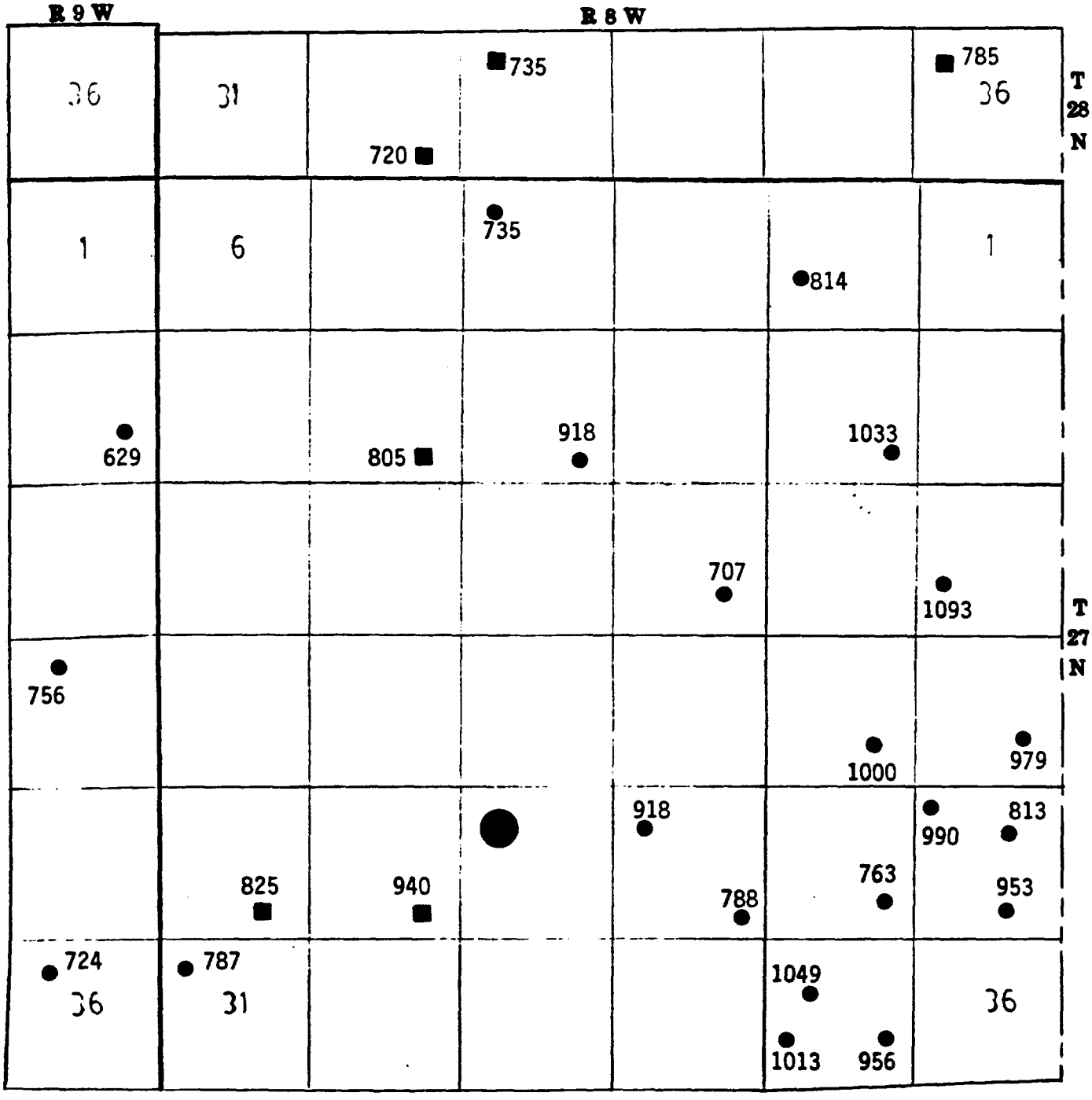
Initial Shut-In Pressure (PSI)

● **Producing Well**

● **Bolack C LS #11A**

EXHIBIT 1

MESAVERDE



Initial Shut-In Pressure (PSI)

- ● Recent Infill (post 1978)
- ■ 1985 Tenneco Completion
- ● Bolack C LS #11A

EXHIBIT 2

CHACRA/MESAVERDE COMMINGLING APPLICATION

Assumptions Used in Pressure Calculations

Chacra	Gravity = .665*
	P_c = 670.4 psia
	T_c = 378.6°R
Mesaverde	Gravity = .701*
	P_c = 669.1 psia
	T_c = 389.7°R
Local Temperature Gradient	.0139°F/ft.
Ambient Temperature	60°F

Pressures were calculated using a modified Cullender & Smith method.

*Gas gravities estimated from chromatographic analyses of local Chacra and Mesaverde gas samples.

SMS:pe:2/24/86
4086R

CHACRA/MESAVERDE COMMINGLING APPLICATION

INITIAL SHUT-IN PRESSURE DATA

RECENT MESAVERDE INFILL WELLS (POST 1978)

WELL NAME	LOCATION		OPERATOR	DOFP	INITIAL SHUT-IN PRESSURE
State Com #47	SW/2	27N 8W	Mesa	2/79	814
Dawson A #1M	NW/4	27N 8W	TOC	3/81	735
Graham C WN Fed Com #1A	SE/9	27N 8W	Arco	3/78	918
Federal J #1A	SE/11	27W 8W	AAA Oper. Co. Inc.	4/80	1133
Federal E #3A	SW/13	27N 8W	AAA Oper. Co. Inc.	4/80	1193
Federal R #1A	SE/15	27N 8W	AAA Oper. Co. Inc.	3/84	707
Federal E #2A	SE/23	27N 8W	AAA Oper. Co. Inc.	10/79	1000
Marron WN Fed Com #6A	SE/24	27N 8W	Arco	4/78	979
Hammond #41R	NE/25	27N 8W	Russell WM. C.	2/78	813
Federal E #1A	NW/25	27N 8W	AAA Oper. Co. Inc.	10/79	990
Federal E #1	SE/25	27N 8W	AAA Oper. Co. Inc.	6/72	953
Hammond #55A	SE/26	27N 8W	Great Lakes Chem.	3/79	763
Marron WN Fed Com #1A	NW/27	27N 8W	Arco	1/78	918
Marron #5A	SE/27	27N 8W	Western Oil & Min.	7/79	788
Linda #1A	NW/31	27N 8W	Consolidated O & G	6/79	787
Hammond #5	NW/35	27N 8W	Great Lakes Chem.	2/78	1049
Hammond WN Fed #7A	SE/35	27N 8W	Arco	4/79	956
Hammond #47R	SW/35	27N 8W	R & G Drilling Co.	4/78	1013
Blanco #2A	SE/12	27N 9W	NWPL	5/82	629
Huerfanito Unit #77A	NW/24	27N 9W	EPNG	3/83	756
Huerfanito Unit #86A	NW/36	27N 9W	EPNG	1/80	724

1985 TENNECO MESAVERDE INFILL WELLS

WELL NAME	LOCATION		OPERATOR	DOFP	INITIAL SHUT-IN PRESSURE
Riddle F LS #5A	SE/32	28N 8W			720
Bolack B LS #1A	NW/33	28N 8W			735
Blanco LS #12A	NW/36	28N 8W			785
Schwertdfeger A LS #20M	SE/8	27N 8W			805
Bolack C LS #12A	SE/29	27N 8W			940
Bolack C LS #14A	SE/30	27N 8W			825

OTERO CHACRA OFFSET WELLS

WELL NAME	LOCATION		OPERATOR	DOFP	INITIAL SHUT-IN PRESSURE
Graham #3	SE/3	27N 8W	Great Lakes Chem.	8/77	1031
Graham #1A	SE/4	27N 8W	Great Lakes Chem.	7/76	870
Graham C WN Fed Com #1A	SE/9	27N 8W	Arco	3/78	989
Graham #51	NE/10	27N 8W	Russell William C.	10/72	1063
Graham #96	SE/10	27N 8W	Russell William C.	12/83	913
Federal J #1	NE/11	27N 8W	AAA Oper. Co. Inc.	7/72	1043
Largo Fed. #4	NW/11	27N 8W	AAA Oper. Co. Inc.	12/73	1076
Largo Fed. #1	SW/11	27N 8W	AAA Oper. Co. Inc.	7/72	955
Federal J #2	SE/11	27N 8W	AAA Oper. Co. Inc.	4/80	1043
Largo Fed #5	NE/13	27N 8W	AAA Oper. Co. Inc.	12/73	1084
Federal E #3	NW/13	27N 8W	AAA Oper. Co. Inc.	7/72	1006
Largo Federal #2	SE/13	27N 8W	AAA Oper. Co. Inc.	5/73	1107
Federal E #6	SW/13	27N 8W	AAA Oper. Co. Inc.	4/80	1063
Largo Federal #3	NE/14	27N 8W	AAA Oper. Co. Inc.	5/73	882
Largo Federal #6	SE/14	27N 8W	AAA Oper. Co. Inc.	12/73	1125
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Marron #94	NW/23	27N 8W	Russell William C.	1/80	968
Federal E #2	NE/23	27N 8W	AAA Oper. Co. Inc.	6/72	1042
Federal E #5	SE/23	27N 8W	AAA Oper. Co. Inc.	9/79	885
Marron #6A	NW/24	27N 8W	Western Oil & Min.	2/76	1023
Marron WN Fed. Com #6A	SE/24	27N 8W	Arco	4/78	975
Snodgrass #1	SW/24	27N 8W	Western Oil & Min.	4/78	970
Federal E #4	NW/25	27N 8W	AAA Oper. Co. Inc.	9/79	874
Hammond #91	NE/25	27N 8W	Russell William C.	12/77	925
Federal E #1	SW/25	27N 8W	AAA Oper. Co. Inc.	7/72	1029
Hammond #92	SE/25	27N 8W	Russell William C.	1/80	1013
Hammond #52	NE/26	27N 8W	Russell William C.	12/74	1150
Blanco #25	NW/12	27N 9W	NWPL	6/75	951
John Charles #7E	NW/13	27N 9W	Getty	5/81	979

CHACRA/MESAVERDE COMMINGLING APPLICATION

RESERVE ESTIMATION AND PRODUCTION ALLOCATION

WELL: Bolack C LS #11A
LOCATION: NW/4 Sec. 28 T27N, R8W

Chacra Reserves

Total Estimated Reserves (Exhibit 3) = 300 MMCF

Mesaverde Reserves

Net Pay Thickness (Exhibit 4) = 17 ft.
Total Estimated Reserves (Exhibit 5) = 1025 MMCF

Production Allocation

Chacra: (300)/(300 + 1025) = .2264 = 22.64%

Mesaverde: (1025)/(300 + 1025) = .7736 = 77.36%

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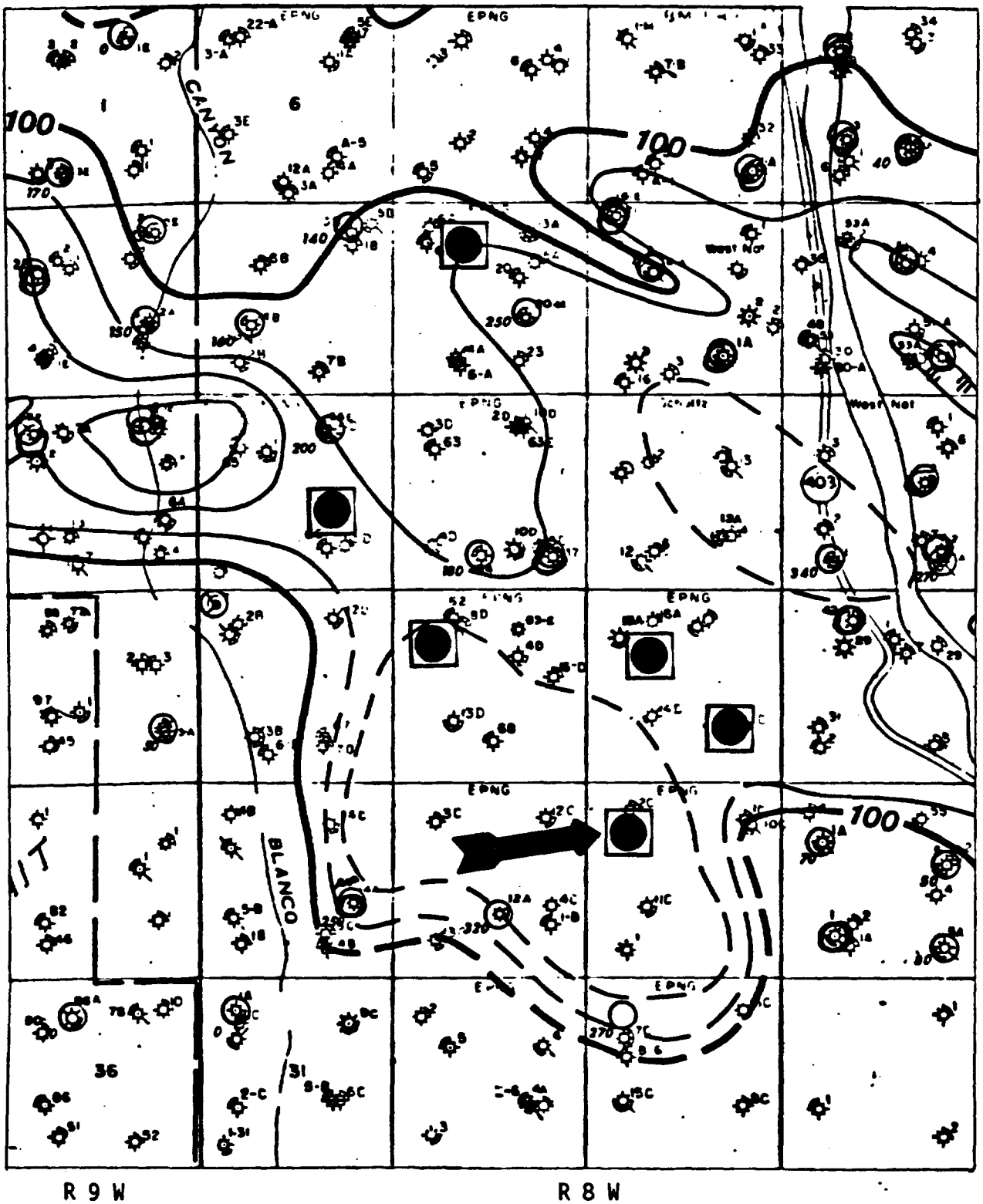
4129R-5

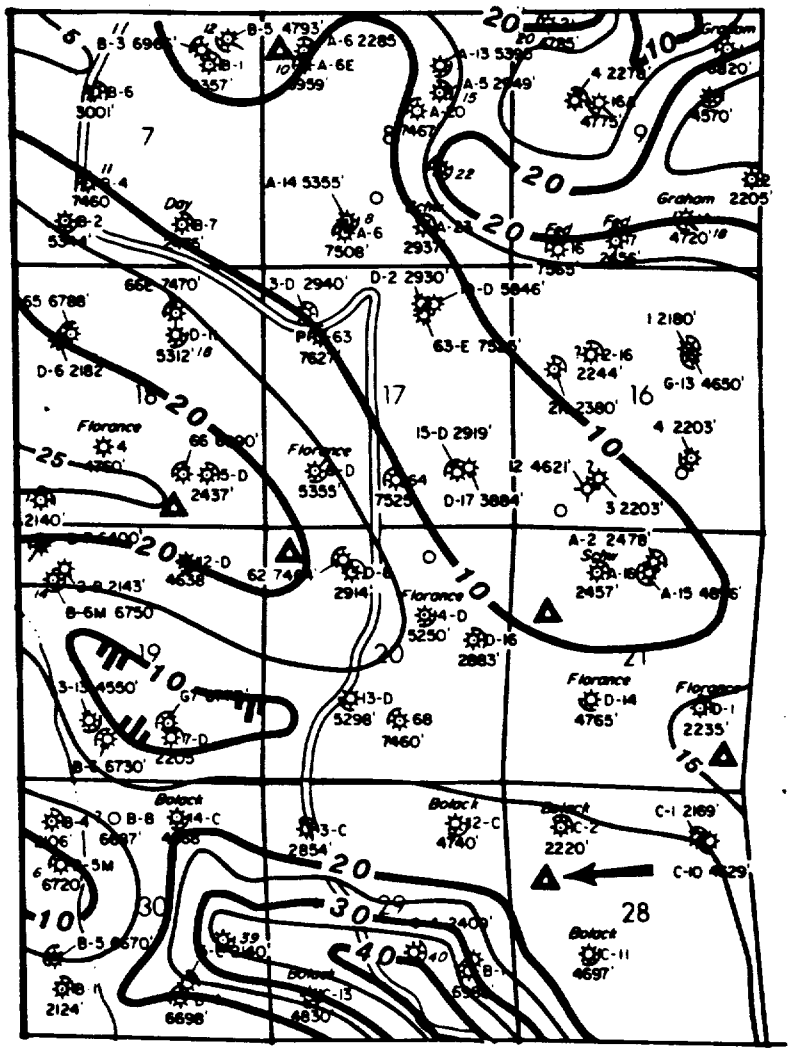
CHACRA ISO-RESERVE MAP (MMCF) EXHIBIT 3



Bolack C LS #11A 300 MMCF

EXHIBIT 4

R 8 W



R 8 W

LEGEND

- PICTURED CLIFFS PENETRATION
- CHACRA PENETRATION
- MESA VERDE PENETRATION
- GALLUP PENETRATION
- DAKOTA PENETRATION
- PROPOSED LOCATION

Tenneco Oil
Exploration and Production
WESTERN ROCKY MOUNTAIN DIVISION

TENNECO

San Juan Basin

CLIFFHOUSE & POINT LOOKOUT
COMPOSITE NET PAY ISOPACH

MKD 3/4/86

C.I. = 10'
1:4000

MESAVERDE T27N–R8W

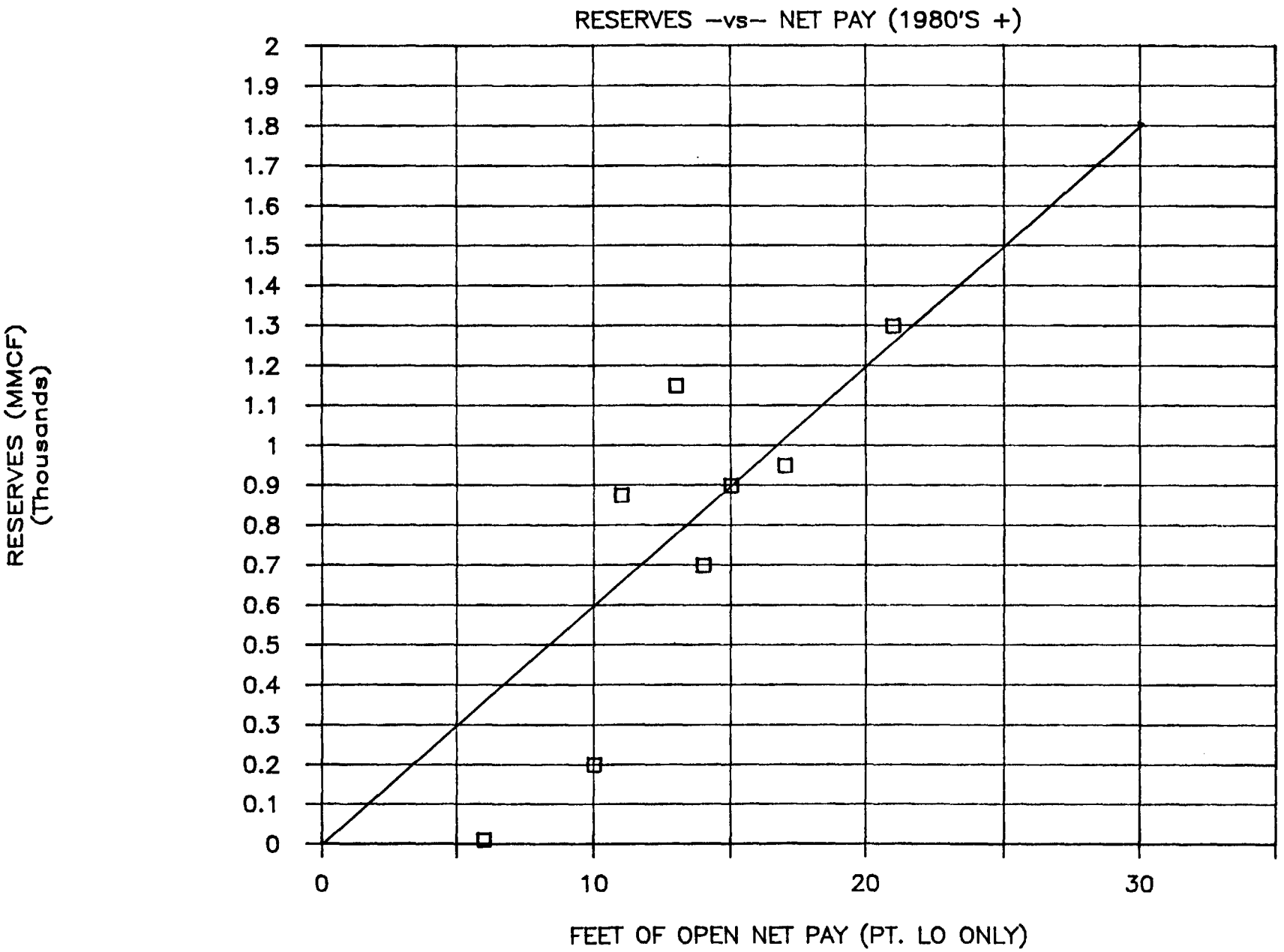
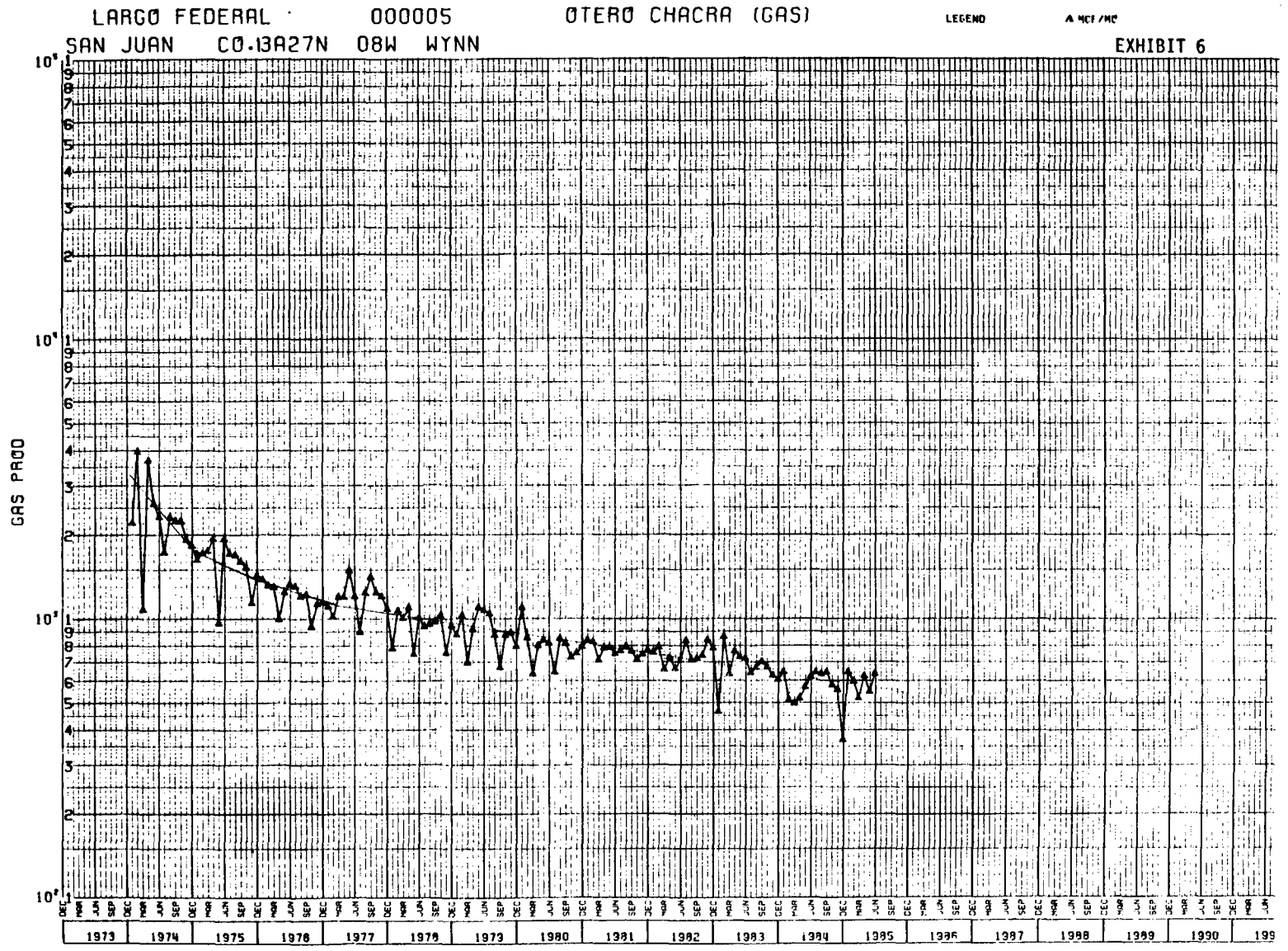
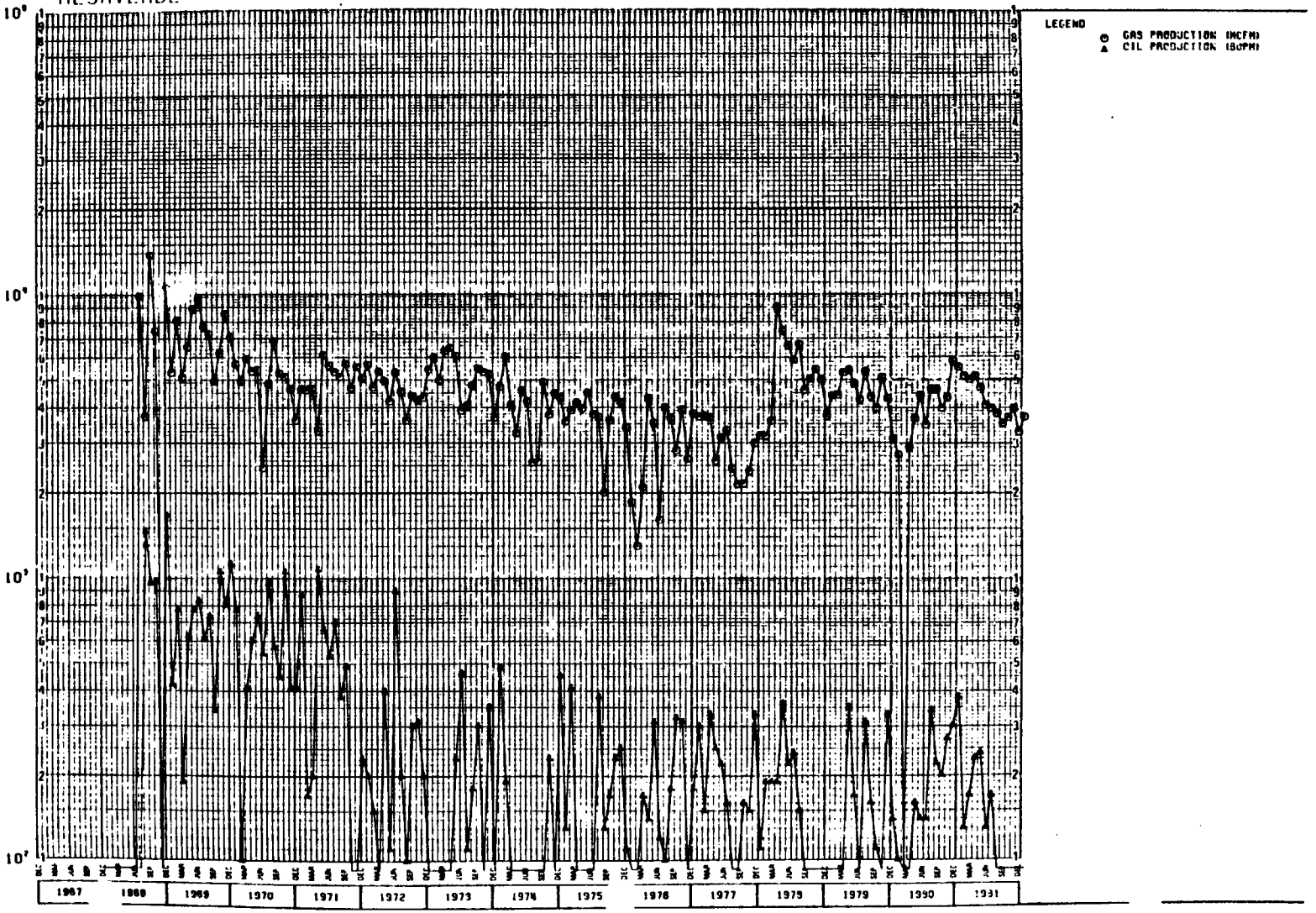


EXHIBIT 5


LARGO FEDERAL 000005 OTERO CHACRA (GAS)
SAN JUAN CO.13N27W 08W WYNN
LEGEND
A MCF/MO
EXHIBIT 6
GAS PROD
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
PLO

DAWSON FEDERAL 1
027N008W26D
MESAVERDE

EXHIBIT 7



PLOT-ID (MH001)

INITIAL RATE VS RESERVES

TYPE DECLINE (45–30–20–10)

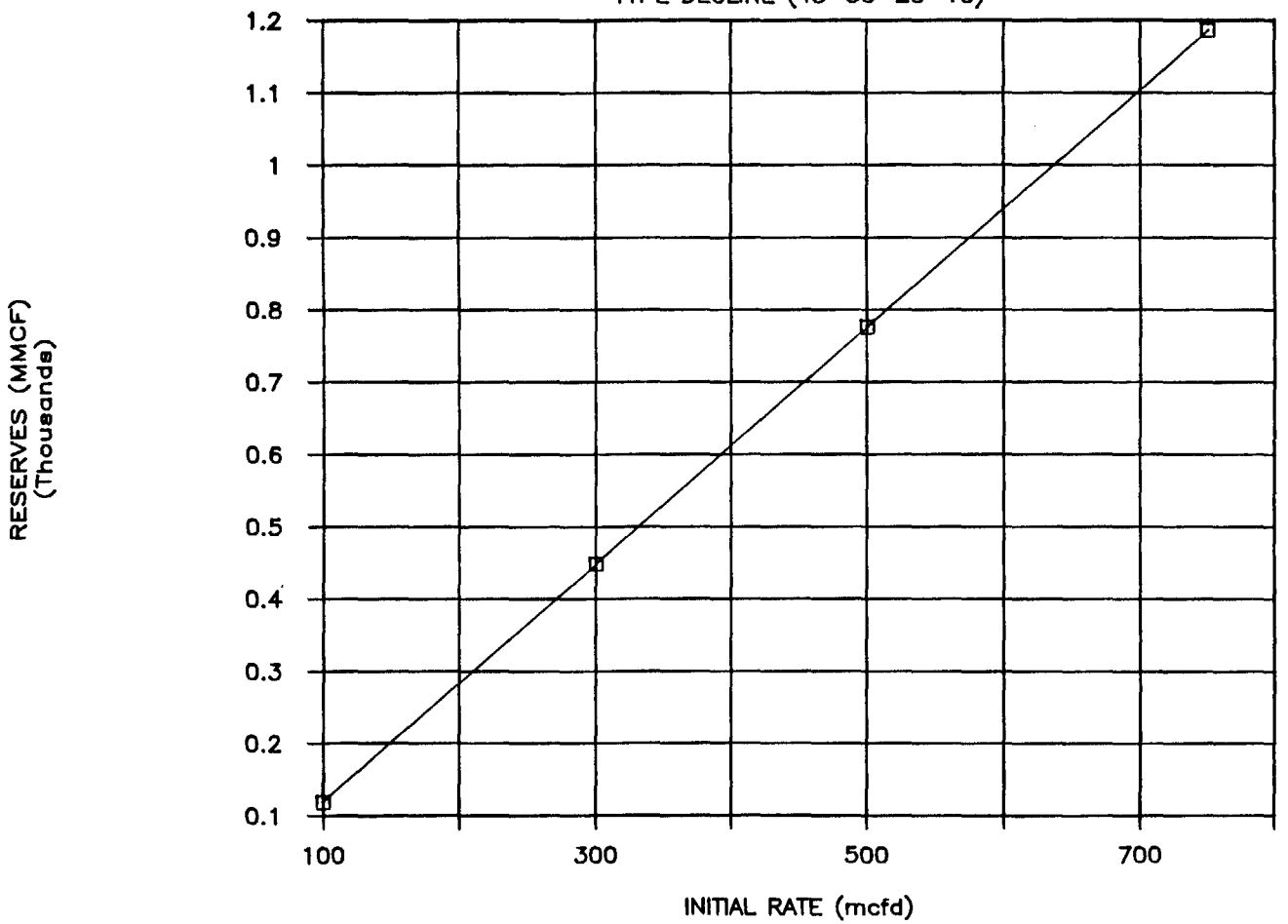


EXHIBIT 8

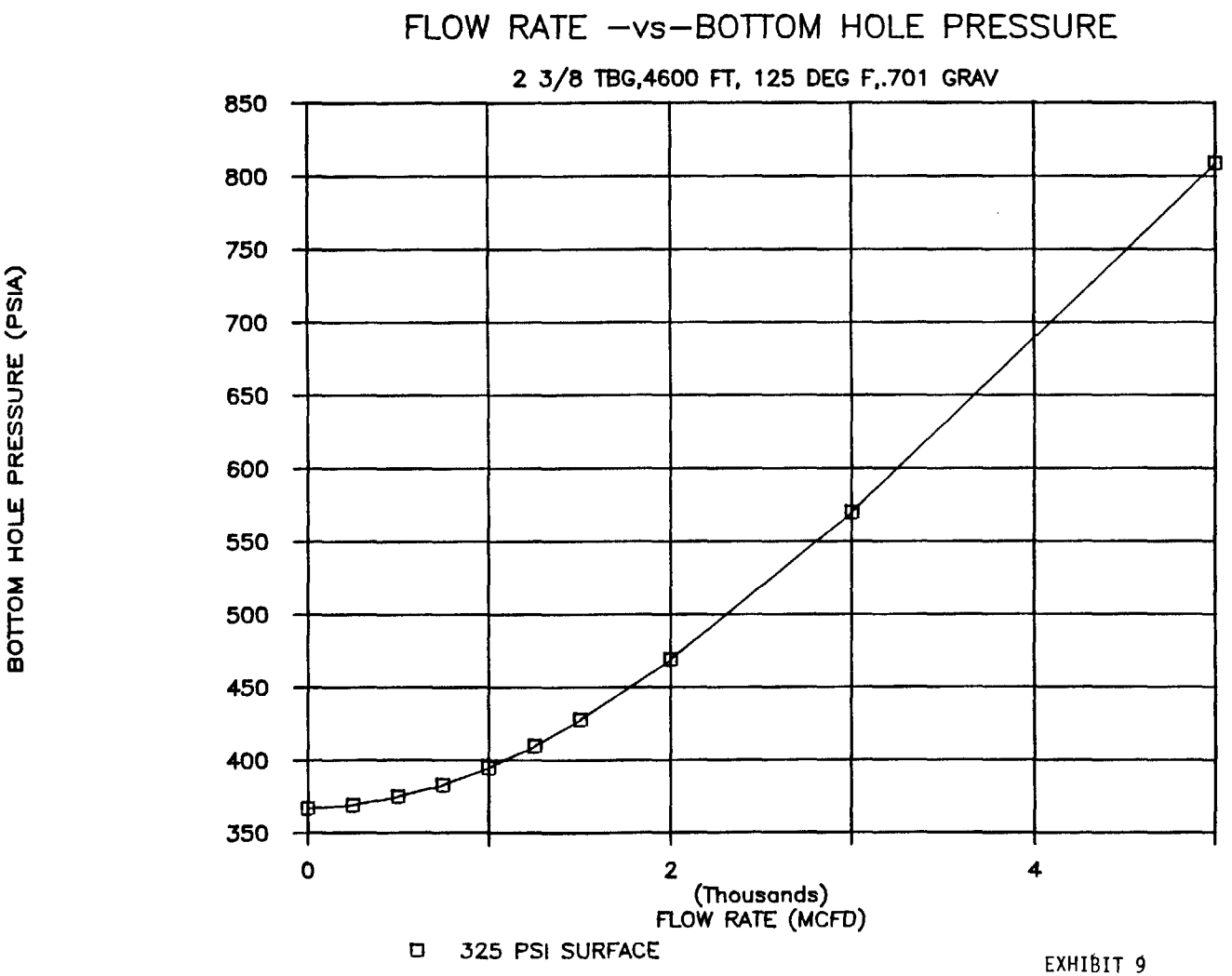

FLOW RATE –vs–BOTTOM HOLE PRESSURE
2 3/8 TBG,4600 FT, 125 DEG F,.701 GRAV
BOTTOM HOLE PRESSURE (PSIA)
850
800
750
700
650
600
550
500
450
400
350
0
2
4
(Thousands)
FLOW RATE (MCFD)
325 PSI SURFACE

EXHIBIT 9

COMMINGLING CAPITAL SAVINGS

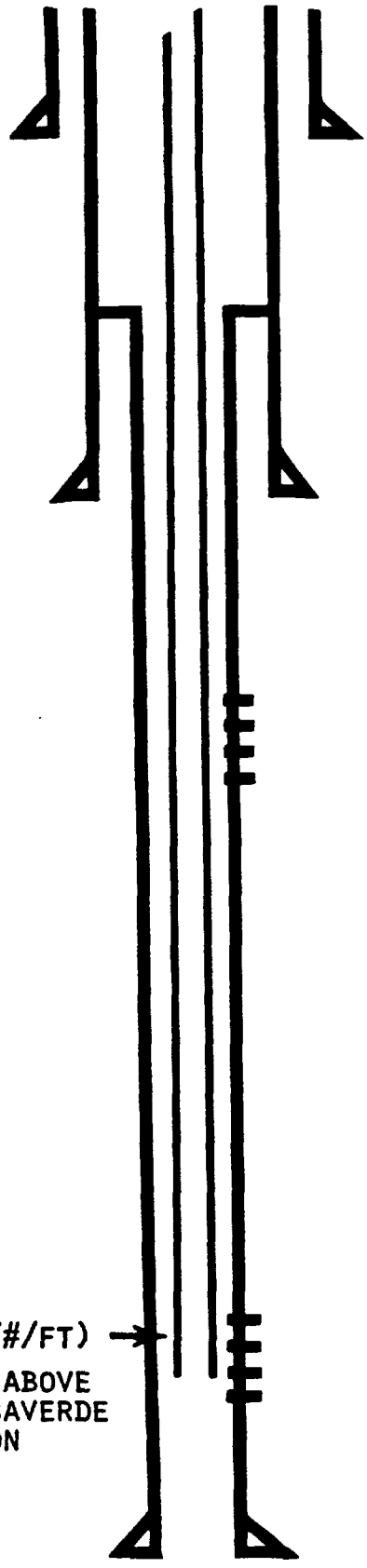
Dual Wellhead	$ 5,000	
Separators	$ 5,500	
1 1/4" Tubing	$17,000	
PKR	$ 3,500	
Blast Jts/Pup Jts	$ 5,000	
Miscellaneous Plugs, Etc.	$ 2,000	
Casing	$ 5,000	(Less 7", More 4 1/2")
Drilling Miscellaneous	$ 2,500	(Deeper 8 1/4" hole)
Completion Miscellaneous	$10,500	(Rig time, nitrogen)
Taxes - Misc. Contingency (3%)	$ 2,000	
	$57,000	

The above total represents the additional capital required to produce the Chacra reserves separately. In light of current gas market trends (gas price estimate $1.50 - 2.00/MCF), estimated demand (50-70% takes), hook-up delay, and associated risk, Chacra reserves are insufficient to justify the above incremental investment. To prevent the waste of these Chacra reserves it is necessary to obtain commingling approval. Correlative rights will be protected. The commingled wellbore will more efficiently recover Mesaverde reserves and extend the economic life of the well.

SMS:pe:3/17/86
4135R

CHACRA/MESAVERDE COMMINGLING APPLICATION

BOLACK C LS #11A WELL BORE DIAGRAM



CASING: SURFACE
9-5/8" (36#/FT) @ 280 FEET

CASING: INTERMEDIATE
7" (23#/FT)
250 FEET INTO LEWIS SHALE

CHACRA PERFORATIONS @ 3160 FEET

TUBING:
2-3/8" (4.7#/FT)
ONE JOINT ABOVE
BOTTOM MESAVERDE
PERFORATION

MESAVERDE PERFORATIONS @ 4531 FEET

LINER:
4-1/2" (10.5#/FT) TO T.D. 4681 FEET

CHACRA/MESAVERDE COMMINGLING APPLICATION

WELL NAME: FLORANCE D LS #11A
LOCATION: SE/4 SEC. 18 T27N, R8W

Tenneco Oil Company currently plans to drill the captioned well during the third or fourth quarter of 1986. The well is anticipated to encounter productive sands in both the Mesaverde and Chacra formations. Tenneco Oil Company seeks to obtain the Commission's approval to down-hole commingle production from the Chacra and Mesaverde formations. The attached documentation indicates that the two zones proposed for commingling will satisfy all requirements as stipulated by the Commission (303C(b)(1-6).

The Mesaverde formation is the primary target of the captioned well. In light of current market conditions estimated reserves associated with a Chacra completion at the above location are considered to be insufficient to justify the capital expenditure required to separately produce these reserves. In the event that approval to commingle production is not granted, the Chacra interval would not be completed.

Estimated bottom hole pressures for the two zones were extrapolated statistically from offset Mesaverde and Chacra wells (Exhibits 1 & 2). The anticipated pressure of the lower pressured zone (Mesaverde) is estimated to be 87.67% of the pressure anticipated in the higher pressured zone (Chacra), when adjusted to a common datum. Therefore, rules 303C(b)(2) and 303C(b)(6) are satisfied.

A compatibility test was performed using the produced Chacra water from a nearby offset (Dryden LS #1A; SE/4 Sec. 28 T28N, R8W) and the produced Mesaverde water from another nearby offset (Schwerdtfeger A LS #14; SW/4 Sec. 8 T27N, R8W). The test indicated that no scale or precipitate problems should result when production streams from these two horizons are commingled. Water analyses also indicated that corresponding salinities are similar, and no formation damage should occur due to the presence of produced water from another zone. Therefore, rules 303C(b)(3) and 303C(b)(4) are satisfied.

Common ownership exists between the Chacra and Mesaverde zones, satisfying rule 303C(b)(5). A detailed ownership breakdown is attached.

It is recommended that production be allocated on a strict percentage basis according to the fraction of total reserves contributed by each zone. Chacra reserves were estimated from the attached iso-reserve map (Exhibit 3). Mesaverde reserves were estimated from the attached net pay

isopach map (Exhibit 4) and a linear correlation of reserves versus net pay (Exhibit 5). Exhibit 5 was obtained by plotting estimated ultimate recoveries (decline curve derived) from recent (1980+) Mesaverde wells against the amount of net perforated pay as determined from log analysis and completion reports. Chacra reserves are estimated to be 250 MMCF, while Mesaverde reserves are estimated to be 1450 MMCF. Production allocated to the Chacra should be 14.71% of total, and the production allocated to the Mesaverde should be 85.29% of total.

Both Chacra and Mesaverde wells in this area exhibit similarly shaped decline curves. Exhibits 6 and 7 are representative type decline curves for local Mesaverde and Chacra wells.

Despite the large disparity in estimated reserves, both formations have very similar reserve lives. Exhibit 8 shows initial rate versus reserves for the type decline scenario used. The following table compares reserve lives from each of the two zones assuming a 10 MCF/D economic limit. An average reserve ratio was taken for this example:

FORMATION	RESERVES (MMCF)	INITIAL RATE (MCF/D)	ECONOMIC* LIMIT (MCF/D)	RESERVE LIFE (YRS)
Mesaverde	1150	735	8	31.7
Chacra	235	160	2	31.2
			10	

Produced Chacra gas is extremely dry. Chacra wells in the vicinity of the subject well produce less than 1 BBL/MMCF of water and condensate (combined) on an average basis. Local Mesaverde wells produce considerably more liquids than do the Chacra wells. Average condensate and water yields are approximately 5 BBL/MMCF and 2 BBL/MMCF, respectively, for the Mesaverde producers. As the production capacity of the Mesaverde zone decreases with time, its ability to unload produced fluids also decreases. The increased

*The economic limit was allocated roughly according to the reserve ratio: 83% Mesaverde / 17% Chacra

volume of commingled dry Chacra gas through the tubing will help to lift the produced Mesaverde liquids. Over the life of the well, the commingled Chacra production will definitely improve the flow efficiency of the Mesaverde zone. Early in the life of the well, while both zones are producing at maximum rates, there will be a slight increase in friction loss (tubing) due to the additional volume of Chacra gas. Exhibit 9 shows that the flowing bottom hole pressure goes from 390 psi for a well producing 750 mcf/d, to 405 psi for a well producing at 1250 mcf/d. An increased pressure drop of 15 psi is insignificant, and would represent a maximum considering the initial rate of the Chacra production will be much closer to 200 mcf/d rather than 500 mcf/d.

All operators of offset wells have been notified in writing of the proposed commingling within the time limits provided under rule #1207.

S. M. Struna
Petroleum Engineer

SMS:pe:3/13/86
4131R

Attachment

CHACRA/MESAVERDE COMMINGLING APPLICATION

WELL: Florance D LS #11A
LOCATION: SE/4 Sec. 18 T27N, R8W

Estimated Chacra completed interval midpoint:	3304 ft.
Estimated Mesaverde completed interval midpoint:	4675 ft.
Average surrounding Chacra ISIP's (surface)	1002 psi
Average surrounding Mesaverde ISIP's (surface)	867 psi
Average Surrounding Chacra Completed Interval Midpoint:	3244 ft.
Average surrounding Mesaverde Completed Interval Midpoint:	4616 ft.
Chacra Pressure Gradient	.3382 psi/ft.
Mesaverde Pressure Gradient	.2143 psi/ft.
Anticipated Chacra shut in pressure (bottom hole):	1069 psi
Anticipated Mesaverde shut in pressure (bottom hole):	971 psi

Anticipated pressures adjusted to 4000 ft. datum:

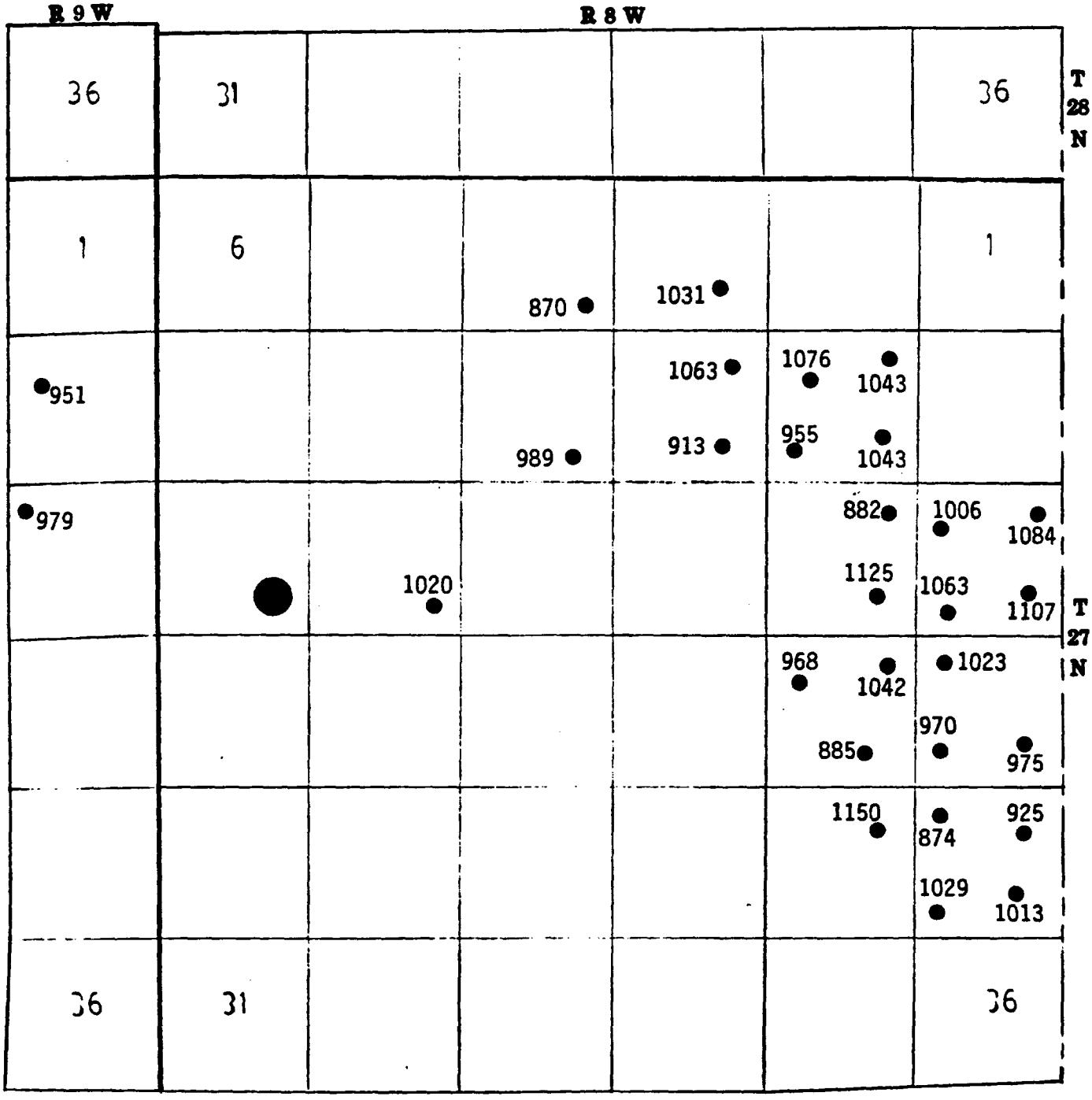
Chacra	1088 psi
Mesaverde	953 psi

Ratio 953/1088 = .8767

Satisfies 50% pressure requirement

SMS:pe:2/24/86
4086R-3

CHARCA

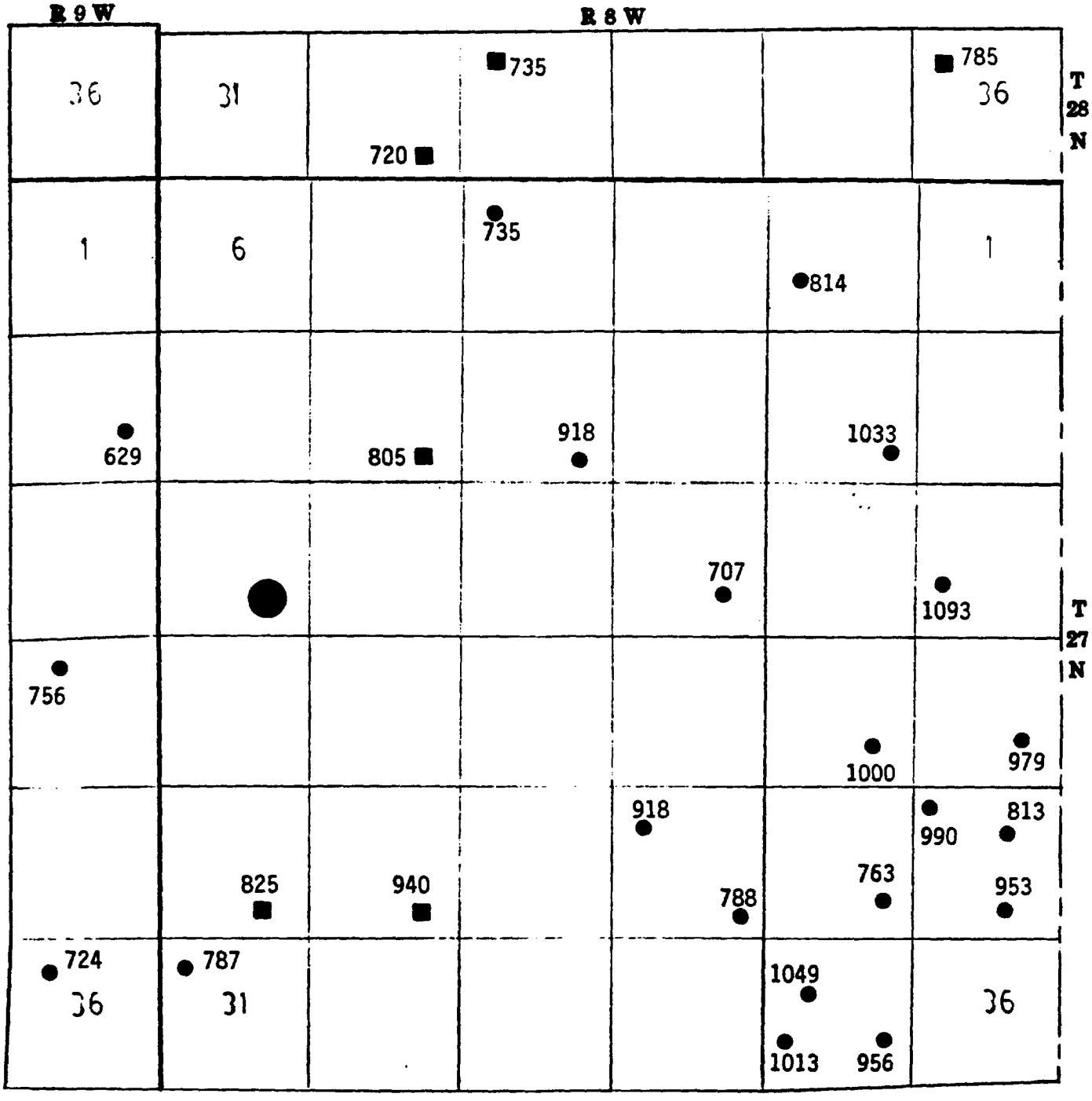


Initial Shut-In Pressure (PSI)

- **Producing Well**
- **Florance D LS #11A**

EXHIBIT 1

MESAVERDE



Initial Shut-In Pressure (PSI)

- ● **Recent Infill (post 1978)**
- ■ **1985 Tenneco Completion**
- ⬤ **Florance D LS #11A**

EXHIBIT 2

CHACRA/MESAVERDE COMMINGLING APPLICATION

Assumptions Used in Pressure Calculations

Chacra	Gravity = .665*
	P_c = 670.4 psia
	T_c = 378.6°R
Mesaverde	Gravity = .701*
	P_c = 669.1 psia
	T_c = 389.7°R
Local Temperature Gradient	.0139°F/ft.
Ambient Temperature	60°F

Pressures were calculated using a modified Cullender & Smith method.

*Gas gravities estimated from chromatographic analyses of local Chacra and Mesaverde gas samples.

SMS:pe:2/24/86
4086R

CHACRA/MESAVERDE COMMINGLING APPLICATION

INITIAL SHUT-IN PRESSURE DATA

RECENT MESAVERDE INFILL WELLS (POST 1978)

WELL NAME	LOCATION		OPERATOR	DOFP	INITIAL SHUT-IN PRESSURE
State Com #47	SW/2	27N 8W	Mesa	2/79	814
Dawson A #1M	NW/4	27N 8W	TOC	3/81	735
Graham C WN Fed Com #1A	SE/9	27N 8W	Arco	3/78	918
Federal J #1A	SE/11	27W 8W	AAA Oper. Co. Inc.	4/80	1133
Federal E #3A	SW/13	27N 8W	AAA Oper. Co. Inc.	4/80	1193
Federal R #1A	SE/15	27N 8W	AAA Oper. Co. Inc.	3/84	707
Federal E #2A	SE/23	27N 8W	AAA Oper. Co. Inc.	10/79	1000
Marron WN Fed Com #6A	SE/24	27N 8W	Arco	4/78	979
Hammond #41R	NE/25	27N 8W	Russell WM. C.	2/78	813
Federal E #1A	NW/25	27N 8W	AAA Oper. Co. Inc.	10/79	990
Federal E #1	SE/25	27N 8W	AAA Oper. Co. Inc.	6/72	953
Hammond #55A	SE/26	27N 8W	Great Lakes Chem.	3/79	763
Marron WN Fed Com #1A	NW/27	27N 8W	Arco	1/78	918
Marron #5A	SE/27	27N 8W	Western Oil & Min.	7/79	788
Linda #1A	NW/31	27N 8W	Consolidated O & G	6/79	787
Hammond #5	NW/35	27N 8W	Great Lakes Chem.	2/78	1049
Hammond WN Fed #7A	SE/35	27N 8W	Arco	4/79	956
Hammond #47R	SW/35	27N 8W	R & G Drilling Co.	4/78	1013
Blanco #2A	SE/12	27N 9W	NWPL	5/82	629
Huerfanito Unit #77A	NW/24	27N 9W	EPNG	3/83	756
Huerfanito Unit #86A	NW/36	27N 9W	EPNG	1/80	724

1985 TENNECO MESAVERDE INFILL WELLS

WELL NAME	LOCATION		OPERATOR	DOFP	INITIAL SHUT-IN PRESSURE
Riddle F LS #5A	SE/32	28N 8W			720
Bolack B LS #1A	NW/33	28N 8W			735
Blanco LS #12A	NW/36	28N 8W			785
Schwertdfeger A LS #20M	SE/8	27N 8W			805
Bolack C LS #12A	SE/29	27N 8W			940
Bolack C LS #14A	SE/30	27N 8W			825

Chacra/Mesaverde Commingling Application
Initial Shut-in Pressure Data
Page 2

OTERO CHACRA OFFSET WELLS

WELL NAME	LOCATION		OPERATOR	DOFP	INITIAL SHUT-IN PRESSURE
Graham #3	SE/3	27N 8W	Great Lakes Chem.	8/77	1031
Graham #1A	SE/4	27N 8W	Great Lakes Chem.	7/76	870
Graham C WN Fed Com #1A	SE/9	27N 8W	Arco	3/78	989
Graham #51	NE/10	27N 8W	Russell William C.	10/72	1063
Graham #96	SE/10	27N 8W	Russell William C.	12/83	913
Federal J #1	NE/11	27N 8W	AAA Oper. Co. Inc.	7/72	1043
Largo Fed. #4	NW/11	27N 8W	AAA Oper. Co. Inc.	12/73	1076
Largo Fed. #1	SW/11	27N 8W	AAA Oper. Co. Inc.	7/72	955
Federal J #2	SE/11	27N 8W	AAA Oper. Co. Inc.	4/80	1043
Largo Fed #5	NE/13	27N 8W	AAA Oper. Co. Inc.	12/73	1084
Federal E #3	NW/13	27N 8W	AAA Oper. Co. Inc.	7/72	1006
Largo Federal #2	SE/13	27N 8W	AAA Oper. Co. Inc.	5/73	1107
Federal E #6	SW/13	27N 8W	AAA Oper. Co. Inc.	4/80	1063
Largo Federal #3	NE/14	27N 8W	AAA Oper. Co. Inc.	5/73	882
Largo Federal #6	SE/14	27N 8W	AAA Oper. Co. Inc.	12/73	1125
Florance D LS #17	SE/17	27N 8W	TOC	10/72	1020
Marron #94	NW/23	27N 8W	Russell William C.	1/80	968
Federal E #2	NE/23	27N 8W	AAA Oper. Co. Inc.	6/72	1042
Federal E #5	SE/23	27N 8W	AAA Oper. Co. Inc.	9/79	885
Marron #6A	NW/24	27N 8W	Western Oil & Min.	2/76	1023
Marron WN Fed. Com #6A	SE/24	27N 8W	Arco	4/78	975
Snodgrass #1	SW/24	27N 8W	Western Oil & Min.	4/78	970
Federal E #4	NW/25	27N 8W	AAA Oper. Co. Inc.	9/79	874
Hammond #91	NE/25	27N 8W	Russell William C.	12/77	925
Federal E #1	SW/25	27N 8W	AAA Oper. Co. Inc.	7/72	1029
Hammond #92	SE/25	27N 8W	Russell William C.	1/80	1013
Hammond #52	NE/26	27N 8W	Russell William C.	12/74	1150
Blanco #25	NW/12	27N 9W	NWPL	6/75	951
John Charles #7E	NW/13	27N 9W	Getty	5/81	979

CHACRA/MESAVERDE COMMINGLING APPLICATION

RESERVE ESTIMATION AND PRODUCTION ALLOCATION

WELL: Florance D LS #11A
LOCATION: SE/4 Sec. 18 T27N, R8W

Chacra Reserves

Total Estimated Reserves (Exhibit 3) = 250 MMCF

Mesaverde Reserves

Net Pay Thickness (Exhibit 4) = 24 ft.
Total Estimated Reserves (Exhibit 5) = 1450 MMCF

Production Allocation

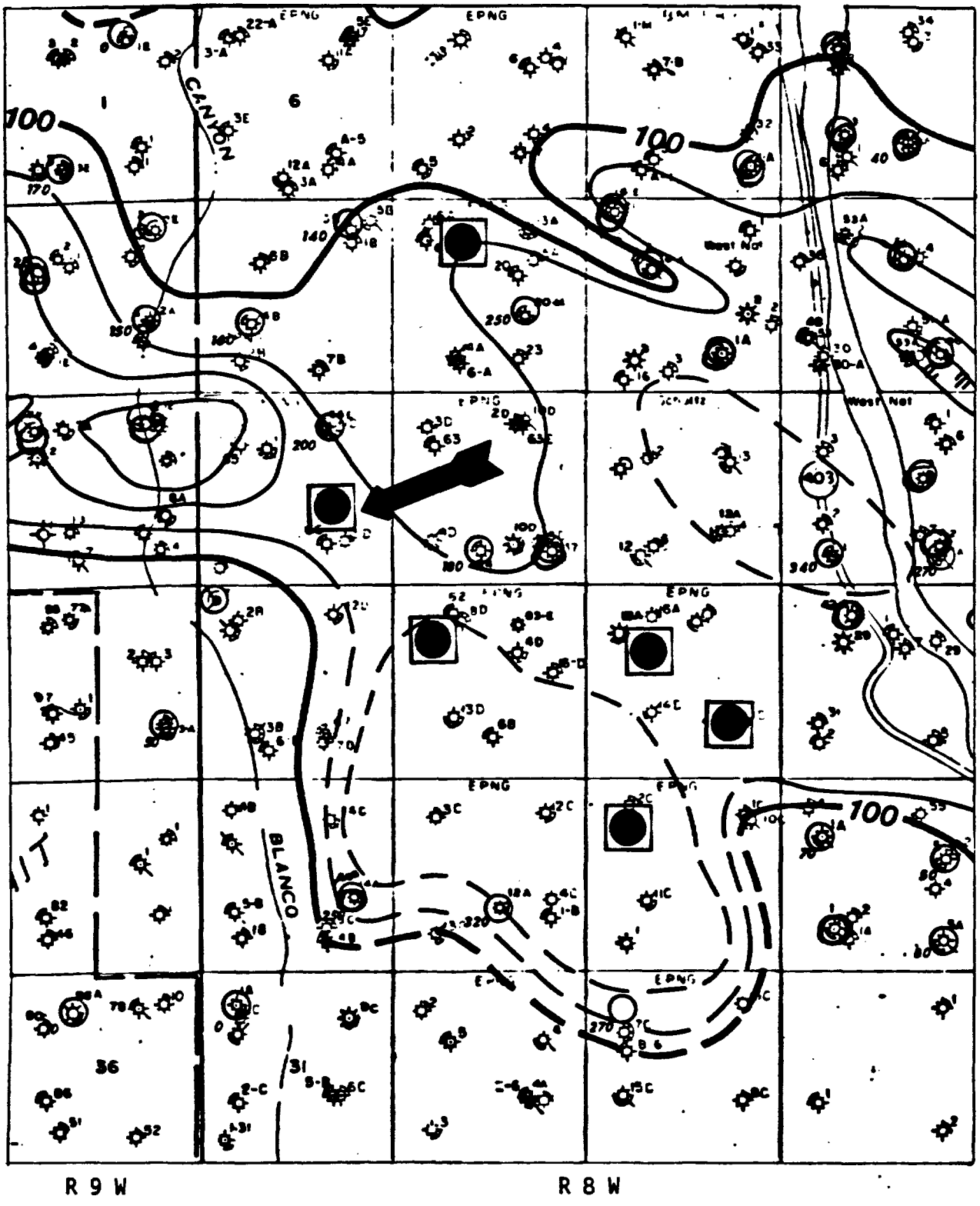
Chacra: (250)/(250 + 1450) = .1471 = 14.71%

Mesaverde: (1450)/(250 + 1450) = .8529 = 85.29%

SMS:pe:3/11/86
4129R-6

CHACRA ISO-RESERVE MAP (MMCF)

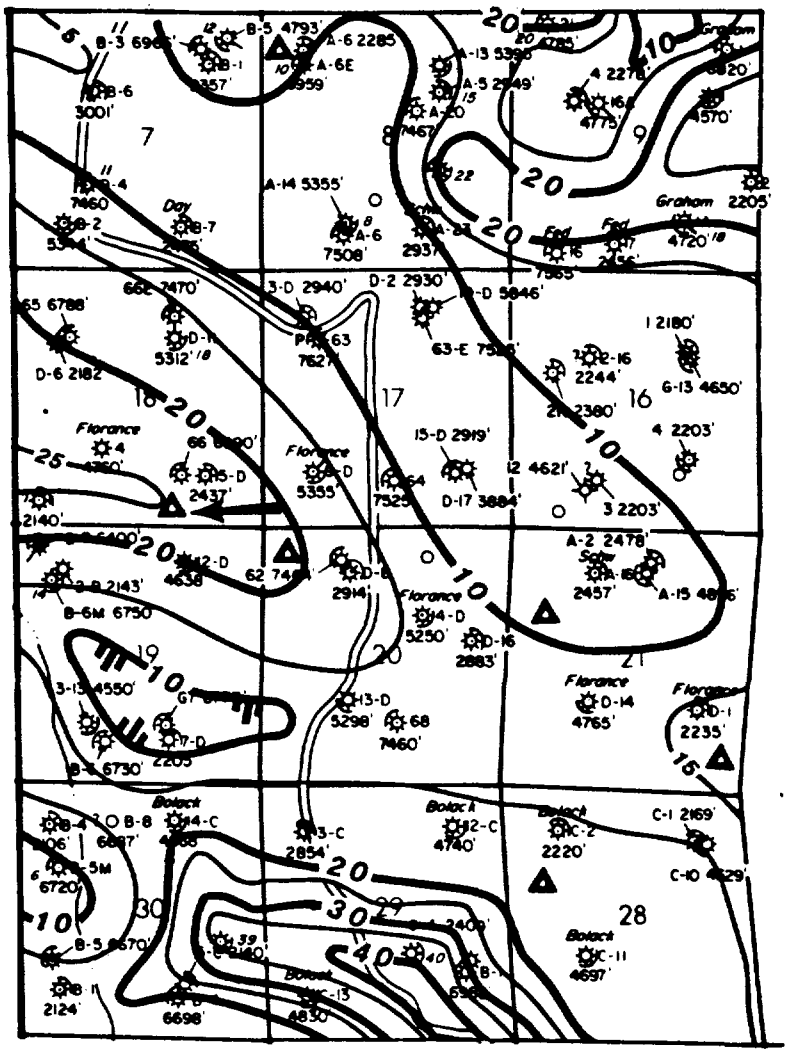
EXHIBIT 3



Florance D LS #11A 250 MMCF

EXHIBIT 4

R 8 W



LEGEND

- PICTURED CLIFFS PENETRATION
- CHACRA PENETRATION
- MESA VERDE PENETRATION
- GALLUP PENETRATION
- DAKOTA PENETRATION
- PROPOSED LOCATION

Tenneco Oil
Exploration and Production
WESTERN ROCKY MOUNTAIN DIVISION

TENNECO

San Juan Basin

CLIFFHOUSE & POINT LOOKOUT
COMPOSITE NET PAY ISOPACH

MKD 3/4/86

C.I. = 10'
1:4000

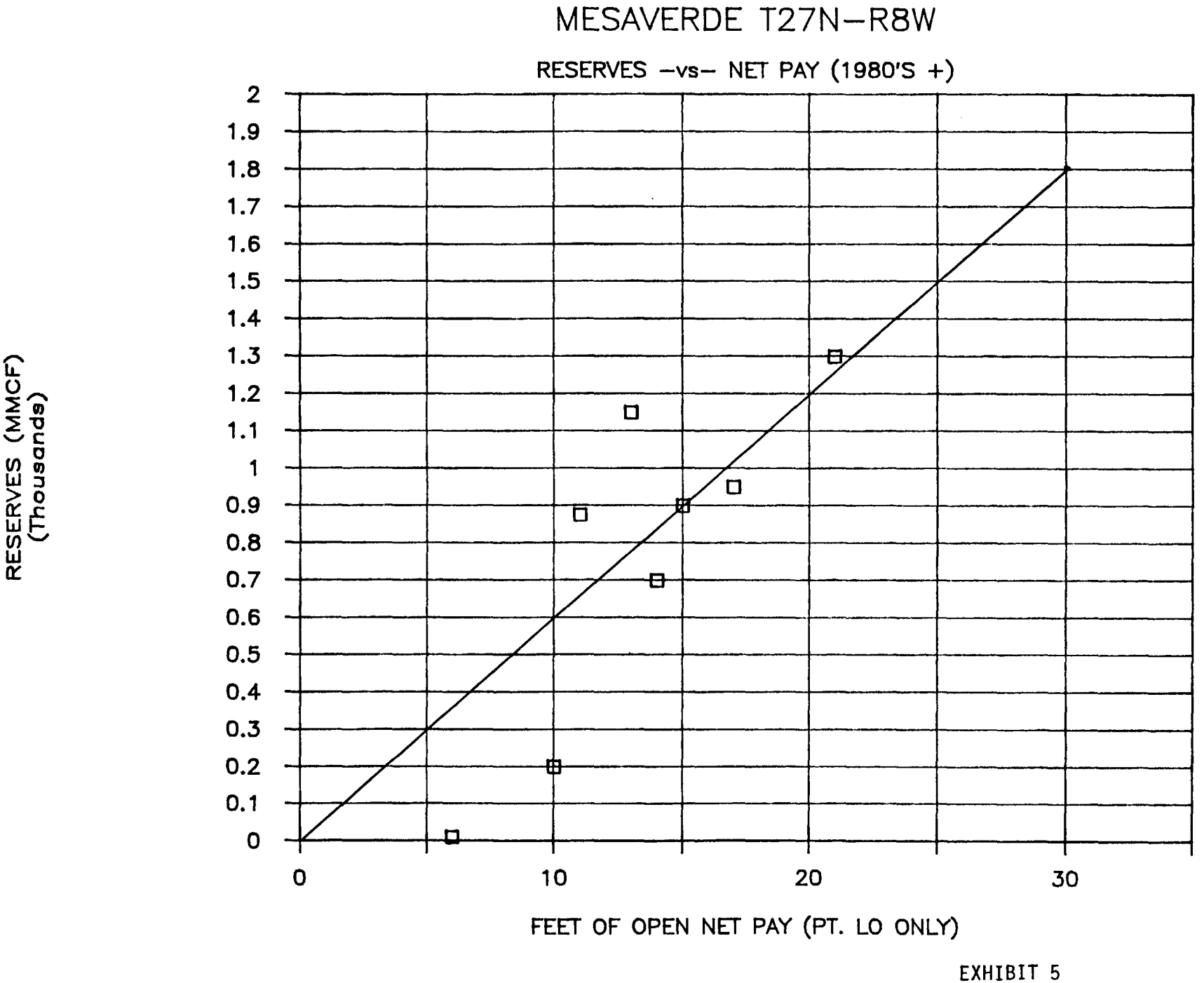

MESAVERDE T27N-R8W
RESERVES -vs- NET PAY (1980'S +)
RESERVES (MMCF)
(Thousands)
2
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
10
20
30
FEET OF OPEN NET PAY (PT. LO ONLY)

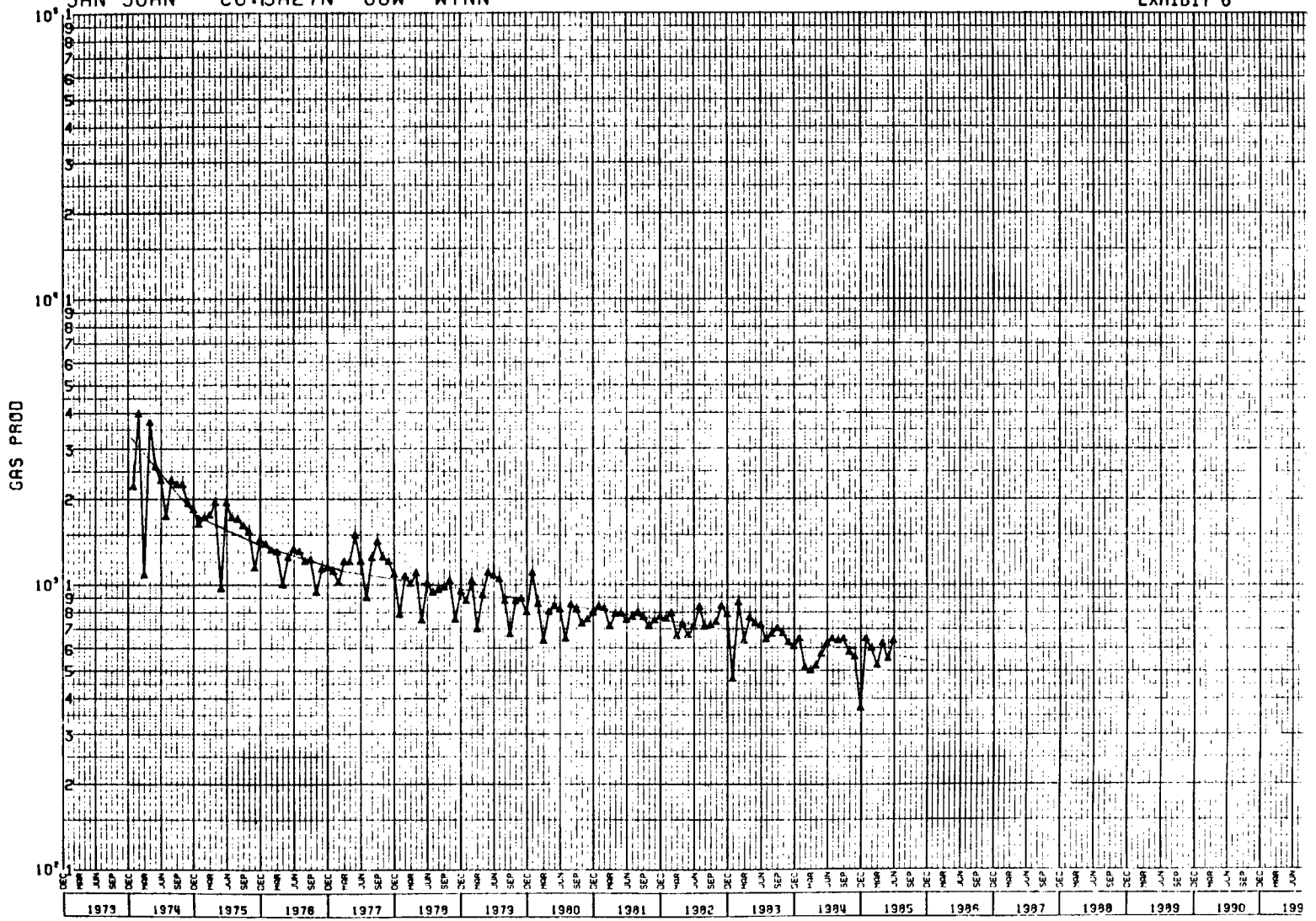
EXHIBIT 5

LARGO FEDERAL 000005 OTERO CHACRA (GAS)

SAN JUAN CO.13N27W 08W WYNN

LEGEND A MCF/MO

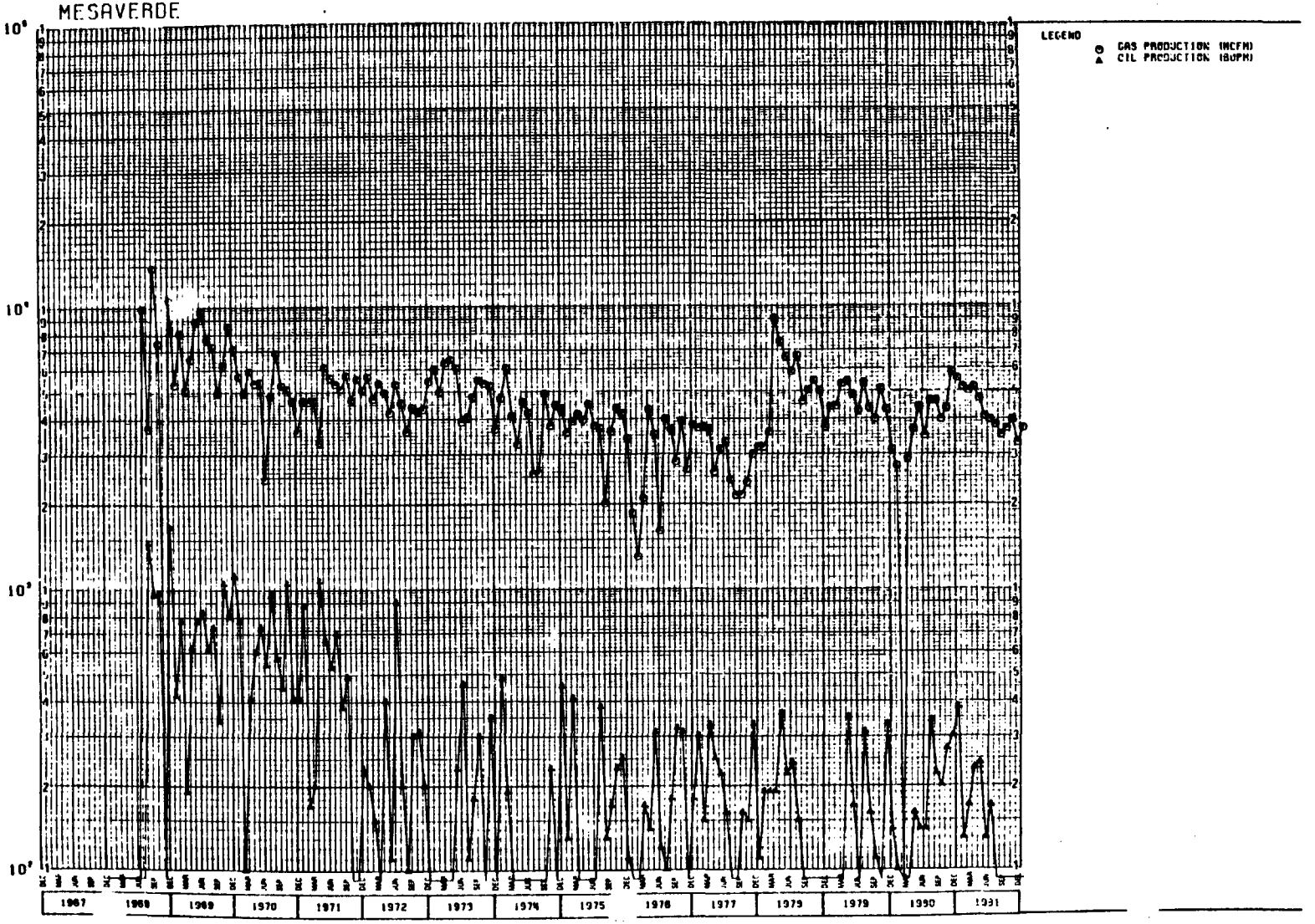
EXHIBIT 6



PLO

DAWSON FEDERAL 1
027N008W26D
MESAVERDE

EXHIBIT 7



PLOT-ID (MH001

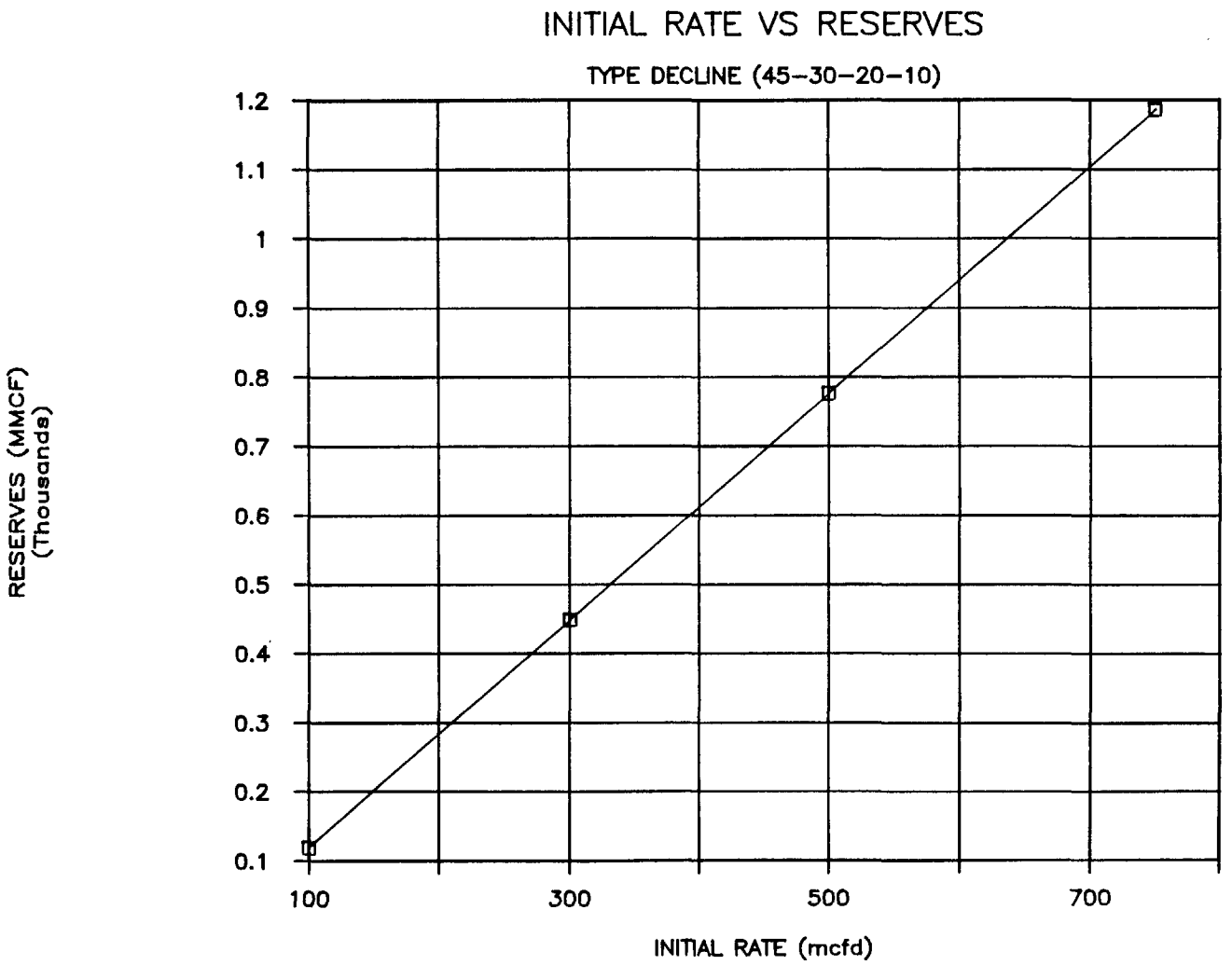

INITIAL RATE VS RESERVES
TYPE DECLINE (45-30-20-10)
RESERVES (MMCF)
(Thousands)
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
100
300
500
700
INITIAL RATE (mcfd)

EXHIBIT 8

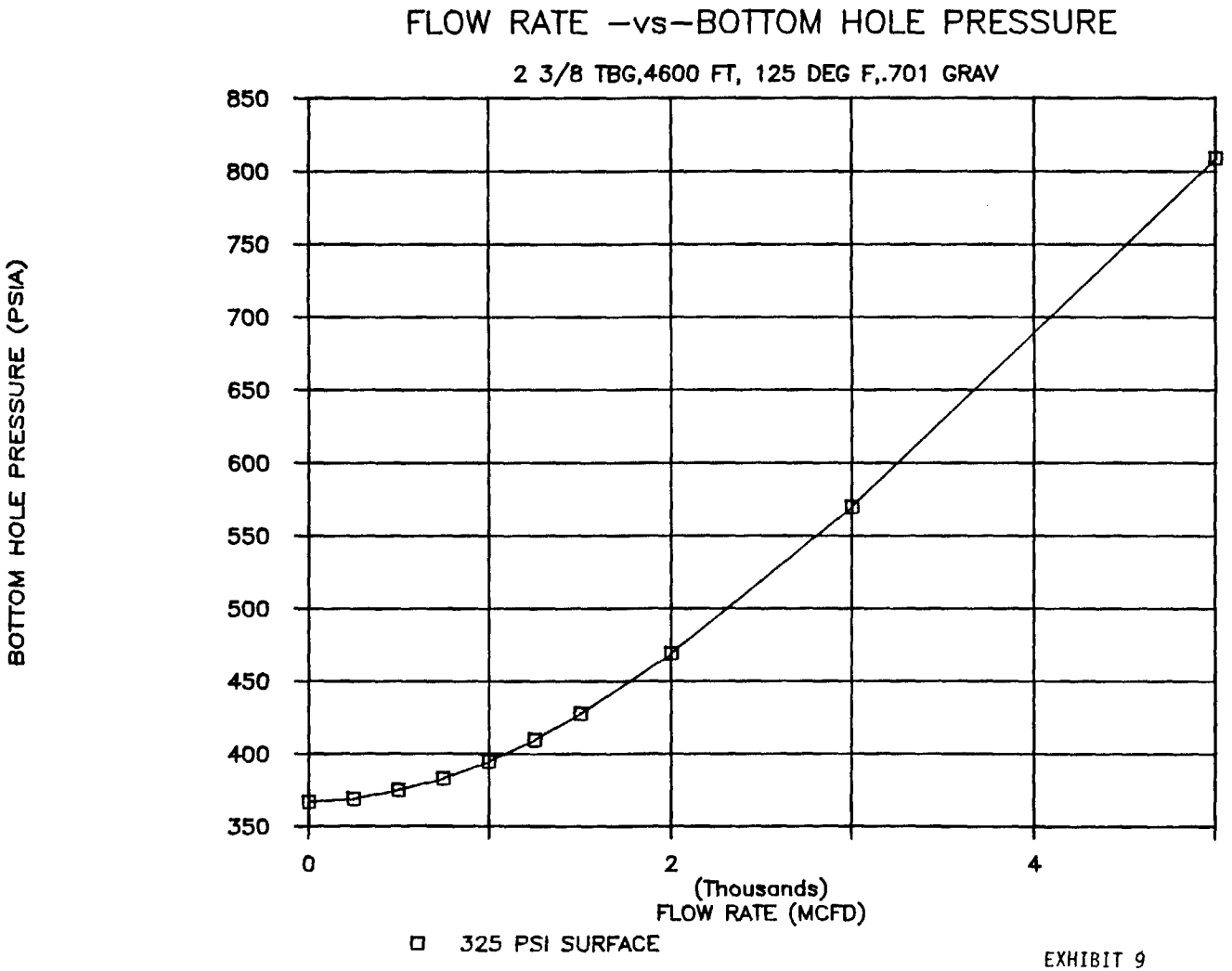

FLOW RATE –vs–BOTTOM HOLE PRESSURE
2 3/8 TBG,4600 FT, 125 DEG F,.701 GRAV
BOTTOM HOLE PRESSURE (PSIA)
850
800
750
700
650
600
550
500
450
400
350
0
2
4
(Thousands)
FLOW RATE (MCFD)
325 PSI SURFACE

EXHIBIT 9

COMMINGLING CAPITAL SAVINGS

Dual Wellhead	$ 5,000	
Separators	$ 5,500	
1 1/4" Tubing	$17,000	
PKR	$ 3,500	
Blast Jts/Pup Jts	$ 5,000	
Miscellaneous Plugs, Etc.	$ 2,000	
Casing	$ 5,000	(Less 7", More 4 1/2")
Drilling Miscellaneous	$ 2,500	(Deeper 8 1/4" hole)
Completion Miscellaneous	$10,500	(Rig time, nitrogen)
Taxes - Misc. Contingency (3%)	$ 2,000	
	$57,000	

The above total represents the additional capital required to produce the Chacra reserves separately. In light of current gas market trends (gas price estimate $1.50 - 2.00/MCF), estimated demand (50-70% takes), hook-up delay, and associated risk, Chacra reserves are insufficient to justify the above incremental investment. To prevent the waste of these Chacra reserves it is necessary to obtain commingling approval. Correlative rights will be protected. The commingled wellbore will more efficiently recover Mesaverde reserves and extend the economic life of the well.

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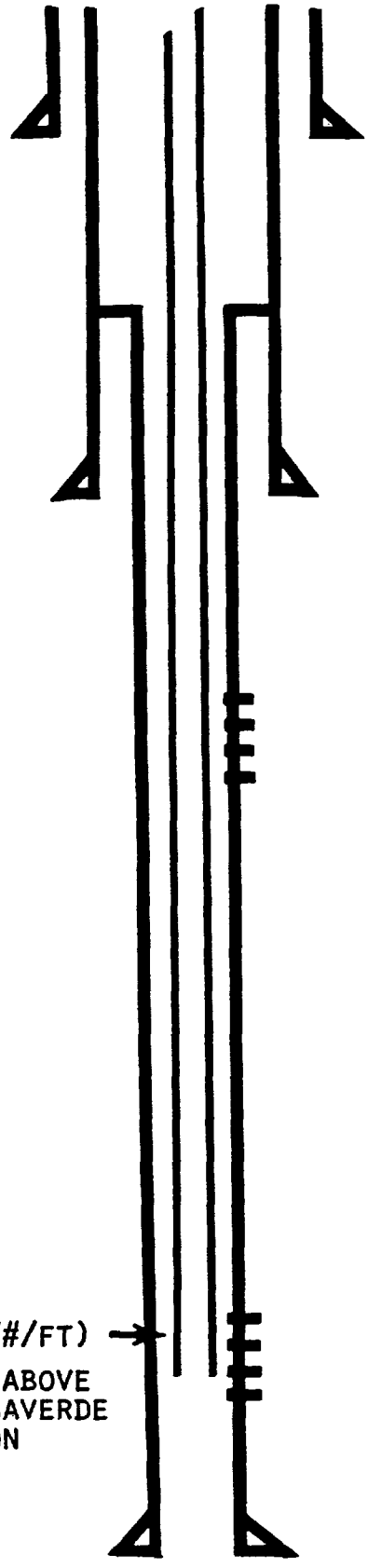
4135R

CHACRA/MESAVERDE COMMINGLING APPLICATION
FLORANCE D LS #11A WELL BORE DIAGRAM



CASING: SURFACE
9-5/8" (36#/FT) @ 280 FEET

CASING: INTERMEDIATE
7" (23#/FT)
250 FEET INTO LEWIS SHALE

CHACRA PERFORATIONS @ 3304 FEET

TUBING:
2-3/8" (4.7#/FT)
ONE JOINT ABOVE
BOTTOM MESAVERDE
PERFORATION

MESAVERDE PERFORATIONS @ 4675 FEET

LINER:
4-1/2" (10.5#/FT) TO T.D. 4825 FEET

CHACRA/MESAVERDE COMMINGLING APPLICATION

WELL NAME: FLORANCE D LS #13A
LOCATION: NW/4 SEC. 20 T27N, R8W

Tenneco Oil Company currently plans to drill the captioned well during the third or fourth quarter of 1986. The well is anticipated to encounter productive sands in both the Mesaverde and Chacra formations. Tenneco Oil Company seeks to obtain the Commission's approval to down-hole commingle production from the Chacra and Mesaverde formations. The attached documentation indicates that the two zones proposed for commingling will satisfy all requirements as stipulated by the Commission (303C(b)(1-6).

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Common ownership exists between the Chacra and Mesaverde zones, satisfying rule 303C(b)(5). A detailed ownership breakdown is attached.

It is recommended that production be allocated on a strict percentage basis according to the fraction of total reserves contributed by each zone. Chacra reserves were estimated from the attached iso-reserve map (Exhibit 3). Mesaverde reserves were estimated from the attached net pay

isopach map (Exhibit 4) and a linear correlation of reserves versus net pay (Exhibit 5). Exhibit 5 was obtained by plotting estimated ultimate recoveries (decline curve derived) from recent (1980+) Mesaverde wells against the amount of net perforated pay as determined from log analysis and completion reports. Chacra reserves are estimated to be 300 MMCF, while Mesaverde reserves are estimated to be 1250 MMCF. Production allocated to the Chacra should be 19.35% of total, and the production allocated to the Mesaverde should be 80.65% of total.

Both Chacra and Mesaverde wells in this area exhibit similarly shaped decline curves. Exhibits 6 and 7 are representative type decline curves for local Mesaverde and Chacra wells.

Despite the large disparity in estimated reserves, both formations have very similar reserve lives. Exhibit 8 shows initial rate versus reserves for the type decline scenario used. The following table compares reserve lives from each of the two zones assuming a 10 MCF/D economic limit. An average reserve ratio was taken for this example:

FORMATION	RESERVES (MMCF)	INITIAL RATE (MCF/D)	ECONOMIC* LIMIT (MCF/D)	RESERVE LIFE (YRS)
Mesaverde	1150	735	8	31.7
Chacra	235	160	2	31.2
			10	

Produced Chacra gas is extremely dry. Chacra wells in the vicinity of the subject well produce less than 1 BBL/MMCF of water and condensate (combined) on an average basis. Local Mesaverde wells produce considerably more liquids than do the Chacra wells. Average condensate and water yields are approximately 5 BBL/MMCF and 2 BBL/MMCF, respectively, for the Mesaverde producers. As the production capacity of the Mesaverde zone decreases with time, its ability to unload produced fluids also decreases. The increased

*The economic limit was allocated roughly according to the reserve ratio: 83% Mesaverde / 17% Chacra

volume of commingled dry Chacra gas through the tubing will help to lift the produced Mesaverde liquids. Over the life of the well, the commingled Chacra production will definitely improve the flow efficiency of the Mesaverde zone. Early in the life of the well, while both zones are producing at maximum rates, there will be a slight increase in friction loss (tubing) due to the additional volume of Chacra gas. Exhibit 9 shows that the flowing bottom hole pressure goes from 390 psi for a well producing 750 mcf/d, to 405 psi for a well producing at 1250 mcf/d. An increased pressure drop of 15 psi is insignificant, and would represent a maximum considering the initial rate of the Chacra production will be much closer to 200 mcf/d rather than 500 mcf/d.

All operators of offset wells have been notified in writing of the proposed commingling within the time limits provided under rule #1207.

S. M. Struna
Petroleum Engineer

SMS:pe:3/13/86
4131R

Attachment

CHACRA/MESAVERDE COMMINGLING APPLICATION

WELL: Florance D LS #13A
LOCATION: NW/4 Sec. 20 T27N, R8W

Estimated Chacra completed interval midpoint:	3840 ft.
Estimated Mesaverde completed interval midpoint:	5211 ft.
Average surrounding Chacra ISIP's (surface)	1002 psi
Average surrounding Mesaverde ISIP's (surface)	867 psi
Average Surrounding Chacra Completed Interval Midpoint:	3244 ft.
Average surrounding Mesaverde Completed Interval Midpoint:	4616 ft.
Chacra Pressure Gradient	.3382 psi/ft.
Mesaverde Pressure Gradient	.2143 psi/ft.
Anticipated Chacra shut in pressure (bottom hole):	1299 psi
Anticipated Mesaverde shut in pressure (bottom hole):	1117 psi

Anticipated pressures adjusted to 4000 ft. datum:

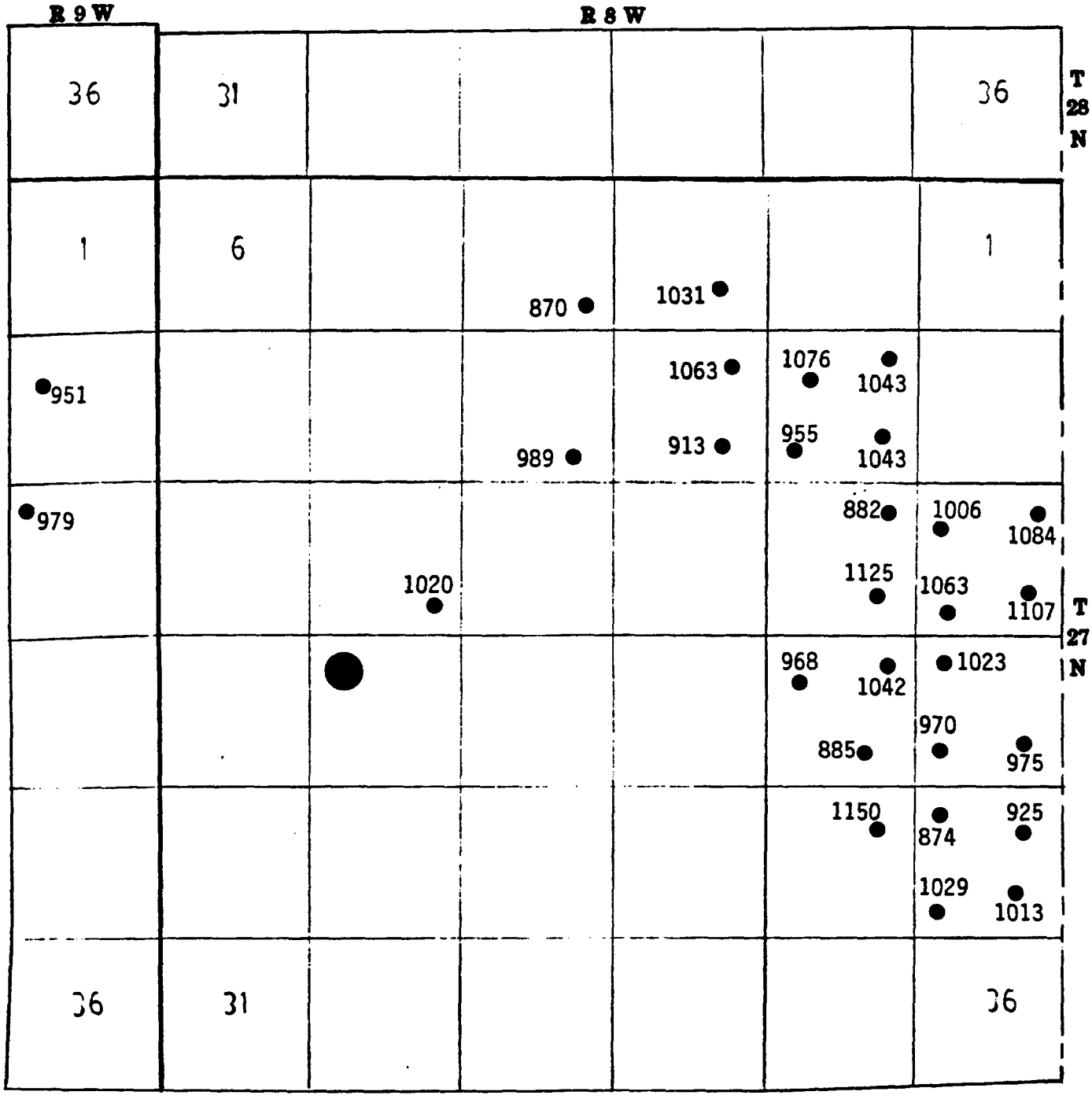
Chacra	1304 psi
Mesaverde	1082 psi

Ratio 1082/1304 = .8298

Satisfies 50% pressure requirement

SMS:pe:2/24/86
4086R-2

CHARCA



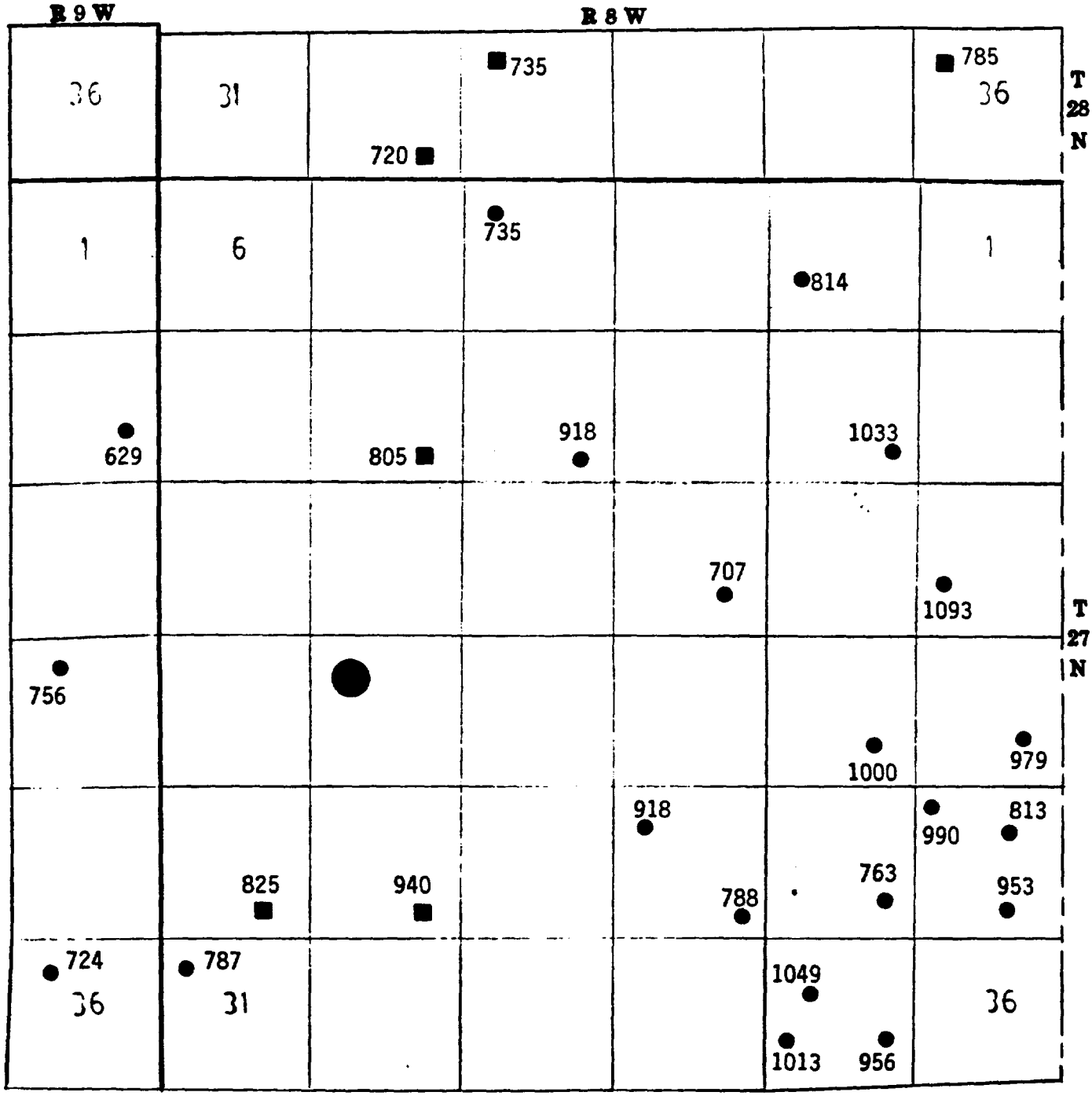
Initial Shut-In Pressure (PSI)

● **Producing Well**

● **Florance D LS #13A**

EXHIBIT 1

MESAVERDE



Initial Shut-In Pressure (PSI)

- ● Recent Infill (post 1978)
- ■ 1985 Tenneco Completion
- ● Florance D LS #13A

EXHIBIT 2

CHACRA/MESAVERDE COMMINGLING APPLICATION

Assumptions Used in Pressure Calculations

Chacra	Gravity = .665*
	P_c = 670.4 psia
	T_c = 378.6°R
Mesaverde	Gravity = .701*
	P_c = 669.1 psia
	T_c = 389.7°R
Local Temperature Gradient	.0139°F/ft.
Ambient Temperature	60°F

Pressures were calculated using a modified Cullender & Smith method.

*Gas gravities estimated from chromatographic analyses of local Chacra and Mesaverde gas samples.

SMS:pe:2/24/86
4086R

CHACRA/MESAVERDE COMMINGLING APPLICATION

INITIAL SHUT-IN PRESSURE DATA

RECENT MESAVERDE INFILL WELLS (POST 1978)

WELL NAME	LOCATION		OPERATOR	DOFP	INITIAL SHUT-IN PRESSURE
State Com #47	SW/2	27N 8W	Mesa	2/79	814
Dawson A #1M	NW/4	27N 8W	TOC	3/81	735
Graham C WN Fed Com #1A	SE/9	27N 8W	Arco	3/78	918
Federal J #1A	SE/11	27W 8W	AAA Oper. Co. Inc.	4/80	1133
Federal E #3A	SW/13	27N 8W	AAA Oper. Co. Inc.	4/80	1193
Federal R #1A	SE/15	27N 8W	AAA Oper. Co. Inc.	3/84	707
Federal E #2A	SE/23	27N 8W	AAA Oper. Co. Inc.	10/79	1000
Marron WN Fed Com #6A	SE/24	27N 8W	Arco	4/78	979
Hammond #41R	NE/25	27N 8W	Russell WM. C.	2/78	813
Federal E #1A	NW/25	27N 8W	AAA Oper. Co. Inc.	10/79	990
Federal E #1	SE/25	27N 8W	AAA Oper. Co. Inc.	6/72	953
Hammond #55A	SE/26	27N 8W	Great Lakes Chem.	3/79	763
Marron WN Fed Com #1A	NW/27	27N 8W	Arco	1/78	918
Marron #5A	SE/27	27N 8W	Western Oil & Min.	7/79	788
Linda #1A	NW/31	27N 8W	Consolidated O & G	6/79	787
Hammond #5	NW/35	27N 8W	Great Lakes Chem.	2/78	1049
Hammond WN Fed #7A	SE/35	27N 8W	Arco	4/79	956
Hammond #47R	SW/35	27N 8W	R & G Drilling Co.	4/78	1013
Blanco #2A	SE/12	27N 9W	NWPL	5/82	629
Huerfanito Unit #77A	NW/24	27N 9W	EPNG	3/83	756
Huerfanito Unit #86A	NW/36	27N 9W	EPNG	1/80	724

1985 TENNECO MESAVERDE INFILL WELLS

WELL NAME	LOCATION		OPERATOR	DOFP	INITIAL SHUT-IN PRESSURE
Riddle F LS #5A	SE/32	28N 8W			720
Bolack B LS #1A	NW/33	28N 8W			735
Blanco LS #12A	NW/36	28N 8W			785
Schwertdfeger A LS #20M	SE/8	27N 8W			805
Bolack C LS #12A	SE/29	27N 8W			940
Bolack C LS #14A	SE/30	27N 8W			825

OTERO CHACRA OFFSET WELLS

WELL NAME	LOCATION		OPERATOR	DOFP	INITIAL SHUT-IN PRESSURE
Graham #3	SE/3	27N 8W	Great Lakes Chem.	8/77	1031
Graham #1A	SE/4	27N 8W	Great Lakes Chem.	7/76	870
Graham C WN Fed Com #1A	SE/9	27N 8W	Arco	3/78	989
Graham #51	NE/10	27N 8W	Russell William C.	10/72	1063
Graham #96	SE/10	27N 8W	Russell William C.	12/83	913
Federal J #1	NE/11	27N 8W	AAA Oper. Co. Inc.	7/72	1043
Largo Fed. #4	NW/11	27N 8W	AAA Oper. Co. Inc.	12/73	1076
Largo Fed. #1	SW/11	27N 8W	AAA Oper. Co. Inc.	7/72	955
Federal J #2	SE/11	27N 8W	AAA Oper. Co. Inc.	4/80	1043
Largo Fed #5	NE/13	27N 8W	AAA Oper. Co. Inc.	12/73	1084
Federal E #3	NW/13	27N 8W	AAA Oper. Co. Inc.	7/72	1006
Largo Federal #2	SE/13	27N 8W	AAA Oper. Co. Inc.	5/73	1107
Federal E #6	SW/13	27N 8W	AAA Oper. Co. Inc.	4/80	1063
Largo Federal #3	NE/14	27N 8W	AAA Oper. Co. Inc.	5/73	882
Largo Federal #6	SE/14	27N 8W	AAA Oper. Co. Inc.	12/73	1125
Florance D LS #17	SE/17	27N 8W	TOC	10/72	1020
Marron #94	NW/23	27N 8W	Russell William C.	1/80	968
Federal E #2	NE/23	27N 8W	AAA Oper. Co. Inc.	6/72	1042
Federal E #5	SE/23	27N 8W	AAA Oper. Co. Inc.	9/79	885
Marron #6A	NW/24	27N 8W	Western Oil & Min.	2/76	1023
Marron WN Fed. Com #6A	SE/24	27N 8W	Arco	4/78	975
Snodgrass #1	SW/24	27N 8W	Western Oil & Min.	4/78	970
Federal E #4	NW/25	27N 8W	AAA Oper. Co. Inc.	9/79	874
Hammond #91	NE/25	27N 8W	Russell William C.	12/77	925
Federal E #1	SW/25	27N 8W	AAA Oper. Co. Inc.	7/72	1029
Hammond #92	SE/25	27N 8W	Russell William C.	1/80	1013
Hammond #52	NE/26	27N 8W	Russell William C.	12/74	1150
Blanco #25	NW/12	27N 9W	NWPL	6/75	951
John Charles #7E	NW/13	27N 9W	Getty	5/81	979

CHACRA/MESAVERDE COMMINGLING APPLICATION

RESERVE ESTIMATION AND PRODUCTION ALLOCATION

WELL: Florance D LS #13A
LOCATION: NW/4 Sec. 20 T27N, R8W

Chacra Reserves

Total Estimated Reserves (Exhibit 3) = 300 MMCF

Mesaverde Reserves

Net Pay Thickness (Exhibit 4) = 21 ft.
Total Estimated Reserves (Exhibit 5) = 1250 MMCF

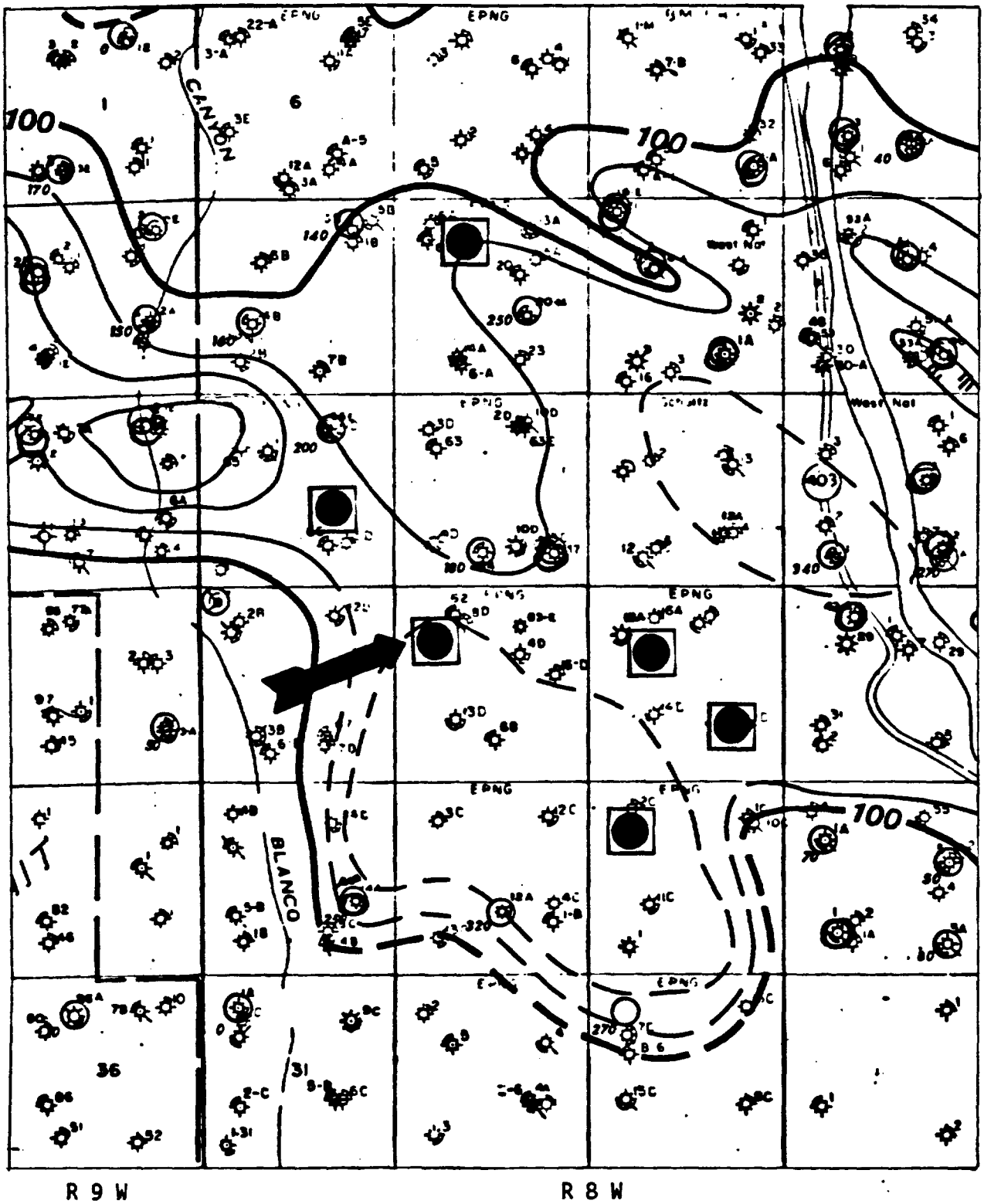
Production Allocation

Chacra: (300)/(300 + 1250) = .1935 = 19.35%

Mesaverde: (1250)/(300 + 1250) = .8065 = 80.65%

SMS:pe:3/11/86
4129R-2

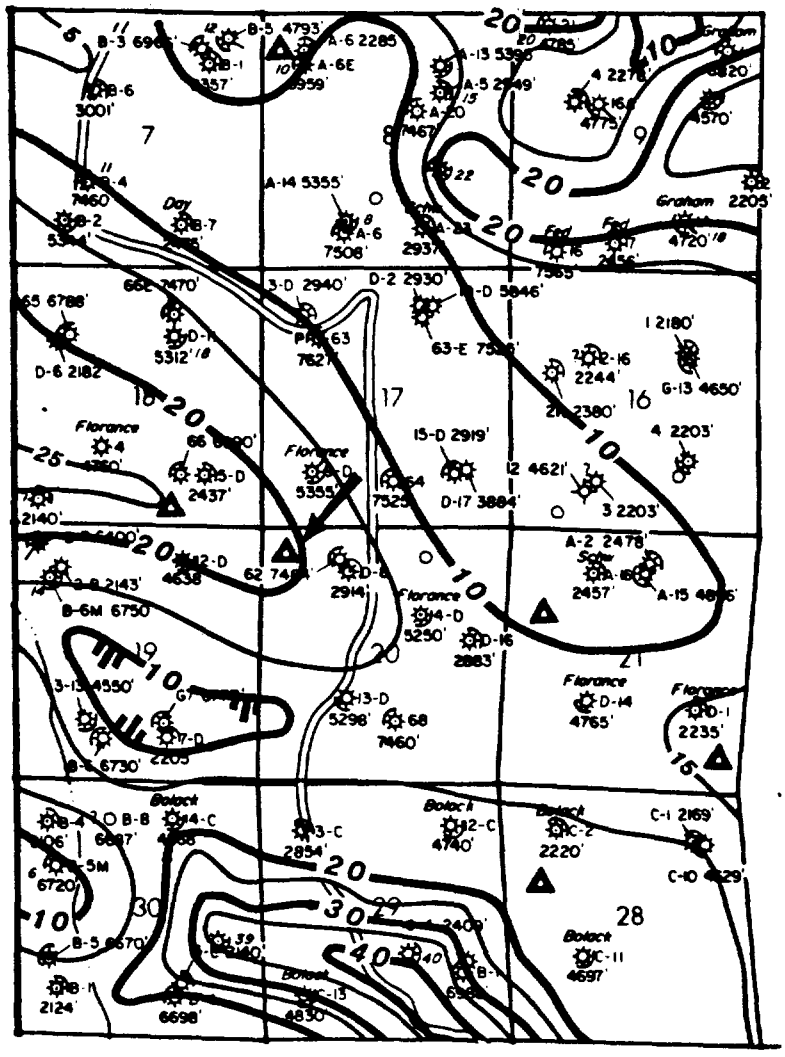
CHACRA ISO-RESERVE MAP (MMCF) EXHIBIT 3



Florance D LS #13A 300 MMCF

EXHIBIT 4

R 8 W



R 8 W

LEGEND

- PICTURED CLIFFS PENETRATION
- CHACRA PENETRATION
- MESA VERDE PENETRATION
- GALLUP PENETRATION
- DAKOTA PENETRATION
- PROPOSED LOCATION

Tenneco Oil
Exploration and Production
WESTERN ROCKY MOUNTAIN DIVISION

TENNECO

San Juan Basin

CLIFFHOUSE & POINT LOOKOUT COMPOSITE NET PAY ISOPACH

MKD 3/4/86

C.I. = 10'
1:4000

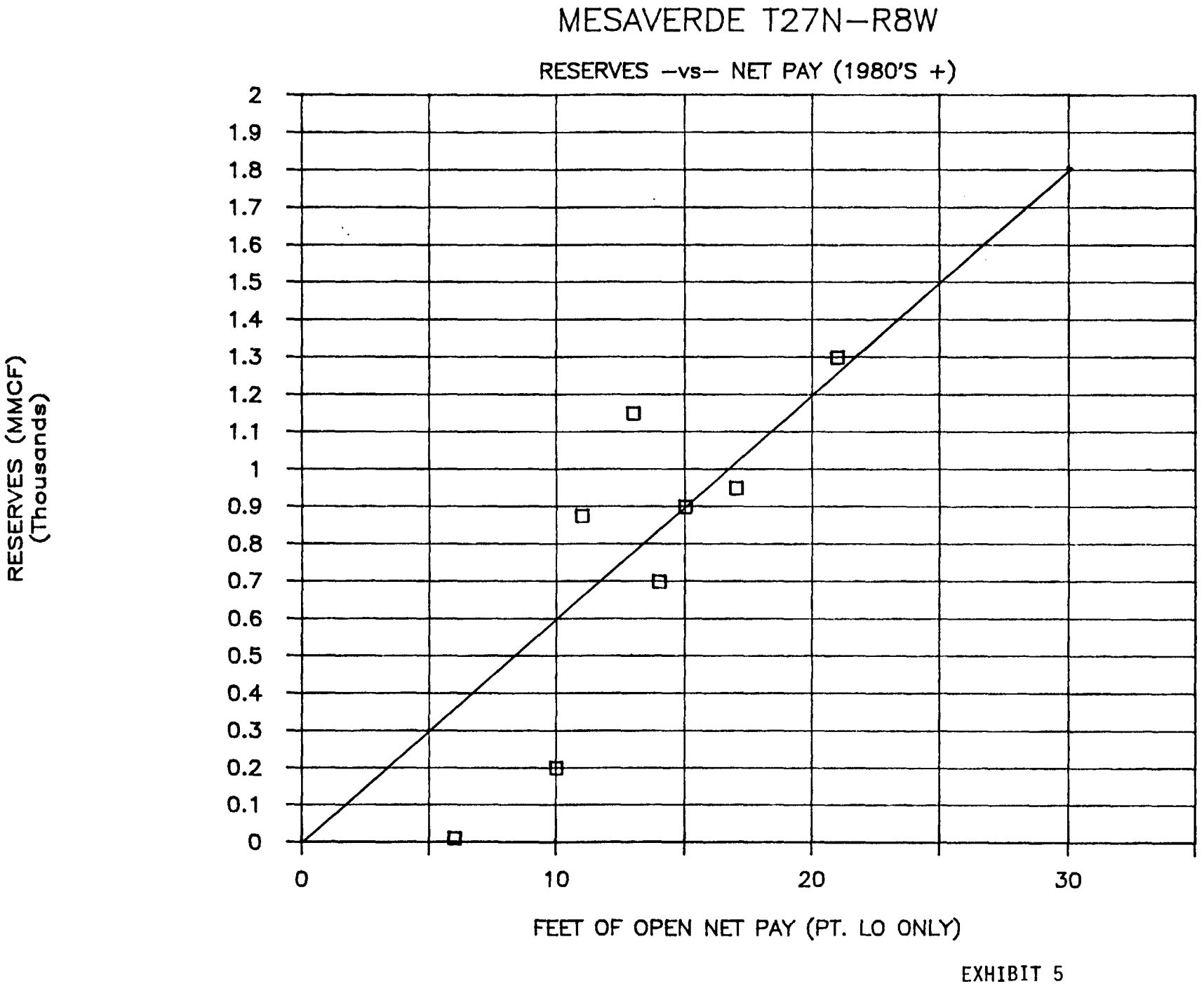

MESAVERDE T27N–R8W
RESERVES –vs– NET PAY (1980'S +)
RESERVES (MMCF)
(Thousands)
2
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
10
20
30
FEET OF OPEN NET PAY (PT. LO ONLY)

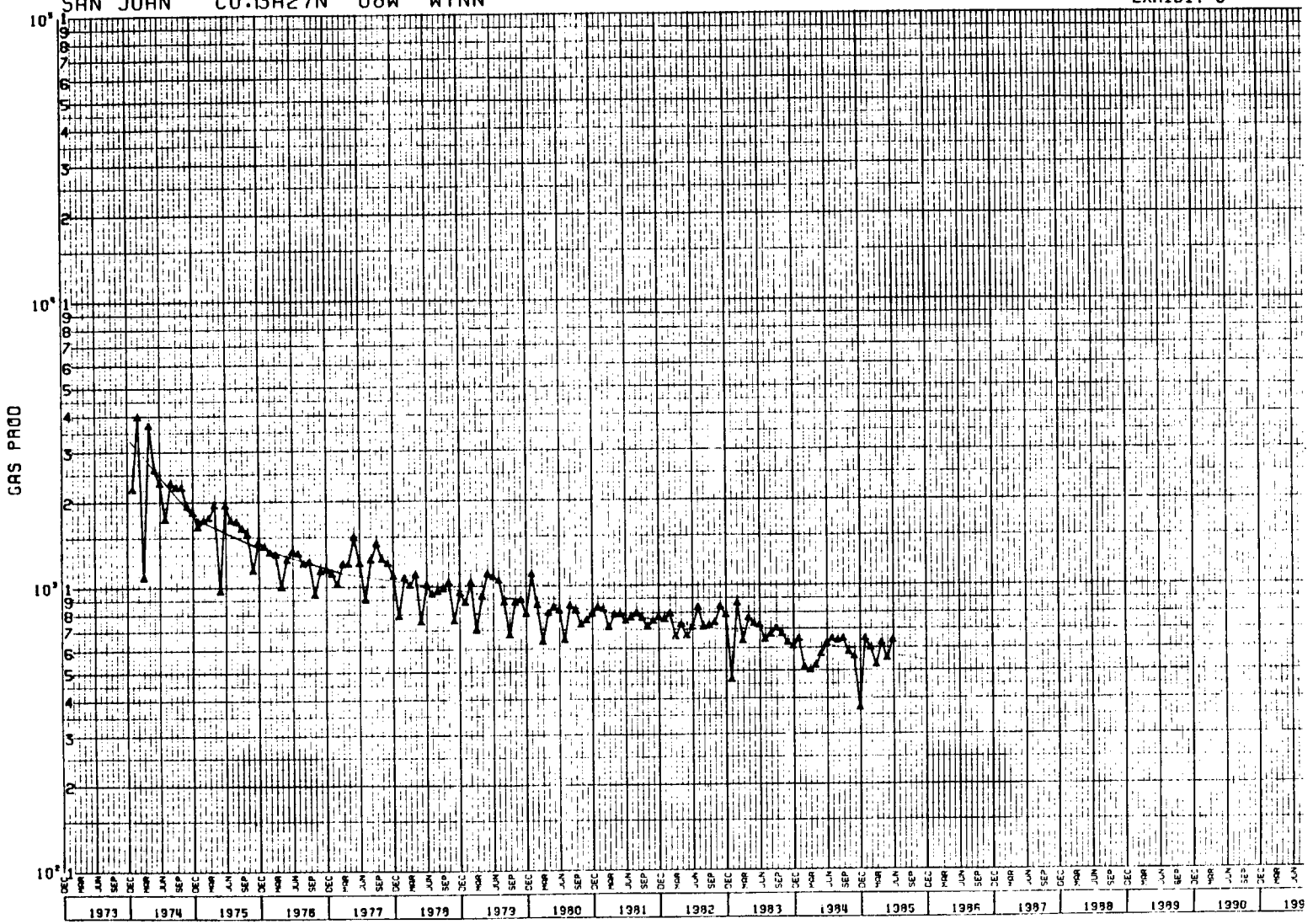
EXHIBIT 5

LARGO FEDERAL 000005 OTERO CHACRA (GAS)

SAN JUAN CO.13A27N 08W WYNN

LEGEND A MCF/MO

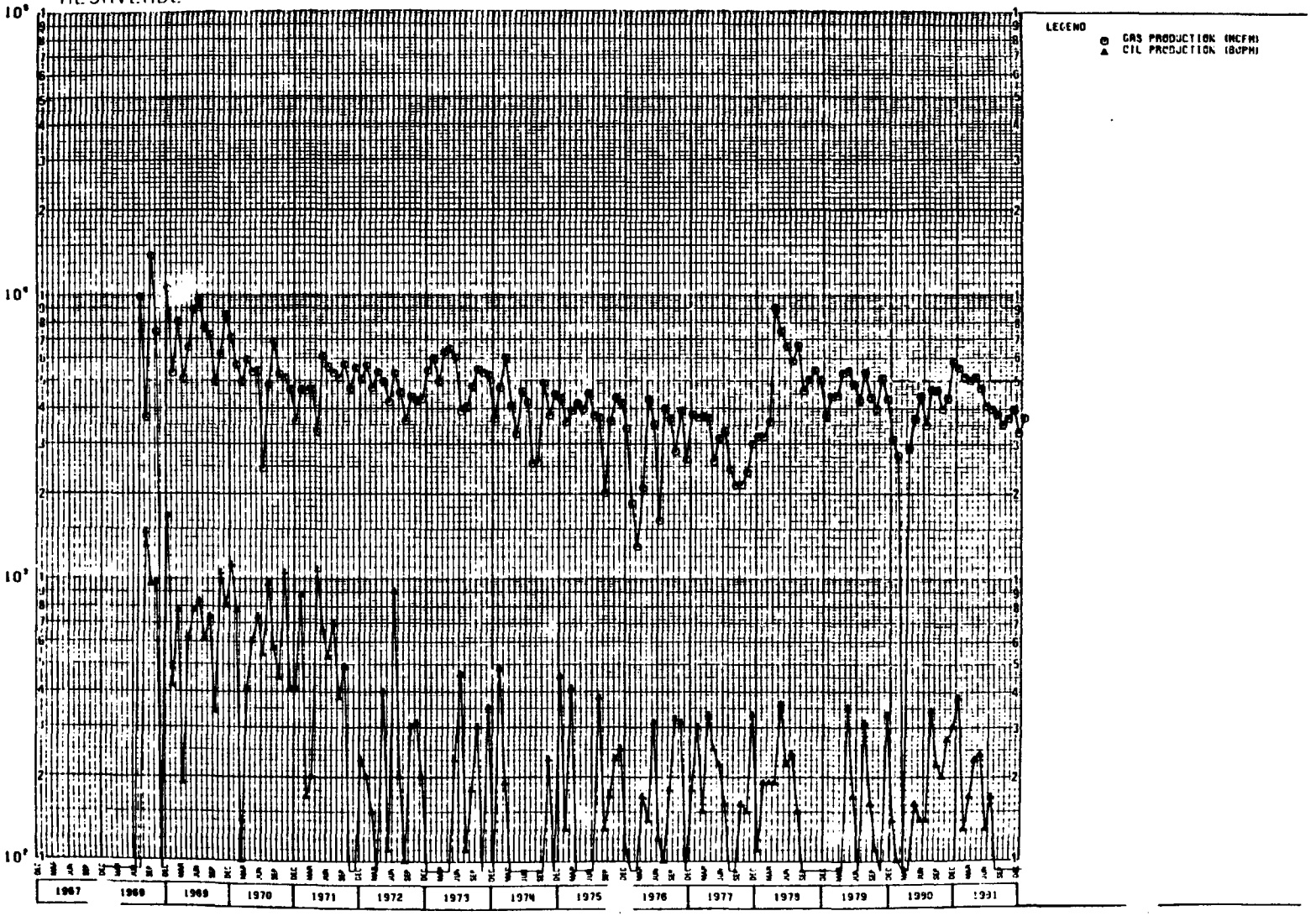
EXHIBIT 6



PLO

DAWSON FEDERAL 1
027N008W26D
MESAVERDE

EXHIBIT 7



PLOT-ID (MH001)

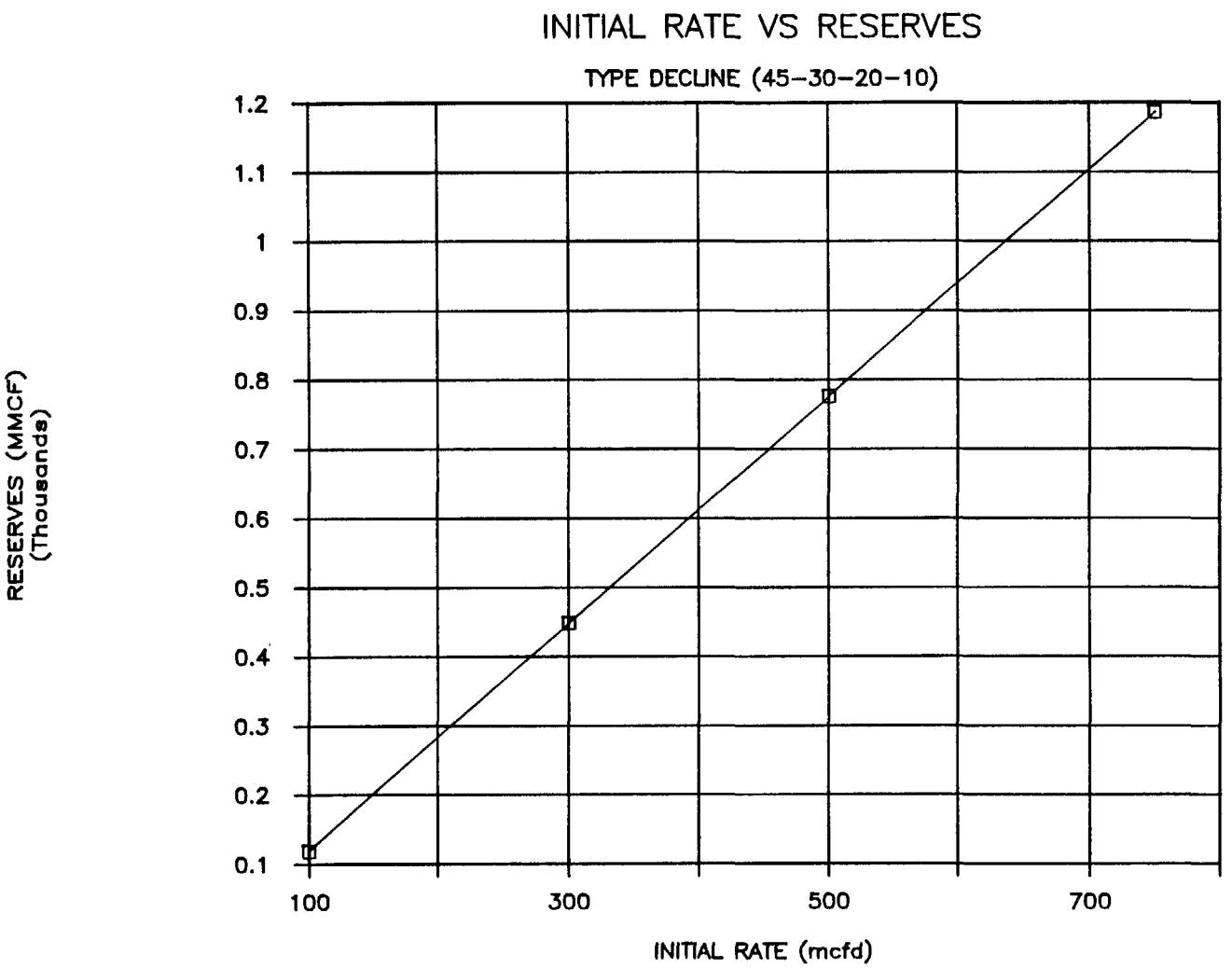

INITIAL RATE VS RESERVES
TYPE DECLINE (45-30-20-10)
RESERVES (MMCF)
(Thousands)
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
100
300
500
700
INITIAL RATE (mcfd)

EXHIBIT 8

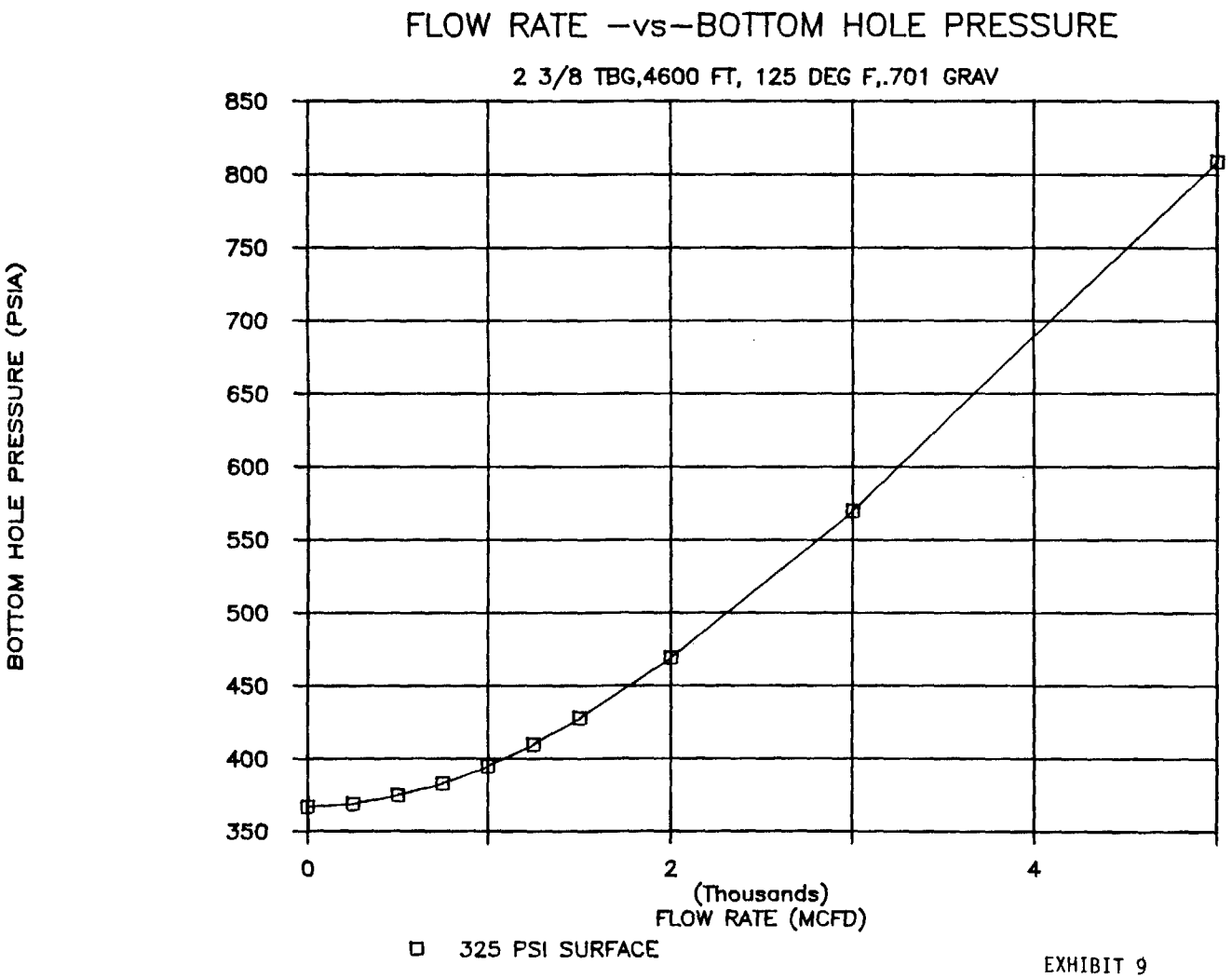

FLOW RATE –vs–BOTTOM HOLE PRESSURE
2 3/8 TBG,4600 FT, 125 DEG F,.701 GRAV
BOTTOM HOLE PRESSURE (PSIA)
850
800
750
700
650
600
550
500
450
400
350
0
2
4
(Thousands)
FLOW RATE (MCFD)
325 PSI SURFACE

EXHIBIT 9

COMMINGLING CAPITAL SAVINGS

Dual Wellhead	$ 5,000	
Separators	$ 5,500	
1 1/4" Tubing	$17,000	
PKR	$ 3,500	
Blast Jts/Pup Jts	$ 5,000	
Miscellaneous Plugs, Etc.	$ 2,000	
Casing	$ 5,000	(Less 7", More 4 1/2")
Drilling Miscellaneous	$ 2,500	(Deeper 8 1/4" hole)
Completion Miscellaneous	$10,500	(Rig time, nitrogen)
Taxes - Misc. Contingency (3%)	$ 2,000	
	$57,000	

The above total represents the additional capital required to produce the Chacra reserves separately. In light of current gas market trends (gas price estimate $1.50 - 2.00/MCF), estimated demand (50-70% takes), hook-up delay, and associated risk, Chacra reserves are insufficient to justify the above incremental investment. To prevent the waste of these Chacra reserves it is necessary to obtain commingling approval. Correlative rights will be protected. The commingled wellbore will more efficiently recover Mesaverde reserves and extend the economic life of the well.

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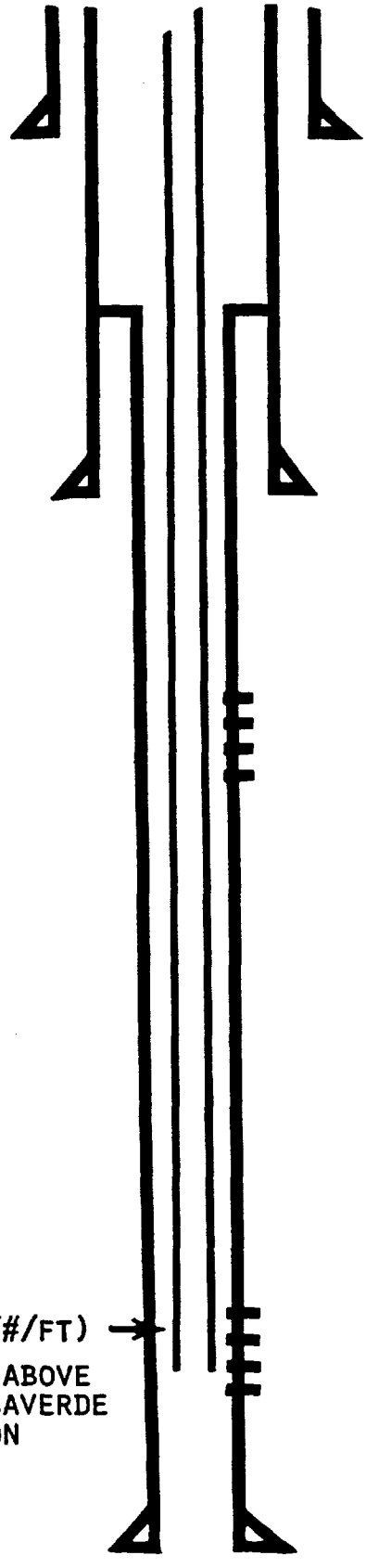
4135R

CHACRA/MESAVERDE COMMINGLING APPLICATION
FLORANCE D LS #13A WELL BORE DIAGRAM



CASING: SURFACE
9-5/8" (36#/FT) @ 280 FEET

CASING: INTERMEDIATE
7" (23#/FT)
250 FEET INTO LEWIS SHALE

CHACRA PERFORATIONS @ 3840 FEET

TUBING:
2-3/8" (4.7#/FT)
ONE JOINT ABOVE
BOTTOM MESAVERDE
PERFORATION

MESAVERDE PERFORATIONS @ 5211 FEET

LINER:
4-1/2" (10.5#/FT) TO T.D. 5361 FEET

CHACRA/MESAVERDE COMMINGLING APPLICATION

WELL NAME: LACKEY B LS #4A
LOCATION: NW/4 SEC. 29 T28N, R9W

Tenneco Oil Company currently plans to drill the captioned well during the third or fourth quarter of 1986. The well is anticipated to encounter productive sands in both the Mesaverde and Chacra formations. Tenneco Oil Company seeks to obtain the Commission's approval to down-hole commingle production from the Chacra and Mesaverde formations. The attached documentation indicates that the two zones proposed for commingling will satisfy all requirements as stipulated by the Commission (303C(b)(1-6).

The Mesaverde formation is the primary target of the captioned well. In light of current market conditions estimated reserves associated with a Chacra completion at the above location are considered to be insufficient to justify the capital expenditure required to separately produce these reserves. In the event that approval to commingle production is not granted, the Chacra interval would not be completed.

Estimated bottom hole pressures for the two zones were extrapolated statistically from offset Mesaverde and Chacra wells (Exhibits 1 & 2). The anticipated pressure of the lower pressured zone (Mesaverde) is estimated to be 84.76% of the pressure anticipated in the higher pressured zone (Chacra), when adjusted to a common datum. Therefore, rules 303C(b)(2) and 303C(b)(6) are satisfied.

A compatibility test was performed using the produced Chacra water from a nearby offset (Dryden LS #1A; SE/4 Sec. 28 T28N, R8W) and the produced Mesaverde water from another nearby offset (Schwerdtfeger A LS #14; SW/4 Sec. 8 T27N, R8W). The test indicated that no scale or precipitate problems should result when production streams from these two horizons are commingled. Water analyses also indicated that corresponding salinities are similar, and no formation damage should occur due to the presence of produced water from another zone. Therefore, rules 303C(b)(3) and 303C(b)(4) are satisfied.

Common ownership exists between the Chacra and Mesaverde zones, satisfying rule 303C(b)(5). A detailed ownership breakdown is attached.

It is recommended that production be allocated on a strict percentage basis according to the fraction of total reserves contributed by each zone. Chacra reserves were estimated from the attached iso-reserve map (Exhibit 3). Mesaverde reserves were estimated from a figure similar to the attached net pay isopach map (Exhibit 4) and a linear correlation of reserves versus net

pay (similar to Exhibit 5)†. Exhibit 5 was obtained by plotting estimated ultimate recoveries (decline curve derived) from recent (1980+) Mesaverde wells against the amount of net perforated pay as determined from log analysis and completion reports. Chacra reserves are estimated to be 200 MMCF, while Mesaverde reserves are estimated to be 650 MMCF. Production allocated to the Chacra should be 23.53% of total, and the production allocated to the Mesaverde should be 76.47% of total.

Both Chacra and Mesaverde wells in this area exhibit similarly shaped decline curves. Exhibits 6 and 7 are representative type decline curves for local Mesaverde and Chacra wells.

Despite the large disparity in estimated reserves, both formations have very similar reserve lives. Exhibit 8 shows initial rate versus reserves for the type decline scenario used. The following table compares reserve lives from each of the two zones assuming a 10 MCF/D economic limit. An average reserve ratio was taken for this example:

FORMATION	RESERVES (MMCF)	INITIAL RATE (MCF/D)	ECONOMIC* LIMIT (MCF/D)	RESERVE LIFE (YRS)
Mesaverde	1150	735	8	31.7
Chacra	235	160	2	31.2
			10	

Produced Chacra gas is extremely dry. Chacra wells in the vicinity of the subject well produce less than 1 BBL/MMCF of water and condensate (combined) on an average basis. Local Mesaverde wells produce considerably more liquids than do the Chacra wells. Average condensate and water yields are approximately 5 BBL/MMCF and 2 BBL/MMCF, respectively, for the Mesaverde

*The economic limit was allocated roughly according to the reserve ratio: 83% Mesaverde / 17% Chacra

†Tenneco Oil Company considers net pay isopach maps to be proprietary information and is reluctant to include an additional map over this specific area (T28N R9W). The process used in obtaining Mesaverde reserves on the subject well is identical to that used on the previous six wells.

producers. As the production capacity of the Mesaverde zone decreases with time, its ability to unload produced fluids also decreases. The increased volume of commingled dry Chacra gas through the tubing will help to lift the produced Mesaverde liquids. Over the life of the well, the commingled Chacra production will definitely improve the flow efficiency of the Mesaverde zone. Early in the life of the well, while both zones are producing at maximum rates, there will be a slight increase in friction loss (tubing) due to the additional volume of Chacra gas. Exhibit 9 shows that the flowing bottom hole pressure goes from 390 psi for a well producing 750 mcf/d, to 405 psi for a well producing at
1250 mcf/d. An increased pressure drop of 15 psi is insignificant, and would represent a maximum considering the initial rate of the Chacra production will be much closer to 200 mcf/d rather than 500 mcf/d.

All operators of offset wells have been notified in writing of the proposed commingling within the time limits provided under rule #1207.

S. M. Struna
Petroleum Engineer

SMS:pe:3/13/86
4131R

Attachment

CHACRA/MESAVERDE COMMINGLING APPLICATION

WELL: Lackey B LS #4A
LOCATION: NW/4 Sec. 29 T28N, R9W

Estimated Chacra completed interval midpoint:	3037 ft.
Estimated Mesaverde completed interval midpoint:	4383 ft.
Average surrounding Chacra ISIP's (surface)	932 psi
Average surrounding Mesaverde ISIP's (surface)	775 psi
Average Surrounding Chacra Completed Interval Midpoint:	3244 ft.
Average surrounding Mesaverde Completed Interval Midpoint:	4616 ft.
Chacra Pressure Gradient	.3142 psi/ft.
Mesaverde Pressure Gradient	.1911 psi/ft.
Anticipated Chacra shut in pressure (bottom hole):	954 psi
Anticipated Mesaverde shut in pressure (bottom hole):	829 psi

Anticipated pressures adjusted to 4000 ft. datum:

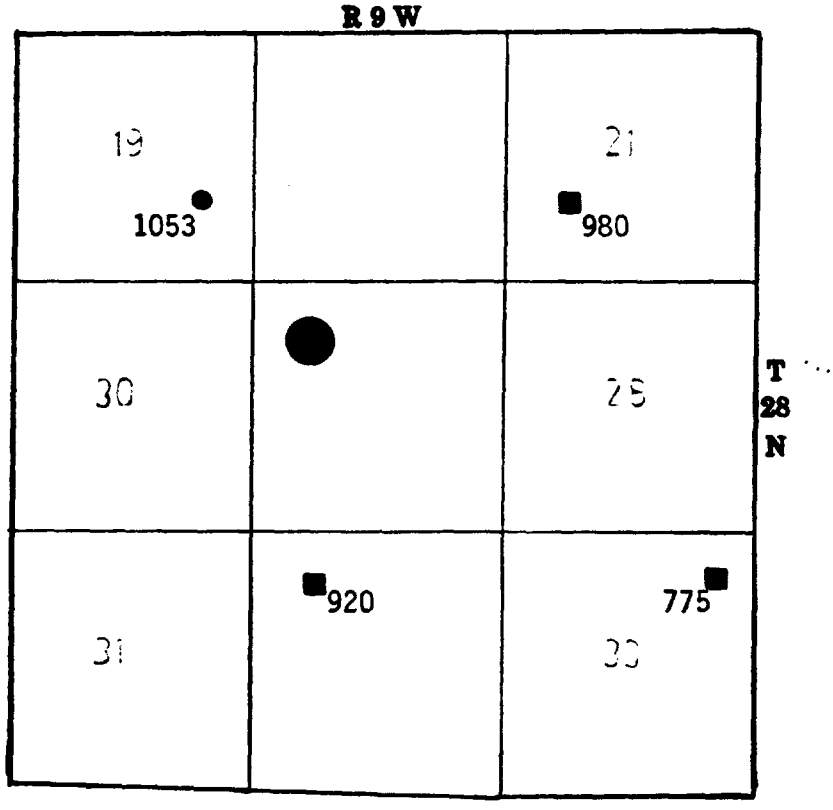
Chacra	978 psi
Mesaverde	829 psi

Ratio 829/978 = .8476

Satisfies 50% pressure requirement

MS:pe:2/21/86
4086R-1

CHACRA

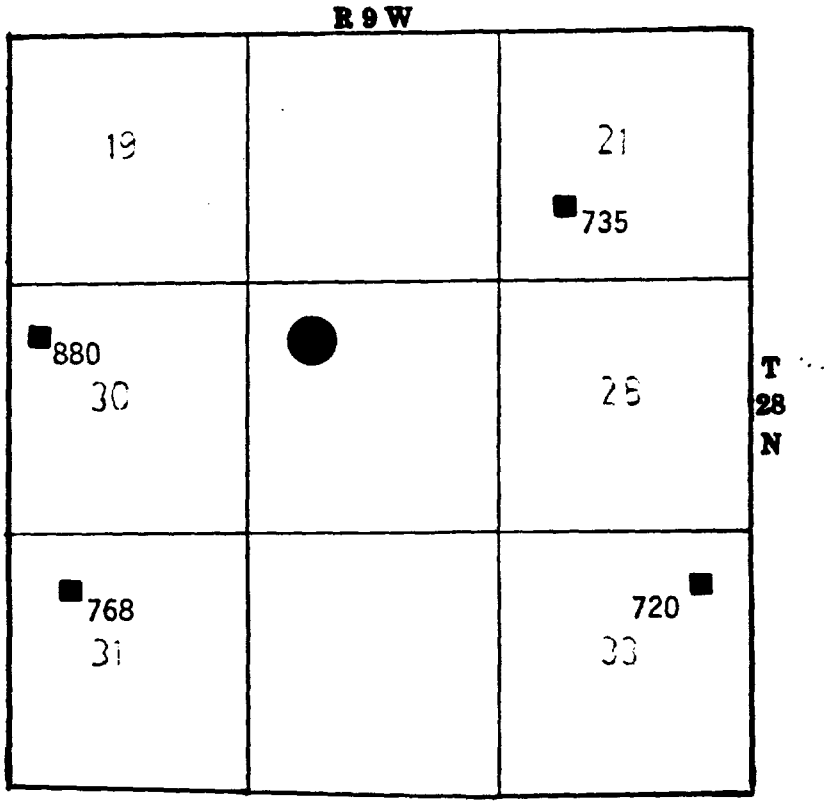


Initial Shut-In Pressure (PSI)

- ● **Producing Well**
- ■ **1985 Tenneco Completion**
- ● **Lackey B LS #4A**

EXHIBIT 1

MESAVERDE



Initial Shut-In Pressure (PSI)

- **Recent Infill (post 1978)**
- **1985 Tenneco Completion**
- **Lackey B LS #4A**

EXHIBIT 2

CHACRA/MESAVERDE COMMINGLING APPLICATION

Assumptions Used in Pressure Calculations

Chacra	Gravity = .665*
	P_c = 670.4 psia
	T_c = 378.6°R
Mesaverde	Gravity = .701*
	P_c = 669.1 psia
	T_c = 389.7°R
Local Temperature Gradient	.0139°F/ft.
Ambient Temperature	60°F

Pressures were calculated using a modified Cullender & Smith method.

*Gas gravities estimated from chromatographic analyses of local Chacra and Mesaverde gas samples.

SMS:pe:2/24/86
4086R

Chacra/Mesaverde Commingling Application
Initial Shut-in Pressure Data

RECENT TOC COMPLETIONS (1985) IN THE AREA

WELL NAME	LOCATION	FORMATION	DOFP	INITIAL SHUT-IN PRESSURE
Lackey B LS #11A	NW/30 28N 9W	Mesaverde		880
Lackey B LS #12A	SW/21 28N 9W	Mesaverde		735
Michener A LS #5A	NW/31 28N 9W	Mesaverde		768
Michener A #7	NE/33 28N 9W	Mesaverde		720
Daum LS #6E	NW/32 28N 9W	Chacra		920
Lackey B LS #12A	SW/21 28N 9W	Chacra		980
Michener A #7	NE/33 28N 9W	Chacra		775

SMS:pe:2/24/86
4092R

CHACRA/MESAVERDE COMMINGLING APPLICATION

RESERVE ESTIMATION AND PRODUCTION ALLOCATION

WELL: Lackey B LS #4A
LOCATION: NW/4 Sec. 29 T28N, R9W

Chacra Reserves

Total Estimated Reserves (Exhibit 3) = 200 MMCF

Mesaverde Reserves

Net Pay Thickness (Exhibit 4) = 12 ft.
Total Estimated Reserves (Exhibit 5) = 650 MMCF

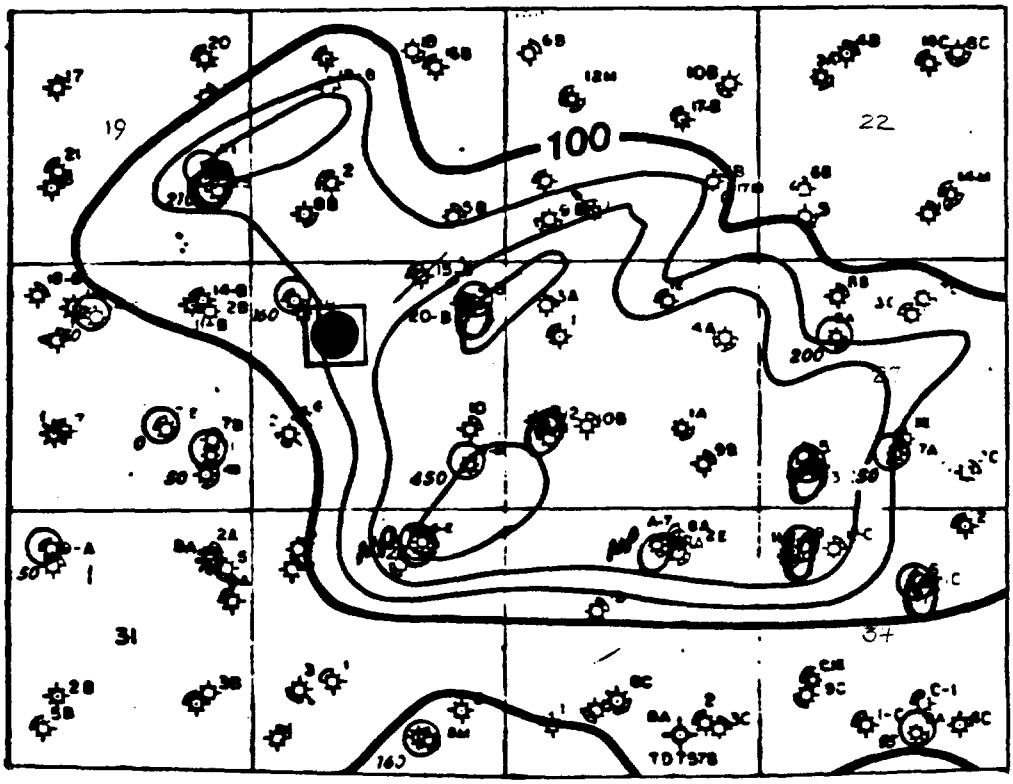
Production Allocation

Chacra: (200)/(200 + 650) = .2353 = 23.53%

Mesaverde: (650)/(200 + 650) = .7647 = 76.47%

SMS:pe:3/11/86
4129R-7

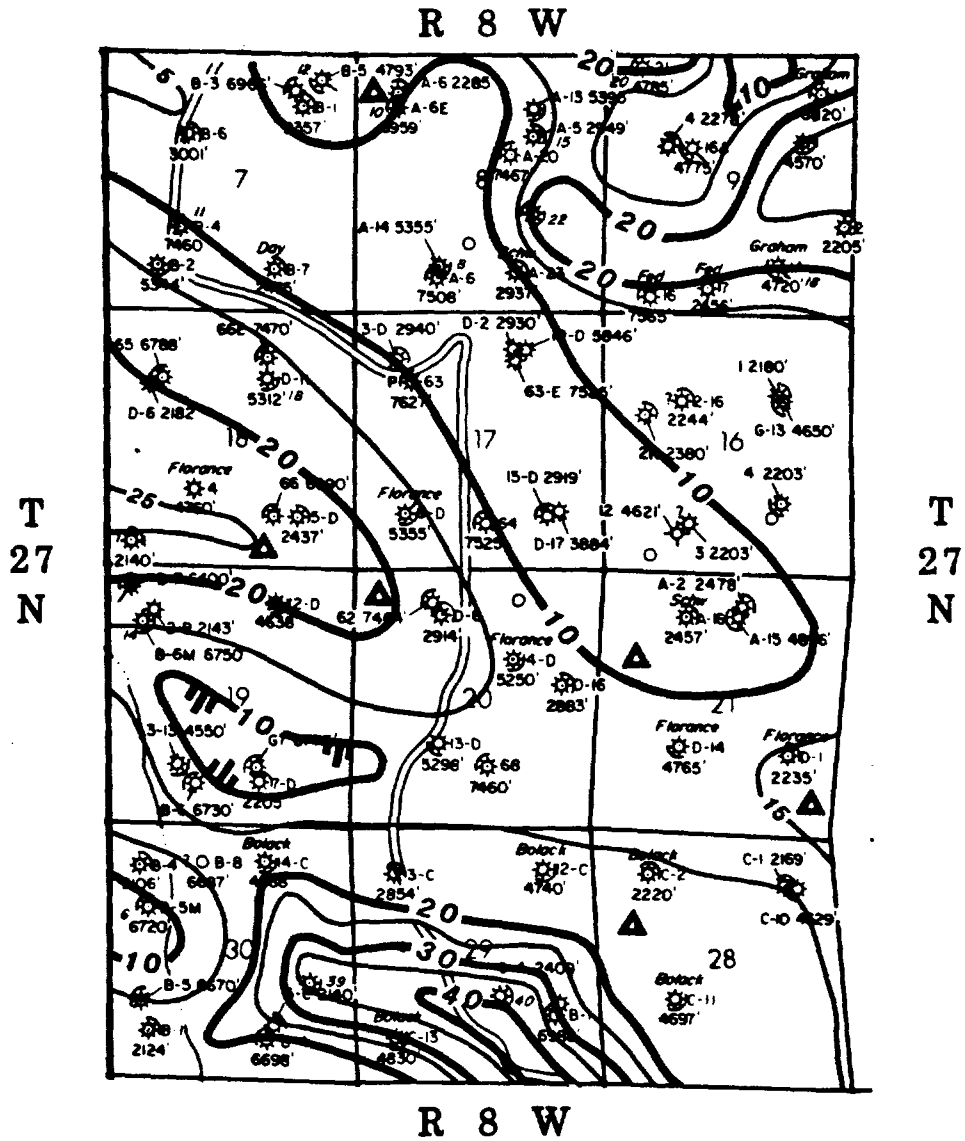
CHACRA ISO-RESERVE MAP (MMCF)



Lackey B LS #4A 200 MMCF

EXHIBIT 3

EXHIBIT 4



LEGEND

- PICTURED CLIFFS PENETRATION
- CHACRA PENETRATION
- MESA VERDE PENETRATION
- GALLUP PENETRATION
- DAKOTA PENETRATION
- PROPOSED LOCATION

Tenneco Oil
Exploration and Production
WESTERN ROCKY MOUNTAIN DIVISION

TENNECO

San Juan Basin

CLIFFHOUSE & POINT LOOKOUT COMPOSITE NET PAY ISOPACH

C.I. = 10'

MKD 3/4/86

1:4000

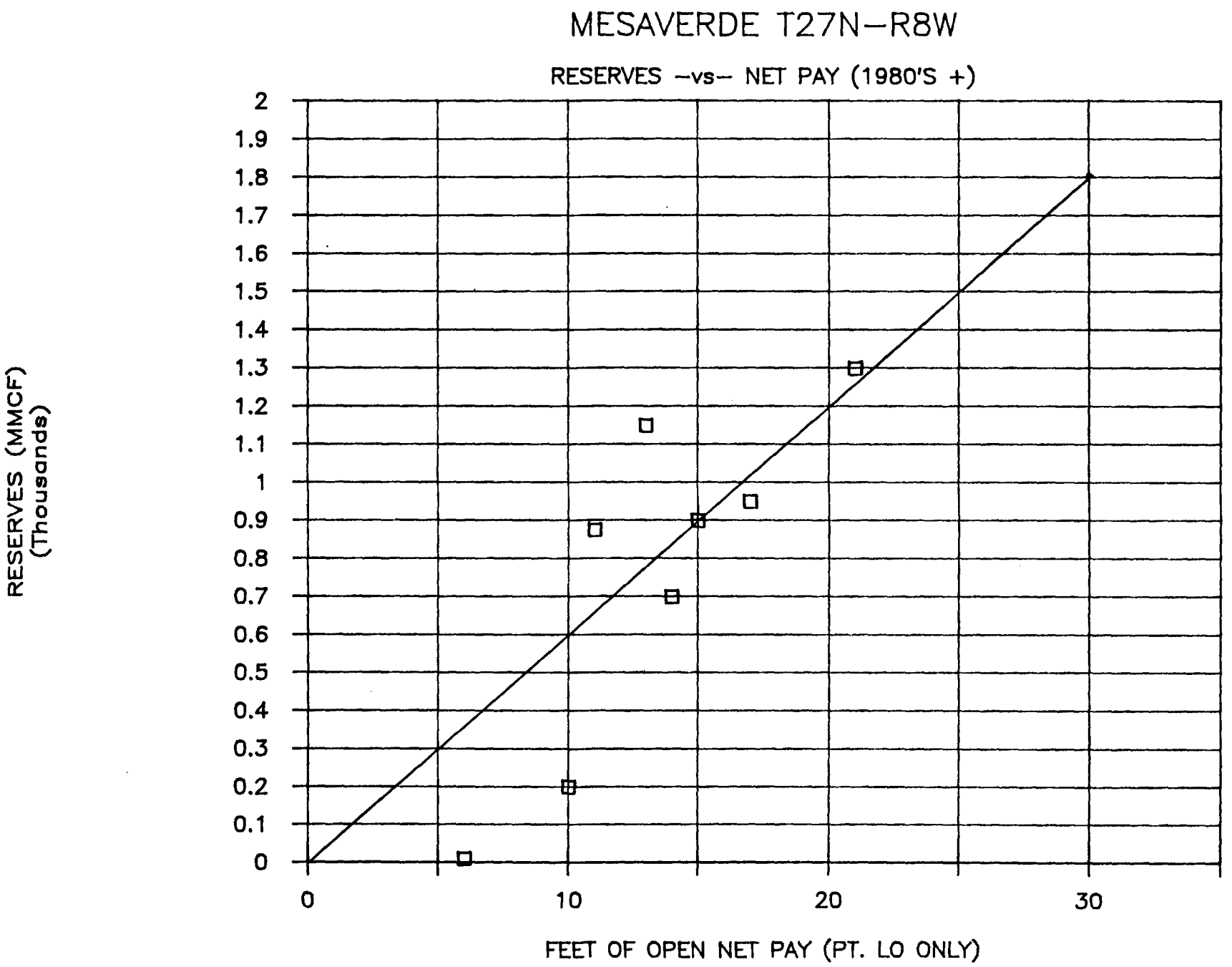

MESAVERDE T27N-R8W
RESERVES -vs- NET PAY (1980'S +)
RESERVES (MMCF)
(Thousands)
2
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
10
20
30
FEET OF OPEN NET PAY (PT. LO ONLY)

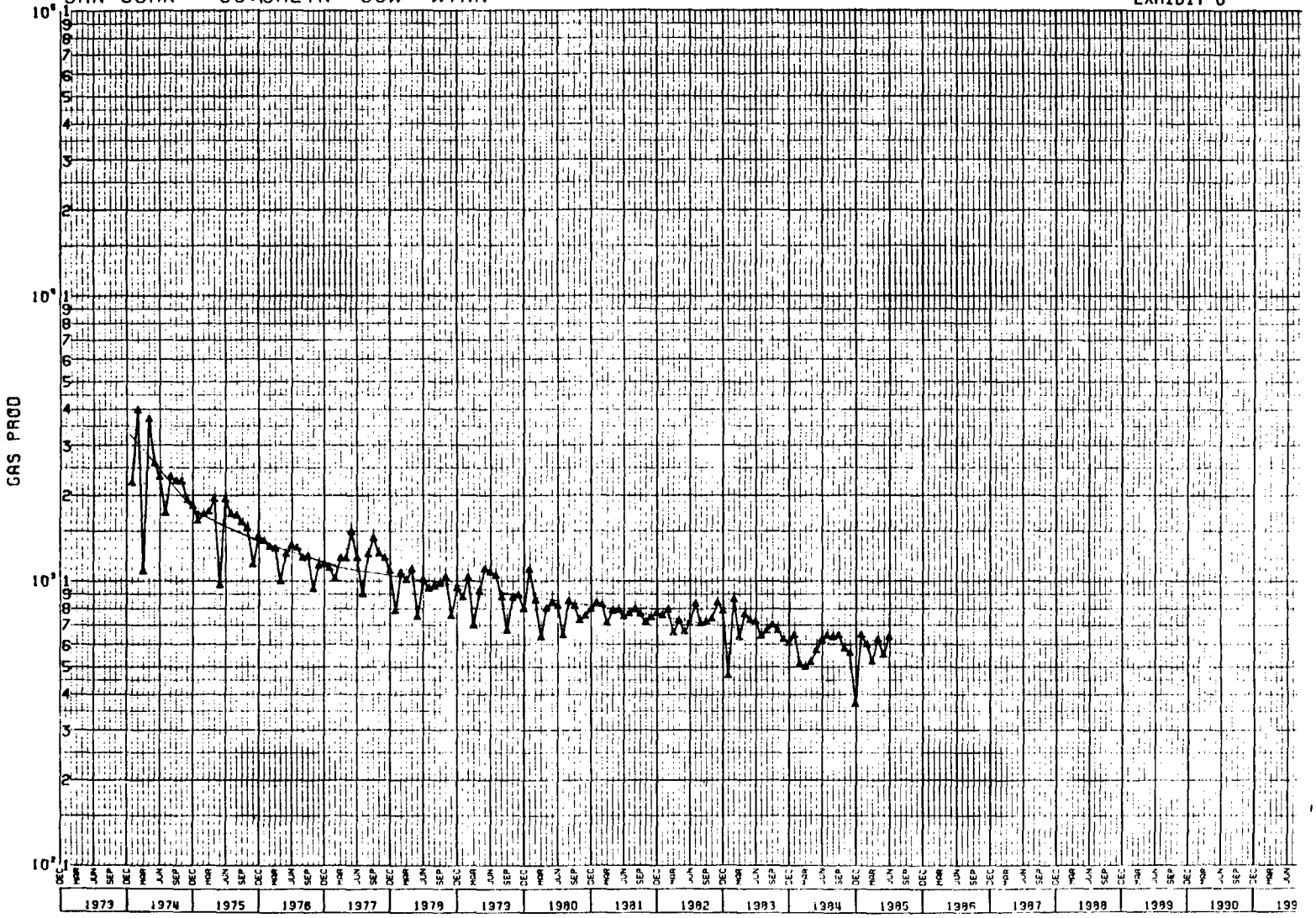
EXHIBIT 5

LARGO FEDERAL 000005 OTERO CHACRA (GAS)

SAN JUAN CO.13A27N 08W WYNN

LEGEND ▲ MCF/MO

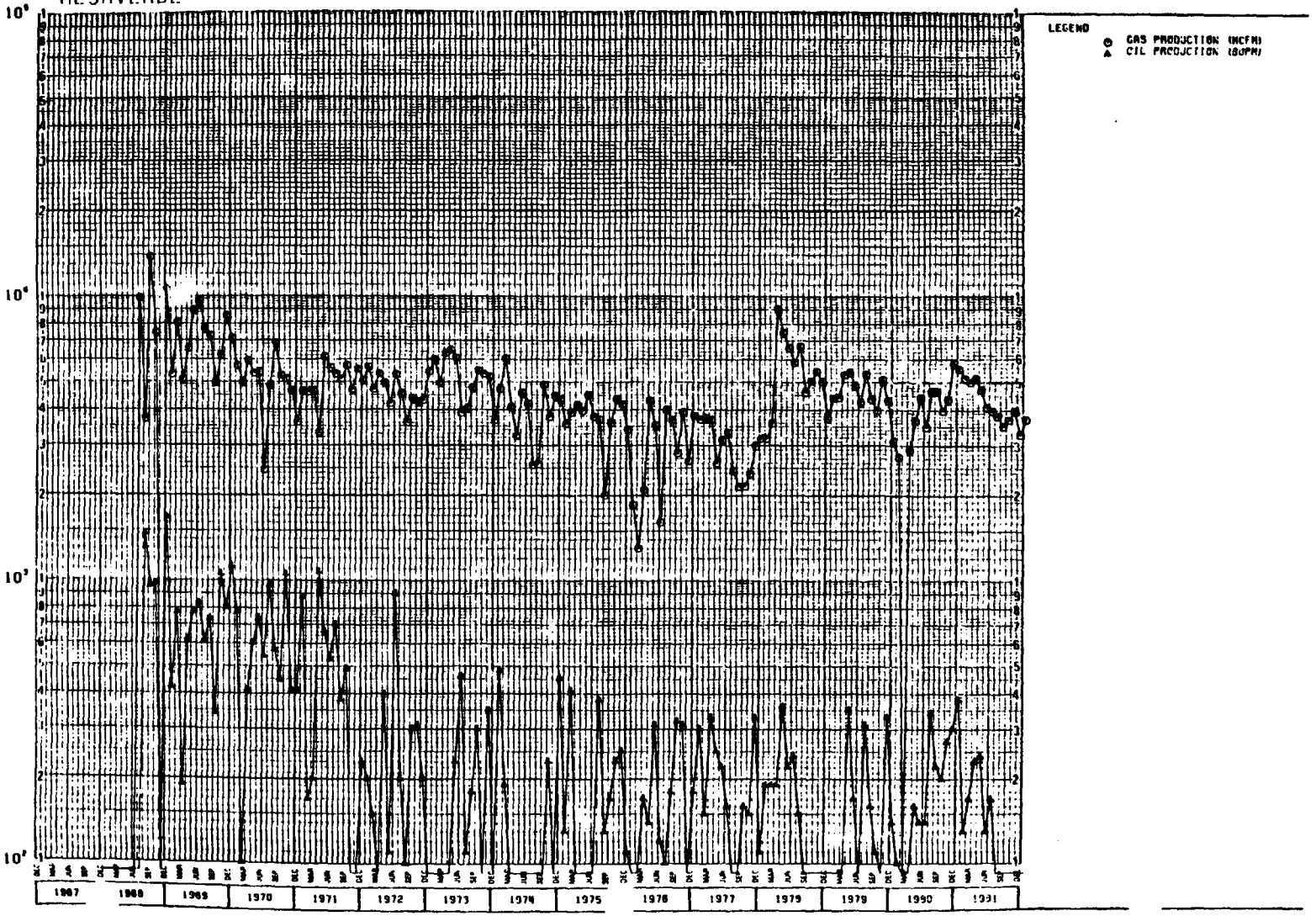
EXHIBIT 6



PLO

DAWSON FEDERAL 1
027N008W26D
MESAVERDE

EXHIBIT 7



PLOT-ID : MH001

INITIAL RATE VS RESERVES

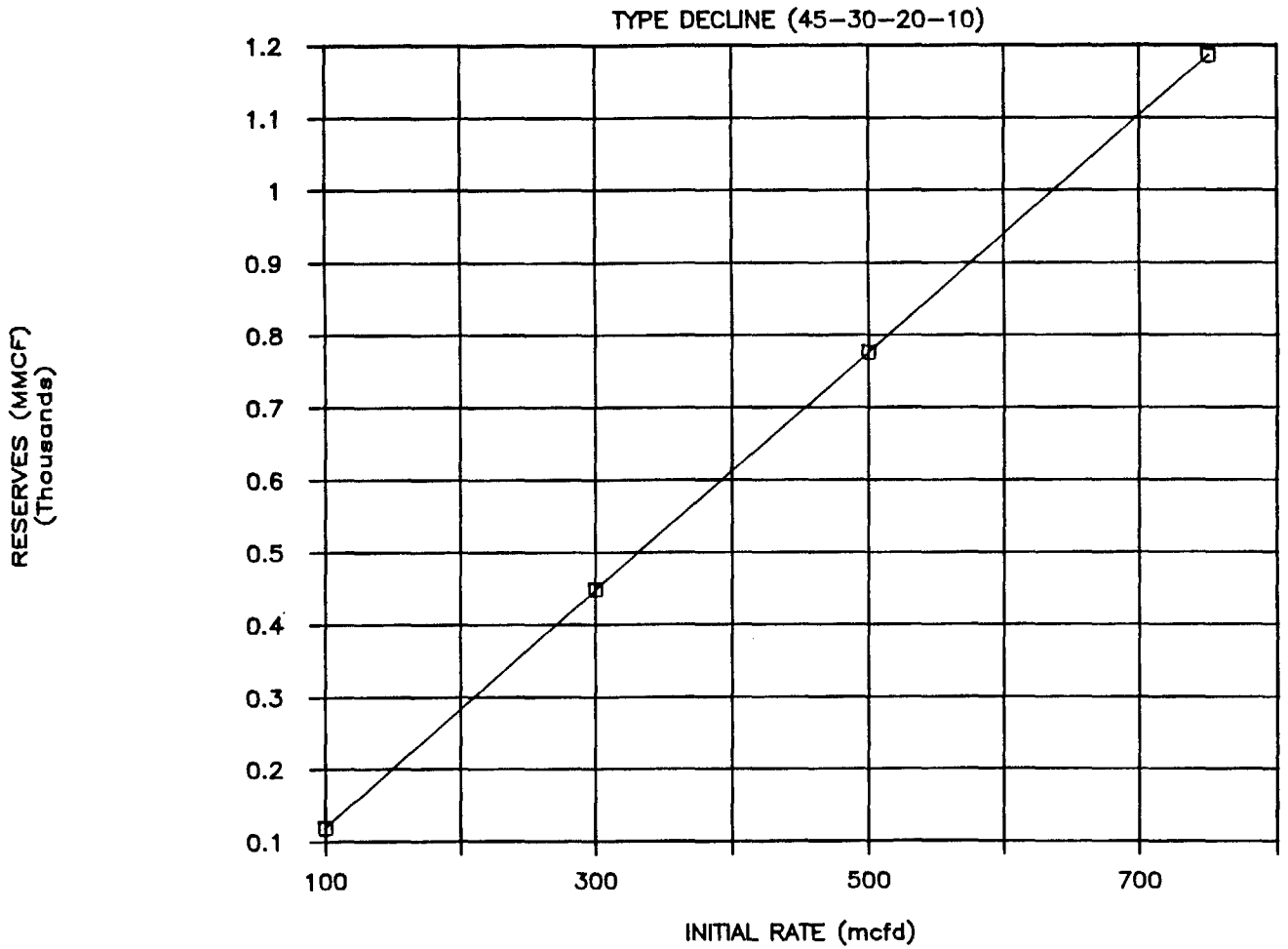


EXHIBIT 8

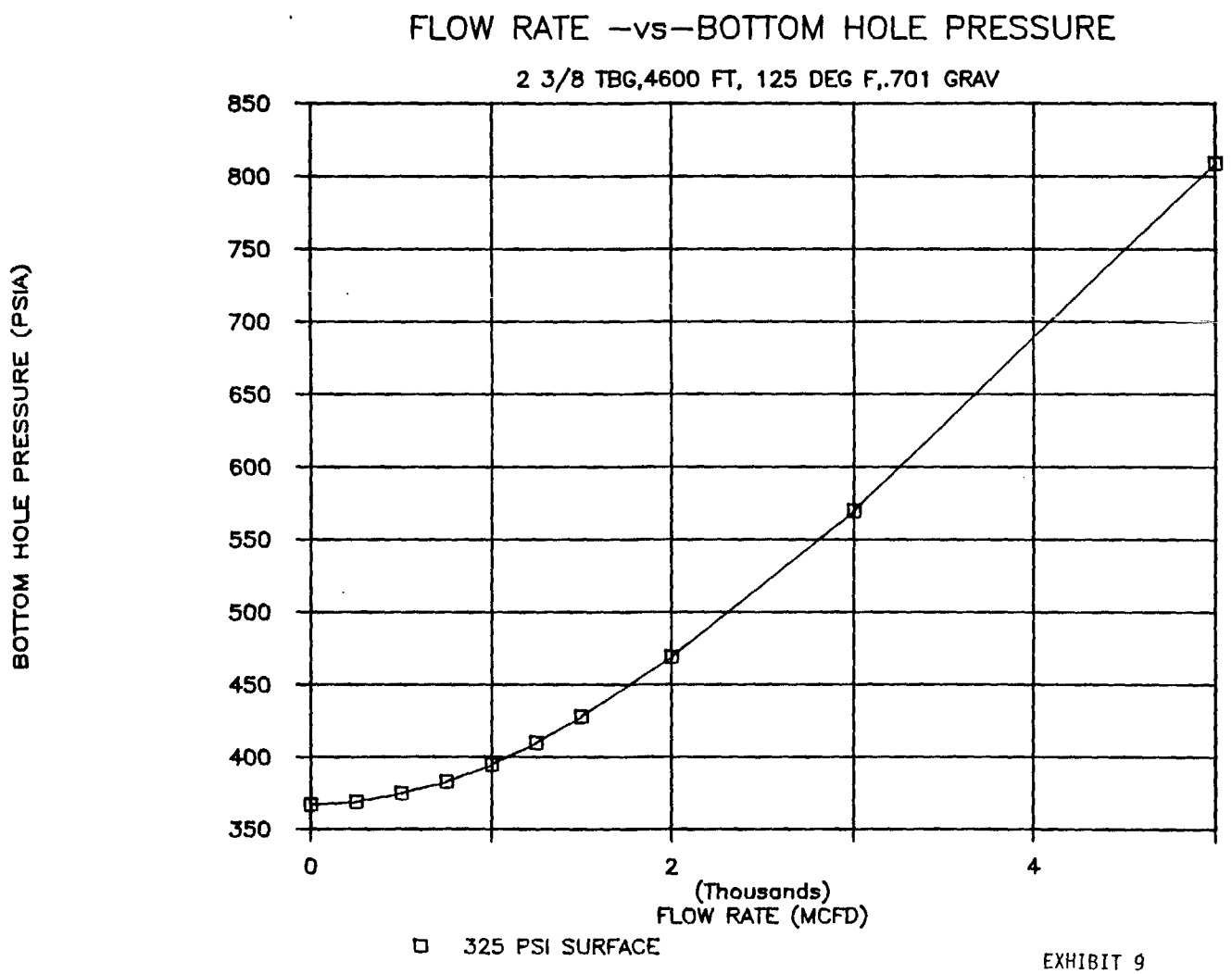

FLOW RATE –vs– BOTTOM HOLE PRESSURE
2 3/8 TBG,4600 FT, 125 DEG F,.701 GRAV
BOTTOM HOLE PRESSURE (PSIA)
850
800
750
700
650
600
550
500
450
400
350
0
2
4
(Thousands)
FLOW RATE (MCFD)
325 PSI SURFACE

EXHIBIT 9

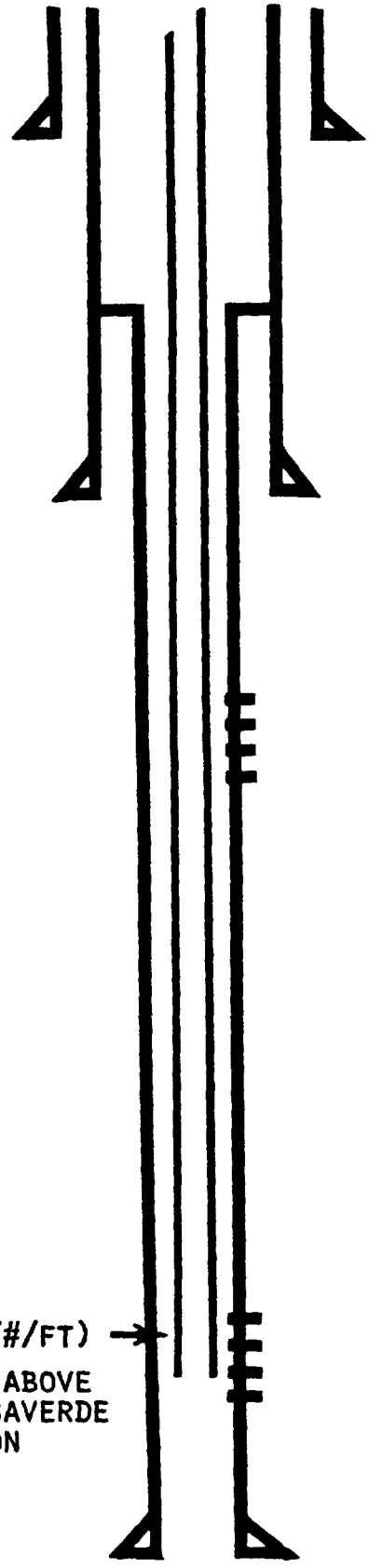
COMMINGLING CAPITAL SAVINGS

Dual Wellhead	$ 5,000	
Separators	$ 5,500	
1 1/4" Tubing	$17,000	
PKR	$ 3,500	
Blast Jts/Pup Jts	$ 5,000	
Miscellaneous Plugs, Etc.	$ 2,000	
Casing	$ 5,000	(Less 7", More 4 1/2")
Drilling Miscellaneous	$ 2,500	(Deeper 8 1/4" hole)
Completion Miscellaneous	$10,500	(Rig time, nitrogen)
Taxes - Misc. Contingency (3%)	$ 2,000	
	$57,000	

The above total represents the additional capital required to produce the Chacra reserves separately. In light of current gas market trends (gas price estimate $1.50 - 2.00/MCF), estimated demand (50-70% takes), hook-up delay, and associated risk, Chacra reserves are insufficient to justify the above incremental investment. To prevent the waste of these Chacra reserves it is necessary to obtain commingling approval. Correlative rights will be protected. The commingled wellbore will more efficiently recover Mesaverde reserves and extend the economic life of the well.

SMS:pe:3/17/86
4135R

CHACRA/MESAVERDE COMMINGLING APPLICATION
LACKEY B LS #4A WELL BORE DIAGRAM



CASING: SURFACE
9-5/8" (36#/FT) @ 280 FEET

CASING: INTERMEDIATE
7" (23#/FT)
250 FEET INTO LEWIS SHALE

CHACRA PERFORATIONS @ 3037 FEET

TUBING:
2-3/8" (4.7#/FT)
ONE JOINT ABOVE
BOTTOM MESAVERDE
PERFORATION

MESAVERDE PERFORATIONS @ 4383 FEET

LINER:
4-1/2" (10.5#/FT) TO T.D. 4533 FEET

SMITH ENERGY SERVICES
Divison of Smith International, Inc.

2198 East Bloomfield Highway
Farmington, New Mexico 87401
Phone (505) 327-7281

February 25, 1986

Tenneco Oil Co.
Western Rocky Mountain Division
P.O. Box 3249
Englewood, Co. 80155

ATTN: Bob Sagel

Dear Mr. Sagel:

Water analysis and compatibility studies were conducted using the following water samples:

1. Schwerdtfeger ALS-14 Mesa Verde
2. Dryden LS-1A (CHACRA)

No solid precipitates of any type were noted and these samples should be considered compatible for mixing.

Sincerely,
SMITH ENERGY SERVICES

Loren L. Diede
District Engineer

LLD/kr

Report No:
Date: 2-26-86

Company: TENNECO
Address:
County:
Field:
Formation: MESA VERDE
Attention: BOB SAGEL
Lease: SCWHTFEGER
Date Sampled: 2-26-86
Well: ALS 14

WATER ANALYSIS

Specific Grav:	1.000	pH:	7.00
Chloride:	2,200 mg/l	Calcium:	40 mg/l
Bicarbonate:	61 mg/l	Magnesium:	49 mg/l
Sulfate:	0	Total Iron:	3 mg/l
Sulfide:	0	Sodium:	1,308 mg/l
Total Hardness (as CaCO3):	300 mg/l	Total Dislvd Solids:	3,660 mg/l
Resistivity:	1.60	Ohm Meters @:	70 F
Potassium:	0	Carbonate:	N D

Sample Source: PRODUCTION UNIT

Remarks:

Analyst: LOREN L. DIEDE
Smith Representative: M. CONREY

		Report No:	
		Date:	2-20-86
Company:	TENNECO	County:	
Address:		Field:	
		Formation:	
Attention:	BOB SAGEL	Lease:	DRYDEN
Date Sampled:	2-19-86	Well:	LS1A

WATER ANALYSIS

Specific Grav:	1.010	pH:	7.00
Chloride:	9,998 mg/l	Calcium:	321 mg/l
Bicarbonate:	183 mg/l	Magnesium:	121 mg/l
Sulfate:	300 mg/l	Total Iron:	3 mg/l
Sulfide:	0	Sodium:	5,800 mg/l
Total Hardness (as CaCO3):	1,301 mg/l	Total Dislvd Solids:	17,225 mg/l
Resistivity:	0.48	Ohm Meters @:	70 F
Potassium:	500 mg/l	Carbonate:	N D

Sample Source:

Remarks:

Analyst: LOREN L. DIEDE
Smith Representative: M. CONREY

TENNECO

TOC E & P
(COMPANY)

INTEROFFICE COMMUNICATION

TO: WRMD

DATE: March 4, 1986

FOR: Steve Struna

FROM: Kevin G. Heringer

RE: Chacra-Mesaverde Commingling

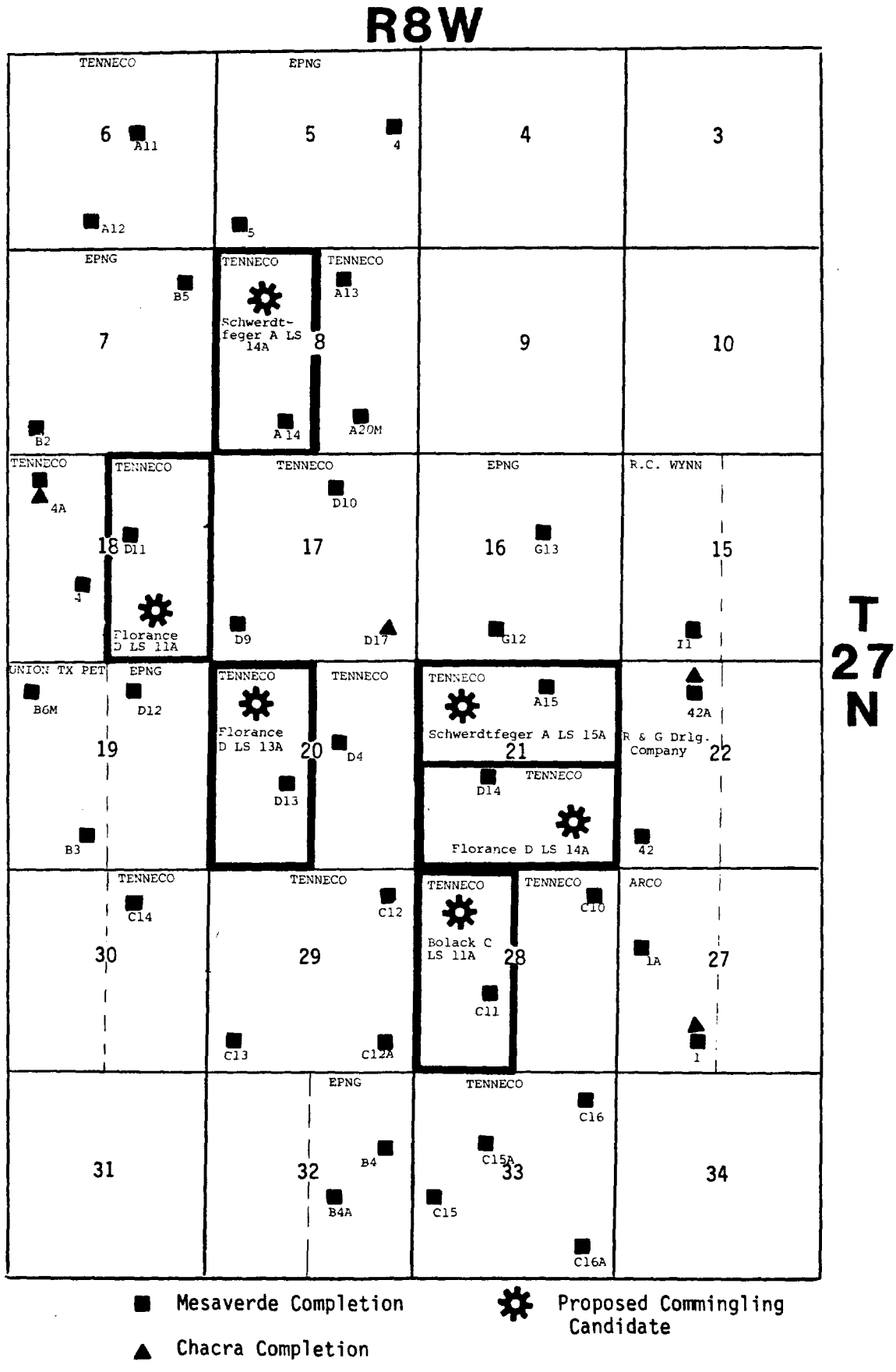
Listed below is an ownership breakdown for the 7 proposed Chacra-Mesaverde commingled wells.

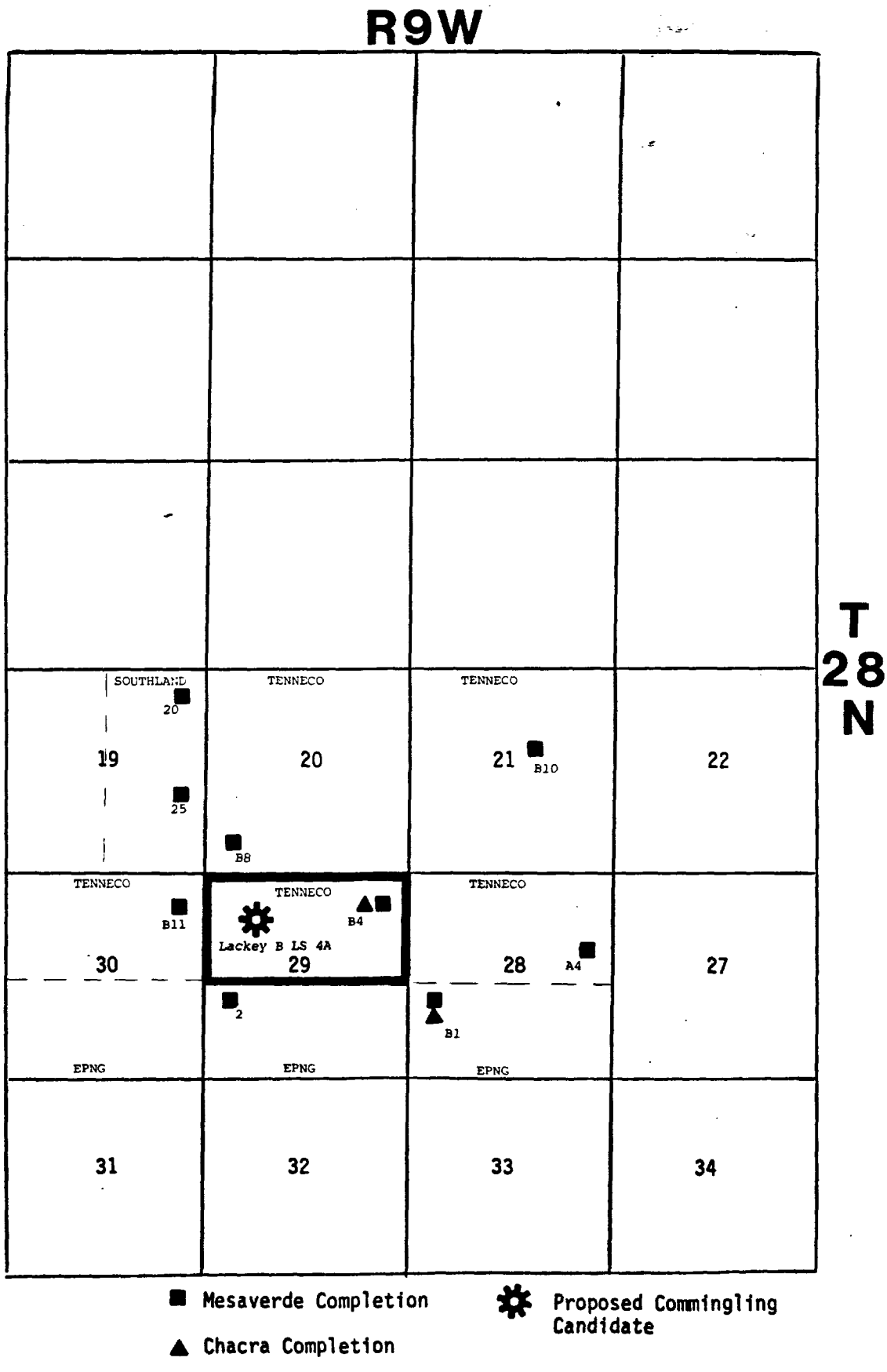
WELL NAME	SPACING	FORMATION	OWNERSHIP	FED. LSE. #	EFFECTIVE DATE	EXPIRES
Schwerdtfeger A LS 14A	W/2-8-27N-8W	Surface to base of MV	TOC - 50% CON - 50%	U.S.A. SF-079319	10/1/48	HBP
Florance D LS 11A	E/2-18-27N-8W	Surface to base of MV	TOC - 50% CON - 50%	U.S.A. NM-03380	4/1/48	HBP
Florance D LS 13A	W/2-20-27N-8W	Surface to base of MV	TOC - 50% CON - 50%	U.S.A. NM-03380	4/1/48	HBP
Schwerdtfeger A LS 15A	N/2-21-27N-8W	Surface to base of MV	TOC - 50% CON - 50%	U.S.A. SF-079319	10/1/48	HBP
Florance D LS 14A	S/2-21-27N-8W	Surface to base of MV	TOC - 50% CON - 50%	U.S.A. NM-03380	4/1/48	HBP
Bolack C LS 11A	W/2-28-27N-8W	Surface to base of MV	TOC - 50% CON - 50%	U.S.A. SF-079232	10/1/48	HBP
Lackey B LS 4A	N/2-29-28N-9W	All formations	TOC - 50% CON - 50%	U.S.A. SF-077106	3/1/47	HBP

Kevin G. Heringer

Kevin G. Heringer

KGH/lh


R8W
T 27 N
TENNECO
EPNG
6
A11
A12
5
4
3
7
B5
B2
Schwerdt-feger A LS 14A
8
A13
A 14
A20M
9
10
4A
18
D11
4
Florance D LS 11A
17
D10
D9
D17
16
G13
G12
15
I1
R.C. WYNN
UNION TX PET
B6M
19
D12
B3
Florance D LS 13A
20
D4
D13
Schwerdtfeger A LS 15A
21
A15
D14
Florance D LS 14A
R & G Drlg. Company
22
42A
42
30
C14
29
C12
C13
C12A
Bolack C LS 11A
28
C10
C11
ARCO
1A
27
1
31
32
B4
B4A
33
C16
C15A
C15
C16A
34
Mesaverde Completion
Chacra Completion
Proposed Commingling Candidate


R9W
T 28 N
SOUTHLAND
20
19
25
TENNECO
20
B8
TENNECO
21
B10
22
TENNECO
B11
30
TENNECO
B4
Lackey B LS 4A
29
2
TENNECO
28
A4
B1
27
EPNG
EPNG
EPNG
31
32
33
34
Mesaverde Completion
Chacra Completion
Proposed Commingling Candidate