CASE NO.

7154

APPLICATION,

TRANSCRIPTS,

SMALL EXHIBITS,

ETC.

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

BRUCE KING
GOVERNOR

POST OFFICE BOX 2088
STATE LAND OFFICE BUILDING
SANTA FE, NEW MEXICO 87501
(505) 827-2434

July 20, 1982

Mr. Howard Kilchrist
Federal Energy Regulatory Commission
825 N. Capitol Street
Washington, D.C. 20426

Case 7154

Dear Howard:

This will confirm our telephone conversation earlier this month concerning the New Mexico application for "Tight Sand" designation as approved by Division Order No. R-6678.

Mobil has requested that if the application, with the supplemental economic information, cannot be approved, they would request it be withdrawn.

Therefore, please return this application to this office.

Yours very truly,

JOE D. RAMEY
Director

JDR/fd

cc: Mike Stogner
J. A. Morris
Mobil Producing Texas & New Mexico

Mobil Producing Texas & New Mexico Inc.

NINE GREENWAY PLAZA—SUITE 2700
HOUSTON, TEXAS 77046

June 29, 1982

Mr. Joe D. Ramey, Director
Oil Conservation Division
Energy and Minerals Department
State of New Mexico
P. O. Box 2088
Santa Fe, New Mexico 87501

RE: TIGHT GAS FORMATION DESIGNATION
APPLICATION (N.M. CASE 7154), R-6678
MESAVERDE FORMATION,
F.E.R.C. DOCKET NO. RM 79-76
(NEW MEXICO - 5)

Dear Mr. Ramey:

The Federal Energy Regulatory Commission (F.E.R.C.) has continued to question our application for Tight Gas Formation Designation for the Mesaverde Formation in portions of Rio Arriba County which was granted by the New Mexico Oil Conservation Division Order No. R-6678. While the Mesaverde is a very tight gas formation, as proven by previous approval of several other applications in New Mexico and Colorado, the infill drilling aspect of the subject application area has caused the F.E.R.C. to request additional economic information. We have supplied such information and conferred with them at some length.

The F.E.R.C. letter to you dated May 26, 1982 requested detailed well cost data including "receipts, invoices, check stubs", etc. We are a reputable operator desirous of making a profit and if the drilling of the subject area was worthwhile we would have drilled before now.

We therefore request that you petition F.E.R.C. to (1) confirm your approval of the application as submitted, (2) approve the outside non-infill drilling area, or (3) return the application.

Yours very truly,

J. A. Morris
Regulatory Engineering Supervisor

JAM/mma

ECONOMIC JUSTIFICATION

APPLICATION FOR TIGHT

GAS FORMATION DESIGNATION

BLANCO MESAVERDE FIELD

MOBIL PRODUCING TEXAS & NEW MEXICO OPERATED LEASES

RIO ARRIBA COUNTY

NEW MEXICO

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INTRODUCTION

The Federal Energy Regulatory Commission (FERC) requested economics justifying the need for incentive prices in the Blanco Mesaverde field since previous infill drilling may have indicated to the contrary. Mobil enquired as to the specific data required. FERC requested the following issues to be addressed.

1. Summarize Mobil's infill drilling program.

2. Supply back up material to support the letter sent to the New Mexico Oil Conservation Commission concerning Mobil's 1978 infill drilling program.

3. Justification of reserves to be used in the economic analysis for the remaining locations.

4. Economics and support material for continued development of this area.

5. Information indicating operating cost for wells in this area.

6. Information showing frac. job sizes on past wells.

7. Prospects for drilling deeper to the Mesaverde formation in the Pictured Cliffs wells on the Jicarilla D lease.

The following information is presented to address all of the above issues.

MOBIL PRODUCING TEXAS & NEW MEXICO INC.
BLANCO MESAVERDE INFILL DRILLING PROGRAM

In November 1974, infill drilling was approved for the Blanco Mesaverde field. Mobil opposed the ruling because the economics for infill wells were marginal at the time. The locations in the northern and southern most portions of our property were expected to be uneconomical due to low recovery.

Table 1 and figure 1 summarize Mobil's infill drilling program. In 1975, one infill well was drilled. It has currently produced 476 MMCF. In 1976, fifteen infill wells were drilled in an attempt to develop the best locations. These wells have averaged 556 MMCF as of 11/31/81. Four more wells were drilled in 1977 and have averaged 257 MMCF. The infill program in 1978 yielded one dry hole and one poor producer.

Considering the results obtained in 1977 and 1978, the infill program was ceased. After the enactment of incentive prices for gas produced from tight formations, Mobil evaluated the Mesaverde formation. In February of 1981, the necessary documentation was presented to the New Mexico Oil Conservation Commission (NMOCC) and later approved. With the favorable results from the evaluation showing the Mesaverde to meet the requirements for tight gas and the NMOCC's approval, the infill drilling program was started up again in December 1981.

TABLE 1

MOBIL PRODUCING TEXAS & NEW MEXICO INC.
BLANCO MESAVERDE FIELD
INFILL WELLS CUMULATIVE PRODUCTION

Year	Jicarilla Lease	Well#	Cumulative As of 11/81 MMCF
1975	G	7A	476.4
1976	H	6A	903.3
	G	3A	944.2
	H	2A	1028.0
	G	1A	563.3
	H	7A	767.6
	F	6A	799.2
	H	5A	497.2
	G	4A	695.7
	H	1A	157.0
	H	8A	330.5
	G	8A	414.5
	Cheney Federal	2A	189.0
	Cheney Federal	1A	Dry
	F	5A	502.9
	F	1A	548.6
	Average Per Well		556.0
1977	G	5A	187.1
	F	4A	376.2
	F	3A	326.7
	F	2A	137.7
	Average Per Well		257.0
1978	H	4A	Dry
	E	2A	68.8
	Average Per Well		34.4

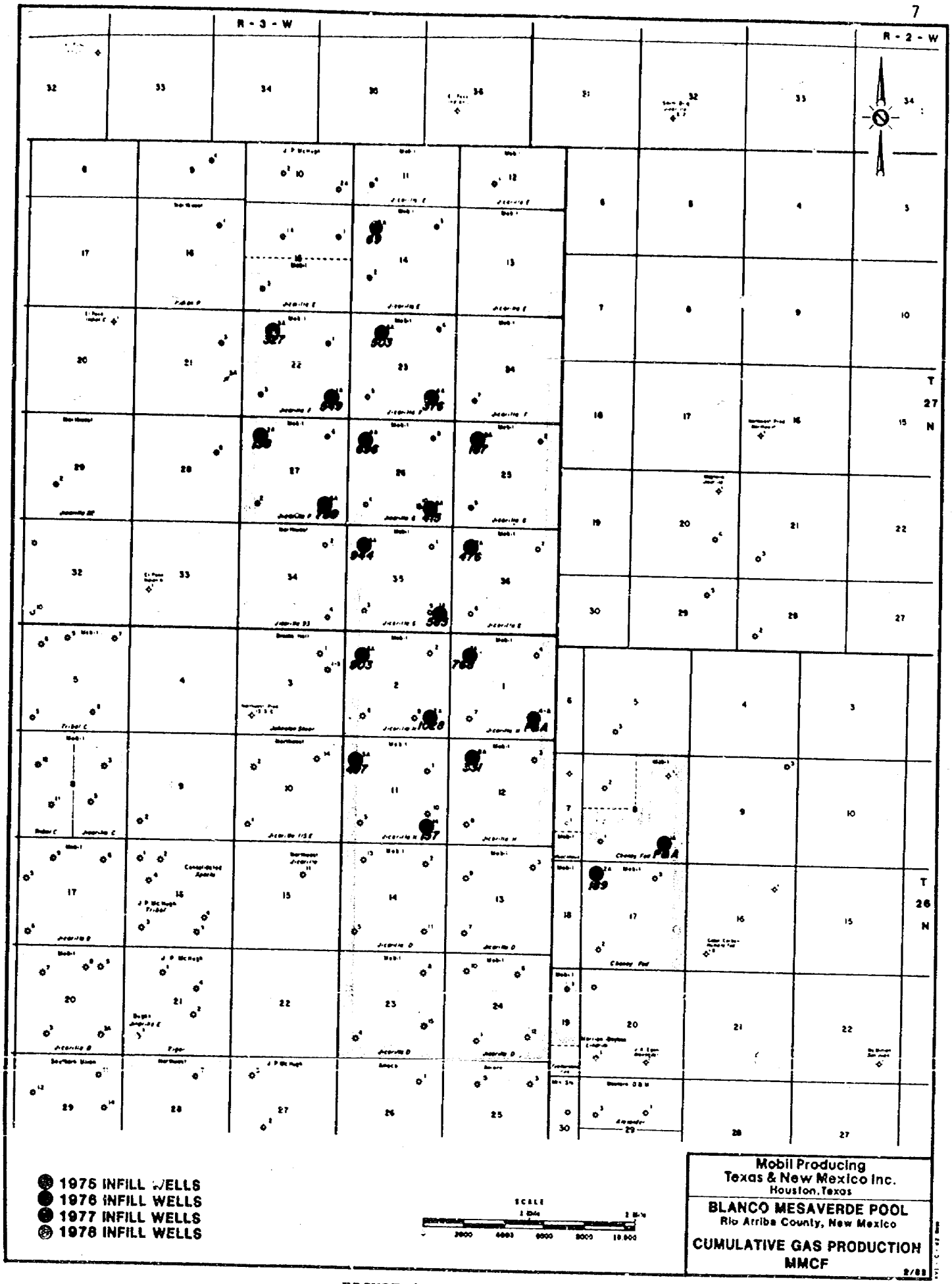

R - 3 - W
R - 2 - W
T 27 N
T 26 N
1976 INFILL WELLS
1976 INFILL WELLS
1977 INFILL WELLS
1978 INFILL WELLS
SCALE
Mobil Producing
Texas & New Mexico Inc.
Houston, Texas
BLANCO MESAVERDE POOL
Rio Arriba County, New Mexico
CUMULATIVE GAS PRODUCTION
MMCF
2/83

FIGURE 1

MOBIL PRODUCING TEXAS & NEW MEXICO INC.
BLANCO MESAVERDE FIELD
1977 INFILL DRILLING PROGRAM EVALUATION

Mobil's 1977 infill drilling program consisted of four wells. Table 2 is a summary of this program. One well was drilled on the Jicarilla G lease and three wells on the Jicarilla F lease. On all four wells, sizable fracture jobs were performed averaging over a half a million pounds of sand per well.

The Jicarilla F-3A and F-4A are the best of the four wells with average cumulatives of 350 MMCF. These wells are expected to recover 467 MMCF and 517 MMCF respectively. Economically they are expected to be a moderate success.

The other two wells, the Jicarilla G-5A and F-2A, have average cumulatives of 163 MMCF and are expected to recover 287 MMCF and 238 MMCF respectively. Economically, these wells are expected to pay for the drilling and operating costs but provide little or no profit.

TABLE 2

MOBIL PRODUCING TEXAS & NEW MEXICO INC.
BLANCO MESAVERDE FIELD
1977 INFILL DRILLING SUMMARY

WELL DATA

		Jicarilla Wells			
		G-5A	F-4A	F-3A	F-2A
Completion Date		10/26/77	10/14/77	11/2/77	11/22/77
Frac. Volume	# of sand	476,000	552,000	1,028,000	552,000
Cumulative Production as of 11/31/81	MMCF	187	376	326	138
Current Production as of 11/81	MCF	80	167	147	14
Estimated Ultimate Recovery	MMCF	287	517	467	238

EVALUATION OF
1978 PROGRAM

MOBIL PRODUCING TEXAS & NEW MEXICO INC.
BLANCO MESAVERDE FIELD
1978 INFILL DRILLING PROGRAM EVALUATION

Mobil's 1978 infill drilling program consisted of two wells. The Jicarilla H-4A was the first well and was a dry hole. The second well, the Jicarilla E-2A, has produced 69 MMCF since it was completed and is not expected to payout.

The following letter was provided to the New Mexico Oil Conservation Commission upon their request for economic data concerning wells completed after January 1, 1978. Included in this section is back-up material to that letter. Figure 2 is a production forecast for the Jicarilla E-2A well verifying the reserves. Table 3 provides the basis for the economic evaluation of the Jicarilla E-2A well. The remaining information verifies the abandoning of the Jicarilla H-4A well.

Mobil Producing Texas & New Mexico Inc.

NINE GREENWAY PLAZA—SUITE 2700
HOUSTON, TEXAS 77046

March 5, 1981

State of New Mexico
Energy & Mineral Department
Oil Conservation Division
P. O. Box 2088
Santa Fe, New Mexico 87501

Attention: Mr. Richard L. Stamets
Technical Support Chief

7.01 MOBIL PRODUCING TX & N.M., INC.'S APPLICATION FOR TIGHT GAS FORMATION DESIGNATION BLANCO MESA VERDE POOL RIO ARRIBA CO., NEW MEXICO DOCKET NO. 5-81 CASE NO. 7154

Dear Sir:

In response to your letter dated February 24, 1981, requesting supplementary information concerning the economics of Blanco Mesa Verde wells completed after January 1, 1978, we are providing the following information.

	Jicarilla 'E' #2A	Jicarilla 'H' #4A
Initial cost (M$)	402	357
Est. Ultimate reserves (MMCF)	100	0
Life (yrs.)	11	0
Est. Net cash recovery (M$)	-90	-193
Rate of return (%)	0	0
Pay out (yrs.)	-	-
Est. Profit/Investment ratio ($/$)	-0.23	-0.54

The above information shows that these wells were not an economic success at current gas prices, nor would they be at tight gas prices. (NOTE: March, 1981 Section 103 gas price is $2.406 per million BTU).

The remaining undeveloped acreage on MPTM's Jicarilla Leases should yield higher recoveries than the above wells, but will likely yield less than 500 MMCF/well.

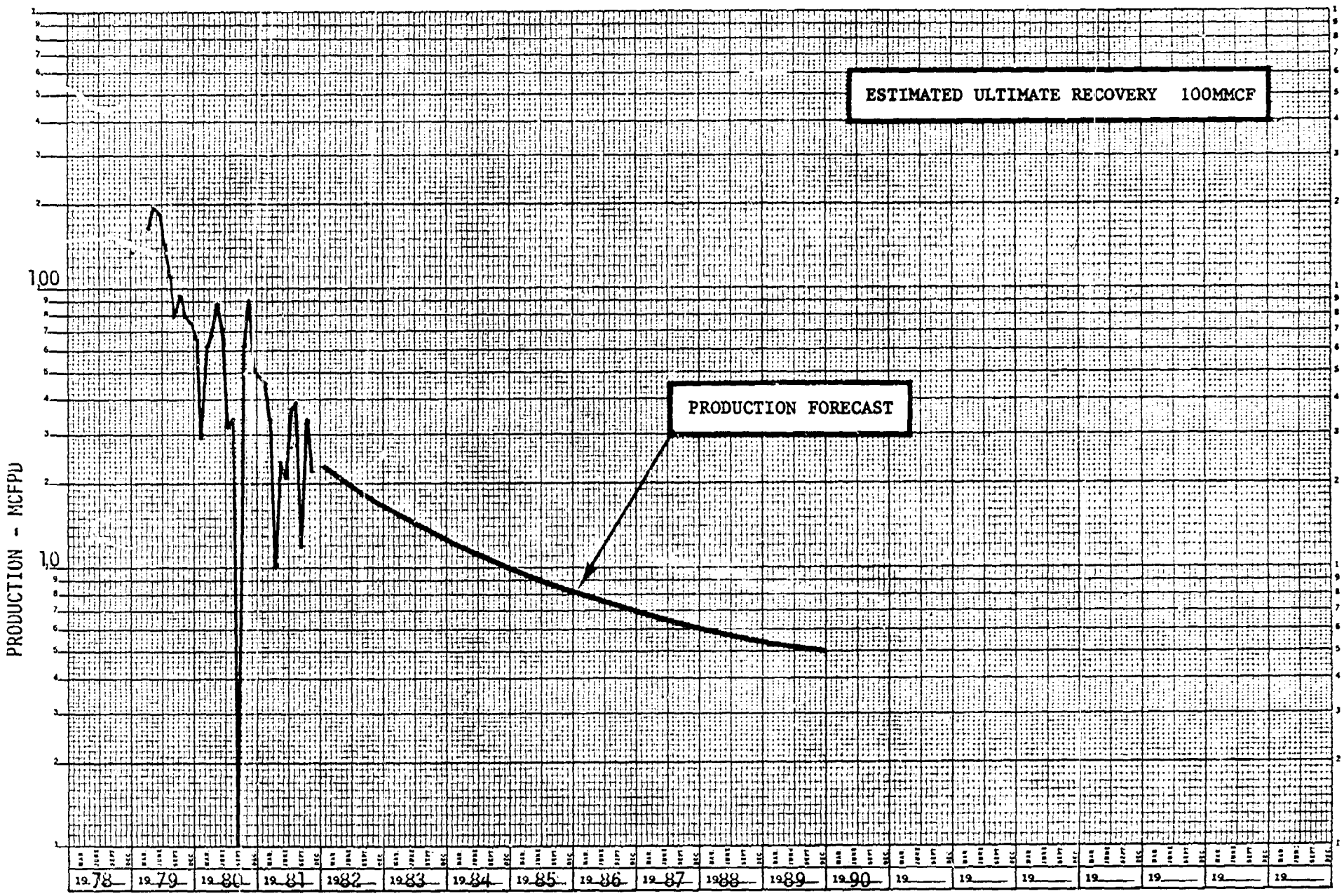
Yours very truly,

J. A. Morris

J. A. Morris
Regulatory Engineering Supervisor

RCH/lj

cc: Jim Sperling - Albequerque, N.M.
Gene Daniel - USGS, Box 26124, Albequerque, N.M. 87125



WELL: JICARILLA E - 2A

PROJECT:

FIELD: BLANCO MESAVERDE

COUNTY: RIO ARRIBA

PRODUCTION HISTORY

FIGURE 2

Mobil Producing
Texas & New Mexico Inc.
Houston, Texas

DATE:

TABLE 3

MOBIL PRODUCING TEXAS & NEW MEXICO INC.
BLANCO MESAVERDE FIELD
JICARILLA E-2A WELL
POST COMPLETION EVALUATION BACK-UP MATERIAL

WELL DATA

Completion Date	11/18/78
Frac. Volume	351,000# of Sand
Cumulative Production as of 11/31/81	68.8 MMCF
Current Production as of 11/81	22 MCFPD
Estimated Ultimate Recovery	100 MMCF

ECONOMIC DATA

Drill and Completion Cost	$	402,000
Operating Cost (1979 Value)	$/Year	2,500
Royalty Interest	%	12.5
Gas Price (1979 Values)	$/MMBTU	2.10
	$/MCF	2.53
Gas Calorific Value		1,200
Rate of Escalation - Revenues	%	-0-
Expenses	%	-0-
Severance Tax	%	7.8
Expense to Revenue Ratio	$/$	0.19

9-331
1973

RECEIVED
NOV 23 1981
REGULATORY ACCOUNTING

Form Approved.
Budget Bureau No. 42-R1424

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUNDRY NOTICES AND REPORTS ON WELLS

(Do not use this form for proposals to drill or to deepen or plug back to a different reservoir. Use Form 9-331-C for such proposals.)

1. oil well ☐ gas well ☒ other

2. NAME OF OPERATOR
Mobil Oil Corporation

3. ADDRESS OF OPERATOR
9 Greenway Plaza, Suite 2700, Hous., TX 77046

4. LOCATION OF WELL (REPORT LOCATION CLEARLY. See space 17 below.)
AT SURFACE: 874 FSL & 732 FEL
AT TOP PROD. INTERVAL: Same as surface
AT TOTAL DEPTH: Same as surface

5. LEASE

6. IF INDIAN, ALLOTTEE OR TRIBE NAME
Jicarilla Contract 96

7. UNIT AGREEMENT NAME

8. FARM OR LEASE NAME
Jicarilla H

9. WELL NO.
4-A

10. FIELD OR WILDCAT NAME
Blanco Mesaverde

11. SEC., T., R., M., OR BLK. AND SURVEY OR AREA
Sec. 1, T26N, R3W

12. COUNTY OR PARISH | 13. STATE
Rio Arriba | New Mexico

14. API NO.

15. ELEVATIONS (SHOW DF, KDB, AND WD)
7085' GR

16. CHECK APPROPRIATE BOX TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA

REQUEST FOR APPROVAL TO:		SUBSEQUENT REPORT OF:	
TEST WATER SHUT-OFF	☐		☐
FRACTURE TREAT	☐		☐
SHOOT OR ACIDIZE	☐		☐
REPAIR WELL	☐		☐
PULL OR ALTER CASING	☐		☐
MULTIPLE COMPLETE	☐		☐
CHANGE ZONES	☐		☐
ABANDON*	☐		☒ *
(other)			

(NOTE: Report results of multiple completion or zone change on Form 9-330.)

*Corrected Copy

17. DESCRIBE PROPOSED OR COMPLETED OPERATIONS (Clearly state all pertinent details, and give pertinent dates, including estimated date of starting any proposed work. If well is directionally drilled, give subsurface locations and measured and true vertical depths for all markers and zones pertinent to this work.)*

TD 6250 PBTD 6106 Mesaverde Perfs. 5434-5851

10/09/79 - Prep MIPU
10/10/79 - Kill well. GIH w/ 173 jts. tbg. Howco set cmt ret. @ 5355. Sqz. perfs 5434-5851 w/ 150 sxs. B Neat. Max press @ 400. Left 30' cmt on top of ret. POH. Set 10 sxs 3600-3750 and 20 sxs 3160-3750. POH
10/11/79 - McCullough found FP @ 1785. Shot csg. @ 1765. Howco spotted 35 sxs 1765-1650. POH LD 4-1/2" csg. Set 70 sxs 349-250. POH, set 10 sx plug 0-35. Rec. 54 jts. 4-1/2" csg. 1750, erected PA monument 10-11-79.
FINAL REPORT

RECEIVED
NOV 24 1981
PRODUCTION ACCTG.

Subsurface Safety Valve: Manu. and Type _____ Set @ _____ ft.

18. I hereby certify that the foregoing is true and correct

SIGNED Robbie Gay TITLE Authorized Agent DATE 11/27/79

(This space for Federal or State office use)

APPROVED BY _____ TITLE _____ DATE _____
CONDITIONS OF APPROVAL, IF ANY:

APPROVED
NOV 16 1981
Dean Elliott
For DISTRICT ENGINEER

*See Instructions on Reverse Side

Operator

NOV 30 1979
U. S. GEOLOGICAL SURVEY
DURANGO, COLO.

STATEMENT OF SURFACE RESTORATION INTENTION
ATTACHMENT TO USGS FORM 9-331, SUNDRY NOTICE OF INTENT TO ABANDON

Applicable To: Mobil Oil Corporation
Three Greenway Plaza East, Suite 800
Houston, Texas 77046

Lease Name: Jicarilla H

Well No: 4-A

Location: Sec. 1, T26N, R3W

This is to advise your office that surface restoration associated with the above described proposed plugging and abandonment will be conducted in accordance with applicable rules and regulations of the United States Geological Survey and the New Mexico Oil Conservation Commission; and in accordance with any existent agreement with the surface landowner, or in a manner arrived at by agreement with the surface landowner.

Such restoration work will include:

Backfilling of all pits and cellar. Levelling or contouring the location site. Clearing the location area of junk.

FORM 9-331 Dated: 11/2/79

MOBIL PRODUCING TEXAS & NEW MEXICO INC.
BLANCO MESAVERDE FIELD
REMAINING UNDEVELOPED RESERVES

The remaining undeveloped acreage in the Blanco Mesaverde pool under consideration for tight gas lies in areas where expected recoveries will be less than 500 MMCF per well.

The following figure 3 is a map showing Mobil's development of the Mesaverde pool. There are 53 producing wells, 9 abandoned locations (each produced less than 40 MMCF) and 23 undeveloped locations, 19 of which are infills. The undeveloped locations lie on the fringe of a "sweet spot" identified by the current producers.

The 9 abandoned locations on Mobil's property are in the north, east and south as shown on figure 3. Many of the remaining locations are offset by these abandoned wells which were essentially dry holes. Developing near these locations presents a high risk situation since the formation is known to be of poor quality.

The following figure 4 is a contour map of the cumulative production from the original Mesaverde wells completed in the 1950's. The area between the 0 and 500 contour lines is colored in blue. Of the 23 undeveloped locations shown on this map, 17 fall below the 500 MMCF contour line. Even though the other 6 remaining locations are above this line, it should be noted as shown on figure 4 that the four infill wells drilled in 1977 and the Jicarilla E-2A infill well drilled in 1978 are also above the 500 MMCF contour line. These five wells have estimated ultimate recoveries ranging from a maximum of 517 MMCF down to 100 MMCF.

In the previous discussions concerning infill drilling, the four wells drilled in 1977 had average cumulatives of 257 MMCF and average estimated recoveries of 377 MMCF. Economically, the overall 1977 program is expected to be less than marginal. The 1978 infill wells are obvious losses.

Considering the risks of developing locations offsetting dry holes, developing in areas of low recovery and the results of past drilling activity, the best remaining locations are expected to yield 500 MMCF with the majority of the locations recovering less.

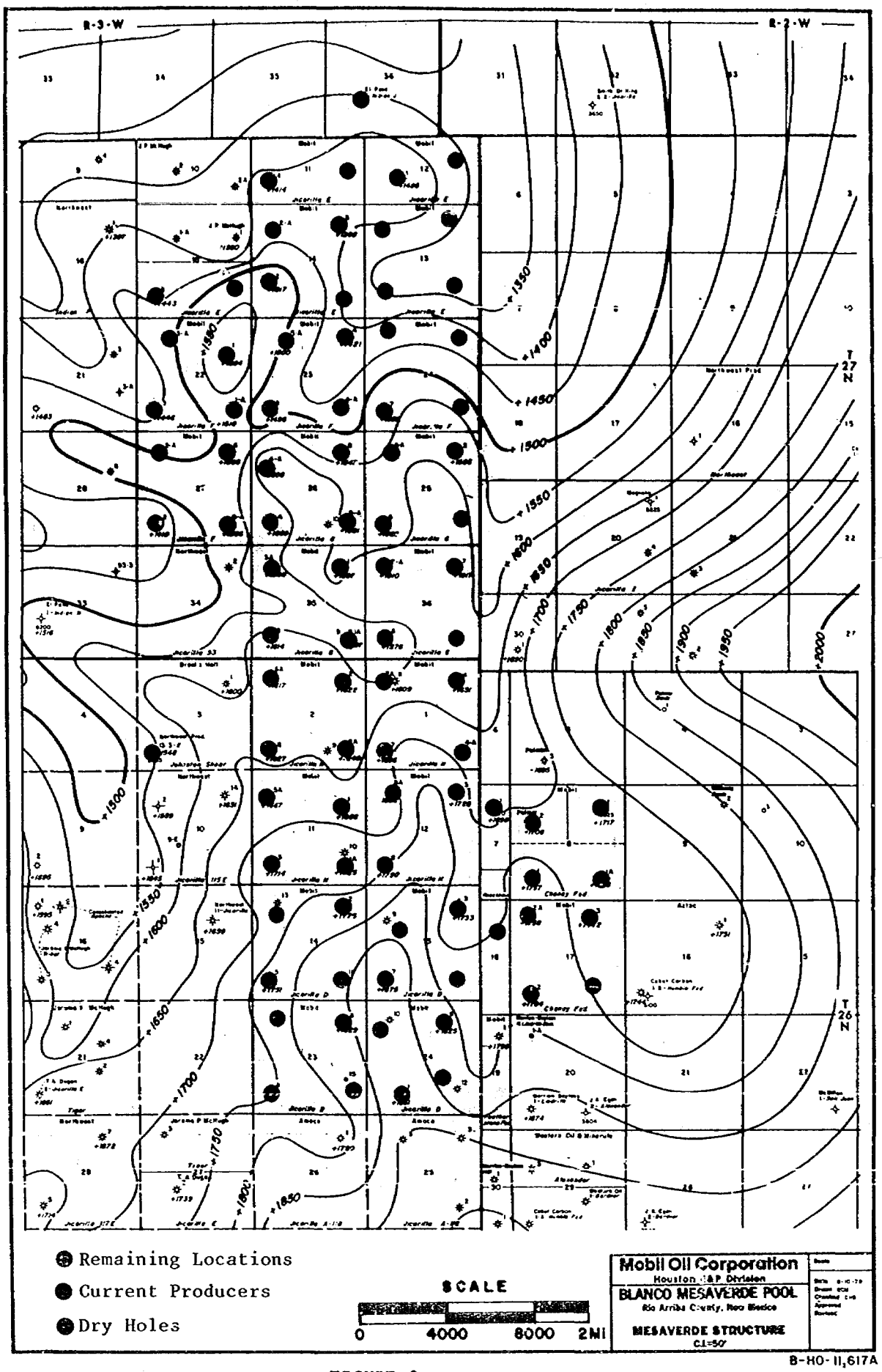

R-3-W
R-2-W
T 27 N
T 26 N
Remaining Locations
Current Producers
Dry Holes
SCALE
0 4000 8000 2MI
Mobil Oil Corporation
Houston E&P Division
BLANCO MESAVERDE POOL
Rio Arriba County, New Mexico
MESAVERDE STRUCTURE
C.I.=50'
B-HO-11,617A

FIGURE 3

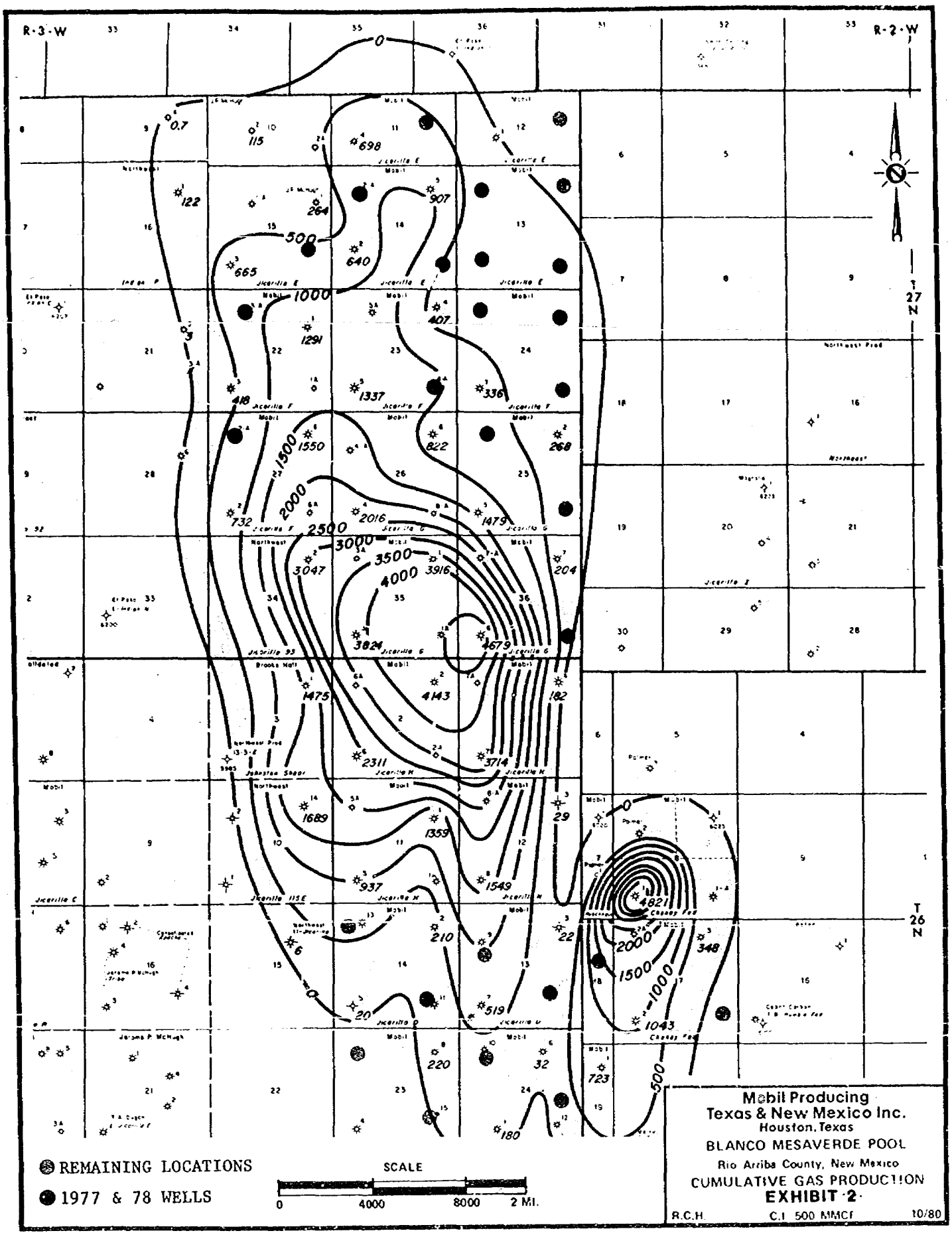

R-3-W
R-2-W
T 27 N
T 26 N
0
0.7
115
698
122
264
907
500
665
640
1000
1291
407
3
418
1337
336
1500
1550
822
268
2000
732
2016
1479
2500
3000
3500
3047
3916
204
4000
3824
4679
1475
4143
182
2311
3714
1689
29
1359
937
1549
210
22
6
0
20
519
4821
2000
1500
1000
348
1043
220
32
723
500
180
REMAINING LOCATIONS
1977 & 78 WELLS
SCALE
0
4000
8000
2 Mi.
Mobil Producing
Texas & New Mexico Inc.
Houston, Texas
BLANCO MESAVERDE POOL
Rio Arriba County, New Mexico
CUMULATIVE GAS PRODUCTION
EXHIBIT 2
R.C.H
C.I 500 MMCF
10/80

FIGURE 4

MOBIL PRODUCING TEXAS & NEW MEXICO INC.
BLANCO MESAVERDE FIELD
ECONOMIC EVALUATION FOR CURRENT INFILL LOCATIONS

Mobil's evaluation of drilling and completing the best of the remaining locations in the Blanco Mesaverde field, expecting to recover 500 MMCF of gas, is as follows:

Investment	M$	732
Net Cash Recovery	M$	439
Rate of Return	%	16
Profit/Investment Ratio	$/$	0.60
Payout	Yrs.	4.1

The low rate of return, the low profit/investment ratio and the long payout makes the continued development of this area unprofitable with the NGPA section 103 gas prices. The majority of the remaining locations are expected to yield even less. Under these conditions, continued development would cease. Table 4 gives the basis for the above economics.

In December 1978 Mobil began receiving the NGPA section 103 gas prices for wells spudded after April 19, 1977. Since December 1978 the section 103 gas price in this area has increased by 35% whereas drilling costs have increased by 82%. Below is a tabulation showing the gas prices and drilling cost from 1978 to December 1981.

Year	December - Section 103 Gas Price - $/MMBTU	Drilling Cost M$
1978	1.97	402 (Jic. E-2A)
1979	2.14	-
1980	2.35	-
1981	2.55	732

Mobil's production from the Mesaverde formation will not be affected by gas decontrols in 1985. This disproportionate increase between gas prices and drilling cost is expected to continue and will further diminish the economics for developing the remaining locations.

The following figures 5 and 6 are curves showing the economics for drilling a Mesaverde well. The curves shown in black were submitted along with the engineering and geologic justification and were based on drilling a well in early 1981. These curves were unescalated, constant price economics, and were inadvertently unadjusted for BTU content of the gas.

Mobil started infill drilling again in December of 1981, almost one year later from what the curves in black represents. The red curves on figure 5 and 6 represents escalated economics, with BTU adjusted gas prices for drilling beginning in December 1981 and early 1982. The above economics are obtained from the red curves. Table 4 is the basis for the all points on the red curves.

TABLE 4

MOBIL PRODUCING TEXAS AND NEW MEXICO INC.
BLANCO MESAVERDE FIELD
ECONOMIC EVALUATION DATA

Drilling and Completion Cost (1982 value) (Includes $40M for a 100,000# water-sand frac.)	$	732,000
Operating Cost (1982 value)	$/year	3,500
Workover Cost through life of well	$	50,000
Royalty Interest	%	12.5
Gas Prices (1982 values)	$/MMBTU $/MCF	2.66 3.19
Gas Calorific Value	BTU/SCF	1200
Rate of Escalation - Gas Prices	%	7.0
Expenses	%	9.0
State and Local Tax Rate	%	7.8
Indian Severance Tax Rate	$/MCF	.05
Minimum Production Rate	MCFPD	5

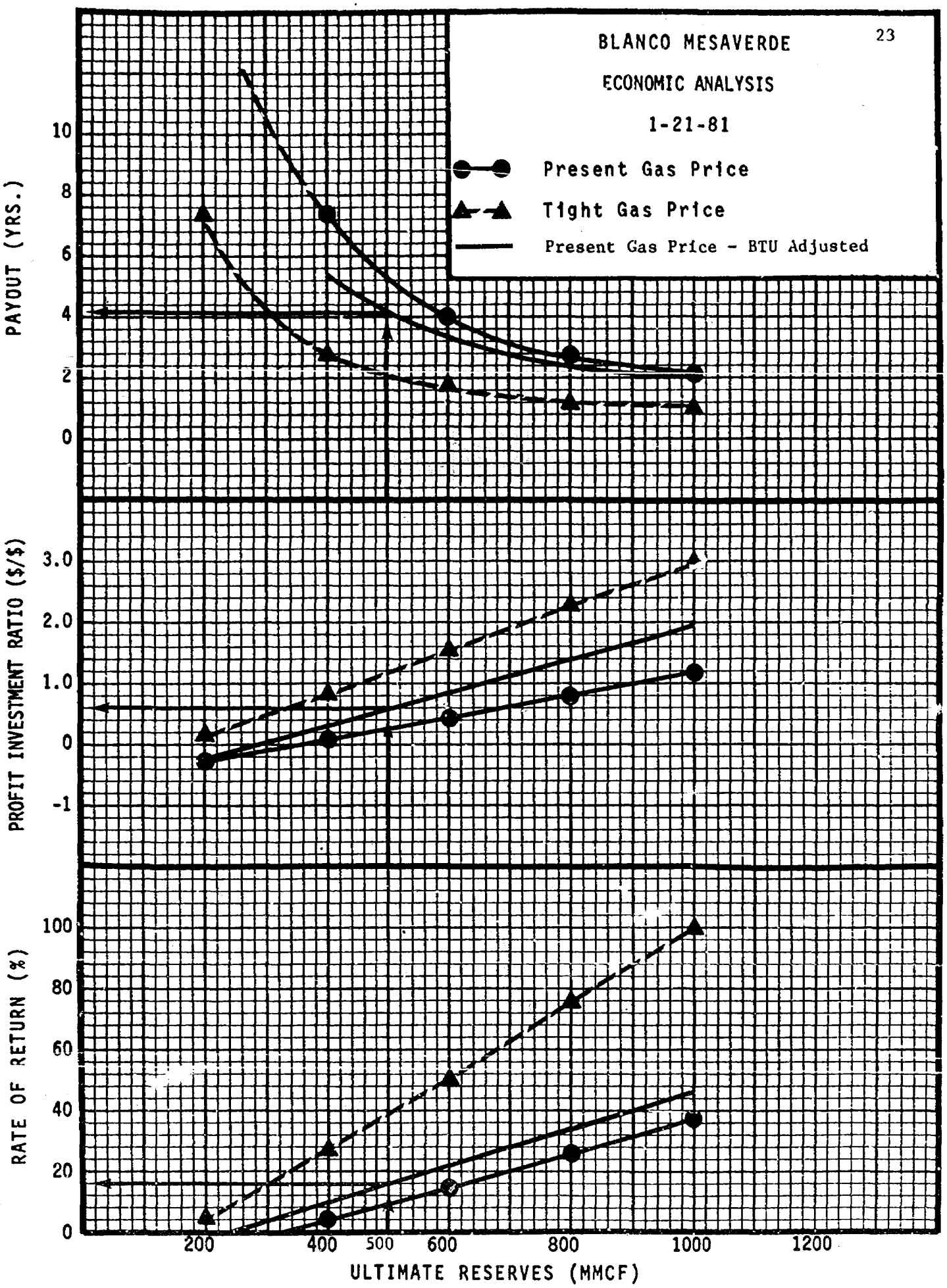

BLANCO MESAVERDE
ECONOMIC ANALYSIS
1-21-81
Present Gas Price
Tight Gas Price
Present Gas Price - BTU Adjusted
PAYOUT (YRS.)
10
8
6
4
2
0
PROFIT INVESTMENT RATIO ($/$)
3.0
2.0
1.0
0
-1
RATE OF RETURN (%)
100
80
60
40
20
0
200
400
500
600
800
1000
1200
ULTIMATE RESERVES (MMCF)

FIGURE 5

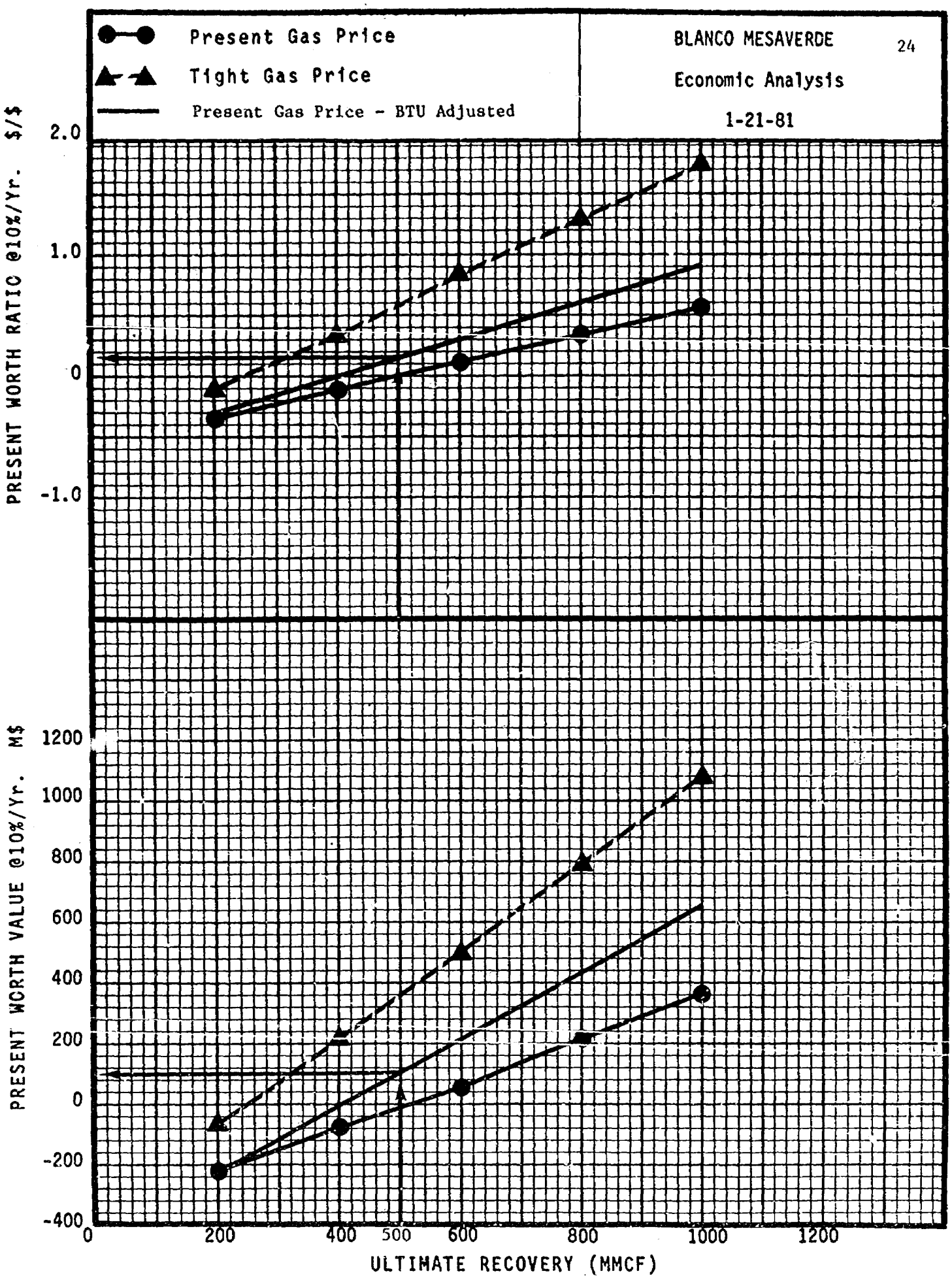

Present Gas Price
Tight Gas Price
Present Gas Price - BTU Adjusted
BLANCO MESAVERDE
Economic Analysis
1-21-81
PRESENT WORTH RATIO @10%/Yr. $/$
2.0
1.0
0
-1.0
M$
1200
1000
800
600
400
200
0
-200
-400
PRESENT WORTH VALUE @10%/Yr.
0
200
400
500
600
800
1000
1200
ULTIMATE RECOVERY (MMCF)

FIGURE 6

MOBIL PRODUCING TEXAS & NEW MEXICO INC.
BLANCO MESAVERDE FIELD
JICARILLA D LEASE DRILL DEEPER PROSPECTS

On the Jicarilla D lease in the Blanco Mesaverde field, there are eight undeveloped infill spacing units under consideration for tight gas. Six of these units currently have wells on them drilled to the base of the Pictured Cliffs formation. Figure 7 shows these six locations.

The possibility of drilling deeper to the Mesaverde formation in these wellbores is not economically feasible. Table 5 is a wellbore summary of the six wells. In each well 3 1/2" casing or smaller was used. It has been Mobil's experience in the past that drilling the additional 2700' required to reach the Mesaverde formation through this casing would cost the same or more as drilling a new well.

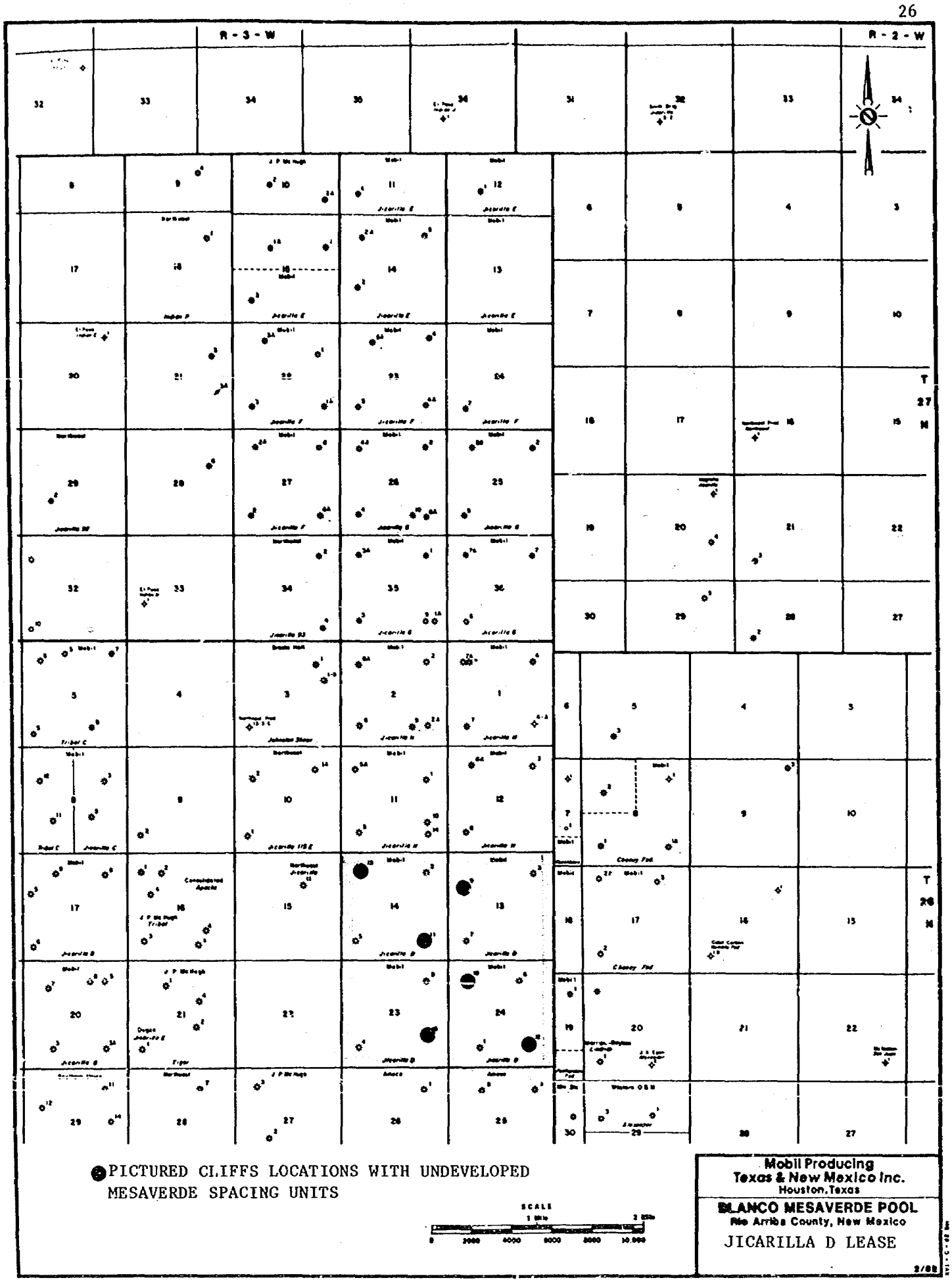

R - 3 - W
R - 2 - W
T 27 N
T 26 N
Mobil Producing
Texas & New Mexico Inc.
Houston, Texas
BLANCO MESAVERDE POOL
Rio Arriba County, New Mexico
JICARILLA D LEASE
PICTURED CLIFFS LOCATIONS WITH UNDEVELOPED MESAVERDE SPACING UNITS
SCALE
2/82

FIGURE 7

TABLE 5

MOBIL PRODUCING TEXAS AND NEW MEXICO INC
BLANCO MESAVERDE FIELD
JICARILLA D LEASE
GAVILAN PICTURED CLIFFS
WELLBORE SUMMARY

Well #	Completion Date	Completion Depth T.D.	Casing Strings
9	10/17/61	3878	7 5/8" to 336' ; 2 7/8" to 3868'
10	12/08/68	3960	7" to 275' ; 3 1/2" to 3953'
11	12/14/68	3892	7" to 260' ; 3 1/2" to 3891'
12	11/26/68	4096	7" to 265' ; 3 1/2" to 4090'
13	04/27/69	3867	7" to 263' ; 3 1/2" to 3866'
15	04/26/69	3892	7" to 270' ; 3 1/2" to 3891'

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

BRUCE KING
GOVERNOR

LARRY KEHOE
SECRETARY

POST OFFICE BOX 2088
STATE LAND OFFICE BUILDING
SANTA FE, NEW MEXICO 87501
(505) 827-2434

June 24, 1982

Mr. Joe Morris
Mobil Producing Texas & New Mexico, Inc.
Nine Greenway Plaza, Suite 2700
Houston, Texas 77046

Re: Case 7154

Dear Mr. Morris:

As per our telephone conversation of June 11, 1982, the Oil Conservation Division will request your application for Tight Formation as granted by Order No. R-6678 be returned by the Federal Energy Regulatory Commission to the Division.

However, before we contact FERC, I would like a letter from you requesting the withdrawal.

Yours very truly,

JOE D. RAMEY
Director

JDR/fd

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, D.C. 20426

MAY 2 6 1982

IN REPLY REFER TO: N840-A

Mr. Joe Ramey
Department of Energy and Minerals
Oil Conservation Division
P.O. Box 2088
Santa Fe, New Mexico 87501

In Re: Docket No. RM79-76
(New Mexico - 5)
Tight Formation Recommendation
Mesaverde Formation
New Mexico Case No. 7154

RLS

Dear Mr. Ramey:

On July 30, 1981, the Commission received the New Mexico Oil Conservation Division's (New Mexico) recommendation that the Mesaverde Formation in portions of Rio Arriba County, New Mexico, be designated a tight formation under section 271.703(c) of the Commission's regulations.

Initial review showed the recommended area, contained within the Blanco Mesaverde Gas Pool, is subject to New Mexico Order No. R-1670-T authorizing infill drilling. Since the Mesaverde Formation had been substantially developed before issuance of New Mexico's infill order and further development drilling was deemed economically feasible at the then available rates, the Commission requested supplemental economic data to clearly demonstrate that the incentive price established in section 271.703(a) was necessary to provide reasonable incentives for further development of the recommended area.

On March 18, 1982, we received supplemental economic data from New Mexico in response to our letter of November 18, 1981. This data showed a projected investment of $732,000 per well for a typical Mesaverde gas well drilled to 6,500 feet in the proposed area. On April 5, 1982, Mr. Michael Lacy, of my staff telephoned Mr. H. R. Hartsfield of Mobil Producing Texas & New Mexico Inc. (Mobil) to find out what specific costs were projected for the drilling and completion estimate. The specific costs Mr. Lacy recorded showed $100,000 under the miscellaneous expenses, other equipment, and other drilling cost categories. On April 20, 1982, Mr. Lacy requested by telephone a written clarification of the estimated $100,000 miscellaneous expenses, etc. On April 28, 1982, we received an explanation from Mobil also containing a $30,000 reduction in total drilling and completion cost estimate for a Mesaverde gas well (see attachment). Mobil stated the reduction is due to increased rig availability which they believe enables them to negotiate a day work cost of $5,000 per day instead of the original estimate of $6,500. Mobil's revised drilling and completion costs estimate now totals $702,000 per Blanco Mesaverde gas well.

Average drilling and completion costs for 1980 for a Mesaverde well in the San Juan Basin area are reported to be $355,719 per well for an average depth of 6,497 feet. 1/ This figure is based on cost and drilling data compiled from 454 gas wells drilled in western New Mexico in 1980. In addition, New Mexico has submitted well cost data in Docket No. RM79-76 New Mexico-8 and New Mexico-9 Tight Gas recommendations, projecting current drilling and completion costs ranging from $380,000 to $420,000 for wells drilled and completed to about 7,000 feet in San Juan Basin area. These gas wells, completed in the Dakota Formation range 500 to 1,000 feet deeper than Mobil's proposed Mesaverde gas wells. Since our current estimates of drilling costs in the San Juan Basin area are about $300,000 less than Mobil's projected well cost at comparable depths, please provide an explanation as to the large difference in costs.

The Commission in Order No. 137-A stated that, where substantial development by infill drilling had been economic at existing prices, sufficient economic data and supporting evidence must be presented to demonstrate that the recommended area cannot be developed without receiving the incentive price. Mobil's submission to you, while providing a detailed economic projection, is not supported by sufficient documentation of their estimated costs for drilling and completing a Mesaverde gas well.

Accordingly, as authorized by section 271.703(c)(3)(vii) of the Commission's regulations, we request that the submittal be supplemented with all available cost data on Mobil's late 1981 infill wells in the proposed area. This submission should include receipts, invoices, check stubs, and any other documentation which shows total expenses for drilling and completing a Mesaverde gas well in the proposed area.

Attached is a copy of Mobil's letter to Mr. Lacy dated April 27, 1982, for inclusion in your files. If we can be of further assistance, please call me at (202) 357-8585 or Victor Zabel at (202) 357-8616.

Very truly yours,

Howard Kilchrist

Howard Kilchrist, Director
Division of NGPA Compliance

Attachment

cc: Mr. H.R. Hartsfield
Mobil Producing Texas & New Mexico Inc.
Nine Greenway Plaza, Suite 2700
Houston, Texas 77046

1/ The cost data are found in Table 31 of the 1980 Joint Association Survey on Drilling Costs sponsored by the American Petroleum Institute, the Independent Petroleum Associations of America and the Mid-Continent Oil & Gas Association.

Mobil Producing Texas & New Mexico Inc.

NINE GREENWAY PLAZA—SUITE 2700
HOUSTON, TEXAS 77046

April 27, 1982

United States of America
Federal Energy Regulatory Commission
825 North Capitol Street
N.E. Washington D.C. 20426

Attention: Mr. Mike Lacy
Staff Geologist

Mr. Lacy:

Attached is an interoffice response to your inquiry concerning the drilling cost estimate for a Blanco Mesaverde well. If additional clarification is needed, please let me know.

Sincerely,

H.R. Hartsfield

HRH/mm
Attachment

H.R. Hartsfield
Reservoir Engineer

CO-273 B (6-75)

INTEROFFICE CORRESPONDENCE

DATE April 27, 1982

TO R.J. Boriskie

CC L.W. Randerson

7.42 WELL COST ESTIMATE
BLANCO MESAVERDE FIELD
RIO ARRIBA COUNTY, NEW MEXICO

This letter is in response to the Federal Energy Regulatory Commission's request for an explanation supporting Mobil's drilling cost estimate used in the economic justification of our Blanco Mesaverde field tight gas application. The following attachment is a breakdown of the drilling cost estimate and does not include related lease equipment of $33M.

As of the end of 1981 the well cost estimate of $699M for a Mesaverde was considered by Mobil Producing Texas and New Mexico Inc. (MPTM) to be the amount that we must be prepared to spend when deciding to drill one of these wells. Since the beginning of the year rig availability has increased leading to one revision of the original estimate. Due to this increased rig availability MPTM feels that the day work cost of $6500 per day can be negotiated to $5000 per day therefore reducing the overall drilling cost by $30M. However, drilling related service company products have not decreased in price. Services and items such as logging, mud, cement etc. will not change.

MPTM designs its well programs in accordance with industry accepted standards and selects its rig contractors on a competitive basis among reputable companies with above average crews. We do not expect to encounter any unique problems in drilling the Blanco Mesaverde wells. However, in this area and the adjacent areas, Mobil has encountered mechanical problems such as short fishing jobs for drill pipe and repairing leaks in production casing before testing and completing, that have caused drilling cost to vary by as much as $126M. In addition, the formation being as tight as it is has necessitated changing the treating procedures therefore pushing the cost upward.

Geographically, this area is not ideal. Additional care must be taken for the protection of the Ponderosa Pine trees and Indian ruins. This area is sensitive to archeological surveys and poor weather conditions. Roads leading to drill sites must be located and graded with care because of poor weather conditions. Inevitably, operations are shut down during the spring when roads are impassible due to mud caused by melting snow and rain. Drill sites are also in rugged terrain and are at a distance from major cities handling oilfield equipment and supplies.

On the attached well cost estimate, there are three headings which need further explanation.

(1) Other drilling cost - $40M

These charges are for moving in and moving off a completion rig and the completion rig day cost (± $2200 per day)

(2) Miscellaneous - $40M

This cost includes the rig supervisors charges (± $20M), and miscellaneous welding, wireline and trailer rental ($20M).

(3) Other equipment - $20M

This includes installation equipment (casing hangers, packers etc.) and crews as well as casing crews.

Mobil Producing Texas and New Mexico Inc. feels that $702M ($699M - $30M + $33M related lease equipment) is a proper and reasonable drilling and completion cost estimate for a Blanco Mesaverde well.

J.W. Tucker

HRHartsfield/mm
Attachment

J.W. Tucker
Drilling Engineering Manager

SUPPORTING DATA – EXPLORATION & PRODUCING
WELL COST ESTIMATE

A.F.E. NO.

(I – Used Equipment

OBJECTIVE	QUAD. NO.	PROVINCE	LEASE
☐ OIL ☒ GAS ☐ BOTH		Rio Arriba County, NM	Jicarilla
A.A.P.G. CLASSIFICATION OR REMARKS			
DEVELOPMENT TO 6500	EXPLORATION FROM TO	FIELD Blanco Mesa Verde	
PROPOSED SPUD DATE 3/1/82		TIME SPUD TO COMPLETION 35 DAYS	

CLASS			M$	ORIGINAL ESTIMATE	SUPPLEMENT NO.	REVISED TOTAL
01	WELL COST – INTANGIBLE	DRILLING	FOOTAGE COST MI & MO RT	40		
			DAY WORK COST 20 days @ $6500/day	130		
			OTHER DRILLING COST	40		
			TOTAL DRILLING	210		
02		OTHER	LOCATION AND ROADS	20		
03			MARINE PLATFORMS	—		
04			CORING EQUIPMENT AND SERVICES	—		
05			LOGGING AND TESTING	50		
06			FUEL	35		
07			WATER	10		
08			MUD AND CHEMICALS	20		
09			CEMENT AND CEMENTING SERVICES	40		
12			TRUCKING AND WATER TRANSPORTATION	10		
14			PERFORATING, ACIDIZING AND FRAC.	65		
15			BITS	20		
16			EQUIPMENT RENTAL	25		
22			MISCELLANEOUS	40		
			TOTAL OTHER	335		
			TOTAL WELL COST – INTANGIBLE	545		
	WELL EQUIPMENT – TANGIBLE	CASING	ORIG. 350 OF 8-5/8 • SUPP.	6		
			6500 OF 5-1/2 •	58		
			OF •			
			OF •			
			OF •			
		TUBING	6000 OF 2-3/8 •	30		
			OF •			
			OF •			
			OF •			
		CASING HEAD		10		
		CHRISTMAS TREE AND CONNECTIONS		30		
		OTHER EQUIPMENT		20		
		TOTAL WELL EQUIPMENT – TANGIBLE		154		
		SUB-TOTAL WELL COST		699		
		LESS: CONTRIBUTIONS (CR)				
		SALVABLE EQUIPMENT (CR) (NON-BUDGET)	Tax			
	1. TOTAL WELL COST – GROSS			699		
	QWJ 12-15-81 2. TOTAL WELL COST – MOBIL (APPROVAL COST)					
	REV DPK 12/14/81 kdb 3. TOTAL BUDGET COST – MOBIL					

Mobil Producing Texas & New Mexico Inc

NINE GREENWAY PLAZA SUITE 2700
HOUSTON, TEXAS 77046

April 27, 1982

Mr. Richard L. Stamets
Technical Support Chief
New Mexico Oil Conservation Division
P. O. Box 2088
Santa Fe, New Mexico 87501'

Fle

7.01
MOBIL PRODUCING TX & NM INC.
INTEROFFICE WELL COST ESTIMATE
BLANCO MESAVERDE POOL
TIGHT GAS FORMATION APPLICATION (CASE NO. 7154)
RIO ARRIBA COUNTY, NEW MEXICO

Dear Sir:

Attached is the captioned well cost estimate. This cost estimate was developed due to a direct telephone inquiry to our Engineering staff by the Federal Energy Regulatory Commission. As per our telephone conversation of this afternoon, we have transmitted the attached data to FERC for their use in the Tight Gas Application.

Yours very truly,

J. A. Morris

J. A. Morris
Regulatory Engineering Supervisor

HFWeaver:mma
Attachments

Mobil Producing Texas & New Mexico Inc.

NINE GREENWAY PLAZA—SUITE 2700
HOUSTON, TEXAS 77046

April 27, 1982

Federal Energy Regulatory Commission
825 North Capitol Street
N.E. Washington D.C. 20426

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H. R. Hartsfield

HRH/mm
Attachment

H.R. Hartsfield
Reservoir Engineer

CO-273 B (6-75)

INTEROFFICE CORRESPONDENCE

DATE April 27, 1982

TO R.J. Boriskie

CC L.W. Randerson

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J.W. Tucker

HRHartsfield/mm
Attachment

J.W. Tucker
Drilling Engineering Manager

SUPPORTING DATA – EXPLORATION & PRODUCING
WELL COST ESTIMATE

A.F.E. NO.

U – Used Equipment

OBJECTIVE	QUAD. NO.	PROVINCE	LEASE
☐ OIL ☒ GAS ☐ BOTH		Rio Arriba County, NM	Jicarilla

A.A.P.G. CLASSIFICATION OR REMARKS

DEVELOPMENT	EXPLORATION	FIELD
TO 6500	FROM TO	Blanco Mesa Verde

PROPOSED SPUD DATE 3/1/82 TIME SPUD TO COMPLETION 35 DAYS

Acct.			M$	ORIGINAL ESTIMATE	SUPPLEMENT NO.	REVISED TOTAL
	WELL COST – INTANGIBLE	DRILLING	FOOTAGE COST MI & MO RT	40		
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07			WATER	10		
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		SALVABLE EQUIPMENT (CR) (NON-BUDGET)	Tax			
		1. TOTAL WELL COST – GROSS		699		
		2. TOTAL WELL COST – MOBIL (APPROVAL COST)				
		3. TOTAL BUDGET COST – MOBIL				

RWJ 12-15-81

REV DPK 12/14/81 kdb

APPLICATION FOR TIGHT

GAS FORMATION DESIGNATION

MOBIL PRODUCING TEXAS & NEW MEXICO OPERATED LEASES

RIO ARRIBA COUNTY

NEW MEXICO

TABLE OF CONTENTS

Mobil Producing Texas and New Mexico submits an application to designate the Blanco Mesa Verde Pool as a tight formation underlying following tracts:

T27N R3W: Sections 11, 12, 13, 14, S/2 of 15, 22, 23, 24, 25, 26, 27, 35, 36

T26N R3W: Sections 1, 2, 11, 12, 13, 14, 23, 24

T26N R2W: Lot 4 Sec 7, NE/4 and S/2 Sec 8, Sec 17, Sec 18, Lots 1,2,3 Sec 19

All of these tracts are in Rio Arriba County, New Mexico.

It is believed that the Blanco Mesa Verde Pool in the above area exhibits the characteristics of a tight formation as identified in FERC Order No. 99. The guidelines indicated that (1) the average insitu permeability should be less than 0.1 millidarcy, (2) the pre-stimulation production rate to atmosphere of formations whose tops are between 5500' - 6000' may not exceed 188 MCF/D, and (3) the pre- stimulation oil rate should not exceed 5 BOPD.

Geologic Description:

The Geology of the Mesa Verde Group in T26N and T27N, R3W

The Mesa Verde Group lies between two thick formations of shale, the overlying Lewis shale and the underlying Mancos shale. This group is divided into three formations; the Cliff House, Menefee, and Point Lookout.

The Cliff House sandstone is about 100 ft thick in the west side of T26N, R3W; 40 ft thick in the middle, 60 ft thick in the east and becomes thin in T26N, R2W. The porosity of the Cliff House sandstone usually decreases as the sandstone becomes thinner (See Cross section A-C).

The Menefee shale contains some thin sandstone layers. The formation is not an important reservoir unit although some wells are also perforated for natural gas production.

The Point Lookout is the main reservoir of the Mesa Verde Group. The porous sandstone in the upper part of the formation is about 100 ft thick in the west side of T26N, R3W, 40 ft in the middle, and 55 ft in the east, and becomes thinner in T26N, R2W. The porosity of the Point Lookout sandstone usually decreases as the sandstone becomes thinner.

In general, the sandstones of the Mesa Verde Group form a narrow strip of reservoir about 2 miles wide and 9 miles long in a north-south direction in T26N, R3W and T27N, R3W.

History:

The Blanco Mesa Verde Pool in the subject area was developed in the late 1950s on 320 acre proration units. A few wells were tested before stimulation, but were found to produce at non commercial rates. Subsequent wells were stimulated by fracturing without prior production rate testing. As a result of this policy, pre-frac data is sparse and pre-frac conditions must be inferred from post frac data.

An infill drilling program was initiated in the mid 1970s as the rules were amended to allow for a second well on a proration unit. The drilling program met with moderate success, but several units on the eastern edge were economically unfeasible due to insufficient reserves and have remained undeveloped.

Mobil Producing Texas and New Mexico Inc. has received inquiries pertaining to the future development of undeveloped units. As a prudent operator we are willing to comply with the requests provided that price relief can be obtained. The following discussion will attempt to prove that the Blanco Mesa Verde Pool underlying the aforementioned acreage is characteristic of a tight formation and gas sold from future wells should be subject to tight gas pricing.

Discussion:

Exhibit 1 points out that the aforementioned acreage (± 13,920 acres) comprises the bulk of a separate sand body in the Blanco Mesa Verde Pool that produces independently of the main pool. The acreage is located on the eastern fringe of the main pool and is surrounded by dry holes in the Mesa Verde formation. Therefore data submitted from wells in the subject acreage is valid for this area only and may not be representative of the main Blanco Mesa Verde Pool.

Exhibit 2 is a cumulative gas production map. High recoveries have come from a "sweet spot" located in center of the acreage. Recoveries decrease outward in all directions. Undeveloped acreage lies in areas where expected recoveries will be less than 500 MMCF per well. At present gas prices, reserves of this magnitude are unprofitable.

Exhibit 3 is a table of after frac permeabilities calculated from bottom hole pressure buildups run in 1975 and 1976. The calculated permeabilities for 11 wells were averaged and the resultant permeability was 0.146 millidarcy. It should be noted that the buildups were run after fracturing, and the values would be lower had the buildups been run before fracturing.

Exhibits 4 and 5 summarize the computations involved in calculating formation permeability based on a bottom hole pressure buildup. The calculations are a standard in the industry to obtain accurate formation permeability.

Exhibit 5A utilizes a method for determining pre frac permeability if the fracture length is known. In the case of Jicarilla 'H' #2A, employing a 1,000' fracture in a 160 acre drainage area reveals that the prefrac permeability was 28% of the post frac permeability or 0.07 md.

Exhibit 6 is a summary of permeability analyses of whole cores from these wells. This type of analysis results in apparent permeabilities that are greater than actual due to a reduction in overburden pressure. In the case of the Mesa Verde, compaction can result in a reduction in permeability (see chart in Exhibit). The permeability of the core in one well averaged 0.032 md. The other well was cored in only one out of three sections and averaged 0.216 md. This value would have been lower had all sections been cored and analyzed. Another well averaged 0.18 md permeability. However, this well had fewer samples taken, and these were obtained from the better quality portions of the core. This type of spot sampling does not take into account that all of the interval contributes (both good and poor quality) and the actual average permeability is less than what is measured. Therefore this type of analysis is basically qualitative rather than quantitative.

From the date presented in Exhibits 3, 4, 5, 5A, and 6, it can be inferred that the average insitu permeability of the Mesa Verde formation is less than 0.1 md.

Exhibit 7 tabulates all the known prefrac flow rates in the area. Prefrac testing is usually not performed since it is a known fact that the wells will need stimulation. Natural flow rate tests to atmosphere were run on 15 wells. The average rate of thirteen flow rates was 150 MCFPD.

Two rates (11,960 MCFPD and 2083 MCFPD) were not averaged in since they were not representative of the field. It is believed that the 11,960 MCFPD rate came from fractures in the immediate vicinity of the wellbore and not from the formation itself. This is substantiated in that the production rate dropped to 3221 MCFPD after fracturing and the well has only produced 900 MMCF after 22 years. (average = 112 MCFPD) The other rate came from the best well in the field (4.6 BCF recovery) which is in the small "sweet spot" area. This well is an anomaly and is not representative of the area as a whole.

From the data presented in Exhibit 7, it is evident that the average pre stimulation flow rate to atmosphere is less than 188 MCFPD, which is the maximum acceptable rate for a formation 5500' - 6000'deep.

Exhibit 9 shows the average condensate production rate from all wells in the subject area. Total condensate production from each individual well was divided by each well's total producing life to arrive at an average rate. It is evident that, except for the "sweet spot", production has averaged less than 5 BCPD for the entire area. It should be pointed out that the fluid is condensate and not oil. Based on fluid analysis and production tests, it is believed that the condensate is not in a fluid state in the reservoir, but becomes so at surface conditions.

MPTM's present policy is to set 300' of surface casing with cement circulated behind pipe and also to circulate cement behind the production casing also. This casing program should provide adequate protection of fresh water acquifers, as it meets and exceeds requirements as defined in NMOCD Blanco Mesa Verde Pool Rules 26, 27, and 28 (See Below).

RULE 26. Surface Pipe. The surface pipe shall be set to a minimum depth of 100 feet, and where shallow potable water-bearing beds are present, the surface pipe shall be set to such shallow potable water-bearing beds and a sufficient amount of cement shall be used to circulate the cement behind the pipe to the bottom of the cellar. This surface casing shall stand cemented for at least 24 hours before drilling plug or initiating tests. The surface casing shall be tested after drilling plug by bailing the hole dry. The hole shall remain dry for one hour to constitute satisfactory proof of a water shut-off. In lieu of the foregoing test, the cement job shall be tested by building up a pressure of 1000 psi, closing the valves, and allowing to stand thirty minutes. If the pressure does not drop more than 100 pounds during that period, the test shall be considered satisfactory. This test shall be made both before and after drilling the plug. The Commission shall be notified at least 24 hours prior to the conducting of any test.

RULE 27. Production String. The production string shall be set on top of the Cliff House Sand with a minimum of 100 sacks of cement and shall stand cemented not less than 36 hours before testing the casing. This test shall be made by building up a pressure of 1000 psi, closing the valves, and allowing to stand thirty minutes. If the pressure does not drop more than 100 pounds during that period, the test shall be considered satisfactory.

RULE 28. All cementing shall be done by the pump-and-plug method. Bailing tests may be used on all casing and cement tests, and drill stem tests may be used on cement tests in lieu of pressure tests. In making bailing test, the well shall be bailed dry and remain approximately dry for thirty minutes. If any string of casing fails while being tested by pressure or by bailing tests herein required, it shall be recemented and retested or an additional string of casing should be run and cemented. If an additional string is used, the same test shall be made as outlined for the original string. In submitting Form C-101, "Notice of Intention to Drill," the number of sacks of cement to be used on each string of casing shall be stated.

EXHIBIT 3
POST FRAC PERMEABILITIES
CALCULATED FROM BOTTOM HOLE PRESSURE BUILDUPS
BLANCO MESA VERDE FIELD

Lease and Well No.	kh* (md ft)	h (ft)	k (md)
Jicarilla 'E' #2	3.76	141	.027
Jicarilla 'F' #3	2.49	119	.021
Jicarilla 'F' #7	5.9	45	.13
Jicarilla 'G' #1	24.4	151	.162
Jicarilla 'G' #2	1.7	174	.010
Jicarilla 'G' #3	22.2	115	.193
Jicarilla 'H' #2	19.9	104	.191
Jicarilla 'H' #4	0.945	111	.0085
Jicarilla 'H' #7	19.5	84	.232
Cheney Federal #1	75.9	162	.469
Cheney Federal #3	2.44	16	.153
TOTAL	179.1	1222	1.60

Avg. k = $\frac{179.1 \text{ md ft}}{1222 \text{ ft}}$ = 0.146 md = $\frac{1.60 \text{ md}}{11 \text{ samples}}$

* k = permeability

h = contributing formation interval

EXHIBIT 4
JICARILLA G NO. 1-A
BLANCO MESA VERDE

CHRONOLOGICAL PRESSURE AND PRODUCTION DATA

Δt (hrs)	$\frac{t + \Delta t}{\Delta t}$	BHP
Flowing		490
.25	1045	530
.50	523	541
.75	349	550
1	262	561
2	131.5	594
3	88	612
4	66.2	630
5	53.2	644
6	44.5	655
7	38.3	664
8	33.6	673
10	27.1	689
12	22.8	705
14	19.6	719
16	17.3	732
18	15.5	744
20	14.0	755
22	17.9	764
24	11.9	773
28	10.3	792
32	9.2	812
36	8.3	828
40	7.5	844
44	6.9	860
48	6.4	871
54	5.8	889
60	5.4	905
66	5.0	921
72	4.6	935
78	4.3	948
84	4.1	960
90	3.9	971
96	3.7	985
102	3.6	996
108	3.4	1007
114	3.3	1016
120	3.2	1026
126	3.1	1035
132	3.0	1044
140	2.9	1055
150	2.7	1069
160	2.6	1080
164	2.59	1085
165	2.58	1087

EXHIBIT 4 (continued)
POST FRAC BOTTOM HOLE PRESSURE BUILDUP ANALYSIS
JICARILLA 'G' #1-A

Production Rate prior to shut-in (Q) = 1000 MCF/D
Time of production prior to shut-in (t) = 261 hours
Net feet of contributing formation (h) = 146 feet
Formation porosity (Ø) = 14%
Formation water saturation (Sw) = 34%
Bottom hole flowing pressure (Pwf) = 490 psia
Gas specific gravity = .688
Formation temperature = 142°F = 602°R
Find: Permeability (k) = millidarcies

From plot of BHP vs. $\frac{t + \Delta t}{t}$: slope of straight line (m) = 710 psi/cycle

Average pressure = $\frac{P^* + Pwf}{2} = \frac{1380 + 490}{2}$ = 935 psia

@ 935 psia and 142°F :
gas deviation factor (z) = .8957
gas viscosity (μ) = 0.01372 centipoise

gas formation volume factor (Bg) = $.02829 \frac{zt}{p}$ cu ft/SCF

$= (.02829)\frac{(.8957)(602)}{935}$ cu ft/SCF

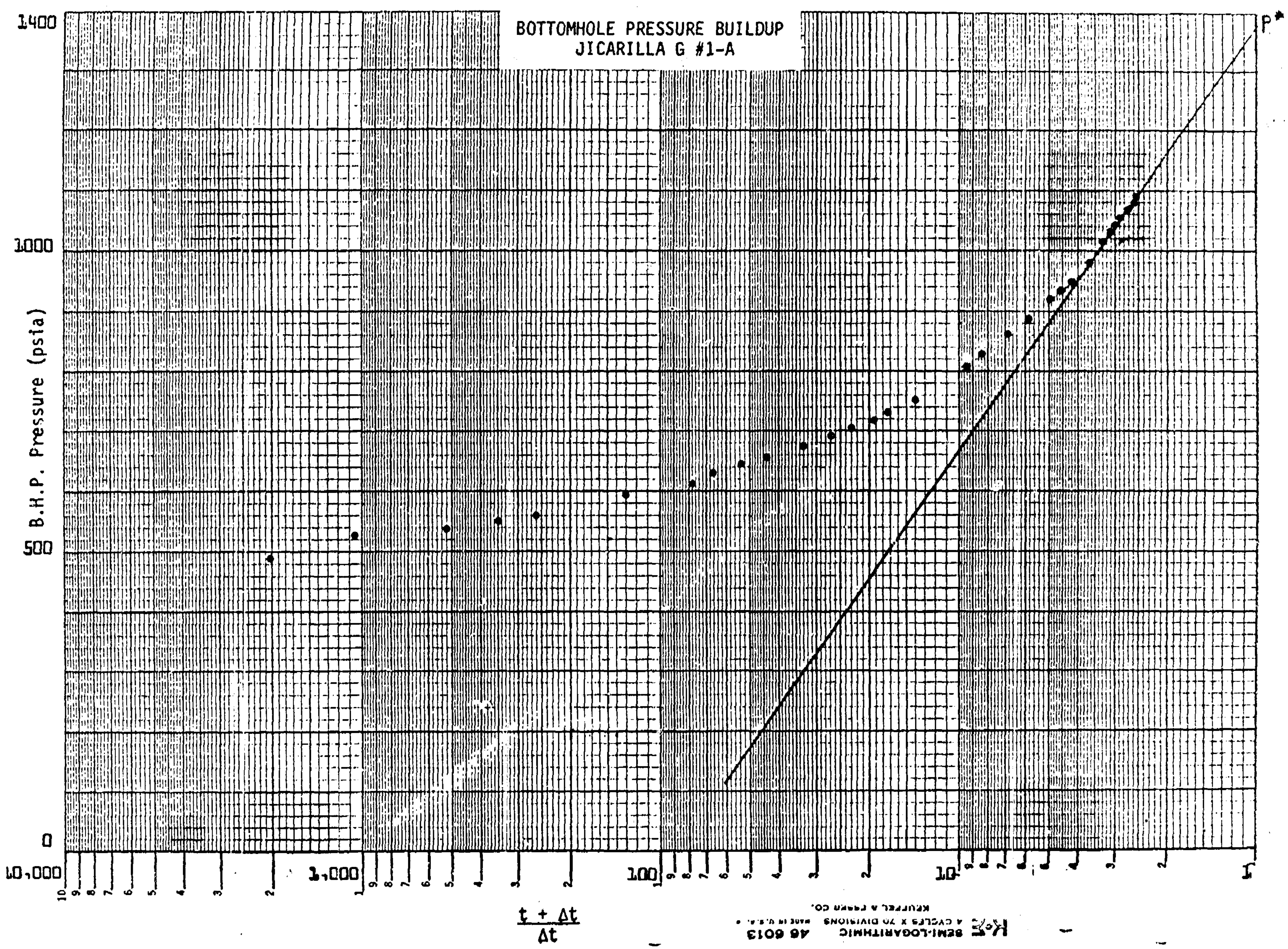
= .0163 cu ft/SCF

Converting: .0163 cu ft/SCF x 1000 SCF/MCF x $\frac{1 \text{ BBL}}{5.61 \text{ cu ft}}$ = 2.91 reservoir bbls/MCF

$kh = \frac{162.6 \times \text{rate} \times \text{viscosity} \times \text{formation volume factor}}{\text{slope of straight line of buildup plot}}$

$kh = \frac{162.6 \times Q \times}{m} = \frac{162.6 \times 1000 \times 0.01372 \times 2.91}{710}$ = 9.14 md ft

$k = \frac{9.14 \text{ md - ft}}{146 \text{ feet}}$ = .063 md



BOTTOMHOLE PRESSURE BUILDUP
JICARILLA G #1-A
P*
B.H.P. Pressure (psia)
1400
1000
500
0
10,000
1,000
100
10
1
$\frac{t + \Delt t}{\Delta t}$
K&E SEMI-LOGARITHMIC 46 6013
4 CYCLES X 70 DIVISIONS MADE IN U.S.A.
KEUFFEL & ESSER CO.

EXHIBIT 5
JICARILLA H-2 NO. A
BLANCO MESA VERDE

CHRONOLOGICAL PRESSURE AND PRODUCTION DATA

Δt (hrs)	$\frac{t + \Delta t}{\Delta t}$	BHP
Flowing	680	
.25	1369	762
.5	685	800
.75	457	832
1.0	343	860
1.5	229	894
2	172	932
3	115	964
4	86.5	989
6	58	1030
8	44	1060
10	35	1080
12	30	1101
16	22	1132
20	18	1157
24	15.2	1178
28	13.2	1194
32	11.7	1210
36	10.5	1223
40	9.6	1237
44	8.8	1246
48	8.1	1255
54	7.3	1269
60	6.7	1283
70	5.9	1298
80	5.3	1312
90	4.8	1326
100	4.4	1337
110	4.1	1348
120	3.8	1358
130	3.6	1364
140	3.4	1371
150	3.3	1378
160	3.1	1385
165	3.07	1388

EXHIBIT 5

POST FRAC BOTTOM HOLE PRESSURE BUILDUP ANALYSIS
JICARILLA 'H' #2-A

Q = 1700 MCF PD
t = 342 hrs
h = 122 ft
ϕ = 14%

Sw = 34%
Pwf = 680 psia
Gas gravity = .688
T = 142°F = 602 °R

from BHP vs $\frac{t + \Delta t}{t}$: m = 300 psi/cycle

Average Pressure (P) = $\frac{P^* + Pwf}{2} = \frac{1530 + 680}{2}$ = 1105 psia

@ 1105 psia and 142°F :

z = 0.8814
μ = 0.01410 cp.
Bg = 2.469 reservoir bbl/MCF

$$kh = \frac{162.6 \times Q \times \mu \times Bg}{m} = \frac{162.6 \times 1700 \times 0.01410 \times 2.469}{300}$$

= 32 md-ft

$$k = \frac{32 \text{ md-ft}}{122 \text{ ft}} = 0.262 \text{ md}$$

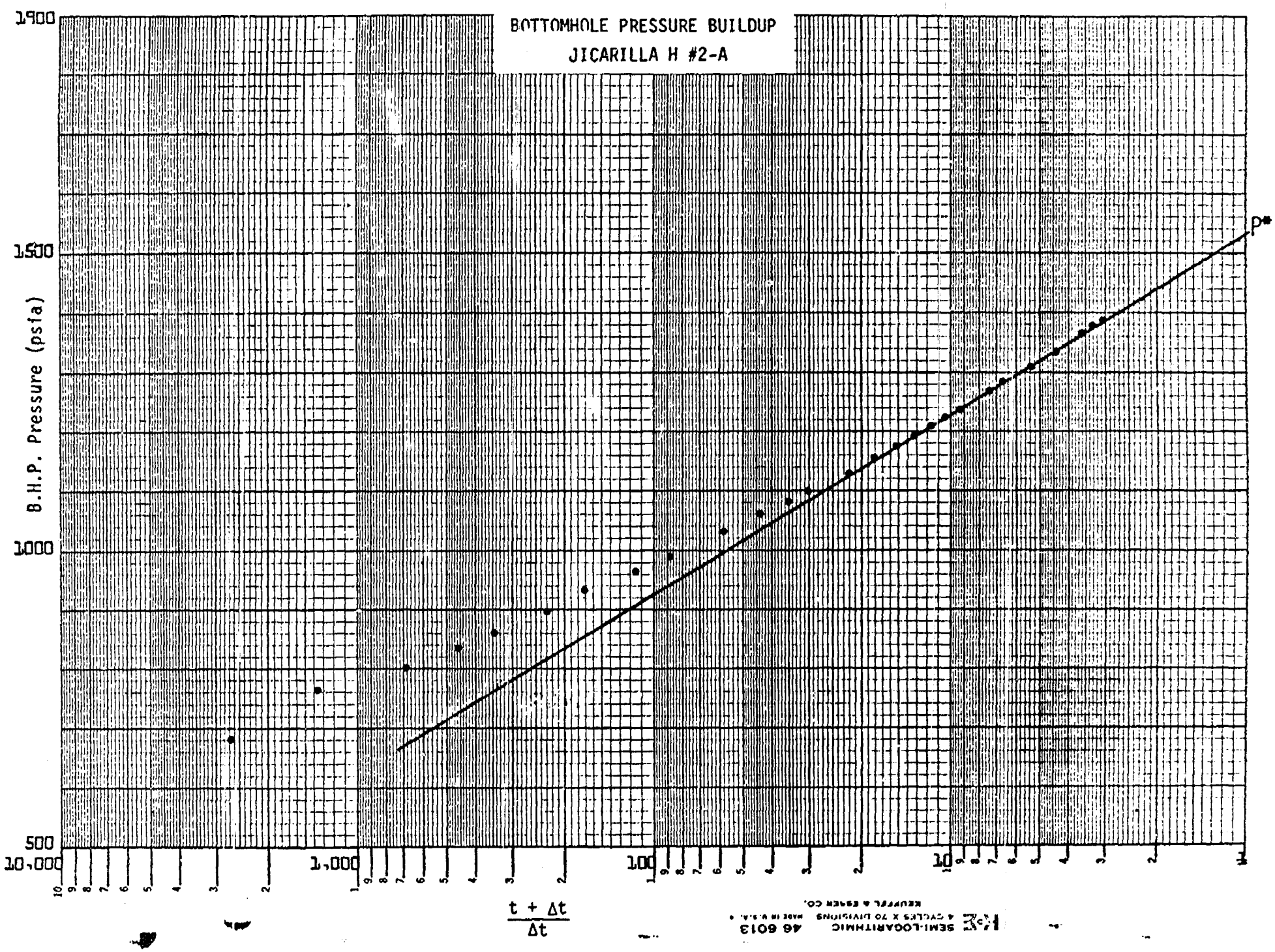

BOTTOMHOLE PRESSURE BUILDUP
JICARILLA H #2-A
1900
1500
1000
500
B.H.P. Pressure (psia)
P*
10,000
1,000
100
10
$\frac{t + \Delta t}{\Delta t}$
SEMI-LOGARITHMIC 46 6013
4 CYCLES X 70 DIVISIONS MADE IN U.S.A.
KEUFFEL & ESSER CO.

EXHIBIT 5A

CALCULATION OF PRE FRAC PERMEABILITY
JICARILLA 'H' #2A

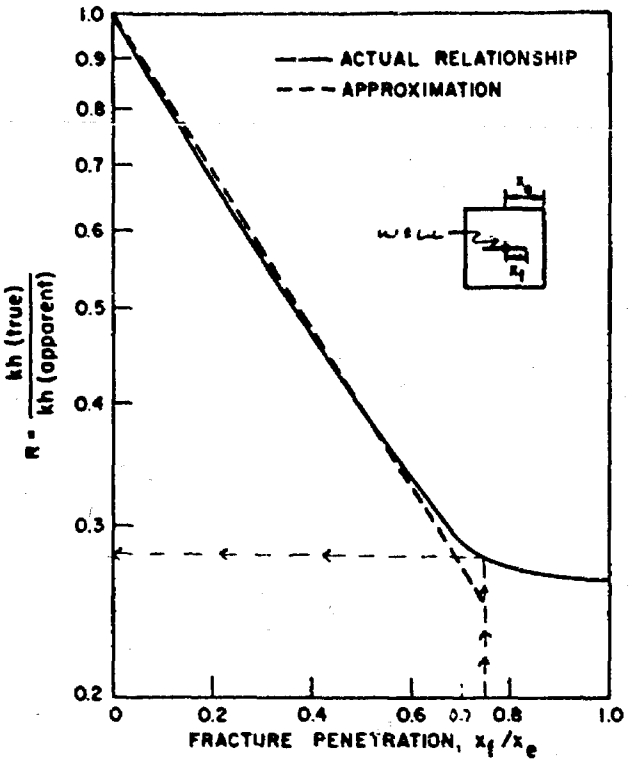


Fig. 10.25 Vertically fractured reservoir, pressure buildup interpretation. (After Russell and Truitt[9])

From SPE Monograph Vol. 1
Pressure Buildup and Flow Tests in Wells p. 108

Given:
Fracture length = 1000' (calculated from frac program)
Proration Unit = 160 acres
kh (apparent) = .262 md x 122 ft = 32 md. ft

Find kh (true):
Xe = $^1/_2$ length of a 160 acre square = $^1/_2$ x 2640' = 1320'
Xf = fracture length = 1000'
fracture penetration = $\frac{Xf}{Xe} = \frac{1000'}{1320'} = 0.76$

from above chart $\frac{Kh\ (true)}{Kh\ apparent} = .28$

Therefore Kh(true) = .28 x Kh apparent = .28 x 32 md ft = 8.96 md ft

$K = \frac{8.96\ md\ ft}{122'} = .0734\ md$

EXHIBIT 5A

HYDRAULIC FRACTURING TREATMENT SCHEDULE
JICARILLA "H", WELL NO. 2-A
BLANCO MESA VERDE FIELD
RIO ARRIBA COUNTY, NEW MEXICO

Formation	Treating Rate (bbls/min)	Base Fluid Type	Treating Fluid Volume and Type	Friction Reducing Agt Type	Friction Reducing Agt Conc (#/1000 gals)	Gelling Agt Type	Gelling Agt Conc (#/1000 gals)	Fluid Loss Agent Type	Fluid Loss Agent Conc (#/1000 gals)	Foaming Agent Type	Foaming Agent Conc (#/1000 gals)	Mesh Size	Sand Data Conc (#/gal)	Quantity (Lbs)
Lower Mesa Verde (5754'-5920'-166'OA-42 holes)	50	1% KCL	5,000 gals.Prepad	FR-20	3.0	None	0	Ad-Aq	30	Surf	2.0	None	0.0	0
	"	"	10,000 gals.Versagel Pad	None	0.0	WG-11	40	"	"	"	"	None	0.0	0
	"	"	7,500 gals.Versagel	"	"	"	"	"	"	"	"	20-40	1.0	7,500
	"	"	7,500 gals.Versagel	"	"	"	"	"	"	"	"	"	2.0	15,000
	"	"	7,500 gals.Versagel	"	"	"	"	"	"	"	"	"	3.0	22,500
	"	"	22,500 gals.Versagel	"	"	"	"	"	"	"	"	"	4.0	90,000
			DROP 18 RCNBS											
	50	1% KCL	5,000 gals.Prepad	FR-20	3.0	None	0	Ad-Aq	30	Surf	2.0	None	0.0	0
	"	"	10,000 gals.Versagel Pad	None	0.0	WG-11	40	"	"	"	"	None	0.0	0
	"	"	7,500 gals.Versagel	"	"	"	"	"	"	"	"	20-40	1.0	7,500
	"	"	7,500 gals.Versagel	"	"	"	"	"	"	"	"	"	2.0	15,000
	"	"	7,500 gals.Versagel	"	"	"	"	"	"	"	"	"	3.0	22,500
	"	"	22,500 gals.Versagel	"	"	"	"	"	"	"	"	"	4.0	90,000
Middle Mesa Verde (5504'-5680'-176'OA-31 holes)	50	1% KCL	3,500 gals.Prepad	FR-20	3.0	None	0	Ad-Aq	30	Surf	2.0	None	0.0	0
	"	"	6,500 gals.Versagel Pad	None	0.0	WG-11	40	"	"	"	"	None	0.0	0
	"	"	5,000 gals.Versagel	"	"	"	"	"	"	"	"	20-40	1.0	5,000
	"	"	5,000 gals.Versagel	"	"	"	"	"	"	"	"	"	2.0	10,000
	"	"	5,000 gals.Versagel	"	"	"	"	"	"	"	"	"	3.0	15,000
	"	"	15,000 gals.Versagel	"	"	"	"	"	"	"	"	"	4.0	60,000
			DROP 4 RCNBS											
	50	1% KCL	3,500 gals.Prepad	FR-20	3.0	None	0	Ad-Aq	30	Surf	2.0	None	0.0	0
	"	"	6,500 gals.Versagel Pad	None	0.0	WG-11	40	"	"	"	"	None	0.0	0
	"	"	5,000 gals.Versagel	"	"	"	"	"	"	"	"	20-40	1.0	5,000
	"	"	5,000 gals.Versagel	"	"	"	"	"	"	"	"	"	2.0	10,000
	"	"	5,000 gals.Versagel	"	"	"	"	"	"	"	"	"	3.0	15,000
	"	"	15,000 gals.Versagel	"	"	"	"	"	"	"	"	"	4.0	60,000
			DROP 4 RCNBS											
	50	1% KCL	3,500 gals.Prepad	FR-20	3.0	None	0	Ad-Aq	30	Surf	2.0	None	0.0	0
	"	"	6,500 gals.Versagel Pad	None	0.0	WG-11	40	"	"	"	"	None	0.0	0
	"	"	5,000 gals.Versagel	"	"	"	"	"	"	"	"	20-40	1.0	5,000
	"	"	5,000 gals.Versagel	"	"	"	"	"	"	"	"	"	2.0	10,000
	"	"	5,000 gals.Versagel	"	"	"	"	"	"	"	"	"	3.0	15,000
	"	"	15,000 gals.Versagel	"	"	"	"	"	"	"	"	"	4.0	60,000
Upper Mesa Verde (5394'-5480'-86'OA-27 holes)	50	1% KCL	10,000 gals.Prepad	FR-20	3.0	None	0	Ad-Aq	30	Surf	2.0	None	0.0	0
	"	"	20,000 gals.Versagel Pad	None	0.0	WG-11	40	"	"	"	"	None	0.0	0
	"	"	15,000 gals.Versagel	"	"	"	"	"	"	"	"	20-40	1.0	15,000
	"	"	15,000 gals.Versagel	"	"	"	"	"	"	"	"	"	2.0	30,000
	"	"	15,000 gals.Versagel	"	"	"	"	"	"	"	"	"	3.0	45,000
	"	"	45,000 gals.Versagel	"	"	"	"	"	"	"	"	"	4.0	180,000

Ad-Aq = Adomite Aqua
Surf = Howco Suds

JESmith/jc
6/30/76

EXHIBIT 5A

FRAC6♦ 5-10-76

FRACPLAN II

JOB TYPE - VERSAGEL FRACTURING PROCESS

MOBIL OIL CO.♦ JICARILLA♦ MESA VERDE FORMATION

1 % KCL♦ 30 LBS. ADOMITE AQUA♦ 2 GALS. PFN-5

INJECTION RATE - BBL/MIN		50.0
ASSUMED FRACTURE HEIGHT - FT		100.0
NET FORMATION THICKNESS - FT		40.0
ELASTIC MODULUS - PSI		0.30E+07
FORMATION PERMEABILITY - MD		0.10
FORMATION POROSITY		0.08
BHTP - PSI		3500.
RESERVOIR PRESSURE - PSI		1000.
RESERVOIR FLUID VIS - CP		0.02
CW - FLUID LOSS COEF. - FT/SQRT(MIN)		0.00100
SPURT LOSS - GAL/SQFT		0.
TYPE OF GEL		WG-11
GEL CONCENTRATION		40#/M
N-PRIME		0.4500
K-PRIME(SLOT) - LBF-SEC♦♦N/SQFT		0.100000
WELL SPACING - ACRES		350.
DRAINAGE RADIUS - FT		2000.
WELLBORE RADIUS - FT		0.400
DAMAGE RATIO		1.0
TYPE & CONC NO 1 PROP	20-40 SAND	5.00 LB/GAL AVG

DESIGN NO	PROD INCREASE (T)	PROD INCREASE (M-S)	TOTAL VOL GAL/1000	PAD VOL GAL/1000	PROPPED FRAC LN FT	PROPPED FRAC HT FT	VIS CPS	FRAC WIDTH IN	PROP 1ST SX	PROP 2ND SX
1	3.7	7.3	60.0	15.6	765.	100.0	536.	0.614	2221.	0.
2	4.0	7.3	70.0	18.6	857.	100.0	560.	0.639	2569.	0.
3	4.2	8.9	80.0	21.8	946.	100.0	582.	0.661	2912.	0.
					1000	100.0	599	0.674	3129.	0.
Y_f = 1000' → 4	4.3	8.9	86.0	23.7				0.682	3253.	0.
	4.4	8.9	90.0	24.9	1033.	100.0	601.			
5	4.7	10.1	100.0	28.2	1117.	100.0	619.	0.700	3591.	0.
6	5.0	10.1	110.0	31.5	1198.	100.0	636.	0.717	3926.	0.
7	5.3	10.1	120.0	34.8	1278.	100.0	652.	0.734	4258.	0.
8	5.6	11.0	130.0	38.2	1356.	100.0	667.	0.749	4589.	0.
9	6.0	11.0	140.0	41.7	1433.	100.0	681.	0.763	4917.	0.
10	6.4	11.8	150.0	45.1	1508.	100.0	694.	0.777	5244.	0.

Y_f = 1000'
W_f = 150'
Rate = 50 BPM
6,000 Gal-Prepad.
[illegible] Gal-Versagel Pad
[illegible] Gal-Versagel
[illegible] # 1 lb/gal Sand
[illegible] Gal-Versagel
[illegible] # 3 lb/gal Sand.
15,000 Gal-Versagel
5 lb/gal Sand
[illegible] Gal-Versagel
7 lb/gal Sand

CREATED LENGTH	HEO	RELATIVE CAP (T)	RELATIVE CAP (M-S)	HF/HI	C-EFF
765.	0.	234.80	415503.	1.00	0.000087
857.	0.	240.25	425140.	1.00	0.000085
946.	0.	244.78	433155.	1.00	0.000084
1033.	0.	248.92	440320.	1.00	0.000083
1117.	0.	252.50	446921.	1.00	0.000082
1198.	0.	255.85	452777.	1.00	0.000081
1278.	0.	258.97	458274.	1.00	0.000081
1356.	0.	261.86	463380.	1.00	0.000080
1433.	0.	264.55	468148.	1.00	0.000079
1508.	0.	267.08	472623.	1.00	0.000078

→ 450,000 lbs Sand Total

Jicarilla "H" Well No. 1
Blanco Mesa V.

John E. Sh
1-28-7

MOBIL OIL CORPORATION
WELL COST STATEMENT

STATE	COUNTY OR PARISH	FIELD	WKG. INT.
NEW MEXICO	RIO ARRIBA	BLANCO (MESA VERDE)	100

REGION	AREA	LEASE	WELL NO.
HOUSTON	356 JICARILLA H	75626-00	2-A

DATE COMMENCED	DATE COMPLETED	TOTAL DEPTH	STATUS	AFE NO.	PREPARED BY
5-04-76	7-12-76	6100	GAS	6241	DALLAS ACCOUNTING CENTER

	COSTS /WHOLE DOLLARS/ ACTUAL		ESTIMATED
DRILLING COSTS			
FOOTAGE COST	57,102		
DAY WORK COST	9,578		
OTHER DRILLING COST	19,352		
TOTAL DRILLING COSTS		66,032	
WELL EXPENSES			
LOCATION AND ROADS	3,296		
LOGGING AND TESTING	7,679		
FUEL	97		
WATER	9,239		
MUD AND CHEMICALS	36,888		
CEMENT AND CEMENTING SERVICES	20,181		
TRANSPORTATION	3,603		
PERFORATING AND STIMULATION	162,872		
EQUIPMENT RENTAL	1,297		
MISCELLANEOUS	6,690		
TOTAL WELL EXPENSES		251,842	371,000
TOTAL INTANGIBLE COSTS		337,874	371,000
WELL EQUIPMENT			
CASING	34,655		
OTHER EQUIPMENT	6,976-		
TOTAL TANGIBLE COSTS		27,679	
TOTAL COSTS		365,553	371,000
APPROXIMATE COST TO MOBIL		365,553	

EXHIBIT 6
PERMEABILITY BASED ON CORE ANALYSIS
BLANCO MESA VERDE FIELD

Lease and Well No.	No. of Samples	Summation of All k Values	Average k	Reduced k due to compaction
Jicarilla H-7 *	28	6.04 md	0.216 md	.17 md
Jicarilla G-1	130	4.10 md	0.032 md	.026 md
Jicarilla G-5	56	9.95 md	0.18 md	.14 md

* only one out of three intervals was cored

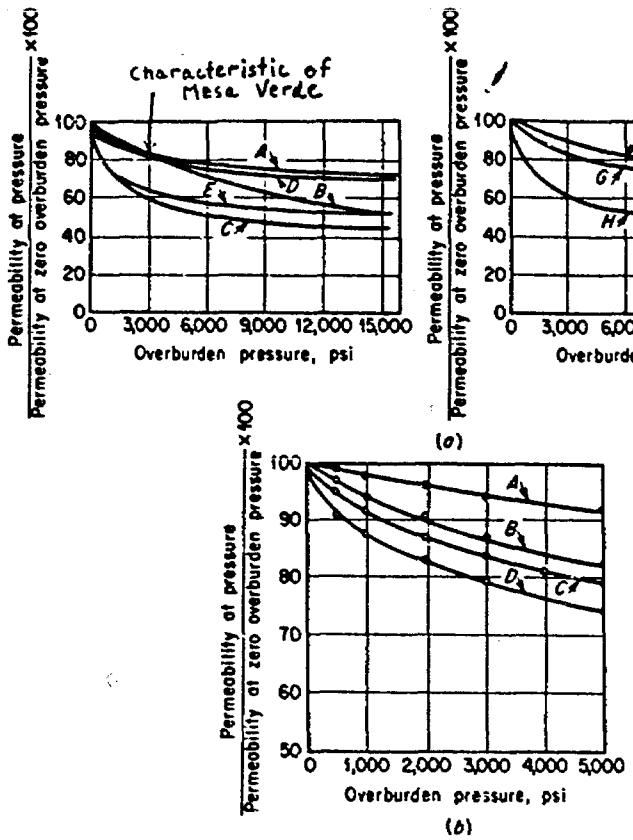


FIG. 2-46. Changes in permeability with overburden pressure. (a) Curve *A*—Colorado; 3.96 millidarcys; *B*—Southern California coast, 40.9; *C*—San Joaquin Valley, Calif., 45.0; *D*—Arizona, 4.36; *E*—Arizona, 632; *F*—San Joaquin Valley, Calif., 40.5; *G*—San Joaquin Valley, Calif., 55.5; *H*—Southern California coast, 318.8. (b) *A*—basal Tuscaloosa, Miss., 229 millidarcys, 15 per cent porosity; *B*—basal Tuscaloosa, Miss., 163, 24; *C*—Southern California coast, 335, 25; *D*—Los Angeles basin, Calif., 110, 22. (*From Fatt and Davis.*[20])

From Petroleum Reservoir Engineering
by AMYX, Bass & Whiting,
page 96

EXHIBIT 7
NATURAL FLOW RATES (C. 1958)
BLANCO MESA VERDE FIELD

Lease and Well No.	Rate (MCFPD)
Jicarilla 'D' #7	12
Jicarilla 'D' #8	69
Jicarilla 'F' #4	258
Jicarilla 'F' #5	7
Jicarilla 'F' #6	32
Jicarilla 'F' #7	44
Jicarilla 'G' #5	293
Jicarilla 'G' #7	7
Jicarilla 'G' #8	15
Jicarilla 'H' #7	325
Jicarilla 'H' #8	7
Cheney Federal #2	11
Featherstone Fed. #1	865

Average Rate = $\frac{\text{1955 MCFPD}}{\text{13 wells}}$ Total = 150 MCFPD

Jicarilla 'G' #6	2083 *
Jicarilla 'E' #5	11,690 *

* See discussion for explanation

EXHIBIT 8

REPORT OF LABORATORY ANALYSIS — FIELD SAMPLE

Form X-6572

Magnolia Petroleum Company

Container No. A042 Analysis No. 12089
Container Pressure 570 psia @ 70 °F. (Field)
480# @ 90 °F. (Lab.)
Date Sampled 5-20-58
Stream Sampled Separator Liquid
Volume of Stream Sampled 3.21 bbls/day (stock)

Lease Name Jicarilla "H" Well No. 1 M.V.
District Lea State New Mexico
Operator Magnolia Petroleum Co.
Field Blanco Mesaverde County Rio Arriba
Sand Mesaverde Depth 5386-5880
Well Depth 5900' Perf. 5380-5880 Shots 6/ft.

Sample Requested by R. D. Myers Submitted by Lee E. Robinson Analyzed by Peters & Willbanks - 6-11-58

FIELD TESTS AND OPERATING DATA:

Pressures: Bottomhole		Temperatures: Bottomhole	
Shutin Casing		Flowing Wellhead	70 est.
Shutin Tubing	1039	Heater Inlet	none
Flowing Tubing	570	Heater Outlet	none
Flowing Casing		Primary Sep. Gas	70
Primary Separator	570	Primary Sep. Oil	70
Secondary Separator	20	Meter Run	70
Stock Tank	Atm.	Stock Tank	55
		Atmospheric	75

Choke Sizes: Tubing none Casing none Heater none

Production Rate: Primary Sep. Gas 486 MCF/D Ratios: Sep. Gas/Sep. Water 48.6 MCF/bbl. est.
Primary Sep. Oil — Sep. Gas/Stock Oil 151.4 MCF/bbl
Primary Sep. Water 10 bbl/day (est) Sep. Gas/Stock Water —
Stock Tank Oil 3.21 bbl/day Sep. Gas/Sep. Oil unknown
Stock Tank Water none Overall Gas/Liquid —

Potential Rates: Gas 5,731 mcf/day pilot Allowable Rates: Gas —
Oil — Oil —

Disposition Production: Gas Pan. NM pipeline Oil tank truck

Field Tests: Charcoal 30-32 ____ GPM Air ____ % Gas Gravity ____
0-32 ____ GPM CO_2 ____ % Oil Gravity ____ @ ____ °F.
0-60 ____ GPM H_2S ____ Gr./100 pH Water ____

Gas Measurement: Method Orifice Meter Pressure Base 14.65
Sample Method Gas displacement. Liquid Outage ____

REMARKS: ____

LABORATORY REPORT:

Component	Mol. %	Vol. %	Content GPM	Vapor Press.
Hydrogen Sulfide				
Carbon Dioxide				
Nitrogen				
Air				
Methane	11.19	4.84		
Ethane	7.41	4.82		
Propane	10.09	7.09		
i-Butane	3.98	3.32		
n-Butane	8.90	7.17		
i-Pentane	6.92	6.47		
n-Pentane	6.50	6.01		
Hexanes (+)	45.01	60.28		
TOTAL	100.00	100.00		

ENGLER: IBP 90 °F. 70% 351 °F.
5% 112 80% 537
10% 126 90% ____
20% 150 95% ____
30% 176 EP 674
40% 198 Rec. 86.5 %
50% 226 Res. 9.5 %
60% 267 Loss 4.0 %

Residue Data: °API Gravity @ 60°F ____
Mol. Wt. 123.913 Reid Vapor Pressure ____
CF/Gal. 19.115
Gal./Mol. 19.880 26/70 Equiv. ____
°API 57.5 Burrell: Air ____ %
Calc. VP 2.14 CO_2 ____ %
Companion Samples ____

REMARKS:

To: L. E. Robinson (2)

cc: RDM ML CTE IBS KEC BCB WS file

Signed G. E. McIver for E. L. Stovall/esn Date 6/30/58

BLANCO MESAVERDE

ECONOMIC ANALYSIS

1-21-81

Present Gas Price 103

Tight Gas Price 107

PAYOUT (YRS.)

10
8
6
4
2
0

PROFIT INVESTMENT RATIO ($/$)

3.0
2.0
1.0
0

RATE OF RETURN (%)

100
80
60
40
20
0

200 400 600 800 1000 1200

ULTIMATE RESERVES (MMCF)

BEFORE EXAMINER STAMETS
OIL CONSERVATION DIVISION
EXHIBIT NO. B
CASE NO. 7744
Submitted by NMOCD
Hearing Date 2-11-81

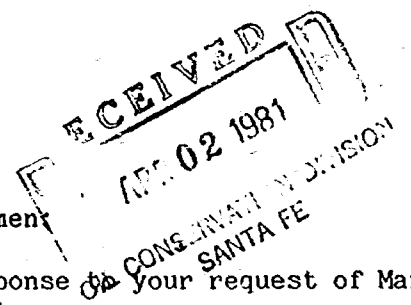
Mobil Producing Texas & New Mexico Inc.

March 27, 1981

NINE GREENWAY PLAZA-SUITE 2700
HOUSTON, TEXAS 77046

State of New Mexico Energy & Minerals Dept.
Oil & Gas Division
P. O. Box 2088
Santa Fe, New Mexico 87501

Attention: Mr. Richard L. Stamets
Technical Support Chief



7.01 MOBIL PRODUCING TX. & N.M., INC.
HEARING DATA - APPLICATION FOR
TIGHT GAS FORMATION
BLANCO MESA VERDE POOL
RIO ARRIBA COUNTY, NEW MEXICO

Gentlemen:

In response to your request of March 25, 1981 to Hap Weaver, we attach the following.

Three copies of the Subject Hearing Data together with a stamped and addressed mailer to FERC.

A copy of the subject Hearing Data for your use.

Four prints of a section (Mesa Verde) type log of a typical well. The log is marked Top MV, Base MV. Also shown on the log are the three zones The Cliff House, The Menefee and the Print Lookout which make up the Mesa Verde Formation.

The average depth to the top of the Mesa Verde Formation is 5563'. This average was based on depths of 25 wells in the Hearing area.

The Hearing Data Folder contains Exhibit "B" the Economic Analysis you requested.

I believe this is all the data you requested, if not or if additional data are required please advise.

Yours very truly,

J. A. Morris

HFWeaver/lcc

J. A. Morris
Regulatory Engineering Supervisor

Attachments

cc: Mr. Jim Sperling

Mobil Producing Texas & New Mexico Inc.

NINE GREENWAY PLAZA - SUITE 2700
HOUSTON, TEXAS 77046

March 5, 1981

State of New Mexico
Energy & Mineral Department
Oil Conservation Division
P. O. Box 2088
Santa Fe, New Mexico 87501

Attention: Mr. Richard L. Stamets
Technical Support Chief

7.01 MOBIL PRODUCING TX & N.M., INC.'S APPLICATION FOR TIGHT GAS FORMATION DESIGNATION BLANCO MESA VERDE POOL RIO ARRIBA CO., NEW MEXICO DOCKET NO. 5-81 CASE NO. 7154

Dear Sir:

In response to your letter dated February 24, 1981, requesting supplementary information concerning the economics of Blanco Mesa Verde wells completed after January 1, 1978, we are providing the following information.

	Jicarilla 'E' #2A		Jicarilla 'H' #4A	
		D NW 14-27N-3W		P SE 1-26N-3W
Initial cost (M$)	402	Spud 11-2-78	357	Spud 10-22-78
Est. Ultimate reserves (MMCF)	100	Tested AOF 1860 MCF 1-16-79	0	
Life (yrs.)	11		0	Dry hole
Est. Net cash recovery (M$)	-90		-193	
Rate of return (%)	0		0	
Pay out (yrs.)	-		-	
Est. Profit/Investment ratio ($/$)	-0.23		-0.54	

The above information shows that these wells were not an economic success at current gas prices, nor would they be at tight gas prices. (NOTE: March, 1981 Section 103 gas price is $2.406 per million BTU).

The remaining undeveloped acreage on MPTM's Jicarilla Leases should yield higher recoveries than the above wells, but will likely yield less than 500 MMCF/well.

Yours very truly,

J. A. Morris

J. A. Morris
Regulatory Engineering Supervisor

RCH/lj

cc: Jim Sperling - Albequerque, N.M.
Gene Daniel - USGS, Box 26124, Albequerque, N.M. 87125

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
DIVISION FOR THE PURPOSE OF
CONSIDERING:

CASE NO. 7154
Order No. R-6678

APPLICATION OF MOBIL PRODUCING TEXAS
AND NEW MEXICO, INC. FOR DESIGNATION
OF A TIGHT FORMATION, RIO ARRIBA
COUNTY, NEW MEXICO.

ORDER OF THE DIVISION

BY THE DIVISION:

This cause came on for hearing at 9 a.m. on February 11, 1981, at Santa Fe, New Mexico, before Examiner Richard L. Stamets.

NOW, on this 4th day of May, 1981, the Division Director, having considered the testimony, the record, and the recommendations of the Examiner, and being fully advised in the premises,

FINDS:

(1) That due public notice having been given as required by law, the Division has jurisdiction of this cause and the subject matter thereof.

(2) That the applicant, Mobil Producing Texas and New Mexico, Inc., requests that the Division in accordance with Section 107 of the Natural Gas Policy Act, and 18 C.F.R. §271.703 recommend to the Federal Energy Regulatory Commission that the Mesaverde formation underlying the following lands situated in Rio Arriba County, approximately 30 miles south of the city of Dulce, New Mexico, hereinafter referred to as the Mesaverde formation, be designated as a tight formation in said Federal Energy Regulatory Commission's regulations:

TOWNSHIP 26 NORTH, RANGE 2 WEST, NMPM
Section 7: Lot 4
Section 8: NE/4 and S/2
Sections 17 and 18: All
Section 19: Lots 1, 2, and 3

TOWNSHIP 26 NORTH, RANGE 3 WEST, NMPM
Sections 1 and 2: All
Sections 11 through 14: All
Sections 23 and 24: All

TOWNSHIP 27 NORTH, RANGE 3 WEST, NMPM
Sections 11 through 14: All
Section 15: S/2
Sections 22 through 27: All
Sections 35 and 36: All

(3) That the area proposed for tight formation designation lies within the horizontal limits of the Blanco Mesaverde Gas Pool as previously defined and described in San Juan and Rio Arriba Counties, New Mexico.

(4) That the area proposed is an isolated sand development separated from the main body of the Blanco Mesaverde reservoir.

(5) That there is additional acreage within the horizontal limits of this isolated sand body including at least the following:

TOWNSHIP 26 NORTH, RANGE 2 WEST, NMPM
Section 6: All
Section 7: Lots 1, 2, and 3
Section 19: Lot 4
Section 20: W/2

TOWNSHIP 26 NORTH, RANGE 3 WEST, NMPM
Section 3: E/2
Section 10: E/2
Section 15: E/2

TOWNSHIP 27 NORTH, RANGE 3 WEST, NMPM
Sections 9 and 10: All
Section 16: E/2
Section 21: E/2
Section 28: E/2
Section 34: All

(6) That there is no evidence of significant geologic difference between the Mesaverde formation underlying the lands described in Findings Nos. (2) and (5) above and the entire area should be considered in any recommendation to the FERC.

(7) That the Mesaverde formation underlies all of the above-described lands; that the formation consists of two 40 to 100 foot thick sand intervals (the Cliff House and the Point

Lookout) separated by approximately 300 feet of shale which may contain thin sandstone layers; that the top of such formation is found at an average depth of 5563 feet below the surface of said area.

(8) That the type section for the Mesaverde formation for the proposed tight formation designation is found at a depth of from approximately 5484 feet to 6018 feet on the Induction Electric log of the Mobil Jicarilla "H" Well No. 7A located in Unit O of Section 1, Township 26 North, Range 3 West, NMPM, run on July 15, 1976.

(9) That the Mesaverde formation underlying the above-described lands has been penetrated by numerous wells at least 69 of which produce or have produced gas therefrom.

(10) That 24 infill wells have been drilled to the Mesaverde formation underlying the above-described lands 22 of which are or were producers therefrom.

(11) That the designation of a tight formation is not necessary for development of those proration units already fully developed by successful infill drilling.

(12) That any tight formation recommendation in this case should apply only to proration units not developed and/or not developed by an infill well capable of production on or before February 11, 1981, such acreage being as described on Exhibit "A" attached hereto.

(13) That the evidence presented in this case demonstrated that the predominant percentage of wells which may be completed in the Mesaverde formation within the undeveloped areas of the proposed tight formation may reasonably be presumed to exhibit permeability, gas productivity, or crude oil productivity not in excess of the following parameters:

(a) average *in situ* gas permeability throughout the pay section of 0.1 millidarcy; and

(b) stabilized production rates, without stimulation, against atmospheric pressure, as found in the table set out in 18 C.F.R. §271.703(c)(2)(B) of the regulations; and

(c) production of more than five barrels of crude oil per day.

(14) That the evidence presented in this case demonstrated that the application of incentive pricing is reasonably necessary to stimulate further development in that portion of the proposed tight formation area described on Exhibit "A" to this order.

(15) That existing State of New Mexico and Federal Regulations relating to casing and cementing of wells will assure that development of the Mesaverde formation will not adversely affect any overlying aquifers.

(16) That the Mesaverde formation within the area described on Exhibit "A" to this order should be recommended to the Federal Energy Regulatory Commission for designation as a tight formation.

IT IS THEREFORE ORDERED:

(1) That it be and hereby is recommended to the Federal Energy Regulatory Commission pursuant to Section 107 of the Natural Gas Policy Act of 1978, and 18 C.F.R. §271.703 of the regulations that the Mesaverde formation underlying those lands in Rio Arriba County, New Mexico, described on Exhibit "A" to this order, be designated as a tight formation.

(2) That jurisdiction of this cause is retained for the entry of such further orders as the Division may deem necessary.

DONE at Santa Fe, New Mexico, on the day and year hereinabove designated.

STATE OF NEW MEXICO
OIL CONSERVATION DIVISION

JOE D. RAMEY
Director

S E A L

fd/

CASE NO. 7154
ORDER NO. R-6678
EXHIBIT "A"

TOWNSHIP 26 NORTH, RANGE 2 WEST, NMPM
Sections 6 and 7: All
Section 17: E/2
Sections 18 and 19: All

TOWNSHIP 26 NORTH, RANGE 3 WEST, NMPM
Section 3: E/2
Section 10: E/2
Section 12: E/2
Sections 13 and 14: All
Section 15: E/2
Sections 23 and 24: All

TOWNSHIP 27 NORTH, RANGE 3 WEST, NMPM
Section 9: All
Sections 11 through 13: All
Section 14: E/2
Section 15: S/2
Section 16: E/2
Section 24: All
Section 25: E/2
Section 28: E/2
Section 34: E/2
Section 36: S/2

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION
STATE LAND OFFICE BLDG.
SANTA FE, NEW MEXICO
11 February 1981

EXAMINER HEARING

IN THE MATTER OF:

Application of Mobil Producing Texas and New Mexico, Inc., for designation of a tight formation, Rio Arriba County, New Mexico.

CASE 7154

BEFORE: Richard L. Stamets

TRANSCRIPT OF HEARING

A P P E A R A N C E S

For the Oil Conservation Division:

Ernest L. Padilla, Esq.
Legal Counsel to the Division
State Land Office Bldg.
Santa Fe, New Mexico 87501

For the Applicant:

James E. Sperling, Esq.
MODRALL, SPERLING, ROEHL, HARRIS, & SISK
P. O. Box 2168
Albuquerque, New Mexico 87103

A P P E A R A N C E S

For Northwest Pipeline Corporation:

William F. Carr, Esq.
CAMPBELL, BYRD, AND BLACK
Jefferson Place
Santa Fe, New Mexico 87501

I N D E X

E X H I B I T S

MR. STAMETS: We'll call next Case Number 7154.

MR. PADILLA: Application of Mobil Producing Texas and New Mexico, Inc., for designation of a tight formation, Rio Arriba County, New Mexico.

MR. SPERLING: James E. Sperling, Albuquerque, New Mexico, appearing for the applicant, Mobil.

We have one witness.

MR. CARR: William F. Carr, with the law firm Campbell, Byrd, & Black, Santa Fe, appearing on behalf of Northwest Pipeline Corporation.

We do not intend to call a witness.

(Witness sworn.)

RAYMOND C. HOFFMASTER

being called as a witness and being duly sworn upon his oath, testified as follows, to-wit:

DIRECT EXAMINATION

BY MR. SPERLING:

Q. Mr. Hoffmaster, have you on any prior occasion testified before the Oil Conservation Division so that your qualifications are a matter of record?

A. No, sir.

Q. That being the case, would you please give us a brief description of your educational and experience background with respect to your profession?

A. I graduated from Texas A & M with a BS in geological engineering in 1974.

I was employed by Mobil immediately out of school. I worked as a field engineer for 4-1/2 years; was transferred to our company office in Houston as a reservoir engineer, where I spent the last year and a half, with responsibility of fields in New Mexico and West Texas.

Q. Have you had in addition to your educational and experience background any other experience in the oil fields that would enhance your qualifications?

A. Yes, I'm a Registered Professional Engineer in the State of Texas.

MR. SPERLING: Are the witness' qualifications acceptable?

MR. STAMETS: They are.

Q. Mr. Hoffmaster, would you tell us briefly the purpose of the application filed by Mobil in this matter?

A. Well, Mobil would like to submit an application to designate the Mesaverde Pool under certain sections as a tight formation. We believe that we can --

that the guidelines established by FERC Order Number 99 can be proved to -- in the Mesaverde formation.

Q. This application relates to the Blanco Mesaverde Pool in northwest New Mexico?

A. Yes.

Q. Would you give us a very brief description of the geology encountered in the Mesaverde Pool with which this -- a portion of which this application is concerned?

A. Well, the --

Q. You're referring now to Exhibit Number One?

A. Yes, I am. Okay, the -- we believe that this is a separate sand body located to the east of the Blanco Mesaverde main pool. It's delineated by dry holes surrounding this area, and we believe it to be a separate sand body that has producing characteristics that are not similar to the Blanco Mesaverde.

We believe it to be a near shore bar type deposit, whereby the center part of the sand body is the thickest, the most permeable. As the sand thins out on to the east or to the west, we believe that the permeability decreases.

Q. It might be well at this time, Mr.

Examiner, to for the record describe the method in which we have identified the exhibits which are to be before the Examiner in this matter.

With the application we have submitted a bound booklet which contains essentially all of the exhibits which support the application. In addition to that, the same bound booklet has been marked for identification here at this hearing as Exhibit A, with Exhibits numbered respectively within Exhibit A, One through Thirteen.

With that explanation, would you now refer to what's been marked for identification as Exhibit Two of A?

A. Okay. Exhibit Two is a cumulative production map. We have plotted cumulative production of wells that were completed in the mid to late '50s.

As you can see in Section 36, Township 27, Range 3 West, that is a sweet spot whereby we have had the highest cumulative production. As you trend in either direction, the cumulative productions decrease and as you approach the wells that were dry holes surrounding this field, that the production stops.

Q. Now the colored area, or the outlined area, represents the approximately 13,000 acre area which is designated in the application as the area which Mobil seeks

to have designated as tight formation area?

A. Yes.

Q. All right. Would you now refer to what has been marked as Exhibit Three and explain the purpose of that exhibit and what it shows?

A. Okay, Exhibit Three --

Q. This is in the bound volume?

A. Yes.

MR. STAMETS: What page is that on?

MR. SPERLING: Five.

A. Page five.

MR. STAMETS: Thank you.

A. Okay, Exhibit Three is a table of after frac permeabilities that were calculated from bottom hole pressure buildups run in 1975 and '76.

The calculated permeabilities were averaged and it was found that the average was .146 millidarcies.

We want to point out that these were after frac permeabilities and that they are higher than would be expected if a -- if the well was not stimulated.

Q. This represents an average after fracture treatment for eleven wells?

A. Yes, sir.

Q. Do you have any further comment on Exhibit Three?

A. We'll attempt to prove later that -- exact to what degree an increase in permeability is caused by fracturing.

Q. All right. Would you refer to Exhibit Four and explain the nature and purpose of that exhibit?

A. Okay. Exhibit Four identifies a typical analysis used in determining the permeability based on the Horner plot.

Q. This exhibit identifies the Jicarilla G No. 1-A Well as the subject of this collection of pressure and production data, is that correct?

A. Correct.

Q. Can you locate that well on Exhibit One for us, or any of the other exhibits that you've already referred to? Perhaps Two would be more appropriate.

A. Okay.

MR. STAMETS: It's the well in the southeast quarter of Section 35 of 27 North, 3 West?

A. Okay, yes, it's in the southeast quarter of Section 35, T 27 North, Range 3 West.

MR. STAMETS: Go ahead.

A. I'd like to mention also that this type

of calculation is a standard in the industry for determining the accurate in situ permeability.

Q. These data were collected over a period of 165 hours?

A. Yes.

Q. Okay. Is the exhibit which is numbered Four and appears on page six a part of the calculation, or at least an application of the data that's shown on page six?

A. Yes, it is. It's a plot of the bottom hole pressure versus T plus delta T over delta T.

Q. How about the intervening page?

A. Yes, that's a summary of the calculations involved.

Q. This on page six is the actual calculation which was performed by you arriving at the conclusions which are stated in the exhibit?

A. Yes. As we can see here, the permeability was .063 millidarcies, which is less than .1 millidarcy requirement, and this is even after fracing the well.

Q. Would you now refer to what's been marked as Exhibit Five and explain the purpose of that exhibit?

A. Exhibit Five is another permeability

calculation based on a Horner plot, similar to Exhibit Four, but on the Jicarilla H-2 No. A.

Now this well was also fraced and we calculated a permeability of .262 millidarcies.

Q. Can you locate that well for us on an exhibit?

A. This well is located in the southeast quarter of Section 2, T 26 North, Range 3 West.

Q. The data collected is essentially the same as that with reference to Exhibit Four except that it relates to another well?

A. Yes.

Q. And this is true of the plot which appears as a part of this exhibit, that simply puts in graph form the data collected on the first page of the exhibit?

A. Yes.

Q. Okay. Exhibit Five-A has been identified in the booklet. Would you refer to that and explain the purpose of the data collected there?

A. Okay. The table you see, or the figure on the page, is taken out of the SPE Monograph Volume 1, Pressure Buildup and Flow Tests in Wells, page 108, and it correlates permeability that has been calculated after fracing to the permeability that is in a pre frac condition.

If you'll notice on subsequent pages on Exhibit Five-A, that we involve our calculations of determining the fracture length based on the volume of -- of sand that we are to use in the fracture.

The calculated fracture length was 1000 feet, which is in this equation identified on the bottom of page 8 as X_f, and X_e is determined to be one-half the length of your drainage radius, or your drainage area, which in this case is 160 acre square, and this is calculated to be 1320 feet.

Now if you divide this X_f by X_e you get a fracture penetration equal to .76.

Now if you follow the axis here at .76, bring it up to this curve and then carry it across to the left to intersect the axis for the ratio of true permeability divided by apparent permeability, we see that this intersects it at .28.

So if you multiply .28 by the permeability that was measured, we get that the true permeability before fracturing was .0734 millidarcies.

Q. Is this a recognized method of determining pre frac permeability?

A. It's been recognized by SPE and included in their monograph.

Q. Do you have any other comments about any portion of Exhibit Five or its parts?

A. We have a cost breakdown for this particular well.

If you'll notice on the perforating and stimulation column, the cost would be --

Q. This would be the exhibit immediately following Five-A and designated Mobil Oil Corporation, Well Cost Statement?

A. Yes. As you can see in the column of perforating and stimulation that the cost for this fracturing was roughly 1/2 the total cost of drilling the well.

Q. Does that represent the cost of carrying out the frac plan which appears on the previous page, the page previous to the Well Cost Statement?

A. Yes, it does. We fractured with 450,000 pounds of sand.

MR. STAMETS: Are these actual figures based on 1976?

A. Yes, this is 1976 figures.

MR. STAMETS: You would have a substantial increase in essentially everyone of these costs in today's dollar figures.

A. That's correct.

Q. Would you classify this fracture treatment as a massive treatment?

A. Yes, I would.

Q. Would you say that this treatment was typical of the treatment required or at least utilized in connection with the completion of the other wells?

A. In the early days of fracturing technology was limited. They basically fraced with just water and sand and the amount of sand put away was considerably less, and this is a new method of fracturing. We believe it can increase considerably the amount of gas to be recovered.

Q. But it is expensive.

A. But it is expensive.

Q. Would you now refer to what's been marked as Exhibit Six and describe the information contained on that exhibit and its purpose?

A. Exhibit Six is a summary of hole core permeability analysis. These are usually compiled by a company such as CORE Lab, whatever, to determine permeabilities in a qualitative manner rather than a quantitative manner.

The method usually is by taking one core per foot of hole core and extracting the core so that all the liquids are out and injecting air into it to determine the permeability.

Now these are noted for being higher than what is actually measured in the formation, mainly due to liquids that are present, your interstitial water saturation and the other fluids that may be in the core, which will reduce the permeability.

The table listed in Exhibit Six shows the reduction of permeability due to compaction. If you look at the upper lefthand graph, you'll notice an 80 percent permeability reduction due just to compaction and it can be applied to permeabilities that are taken off of the core analysis. As you can see, this has reduced the in situ permeabilities.

However, even these permeabilities are higher for the reason I mentioned beforehand.

Another reason for -- like H-7 of .216 --

Q. You're referring now to Well H-7?

A. Okay, this --

Q. Is that correct?

A. Yes, Well H-7. The number of samples taken was only 28 and this was taken out of one portion of the total core, and if all the core had been analyzed and averaged, it would have been a lot less.

So in essence, this is really not accurate as determining permeability, but it's showing that it's

loweven though -- even with, you know, the standard core analysis, and well, it's just kind of qualitative rather than quantitative.

Q. The source of the information which is shown in the middle of the page, I presume is Petroleum Reservoir Engineering by AMYX, is that right?

A. AMYX.

Q. AMYX, okay. Is that a recognized treatise?

A. Yes, this is the reservoir engineering book that's used at Texas A & M and elsewhere.

Q. Would you refer to what has been marked as Exhibit Seven and describe the information contained on that exhibit and its purpose?

A. Exhibit Seven lists a summary of all the pre frac flow rates that have been compiled for the Jicarilla leases. Most of these were taken in the 1950's.

If you were to average these first group, it averages 150 Mcf per day, which is less than the 188 Mcf per day requirement for formations found at this depth.

Q. Now what requirements are you referring to?

A. That's the FERC requirements whereby it states a pre-stimulation production rate to atmosphere of

formations whose tops are between 5500 feet and 6000 feet may not exceed 188 Mcf per day.

Q. Okay. And that reference is to FERC Order Number 99?

A. Yes.

Q. Would you refer to what's been marked as Exhibit Eight and describe the information contained on that exhibit and the source of the information?

A. Exhibit Eight is a laboratory analysis of the field sample taken from Jicarilla "E" No. 1 in 1958.

This exhibit identifies the flow rates that were found and also a component analysis of the liquid hydrocarbons.

As you can see, the GOR is 151,000. We obtained 3.21 barrels per day of liquids out of a flow rate of 486 Mcf per day, and we believe that this is a condensate and not an oil and also that its production rate is less than 5 barrels per day, which satisfies another requirement from FERC Order Number 99, which states that the pre-stimulation oil rate shall not exceed 5 barrels of oil per day.

Q. In view of your last comment, would you now refer to what's been marked as Exhibit Nine, which is a plat of average daily oil production, and I'll ask you if that plat shows the area colored in yellow, which is the

subject of the application, and would you then explain the additional data contained on the exhibit?

A. Okay. This is a plot of old production rates that were averaged throughout the life of the field. We took the cumulative production of liquid hydrocarbons divided into the total gas that was produced to obtain this average, and then it was plotted on contours of equal daily rate.

I would like to point out that we believe that this is a condensate, that it is in a gas form in the reservoir, and it becomes liquid through reduction of pressure and temperature at the surface.

Q. Now the exhibit identifies, and you have identified it as average daily oil production. For what period or during what interval of time?

A. This is calculated from the initial potential through the present day.

Q. For all wells?

A. For all wells that are listed here, yes. I believe we got them all.

Q. Over the total life of the well?

A. Yes, sir.

Q. And what conclusions do you draw from that information with respect to oil production in light of

the guidelines contained in Order 99?

A. Well, we have very limited data as to the initial fluid production rate and the best we could do is come up with a daily average throughout the life of the field.

But we'd like to mention that this is not an oil. It's a condensate, as stated before, and that we satisfy the requirements, both that the average if less than five barrels per day and the fact that it's not an oil to begin with.

Q. Does the information contained on Exhibit Eight indicate the gravity, the API gravity of the fluid?

A. Yes, down on the lower righthand corner we have API gravity of 57.5 degrees.

Q. Does that reinforce your conclusion that this is a condensate?

A. Yes, sir.

Q. Would you now refer to what's been marked as Exhibit Ten and explain the purpose of that exhibit?

A. Exhibit Ten is a plot of the initial pre frac rates that we had previously tabulated, just showing their locations.

Q. Now does Exhibit -- underneath each of the wells show the pre frac flow rate that is shown on the

previous exhibit?

A. Yes.

Q. And these rates appear to encompass the north/south and east to west of the majority, or at least a substantial number of the wells within the area which is the subject of the application, right?

A. Right.

Q. Would you refer to Exhibit Eleven and describe the exhibit and what's shown on it? And what its purpose is?

A. Exhibit Eleven is an east/west cross section which shows the formations that make up the MesaVerde.

Q. Would you identify the line of section, please?

A. This is the line designated A-C.

Q. Well, on the map, for example, Exhibit Ten. It's a little hard to read on the cross section itself.

A. Okay, the line extends through our Jicarilla leases, or lease H, which is the southern half of Section 11 and 12 of T26 North, Range 3 West; also encompassing Section -- the southern half of Section 10 and crossing over due west to Section 12 of T 26 North, Range 4 West.

MR. STAMETS: I believe it's Section

17.

A. Pardon?

MR. STAMETS: I believe that's Section 17.

A. Okay, I was giving the western extension of this line.

MR. STAMETS: Oh, I'm sorry. I was looking to the east.

Q. Well then the line of section runs -- begins approximately four or five miles to the west of the area designated on the exhibit and in the application, and extends to the east of that area, is that correct?

A. Yes.

Q. And what conclusions do you draw from the cross section with respect to information essential to consideration of the application?

A. Okay, in the -- starting in the west we have Southland's Jicarilla 101 No. 8, which potentialed in the Mesaverde for 3.2-million a day.

Now if we follow this section line due east, we notice that Consolidated Oil and Gas Jicarilla No. 1-10 was a dry hole in 1963. This is in the southwest -- southwest quarter, I believe, of Section 10, T 26 North, Range 3 West. We believe that this identifies the western

limit of the field delineated by dry holes.

And as we move again to the east we have our Jicarilla H No. 8, potentialed for 4.8-million per day, and then going to our Cheney Federal No. 2, which potentialed for 5.2-million a day. And these are all post frac rates.

Q. The Cheney Federal is in Section 8?

A. No, it's in Section 17.

Q. 16?

A. 17, T 26 North, Range 2 West.

Q. Okay.

A. It's the easternmost point of the cross section.

Q. That's in the southeast -- the southwest quarter of the southwest quarter of 17.

A. Yes, sir.

Q. All right. Do you have anything further on Exhibit Eleven?

A. No, sir.

Q. Would you refer to Exhibit Twelve and describe the information contained on that exhibit and its purpose?

A. This map has spotted all the Mesaverde completions and also Pictured Cliffs completions in the area. The numbers indicate the present gas production in

Mcf per day attributed to each well.

Q. Now the figure, we'll say in Section 35 in Township 27 North, Range 3 West, the well designated as the No. 3 Jicarilla G, is the figure to the left of the well the Pictured Cliffs production?

A. Yes, sir.

Q. And to the right the Mesaverde production?

A. That's correct.

Q. Okay, present production.

A. Yes.

Q. Can you describe for us what conclusions you draw from a comparison of the current daily production rates with respect to the north, south, east, or west areas with particular regard to future development?

A. Well, as can be seen, the wells to the east and west flanks have low daily productions, which correspond to their low cumulative productions that have been obtained from these wells.

Q. Anything else?

Would you now refer to Exhibit Thirteen and explain that exhibit?

A. Exhibit Thirteen is a structure map contoured on the top of the Cliff House formation, I believe, showing the general trend in the area and the location of

our subject leases in comparison.

Q. And this is contoured based upon correlative points on logs or how did you arrive at the --

A. Yes, they're contoured on tops that were located in each -- in each well on the electric logs.

Q. With a common point that is the top of the Point Lookout as the point of reference?

A. The Cliff House.

Q. Cliff House? That's a member of the Mesaverde formation?

A. Yes, the uppermost member.

Q. I want to now call your attention to what's been marked as Exhibit B for the purposes of identification of this hearing and ask you to explain that exhibit and what it is intended to show.

A. This Exhibit B is a plot of profit indicators that -- a result of P & L analysis that were run using various reserves and typical drilling costs, and it shows the first -- the lower one is the rate of return. You notice that anything under 400-million a day at present prices is totally uneconomical to produce.

You see a profit investment ratio of zero, which is a break even condition and we do not believe at the current prices that reserves of this magnitude are

worth drilling for.

Q. Are the ultimate reserves shown at the bottom of the graph intended to reflect any reserve calculation that you have made with respect to undeveloped acreage or is that assumed reserve figures?

A. These are just tentative reserve figures to -- as points on the plot.

Q. Okay. And the two plots show the present gas price being received for production in the field versus the presently prevailing tight gas price permitted under the FERC regulations, right?

A. Yes.

Q. Based upon the information which you've compiled in the form of these exhibits, and your testimony, what conclusions have you reached with respect to the qualification of the area designated in the application as a tight gas formation under the prevailing regulations involved?

A. We believe that we have satisfied all three of the requirements; the requirement that the in situ permeability be less than .1 of a millidarcy; that the production rate for formations of this depth not exceed 188 Mcf per day average; and a pre-stimulated rate -- or condition to atmosphere permit the oil production rate not exceed 5 barrels per day.

I'd like to point out Exhibit Two once more in relation to Exhibit B.

Q. That is cumulative gas exhibit?

A. Yes. Okay, as we stated earlier in Exhibit B, that under the present prices anything under 400-million per day total recovery is uneconomical.

We can see from the cumulative production map that the contour 500 Mcf and on to the zero production rate, we see an area that is basically the undeveloped area that we wish to develop, and the average, you might say it would be 250 Mcf in that whole area.

So based on the current prices we cannot develop this acreage any further until we would receive some price incentive.

Q. Are you designating generally the area to the northeast of the exhibit?

A. Yes, Sections 13, 24, and a few locations in 25 and 36, in T 27 North, Range 3 West.

Q. Okay.

Well, I take it, then, that in your opinion the granting of the application, that the result price application would result in the recovery of otherwise economically unrecoverable reserves?

A. Yes, sir.

Q. Based upon that do you feel that the granting of the application would be in the best interest of conservation?

A. Yes, sir.

Q. Do you have anything further with respect to any of the exhibits or any other ccmments?

A. I don't believe so.

MR. SPERLING: We'd like to offer Exhibits A, One through Thirteen, and Exhibit B at this time, Mr. Examiner.

MR. STAMETS: These exhibits will be admitted.

MR. SPERLING: That's all we have.

CROSS EXAMINATION

BY MR. STAMETS:

Q. Mr. Hoffmaster, you've indicated, I believe, that you feel that the -- this isolated reservoir is defined on the west side by dry holes, is that correct?

A. Yes, sir. And we believe somewhat to the east side, also, and to the north. There has been a dry hole in Section 36, Township 28 North, Range 3 West. Also in Section 32, T 28 North, Range 2 West; in Section 20 of T 27 North, Range 2 West; and we've had a number of uneconо-

mical wells that we have plugged subsequently in our Jicarilla H & D leases, which would be Section -- excuse me, the section 12, it would be the northeast quarter, our Jicarilla H-3 only produced 30-million; the Jicarilla D on Section 13 has produced 22-million, and have been plugged.

So we believe that we can fairly delineate an eastern pinchout, too.

Q. What about down at the southwest end? It looks like there's a possibility there that the pool might be continuous with the main body of the reservoir in Section 15, 26 North, 3 West?

A. There's a dry hole, not a dry hole but it only produced 6-million, in the Northwest Jicarilla No. 11, I believe, in the northeast quarter of Section 15, which you mentioned.

Q. Okay. Now there is some acreage in this isolated reservoir which is outside your yellow line. Why did you leave that acreage out?

A. This is a new development that we believe is isolated from this main pool that we're discussing.

Q. Well, I perhaps didn't explain myself. There's quite a bit of acreage which is between the zero contour line on Exhibit Two and the 500 contour line which is not included inside your yellow outline, and why did you

not include that acreage?

A. Oh, I see, on the west side?

Q. Yeah, correct.

A. Well, we had -- we did not have the production or the data that was available to us on this, and our acreage ends at -- just to the east of here on Section 35, 2, 11, going south, and we were just --

Q. Was there reason to believe that the evidence would be any different concerning that acreage, than the acreage within the yellow outline?

A. No.

Q. Now, referring to the final exhibit, the economic exhibit, what is the cost data based on in there? Is that based on recent drilling activity, your estimate of what well cost would be?

A. This is based on 1982 drilling cost and also prices that we estimate will be in effect then. We used this basically because we believe that before -- that the year would be out before we, all the parties involved would decide on this, you know, course of action concerning this, and we believe that really it's just a slight escalation and that even present prices will still reflect the same profit indicators.

Q. And you indicate that the two-year

payout would be appropriate for a well. Anything beyond two years you think would be a risky venture?

A. Well, we basically look at our profit investment ratio and rate of return rather than two-years payout.

Under current prices you could see that even at 600-million that the rate of return is only about 17 percent or so, which is significantly low.

And furthermore our profit investment ratio only yields approximately 40 cents, I believe, if the scale is right, on the dollar.

Q. Talking about 600 M -- or 600-million?

A. Yes.

Q. Well, I see. I was looking at the -- the situation with the tight --

A. I was looking at current prices.

Q. You were looking at current prices.

A. Yes.

Q. Okay. All right. I'd like to take a look at Exhibit Three, please.

You have a number of wells there. It looks like maybe a dozen and there are more wells than that inside the boundary of the area that you're proposing here. Is there any reason that you selected this group of wells

as opposed to another group or the entire group of wells?

A. These are the only wells where we had bottom hole pressure buildups.

Q. Okay. And on Exhibit Number Four you indicated a very poor permeability for that well even after a frac job, and that well does seem to be fairly close to a sweet spot in the pool. Is this an anomalously poor situation or is that going to be a good well also?

A. The data points I used on this Exhibit Ten, that you're referring to, were used only on wells that were completed in the '50s. I used -- did not use the infill wells and I don't have the data with me as to exactly what that well is producing now.

The reason for this was that wells that were completed in the '50s are basically depleted now and we believe that -- that cumulative production is just about all of the total reserves that they have, you know, they're almost depleted now, and infill wells, if they were used as data points, would not be representative and would really be meaningless.

Q. Now all of the exhibits that represent a map of the area show that some infill wells have been drilled at this time. Probably they're best displayed on Exhibit Twelve. At this time there would be no way, would

there, that we could designate acreage that's already been infill drilled as a tight sands reservoir?

A. Well, we have no further locations to develop. We believe that the entire area should be designated anyway, regardless of the fact that there is no future development in here, mainly because they were used as data, you know, in the reservoir determination.

Q. Are there any wells, infill wells, within the area that have been uneconomical or will be uneconomic wells?

A. Well, we have the Jicarilla H-4A was plugged. I believe that was a dry hole. That was an infill well. This was in Section 1, T 26 North, Range 3 West, in the southeast quarter.

As far as others, I cannot locate them. I believe here, this Jicarilla F-2A on the northeast quarter, excuse me, the northwest quarter of Section 27, T 27 North, Range 3 West, is -- will probably be also uneconomical.

Mainly we've developed as far as we could the best locations for infill development and the fact that we have not developed any further is because we believe that we have run out of economic locations based on current prices.

Q. What wells have you drilled in the last

couple of years in this area?

A. I believe we finished our infill work in 1976. We may have drilled one more,and I cannot recall which one it was, subsequent to that time, but the majority of the infill work was completed in 1976.

Q. So you had already determined before the NGPA came out that there were some locations in here that were not economic at that time.

A. That's correct.

Q. Are there any non-fractured potentials available in this area?

A. Fracturing is required on each well. We do it as a standard policy now to -- as soon as we set pipe, to perforate and fracture, because we -- we tried before to -- in the '50s to produce before fracturing and as tabulated here, our rates were below as required for economic recovery.

MR. STAMETS: Are there other questions of the witness?

Would you identify yourself for the record, please?

MR. BUCKINGHAM: Allen Buckingham, USGS. The Examiner has touched a lot of the USGS questions that we were going to ask, but with me this morning is Sue

Umschler, a petroleum engineer, and Robert Higgens, a geologist, and they have some specific questions to ask.

QUESTIONS BY MS. UMSCHLER:

Q. My first question is, do you have any evidence that would definitely indicate the areas to the east north, and south, do not meet the criteria that you illustrated for this hearing?

A. We have included in our application Mobil leases. As to whether there should be an extension or not, we are not objecting to extending the field limits.

Q. You don't have any evidence whether it would or would not meet the criteria?

A. No, we don't.

Q. Is it possible for you to obtain any information on those wells located outside of your boundary for the permeability and production criteria?

A. Generally we have a hard enough time finding our own data. As far as offset operators, I'm inclined to believe that they really have as limited data as possible, just, you know, other than completion data. I don't believe they probably performed too many buildup tests or anything else.

Q. And there's one -- there's a couple of

infill locations in Township 27, 3 West. If these infill locations have probable reserves of greater than 400 MMcf, would you develop those at current prices?

A. Which are the locations with which you are concerned?

Q. There's one in the southeast quarter of 15, Section 15.

A. Okay, in Township 26 --

Q. 27, 3.

A. 27, 3? Well, we would on a risk rate analysis, we would probably assume the recovery in there to be in the order of, maybe, four to -- close to 500-million, and at current prices this would be low economics to the point of not even considering.

MS. UMSCHLER: That's all my questions.

MR. STAMETS: Are there other questions of the witness?

MR. HIGGINS: Yes, sir.

QUESTIONS BY MR. HIGGINS:

Q. On your Exhibit One it's a boundary question. Looking at the main Mesaverde Pool, there is -- you have sort of an island on your map and on the eastern edge of the pool under consideration there are three or four

dry holes. But further east of that another operator has developed Mesaverde wells.

Could this not be a similar case where we have select spots where there is no production but the actual true boundary of this reservoir may well extend eastward or northward, southward, of the current boundary you have?

A. We are going strictly on dry holes that are around here as our limiting factor here to delineate this structure.

Anything in between these dry holes is open for conjecture.

Q. That's my point, that it's not conclusive in all of these areas. There's a limited number of dry holes to delineate the boundaries established here.

A. Right.

MR. HIGGINS: No more questions.

RECROSS EXAMINATION

BY MR. STAMETS:

Q. I presume Mobil would have no objection if we decided to take in a little more acreage than what you have proposed.

A. No.

Q. Of course I'm speaking about acreage which would be more or less immediately adjacent to the proposed area.

One thing that crosses my mind is the possibility of the replacement of some of these wells where we've already had infill drilling at the higher price if this area was all designated as a tight reservoir. I can visualize a scenario where an unscrupulous operator would come in and take one of those good wells in the sweet spot and screw it up and run in there and drill himself a replacement well. Obviously that's not Mobil's intention, but how could that be guarded against?

A. Well, it's not up to me to define policy; however, we believe that we've sufficiently drained the reserves on sections that are completely developed to the point where we don't believe even a replacement well at this point would be eccnomical, regardless of even tight gas prices.

Q. Okay.

MR. STAMETS: Any other questions of the witness? Mr. Padilla?

CROSS EXAMINATION

BY MR. PADILLA:

Q. Mr. Hoffmaster, I have just a couple of questions.

For instance, what is the average productive life of these Mesaverde wells in the subject area?

A. They can produce -- well, so far they've produced for twenty-five years and we expect, well, maybe ten more years or fifteen, or whatever. You know, you can't say. It would have to be on a per well basis.

Q. Are some of these wells designated as stripper wells now, do you know?

A. I'm not familiar if there are any.

Q. Okay. Now you mentioned that possibly one well has been drilled in this area in the last couple of years.

A. Vaguely I recall. I'm not sure. There may not have been. I know it was not an economical well if it was. I just recall in the back of my mind seeing an economic analysis run on it, a well.

Q. Now going to Exhibit B, what is the current price you're basing your analysis on? Would that be Section 103 or would it be possibly some '78 gas price, or what is the gas price?

A. On Exhibit B?

Q. Yes.

A. The current price? That's the Section 103 price escalated.

Q. The most highest price?

A. Right, that is allowed, yes.

Q. If I understand your testimony, you're actually only seeking tight formation designation for the existing infill wells that need to fully develop the area, and also for the, say, Sections 12, 13, and 24 in the northwest area.

A. We're seeking the entire area designated in yellow on your base map as -- as tight gas.

Q. But practically speaking, you'd only be able to collect 107 price for those not fully developed areas?

A. Right, for the undeveloped locations only.

MR. PADILLA: That's all I have, Mr. Examiner.

MR. STAMETS: Are there any other questions of the witness? He may be excused.

Anything further in this case? Mr. Carr?

MR. CARR: Mr. Stamets, Northwest Pipeline Corporation opposes the application of Mobil in this case.

Northwest believes that the subject area as evidenced by their Exhibit Number Twelve and other exhibits, has been substantially developed under existing prices and therefor should not qualify for tight sand designation. under the provisions of FERC Order Number 99.

Northwest further believes that the area can be developed under the existing infill order at the present prices.

Instead of reading a fairly lengthy statement that Northwest Pipeline Company has prepared in opposition to this application, with your permission I'll simply present it to you.

I have nothing further.

MR. STAMETS: That will be fine, Mr. Carr.

Also, I would like to ask Mobil to submit some clarification subsequent to the hearing on any well which may have been drilled in the last two years, well, 1978 and on.

MR. SPERLING: Right, '78 forward.

MR. STAMETS: Including 1978; '78, '79,

'80 and '81, and if there are any indications that those wells are economical or uneconomical.

A. Okay.

MR. STAMETS: And then I'm going to take this case under advisement.

(Hearing concluded.)

C E R T I F I C A T E

I, SALLY W. BOYD, C.S.R., DO HEREBY CERTIFY that the foregoing Transcript of Hearing before the Oil Conservation Division was reported by me; that the said transcript is a full, true, and correct record of the hearing, prepared by me to the best of my ability.

Sally W. Boyd C.S.R.

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 7154 heard by me on 3-11, 1981.

Richard L. Stamets, Examiner
Oil Conservation Division

SALLY W. BOYD, C.S.R.
Rt. 1 Box 193-B
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Phone (505) 455-7409

STATE OF NEW MEXICO
BEFORE THE
OIL CONSERVATION COMMISSION

In the Matter of:

Application of Mobil Producing Texas and New Mexico, Inc. for Designation of a Tight Formation, Rio Arriba County, New Mexico.	)	Case No. 7154

Comments of Northwest
Pipeline Corporation in
Opposition to
Tight Formation Designation

By notice issued in Docket No. 5-81, the Oil Conservation Commission ("Commission") has set for hearing on February 11, 1981, the application of Mobile Producing Texas and New Mexico, Inc. for designation of certain areas of Rio Arriba County as a Tight Formation in the instant docket pursuant to the authority of § 107(c)(5) of the Natural Gas Policy Act of 1978 and 18 CFR § 271.701 et seq. The formation proposed is the Mesaverde Formation underlying certain areas in Townships 26 and 27 North, Ranges 2 and 3 West.

Northwest Pipeline Corporation ("Northwest") hereby requests leave to present comments in this proceeding and to have those comments considered by the Examiner and the Commission in its consideration of this matter. In support of these requests Northwest states as follows:

Northwest is a Natural Gas Company as defined by the Natural Gas Act, 15 U.S.C. §§ 717 et seq. and is engaged inter alia in the production, transportation and sale of natural gas in the states of New Mexico, Colorado, Utah, Idaho, Wyoming, Oregon and Washington. Northwest purchases or produces a significant portion of its gas supply from wells located in the San Juan Basin of Colorado and New Mexico. The acreage proposed for Tight Formation designation herein is located on the north-eastern edge of the San Juan Basin in an area where Northwest has gas purchase interests, and accordingly, Northwest will be affected by the decision of the Examiner and the Commission in this proceeding, and has interests which cannot be adequately represented by any party to this proceeding.

Any designation of Tight Formation under § 107(c)(5) of the NGPA must comply with the provisions of Order No. 99 issued by the Federal Energy Regulatory Commission ("FERC") on August 15, 1980.

Order No. 99 prescribes several criteria which must be met before a formation can be designated "tight" among which are the absence of an infill drilling program and that the area proposed for designation must not be "substantially developed." 1/

Based upon information available to it, Northwest contends that neither of these conditions have been met in the instant case.

There is in effect for the subject areas a well spacing rule which meets the definition established by FERC of an "infill program." The infill program was established by the New Mexico Commission in Order No. R-1670 as amended (Order No. R-1670-U, September 20, 1978) in which the Commission authorized the spacing of a second well on an existing 320-acre proration unit. This order having been promulgated prior to designation of the subject lands as Tight Formations, and numerous wells which having been drilled in response to this infill program, precludes such designation under FERC Order No. 99 to the extent the acreage is presently "substantially developed."

There are at present some 36 wells producing natural gas from the Mesaverde Formation on the 13,920 acres proposed for designation. Fourteen of these wells are "infill wells" having been drilled subsequent to Order No. R-1670-U. The names of these wells and their locations are set forth in Exhibit No. 1 attached hereto. Northwest's information also indicates that the T27N, R3W area wells have an average cumulative production of 1040 MMcf per well with a current rate of 145 Mcf/day per well. The T26N, R2W area wells have an average cumulative production of 1250 MMcf per well with a current average rate of 88 Mcf/day per well. It is the opinion of Northwest that the portion of the Mesaverde Formation proposed for designation as a Tight Formation is "substantially developed" and, therefore, may not be considered for such designation. 2/

Northwest respectfully submits that these facts preclude designation as Tight Formation of the acreage and formation proposed in this docket.

Wherefore, Northwest urges that the Examiner and the Commission deny the application of Mobil Producing Texas and New Mexico, Inc. in this docket, and that the area proposed for designation not be designated as Tight Formation under 18 CFR § 271.701 et seq.

1/ See, 18 CFR §§ 271.703(b)(6) and (c)(2)(1).

2/ See, 18 CFR § 271.703(a)(6) and Order No. 99, mimeo, at 50-52.

Respectfully submitted,

NORTHWEST PIPELINE CORPORATION

Of Counsel:

Donald C. Shepler
Northwest Pipeline Corporation
315 East Second South
Salt Lake City, Utah 84111

EXHIBIT I

Well Name	Sec	Twp	Rge	Qtr	
Cheney Federal #1	8	26N	2W	M	
Cheney Federal #3	17	26N	2W	B	
Cheney Federal #2A	17	26N	2W	D	(infill)
Cheney Federal #2	17	26N	2W	M	
Featherstone Federal #1*	19	26N	2W	A	
Jicarilla E #4	11	27N	3W	M	
Jicarilla E #5	14	27N	3W	A	
Jicarilla E #2A	14	27N	3W	D	(infill)
Jicarilla E #2	14	27N	3W	L	
Jicarilla E #3	15	27N	3W	M	
Jicarilla F #1	22	27N	3W	B	
Jicarilla F #3A	22	27N	13W	M	(infill)
Jicarilla F #1A	22	27N	3W	P	(infill)
Jicarilla F #4	23	27N	3W	A	
Jicarilla F #5A	23	27N	3W	C	(infill)
Jicarilla F #5	23	27N	3W	M	
Jicarilla F #4A	23	27N	3W	P	(infill)
Jicarilla F #7	24	27N	3W	M	
Jicarilla G #2	25	27N	3W	A	
Jicarilla G #5A	25	27N	3W	D	(infill)
Jicarilla G #5	25	27N	3W	M	
Jicarilla G #8	26	27N	3W	A	
Jicarilla G #4A	26	27N	3W	D	(infill)
Jicarilla G #4	25	27N	3W	M	
Jicarilla G #8A	26	27N	3W	P	(infill)
Jicarilla F #6	27	27N	3W	A	
Jicarilla F #2A	27	27N	3W	D	(infill)
Jicarilla F #2	27	27N	3W	M	
Jicarilla F #6A	27	27N	3W	P	(infill)
Jicarilla G #1	35	27N	3W	A	
Jicarilla G #3A	35	27N	3W	D	(infill)
Jicarilla G #3	35	27N	3W	M	
Jicarilla G #1A	35	27N	3W	P	(infill)
Jicarilla G #7	36	27N	3W	A	
Jicarilla G #7A	36	27N	3W	D	(infill)
Jicarilla G #6	36	27N	3W	M	

* This well is included in the Tight Sands formation if it is in lots one, two or three.

7154

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

18 C.F.R. Part 271

High-Cost Gas Produced from Tight Formations; Notice of Proposed Rulemaking

Docket No. RM79-76 (New Mexico-5)

AGENCY : Federal Energy Regulatory Commission

ACTION : Notice of Proposed Rulemaking

SUMMARY : The Federal Energy Regulatory Commission is authorized by section 107(c)(5) of the Natural Gas Policy Act of 1978 to designate certain types of natural gas as high-cost gas where the Commission determines that the gas is produced under conditions which present extraordinary risks or costs. Under section 107(c)(5), the Commission issued a final regulation designating natural gas produced from tight formations as high-cost gas which may receive an incentive price (18 C.F.R. § 271.703). This rule established procedures for jurisdictional agencies to submit to the Commission recommendations of areas for designation as tight formations. This notice of proposed rulemaking by the Director of the Office of Pipeline and Producer Regulation contains the recommendation of the State of New Mexico and the United States Geological Survey that the Mesaverde Formation be designated as a tight formation under § 271.703(d).

DATE : Comments on the proposed rule are due on September 24, 1981.

Public Hearing : No public hearing is scheduled in this docket as yet. Written requests for a public hearing are due on September 9, 1981.

ADDRESS : Comments and requests for hearing must be filed with the Office of the Secretary, 825 North Capitol Street, N. E., Washington, D. C. 20426.

FOR FURTHER INFORMATION CONTACT :

Leslie Lawner, (202) 357-8307, or Victor Zabel, (202) 357-8616

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

High-Cost Gas Produced from Tight Formations	)))	Docket No. RM79-76 (New Mexico-5)

NOTICE OF PROPOSED RULEMAKING
BY DIRECTOR, OPPR

(Issued August 25, 1981)

I. BACKGROUND

On July 30, 1981, the State of New Mexico Oil Conservation Division (New Mexico) submitted to the Commission a recommendation, in accordance with § 271.703 of the Commission's regulations (45 Fed. Reg. 56034, August 22, 1980), that the Mesaverde Formation located in Rio Arriba County, New Mexico, be designated as a tight formation. The United States Geological Survey (USGS) concurs with New Mexico's recommendation, however, the USGS recommends the addition of contiguous acreage, thereby enlarging the area recommended by New Mexico. The New Mexico and USGS recommendations and supporting data are on file with the Commission and are available for public inspection. Pursuant to § 271.703(c)(4) of the regulations, this Notice of Proposed Rulemaking is hereby issued to determine whether New Mexico's recommendation that certain portions of the Mesaverde Formation be designated a tight formation should be adopted and whether the USGS recommendation to include contiguous acreage should also be adopted.

II. DESCRIPTION OF RECOMMENDATION

The Mesaverde Formation is located in Rio Arriba County, New Mexico, approximately 30 miles south of Dulce, New Mexico. The area recommended by New Mexico and the USGS is situated in Townships 2 and 3 North, Ranges 26 and 27 West along the eastern fringe of the main Blanco Mesaverde Gas Pool. The

specified area is almost 11 miles in length and 4 miles in width. The Mesaverde Formation consists of two 40 to 100 feet thick sand members, the Cliff House and Point Lookout Sandstones, separated by about 300 feet of the Menefee shale member. The average depth to the top of the Mesaverde Formation is 5,563 feet. The recommended area is subject to New Mexico Order No. R-1670-T, issued November 14, 1974, which authorizes infill drilling in the Blanco Mesaverde field. Accordingly, certain portions within the proposed area may be subject to exclusion pursuant to § 271.703(c)(2)(i)(D) of the regulations.

III. DISCUSSION OF RECOMMENDATION

New Mexico claims in its submission that evidence gathered through information and testimony presented at a public hearing in Case No. 7154 convened by New Mexico on this matter demonstrates that:

(1) The average in situ gas permeability throughout the pay section of the proposed area is not expected to exceed 0.1 millidarcy;

(2) The stabilized production rate, against atmospheric pressure, of wells completed for production from the recommended formation, without stimulation, is not expected to exceed the maximum allowable production rate set out in § 271.703(c)(2)(i)(B); and

(3) No well drilled into the recommended formation is expected to produce more than five (5) barrels of oil per day.

New Mexico further asserts that existing State and Federal Regulations assure that development of this formation will not adversely affect any fresh water aquifers.

Accordingly, pursuant to the authority delegated to the Director of the Office of Pipeline and Producer Regulation by Commission Order No. 97, issued in Docket No. RM80-68 (45 Fed. Reg. 53456, August 12, 1980), notice is hereby given of the proposal submitted by New Mexico and the USGS that the Mesaverde Formation, as described and delineated in New Mexico's and the USGS recommendation as filed with the Commission, be designated as a tight formation pursuant to § 271.703.

IV. PUBLIC COMMENT PROCEDURES

Interested persons may comment on this proposed rulemaking by submitting written data, views or arguments to the Office of the Secretary, Federal Energy Regulatory Commission, 825 North Capitol Street, N. E., Washington, D.C. 20426, on or before September 24, 1981. Each person submitting a comment should indicate that the comment is being submitted in Docket No. RM79-76 (New Mexico-5), and should give reasons including supporting data for any recommendations. Comments should include the name, title, mailing address, and telephone number of one person to whom communications concerning the proposal may be addressed. An original and 14 conformed copies should be filed with the Secretary of the Commission. Written comments will be available for public inspection at the Commission's Office of Public Information, Room 1000, 825 North Capitol Street, N. E., Washington, D.C., during business hours.

Any person wishing to present testimony, views, data, or otherwise participate at a public hearing should notify the Commission in writing that they wish to make an oral presentation and therefore request a public hearing. Such request shall specify the amount of time requested at the hearing. Requests should be filed with the Secretary of the Commission no later than September 9, 1981.

(Natural Gas Policy Act of 1978, 15 U.S.C. §§ 3301 - 3342.)

Accordingly, the Commission proposes to amend the regulations in Part 271, Chapter I Title 18, Code of Federal Regulations, as set forth below, in the event New Mexico's and the USGS recommendation is adopted.

(S E A L)

Kenneth A. Williams
Director, Office of Pipeline
and Producer Regulation

Section 271.703(d) is amended by adding new subparagraph (63) to read as follows:

§ 271.703 Tight formations.

* * * * *

(d) Designated tight formations. The following formations are designated as tight formations. A more detailed description of the geographical extent and geological parameters of the designated tight formations is located in the Commission's official file for Docket No. RM79-76, subindexed as indicated, and is also located in the official files of the jurisdictional agency that submitted the recommendation.

* * * * *

(48) through (62) [RESERVED]

(63) Mesaverde Formation in New Mexico. RM79-76 (New Mexico-5).

(i) Delineation of formation. The Mesaverde Formation underlies portions of Townships 2 and 3 North, Ranges 26 and 27 West in Rio Arriba County, New Mexico. The proposed area is within the Blanco Mesaverde Gas Pool approximately 30 miles south of Dulce, New Mexico. It consists of the Cliff House and Point Lookout sandstone members, separated by the Menefee shale member.

(ii) Depth. The Mesaverde Formation is overlain by the Lewis Shale Formation and underlain by the Mancos Shale Formation. The average depth to the top of the Mesaverde Formation is 5,563 feet.

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

18 C.F.R. Part 271

High-Cost Gas Produced from Tight Formations; Notice of Proposed Rulemaking

Docket No. RM79-76 (New Mexico-5)

AGENCY : Federal Energy Regulatory Commission

ACTION : Notice of Proposed Rulemaking

SUMMARY : The Federal Energy Regulatory Commission is authorized by section 107(c)(5) of the Natural Gas Policy Act of 1978 to designate certain types of natural gas as high-cost gas where the Commission determines that the gas is produced under conditions which present extraordinary risks or costs. Under section 107(c)(5), the Commission issued a final regulation designating natural gas produced from tight formations as high-cost gas which may receive an incentive price (18 C.F.R. § 271.703). This rule established procedures for jurisdictional agencies to submit to the Commission recommendations of areas for designation as tight formations. This notice of proposed rulemaking by the Director of the Office of Pipeline and Producer Regulation contains the recommendation of the State of New Mexico and the United States Geological Survey that the Mesaverde Formation be designated as a tight formation under § 271.703(d).

DATE : Comments on the proposed rule are due on September 24, 1981.

Public Hearing : No public hearing is scheduled in this docket as yet. Written requests for a public hearing are due on September 9, 1981.

ADDRESS : Comments and requests for hearing must be filed with the Office of the Secretary, 825 North Capitol Street, N. E., Washington, D. C. 20426.

FOR FURTHER INFORMATION CONTACT :

Leslie Lawner, (202) 357-8307, or Victor Zabel, (202) 357-8616

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

High-Cost Gas Produced from Tight Formations	)))	Docket No. RM79-76 (New Mexico-5)

NOTICE OF PROPOSED RULEMAKING
BY DIRECTOR, OPPR

(Issued August 25, 1981)

I. BACKGROUND

On July 30, 1981, the State of New Mexico Oil Conservation Division (New Mexico) submitted to the Commission a recommendation, in accordance with § 271.703 of the Commission's regulations (45 Fed. Reg. 56034, August 22, 1980), that the Mesaverde Formation located in Rio Arriba County, New Mexico, be designated as a tight formation. The United States Geological Survey (USGS) concurs with New Mexico's recommendation, however, the USGS recommends the addition of contiguous acreage, thereby enlarging the area recommended by New Mexico. The New Mexico and USGS recommendations and supporting data are on file with the Commission and are available for public inspection. Pursuant to § 271.703(c)(4) of the regulations, this Notice of Proposed Rulemaking is hereby issued to determine whether New Mexico's recommendation that certain portions of the Mesaverde Formation be designated a tight formation should be adopted and whether the USGS recommendation to include contiguous acreage should also be adopted.

II. DESCRIPTION OF RECOMMENDATION

The Mesaverde Formation is located in Rio Arriba County, New Mexico, approximately 30 miles south of Dulce, New Mexico. The area recommended by New Mexico and the USGS is situated in Townships 2 and 3 North, Ranges 26 and 27 West along the eastern fringe of the main Blanco Mesaverde Gas Pool. The

specified area is almost 11 miles in length and 4 miles in width. The Mesaverde Formation consists of two 40 to 100 feet thick sand members, the Cliff House and Point Lookout Sandstones, separated by about 300 feet of the Menefee shale member. The average depth to the top of the Mesaverde Formation is 5,563 feet. The recommended area is subject to New Mexico Order No. R-1670-T, issued November 14, 1974, which authorizes infill drilling in the Blanco Mesaverde field. Accordingly, certain portions within the proposed area may be subject to exclusion pursuant to § 271.703(c)(2)(i)(D) of the regulations.

III. DISCUSSION OF RECOMMENDATION

New Mexico claims in its submission that evidence gathered through information and testimony presented at a public hearing in Case No. 7154 convened by New Mexico on this matter demonstrates that:

(1) The average in situ gas permeability throughout the pay section of the proposed area is not expected to exceed 0.1 millidarcy;

(2) The stabilized production rate, against atmospheric pressure, of wells completed for production from the recommended formation, without stimulation, is not expected to exceed the maximum allowable production rate set out in § 271.703(c)(2)(i)(B); and

(3) No well drilled into the recommended formation is expected to produce more than five (5) barrels of oil per day.

New Mexico further asserts that existing State and Federal Regulations assure that development of this formation will not adversely affect any fresh water aquifers.

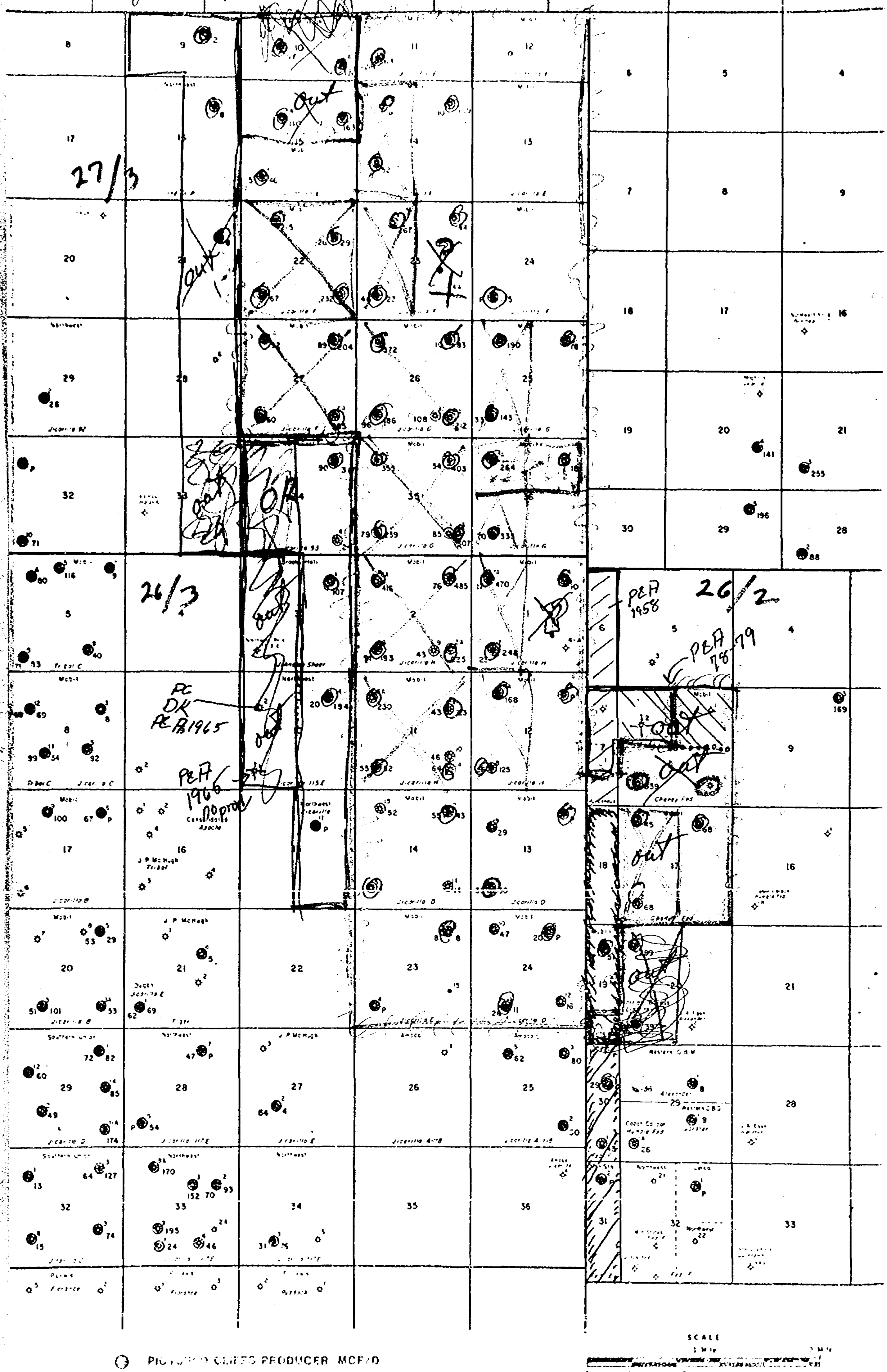
Accordingly, pursuant to the authority delegated to the Director of the Office of Pipeline and Producer Regulation by Commission Order No. 97, issued in Docket No. RM80-68 (45 Fed. Reg. 53456, August 12, 1980), notice is hereby given of the proposal submitted by New Mexico and the USGS that the Mesaverde Formation, as described and delineated in New Mexico's and the USGS recommendation as filed with the Commission, be designated as a tight formation pursuant to § 271.703.

IV. PUBLIC COMMENT PROCEDURES

Interested persons may comment on this proposed rulemaking by submitting written data, views or arguments to the Office of the Secretary, Federal Energy Regulatory Commission, 825 North Capitol Street, N. E., Washington, D.C. 20426, on or before September 24, 1981. Each person submitting a comment should indicate that the comment is being submitted in Docket No. RM79-76 (New Mexico-5), and should give reasons including supporting data for any recommendations. Comments should include the name, title, mailing address, and telephone number of one person to whom communications concerning the proposal may be addressed. An original and 14 conformed copies should be filed with the Secretary of the Commission. Written comments will be available for public inspection at the Commission's Office of Public Information, Room 1000, 825 North Capitol Street, N. E., Washington, D.C., during business hours.

Any person wishing to present testimony, views, data, or otherwise participate at a public hearing should notify the Commission in writing that they wish to make an oral presentation and therefore request a public hearing. Such request shall specify the amount of time requested at the hearing. Requests should be filed with the Secretary of the Commission no later than September 9, 1981.

June 18, 1979
Prepared Bailey McKiss



PICTURED CLIFFS PRODUCER MCF/D

MESAVERDE PRODUCER MCF/D

C E R T I F I C A T E

I, SALLY W. BOYD, C.S.R., DO HEREBY CERTIFY that the foregoing Transcript of Hearing before the Oil Conservation Division was reported by me; that the said transcript is a full, true, and correct record of the hearing, prepared by me to the best of my ability.

SWB

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. _____, heard by me on _____ 19____.

_____, Examiner
Oil Conservation Division

SALLY W. BOYD, C.S.R.
Rt. 1 Box 193-B
Santa Fe, New Mexico 87501
Phone (505) 455-7409

(Natural Gas Policy Act of 1978, 15 U.S.C. §§ 3301 - 3342.)

Accordingly, the Commission proposes to amend the regulations in Part 271, Chapter I Title 18, Code of Federal Regulations, as set forth below, in the event New Mexico's and the USGS recommendation is adopted.

(S E A L)

Kenneth A. Williams
Director, Office of Pipeline
and Producer Regulation

Section 271.703(d) is amended by adding new subparagraph (63) to read as follows:

§ 271.703 Tight formations.

* * * * *

(d) Designated tight formations. The following formations are designated as tight formations. A more detailed description of the geographical extent and geological parameters of the designated tight formations is located in the Commission's official file for Docket No. RM79-76, subindexed as indicated, and is also located in the official files of the jurisdictional agency that submitted the recommendation.

* * * * *

(48) through (62) [RESERVED]

(63) Mesaverde Formation in New Mexico. RM79-76 (New Mexico-5).

(i) Delineation of formation. The Mesaverde Formation underlies portions of Townships 2 and 3 North, Ranges 26 and 27 West in Rio Arriba County, New Mexico. The proposed area is within the Blanco Mesaverde Gas Pool approximately 30 miles south of Dulce, New Mexico. It consists of the Cliff House and Point Lookout sandstone members, separated by the Menefee shale member.

(ii) Depth. The Mesaverde Formation is overlain by the Lewis Shale Formation and underlain by the Mancos Shale Formation. The average depth to the top of the Mesaverde Formation is 5,563 feet.

Memo

From

R. L. STAMETS
Technical
Support Chief

To

26 - 2

7 All partial Section
lots 1-4

Sec 8 All

19 E/2

18 & 19 All partial
lots 1-4

OIL CONSERVATION DIVISION SANTA FE

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION
STATE LAND OFFICE BLDG.
SANTA FE, NEW MEXICO
11 February 1981

EXAMINER HEARING

IN THE MATTER OF:

Application of Mobil Producing Texas and New Mexico, Inc., for designation of a tight formation, Rio Arriba County, New Mexico.

CASE **7154**

BEFORE: Richard L. Stamets

TRANSCRIPT OF HEARING

A P P E A R A N C E S

For the Oil Conservation Division: Ernest L. Padilla, Esq.
Legal Counsel to the Division
State Land Office Bldg.
Santa Fe, New Mexico 87501

For the Applicant: **James E. Sperling, Esq.**
MODRALL, SPERLING, ROEHL, HARRIS, & SISK
P. O. Box 2168
Albuquerque, New Mexico 87103

A P P E A R A N C E S

For Northwest Pipeline Corporation:

William F. Carr, Esq.
CAMPBELL, BYRD, AND BLACK
Jefferson Place
Santa Fe, New Mexico 87501

I N D E X

E X H I B I T S

MR. STAMETS: We'll call next Case Number 7154.

MR. PADILLA: Application of Mobil Producing Texas and New Mexico, Inc., for designation of a tight formation, Rio Arriba County, New Mexico.

MR. SPERLING: James E. Sperling, Albuquerque, New Mexico, appearing for the applicant, Mobil.

We have one witness.

MR. CARR: William F. Carr, with the law firm Campbell, Byrd, & Black, Santa Fe, appearing on behalf of Northwest Pipeline Corporation.

We do not intend to call a witness.

(Witness sworn.)

RAYMOND C. HOFFMASTER

being called as a witness and being duly sworn upon his oath, testified as follows, to-wit:

DIRECT EXAMINATION

BY MR. SPERLING:

Q Mr. Hoffmaster, have you on any prior occasion testified before the Oil Conservation Division so that your qualifications are a matter of record?

A. No, sir.

Q. That being the case, would you please give us a brief description of your educational and experience background with respect to your profession?

A. I graduated from Texas A & M with a BS in geological engineering in 1974.

I was employed by Mobil immediately out of school. I worked as a field engineer for 4-1/2 years; was transferred to our company office in Houston as a reservoir engineer, where I spent the last year and a half, with responsibility of fields in New Mexico and West Texas.

Q. Have you had in addition to your educational and experience background any other experience in the oil fields that would enhance your qualifications?

A. Yes, I'm a Registered Professional Engineer in the State of Texas.

MR. SPERLING: Are the witness' qualifications acceptable?

MR. STAMETS: They are.

Q. Mr. Hoffmaster, would you tell us briefly the purpose of the application filed by Mobil in this matter?

A. Well, Mobil would like to submit an application to designate the Mesaverde Pool under certain sections as a tight formation. We believe that we can --

that the guidelines established by FERC Order Number 99 can be proved to -- in the Mesaverde formation.

Q. This application relates to the Blanco Mesaverde Pool in northwest New Mexico?

A. Yes.

Q. Would you give us a very brief description of the geology encountered in the Mesaverde Pool with which this -- a portion of which this application is concerned?

A. Well, the --

Q. You're referring now to Exhibit Number One?

A. Yes, I am. Okay, the -- we believe that this is a separate sand body located to the east of the Blanco Mesaverde main pool. It's delineated by dry holes surrounding this area, and we believe it to be a separate sand body that has producing characteristics that are not similar to the Blanco Mesaverde.

We believe it to be a near shore bar type deposit, whereby the center part of the sand body is the thickest, the most permeable. As the sand thins out on to the east or to the west, we believe that the permeability decreases.

Q. It might be well at this time, Mr.

Examiner, to for the record describe the method in which we have identified the exhibits which are to be before the Examiner in this matter.

With the application we have submitted a bound booklet which contains essentially all of the exhibits which support the application. In addition to that, the same bound booklet has been marked for identification here at this hearing as Exhibit A, with Exhibits numbered respectively within Exhibit A, One through Thirteen.

With that explanation, would you now refer to what's been marked for identification as Exhibit Two of A?

A. Okay. Exhibit Two is a cumulative production map. We have plotted cumulative production of wells that were completed in the mid to late '50s.

As you can see in Section 36, Township 27, Range 3 West, that is a sweet spot whereby we have had the highest cumulative production. As you trend in either direction, the cumulative productions decrease and as you approach the wells that were dry holes surrounding this field, that the production stops.

Q. Now the colored area, or the outlined area, represents the approximately 13,000 acre area which is designated in the application as the area which Mobil seeks

to have designated as tight formation area?

A. Yes.

Q. All right. Would you now refer to what has been marked as Exhibit Three and explain the purpose of that exhibit and what it shows?

A. Okay, Exhibit Three --

Q. This is in the bound volume?

A. Yes.

MR. STAMETS: What page is that on?

MR. SPERLING: Five.

A. Page five.

MR. STAMETS: Thank you.

A. Okay, Exhibit Three is a table of after frac permeabilities that were calculated from bottom hole pressure buildups run in 1975 and '76.

The calculated permeabilities were averaged and it was found that the average was .146 millidarcies.

We want to point out that these were after frac permeabilities and that they are higher than would be expected if a -- if the well was not stimulated.

Q. This represents an average after fracture treatment for eleven wells?

A. Yes, sir.

Q Do you have any further comment on Exhibit Three?

A. We'll attempt to prove later that -- exact to what degree an increase in permeability is caused by fracturing.

Q All right. Would you refer to Exhibit Four and explain the nature and purpose of that exhibit?

A. Okay. Exhibit Four identifies a typical analysis used in determining the permeability based on the Horner plot.

Q This exhibit identifies the Jicarilla G No. 1-A Well as the subject of this collection of pressure and production data, is that correct?

A. Correct.

Q Can you locate that well on Exhibit One for us, or any of the other exhibits that you've already referred to? Perhaps Two would be more appropriate.

A. Okay.

MR. STAMETS: It's the well in the southeast quarter of Section 35 of 27 North, 3 West?

A. Okay, yes, it's in the southeast quarter of Section 35, T 27 North, Range 3 West.

MR. STAMETS: Go ahead.

A. I'd like to mention also that this type

of calculation is a standard in the industry for determining the accurate in situ permeability.

Q. These data were collected over a period of 165 hours?

A. Yes.

Q. Okay. Is the exhibit which is numbered Four and appears on page six a part of the calculation, or at least an application of the data that's shown on page six?

A. Yes, it is. It's a plot of the bottom hole pressure versus T plus delta T over delta T.

Q. How about the intervening page?

A. Yes, that's a summary of the calculations involved.

Q. This on page six is the actual calculation which was performed by you arriving at the conclusions which are stated in the exhibit?

A. Yes. As we can see here, the permeability was .063 millidarcies, which is less than .1 millidarcy requirement, and this is even after fracing the well.

Q. Would you now refer to what's been marked as Exhibit Five and explain the purpose of that exhibit?

A. Exhibit Five is another permeability

calculation based on a Horner plot, similar to Exhibit Four, but on the Jicarilla H-2 No. A.

Now this well was also fraced and we calculated a permeability of .262 millidarcies.

Q Can you locate that well for us on an exhibit?

A This well is located in the southeast quarter of Section 2, T 26 North, Range 3 West.

Q The data collected is essentially the same as that with reference to Exhibit Four except that it relates to another well?

A Yes.

Q And this is true of the plot which appears as a part of this exhibit, that simply puts in graph form the data collected on the first page of the exhibit?

A Yes.

Q Okay. Exhibit Five-A has been identified in the booklet. Would you refer to that and explain the purpose of the data collected there?

A Okay. The table you see, or the figure on the page, is taken out of the SPE Monograph Volume 1, Pressure Buildup and Flow Tests in Wells, page 108, and it correlates permeability that has been calculated after fracing to the permeability that is in a pre frac condition.

If you'll notice on subsequent pages on Exhibit Five-A, that we involve our calculations of determining the fracture length based on the volume of -- of sand that we are to use in the fracture.

The calculated fracture length was 1000 feet, which is in this equation identified on the bottom of page 8 as X_f, and X_e is determined to be one-half the length of your drainage radius, or your drainage area, which in this case is 160 acre square, and this is calculated to be 1320 feet.

Now if you divide this X_f by X_e you get a fracture penetration equal to .76.

Now if you follow the axis here at .76, bring it up to this curve and then carry it across to the left to intersect the axis for the ratio of true permeability divided by apparent permeability, we see that this intersects it at .28.

So if you multiply .28 by the permeability that was measured, we get that the true permeability before fracturing was .0734 millidarcies.

Q Is this a recognized method of determining pre frac permeability?

A. It's been recognized by SPE and included in their monograph.

Q. Do you have any other comments about any portion of Exhibit Five or its parts?

A. We have a cost breakdown for this particular well.

If you'll notice on the perforating and stimulation column, the cost would be --

Q. This would be the exhibit immediately following Five-A and designated Mobil Oil Corporation, Well Cost Statement?

A. Yes. As you can see in the column of perforating and stimulation that the cost for this fracturing was roughly 1/2 the total cost of drilling the well.

Q. Does that represent the cost of carrying out the frac plan which appears on the previous page, the page previous to the Well Cost Statement?

A. Yes, it does. We fractured with 450,000 pounds of sand.

MR. STAMETS: Are these actual figures based on 1976?

A. Yes, this is 1976 figures.

MR. STAMETS: You would have a substantial increase in essentially everyone of these costs in today's dollar figures.

A. That's correct.

Q Would you classify this fracture treatment as a massive treatment?

A Yes, I would.

Q Would you say that this treatment was typical of the treatment required or at least utilized in connection with the completion of the other wells?

A In the early days of fracturing technology was limited. They basically fraced with just water and sand and the amount of sand put away was considerably less and this is a new method of fracturing. We believe it can increase considerably the amount of gas to be recovered.

Q But it is expensive.

A But it is expensive.

Q Would you now refer to what's been marked as Exhibit Six and describe the information contained on that exhibit and its purpose?

A Exhibit Six is a summary of hole core permeability analysis. These are usually compiled by a company such as CORE Lab, whatever, to determine permeabilities in a qualitative manner rather than a quantitative manner.

The method usually is by taking one core per foot of hole core and extracting the core so that all the liquids are out and injecting air into it to determine the permeability.

Now these are noted for being higher than what is actually measured in the formation, mainly due to liquids that are present, your interstitial water saturation and the other fluids that may be in the core, which will reduce the permeability.

The table listed in Exhibit Six shows the reduction of permeability due to compaction. If you look at the upper lefthand graph, you'll notice an 80 percent permeability reduction due just to compaction and it can be applied to permeabilities that are taken off of the core analysis. As you can see, this has reduced the in situ permeabilities.

However, even these permeabilities are higher for the reason I mentioned beforehand.

Another reason for - like H-7 of .216 --

Q You're referring now to Well H-7?

A Okay, this --

Q Is that correct?

A Yes, Well H-7. The number of samples taken was only 28 and this was taken out of one portion of the total core, and if all the core had been analyzed and averaged, it would have been a lot less.

So in essence, this is really not accurate as determining permeability, but it's showing that it's

loweven though -- even with, you know, the standard core analysis, and well, it's just kind of qualitative rather than quantitative.

Q. The source of the information which is shown in the middle of the page, I presume is Petroleum Reservoir Engineering by AMYX, is that right?

A. AMYX.

Q. AMYX, okay. Is that a recognized treatise?

A. Yes, this is the reservoir engineering book that's used at Texas A & M and elsewhere.

Q. Would you refer to what has been marked as Exhibit Seven and describe the information contained on that exhibit and its purpose?

A. Exhibit Seven lists a summary of all the pre frac flow rates that have been compiled for the Jicarilla leases. Most of these were taken in the 1950's.

If you were to average these first group, it averages 150 Mcf per day, which is less than the 188 Mcf per day requirement for formations found at this depth.

Q. Now what requirements are you referring to?

A. That's the FERC requirements whereby it states a pre-stimulation production rate to atmosphere of

formations whose tops are between 5500 feet and 6000 feet may not exceed 188 Mcf per day.

Q Okay. And that reference is to FERC Order Number 99?

A Yes.

Q Would you refer to what's been marked as Exhibit Eight and describe the information contained on that exhibit and the source of the information?

A Exhibit Eight is a laboratory analysis of the field sample taken from Jicarilla "E" No. 1 in 1958.

This exhibit identifies the flow rates that were found and also a component analysis of the liquid hydrocarbons.

As you can see, the GOR is 151,000. We obtained 3.21 barrels per day of liquids out of a flow rate of 486 Mcf per day, and we believe that this is a condensate and not an oil and also that its production rate is less than 5 barrels per day, which satisfies another requirement from FERC Order Number 99, which states that the pre-stimulation oil rate shall not exceed 5 barrels of oil per day.

Q In view of your last comment, would you now refer to what's been marked as Exhibit Nine, which is a plat of average daily oil production, and I'll ask you if that plat shows the area colored in yellow, which is the

subject of the application, and would you then explain the additional data contained on the exhibit?

A. Okay. This is a plot of old production rates that were averaged throughout the life of the field. We took the cumulative production of liquid hydrocarbons divided into the total gas that was produced to obtain this average, and then it was plotted on contours of equal daily rate.

I would like to point out that we believe that this is a condonsate, that it is in a gas form in the reservoir, and it becomes liquid through reduction of pressure and temperature at the surface.

Q. Now the exhibit identifies, and you have identified it as average daily oil production. For what period or during what interval of time?

A. This is calculated from the initial potential through the present day.

Q. For all wells?

A. For all wells that are listed here, yes. I believe we got them all.

Q. Over the total life of the well?

A. Yes, sir.

Q. And what conclusions do you draw from that information with respect to oil production in light of

the guidelines contained in Order 99?

A. Well, we have very limited data as to the initial fluid production rate and the best we could do is come up with a daily average throughout the life of the field.

But we'd like to mention that this is not an oil. It's a condensate, as stated before, and that we satisfy the requirements, both that the average if less than five barrels per day and the fact that it's not an oil to begin with.

Q. Does the information contained on Exhibit Eight indicate the gravity, the API gravity of the fluid?

A. Yes, down on the lower righthand corner we have API gravity of 57.5 degrees.

Q. Does that reinforce your conclusion that this is a condensate?

A. Yes, sir.

Q. Would you now refer to what's been marked as Exhibit Ten and explain the purpose of that exhibit?

A. Exhibit Ten is a plot of the initial pre frac rates that we had previously tabulated, just showing their locations.

Q. Now does Exhibit - underneath each of the wells show the pre frac flow rate that is shown on the

previous exhibit?

A. Yes.

Q. And these rates appear to encompass the north/south and east to west of the majority, or at least a substantial number of the wells within the area which is the subject of the application, right?

A. Right.

Q. Would you refer to Exhibit Eleven and describe the exhibit and what's shown on it? And what its purpose is?

A. Exhibit Eleven is an east/west cross section which shows the formations that make up the MesaVerde.

Q. Would you identify the line of section, please?

A. This is the line designated A-C.

Q. Well, on the map, for example, Exhibit Ten. It's a little hard to read on the cross section itself.

A. Okay, the line extends through our Jicarilla leases, or lease H, which is the southern half of Section 11 and 12 of T26 North, Range 3 West; also encompassing Section -- the southern half of Section 10 and crossing over due west to Section 12 of T 26 North, Range 4 West.

MR. STAMETS: I believe it's Section

17.

A. Pardon?

MR. STAMETS: I believe that's Section 17.

A. Okay, I was giving the western extension of this line.

MR. STAMETS: Oh, I'm sorry. I was looking to the east.

Q Well then the line of section runs -- begins approximately four or five miles to the west of the area designated on the exhibit and in the application, and extends to the east of that area, is that correct?

A. Yes.

Q And what conclusions do you draw from the cross section with respect to information essential to consideration of the application?

A. Okay, in the -- starting in the west we have Southland's Jicarilla 101 No. 8, which potentialed in the Mesaverde for 3.2-million a day.

Now if we follow this section line due east, we notice that Consolidated Oil and Gas Jicarilla No. 1-10 was a dry hole in 1963. This is in the southwest -- southwest quarter, I believe, of Section 10, T 26 North, Range 3 West. We believe that this identifies the western

limit of the field delineated by dry holes.

And as we move again to the east we have our Jicarilla H No. 8, potentialed for 4.8-million per day, and then going to our Cheney Federal No. 2, which potentialed for 5.2-million a day. And these are all post frac rates.

Q. The Cheney Federal is in Section 8?

A. No, it's in Section 17.

Q. 16?

A. 17, T 26 North, Range 2 West.

Q. Okay.

A. It's the easternmost point of the cross section.

Q. That's in the southeast -- the southwest quarter of the southwest quarter of 17.

A. Yes, sir.

Q. All right. Do you have anything further on Exhibit Eleven?

A. No, sir.

Q. Would you refer to Exhibit Twelve and describe the information contained on that exhibit and its purpose?

A. This map has spotted all the Mesaverde completions and also Pictured Cliffs completions in the area. The numbers indicate the present gas production in

Mcf per day attributed to each well.

Q. Now the figure, we'll say in Section 35 in Township 27 North, Range 3 West, the well designated as the No. 3 Jicarilla G, is the figure to the left of the well the Pictured Cliffs production?

A. Yes, sir.

Q. And to the right the Mesaverde production?

A. That's correct.

Q. Okay, present production.

A. Yes.

Q. Can you describe for us what conclusions you draw from a comparison of the current daily production rates with respect to the north, south, east, or west areas with particular regard to future development?

A. Well, as can be seen, the wells to the east and west flanks have low daily productions, which correspond to their low cumulative productions that have been obtained from these wells.

Q. Anything else?

Would you now refer to Exhibit Thirteen and explain that exhibit?

A. Exhibit Thirteen is a structure map contoured on the top of the Cliff House formation, I believe, showing the general trend in the area and the location of

our subject leases in comparison.

Q And this is contoured based upon correlative points on logs or how did you arrive at the --

A Yes, they're contoured on tops that were located in each -- in each well on the electric logs.

Q With a common point that is the top of the Point Lookout as the point of reference?

A The Cliff House.

Q Cliff House? That's a member of the Mesaverde formation?

A Yes, the uppermost member.

Q I want to now call your attention to what's been marked as Exhibit B for the purposes of identification of this hearing and ask you to explain that exhibit and what it is intended to show.

A This Exhibit B is a plot of profit indicators that -- a result of P & L analysis that were run using various reserves and typical drilling costs, and it shows the first -- the lower one is the rate of return. You notice that anything under 400-million a day at present prices is totally uneconomical to produce.

You see a profit investment ratio of zero, which is a break even condition and we do not believe at the current prices that reserves of this magnitude are

worth drilling for.

Q Are the ultimate reserves shown at the bottom of the graph intended to reflect any reserve calculation that you have made with respect to undeveloped acreage or is that assumed reserve figures?

A These are just tentative reserve figures to -- as points on the plot.

Q Okay. And the two plots show the present gas price being received for production in the field versus the presently prevailing tight gas price permitted under the FERC regulations, right?

A Yes.

Q Based upon the information which you've compiled in the form of these exhibits, and your testimony, what conclusions have you reached with respect to the qualification of the area designated in the application as a tight gas formation under the prevailing regulations involved?

A We believe that we have satisfied all three of the requirements; the requirement that the in situ permeability be less than .1 of a millidarcy; that the production rate for formations of this depth not exceed 100 Mcf per day average; and a pre-stimulated rate -- or condition to atmosphere permit the oil production rate not exceed 5 barrels per day.

I'd like to point out Exhibit Two once more in relation to Exhibit B.

Q That is cumulative gas exhibit?

A Yes. Okay, as we stated earlier in Exhibit B, that under the present prices anything under 400-million per day total recovery is uneconomical.

We can see from the cumulative production map that the contour 500 Mcf and on to the zero production rate, we see an area that is basically the undeveloped area that we wish to develop, and the average, you might say it would be 250 Mcf in that whole area.

So based on the current prices we cannot develop this acreage any further until we would receive some price incentive.

Q Are you designating generally the area to the northeast of the exhibit?

A Yes, Sections 13, 24, and a few locations in 25 and 36, in T 27 North, Range 3 West.

Q Okay.

Well, I take it, then, that in your opinion the granting of the application, that the result price application would result in the recovery of otherwise economically unrecoverable reserves?

A Yes, sir.

Q Based upon that do you feel that the granting of the application would be in the best interest of conservation?

A Yes, sir.

Q Do you have anything further with respect to any of the exhibits or any other comments?

A I don't believe so.

MR. SPERLING: We'd like to offer Exhibits A, One through Thirteen, and Exhibit B at this time, Mr. Examiner.

MR. STAMETS: These exhibits will be admitted.

MR. SPERLING: That's all we have.

CROSS EXAMINATION

BY MR. STAMETS:

Q Mr. Hoffmaster, you've indicated, I believe, that you feel that the -- this isolated reservoir is defined on the west side by dry holes, is that correct?

A Yes, sir. And we believe somewhat to the east side, also, and to the north. There has been a dry hole in Section 36, Township 28 North, Range 3 West. Also in Section 32, T 28 North, Range 2 West; in Section 20 of T 27 North, Range 2 West; and we've had a number of uneconо-

mical wells that we have plugged subsequently in our Jicarilla H & D leases, which would be Section -- excuse me, the section 12, it would be the northeast quarter, our Jicarilla H-3 only produced 30-million; the Jicarilla D on Section 13 has produced 22-million, and have been plugged.

So we believe that we can fairly delineate an eastern pinchout, too.

Q. What about down at the southwest end? It looks like there's a possibility there that the pool might be continuous with the main body of the reservoir in Section 15, 26 North, 3 West?

A. There's a dry hole, not a dry hole but it only produced 6-million, in the Northwest Jicarilla No. 11, I believe, in the northeast quarter of Section 15, which you mentioned.

Q. Okay. Now there is some acreage in this isolated reservoir which is outside your yellow line. Why did you leave that acreage out?

A. This is a new development that we believe is isolated from this main pool that we're discussing.

Q. Well, I perhaps didn't explain myself. There's quite a bit of acreage which is between the zero contour line on Exhibit Two and the 500 contour line which is not included inside your yellow outline, and why did you

not include that acreage?

A. Oh, I see, on the west side?

Q. Yeah, correct.

A. Well, we had -- we did not have the production or the data that was available to us on this, and our acreage ends at -- just to the east of here on Section 35, 2, 11, going south, and we were just -

Q. Was there reason to believe that the evidence would be any different concerning that acreage, than the acreage within the yellow outline?

A. No.

Q. Now, referring to the final exhibit, the economic exhibit, what is the cost data based on in there? Is that based on recent drilling activity, your estimate of what well cost would be?

A. This is based on 1982 drilling cost and also prices that we estimate will be in effect then. We used this basically because we believe that before -- that the year would be out before we, all the parties involved would decide on this, you know, course of action concerning this, and we believe that really it's just a slight escalation and that even present prices will still reflect the same profit indicators.

Q. And you indicate that the two-year

payout would be appropriate for a well. Anything beyond two years you think would be a risky venture?

A. Well, we basically look at our profit investment ratio and rate of return rather than two-years payout.

Under current prices you could see that even at 600-million that the rate of return is only about 17 percent or so, which is significantly low.

And furthermore our profit investment ratio only yields approximately 40 cents, I believe, if the scale is right, on the dollar.

Q. Talking about 600 M -- or 600-million?

A. Yes.

Q. Well, I see. I was looking at the -- the situation with the tight --

A. I was looking at current prices.

Q. You were looking at current prices.

A. Yes.

Q. Okay. All right. I'd like to take a look at Exhibit Three, please.

You have a number of wells there. It looks like maybe a dozen and there are more wells than that inside the boundary of the area that you're proposing here. Is there any reason that you selected this group of wells

as opposed to another group or the entire group of wells?

A. These are the only wells where we had bottom hole pressure buildups.

Q. Okay. And on Exhibit Number Four you indicated a very poor permeability for that well even after a frac job, and that well does seem to be fairly close to a sweet spot in the pool. Is this an anomalously poor situation or is that going to be a good well also?

A. The data points I used on this Exhibit Ten, that you're referring to, were used only on wells that were completed in the '50s. I used -- did not use the infill wells and I don't have the data with me as to exactly what that well is producing now.

The reason for this was that wells that were completed in the '50s are basically depleted now and we believe that -- that cumulative production is just about all of the total reserves that they have, you know, they're almost depleted now, and infill wells, if they were used as data points, would not be representative and would really be meaningless.

Q. Now all of the exhibits that represent a map of the area show that some infill wells have been drilled at this time. Probably they're best displayed on Exhibit Twelve. At this time there would be no way, would

there, that we could designate acreage that's already been infill drilled as a tight sands reservoir?

A Well, we have no further locations to develop. We believe that the entire area should be designated anyway, regardless of the fact that there is no future development in here, mainly because they were used as data, you know, in the reservoir determination.

Q Are there any wells, infill wells, within the area that have been uneconomical or will be uneconomic wells?

A Well, we have the Jicarilla H-4A was plugged. I believe that was a dry hole. That was an infill well. This was in Section 1, T 26 North, Range 3 West, in the southeast quarter.

As far as others, I cannot locate them. I believe here, this Jicarilla F-2A on the northeast quarter, excuse me, the northwest quarter of Section 27, T 27 North, Range 3 West, is -- will probably be also uneconomical.

Mainly we've developed as far as we could the best locations for infill development and the fact that we have not developed any further is because we believe that we have run out of economic locations based on current prices.

Q What wells have you drilled in the last

couple of years in this area?

A. I believe we finished our infill work in 1976. We may have drilled one more, and I cannot recall which one it was, subsequent to that time, but the majority of the infill work was completed in 1976.

Q. So you had already determined before the NGPA came out that there were some locations in here that were not economic at that time.

A. That's correct.

Q. Are there any non-fractured potentials available in this area?

A. Fracturing is required on each well. We do it as a standard policy now to -- as soon as we set pipe, to perforate and fracture, because we -- we tried before to -- in the '50s to produce before fracturing and as tabulated here, our rates were below as required for economic recovery.

MR. STAMETS: Are there other questions of the witness?

Would you identify yourself for the record, please?

MR. BUCKINGHAM: Allen Buckingham, USGS. The Examiner has touched a lot of the USGS questions that we were going to ask, but with me this morning is Sue

Umschler, a petroleum engineer, and Robert Higgens, a geologist, and they have some specific questions to ask.

QUESTIONS BY MS. UMSCHLER:

Q My first question is, do you have any evidence that would definitely indicate the areas to the east north, and south, do not meet the criteria that you illustrated for this hearing?

A We have included in our application Mobil leases. As to whether there should be an extension or not, we are not objecting to extending the field limits.

Q You don't have any evidence whether it would or would not meet the criteria?

A No, we don't.

Q Is it possible for you to obtain any information on those wells located outside of your boundary for the permeability and production criteria?

A Generally we have a hard enough time finding our own data. As far as offset operators, I'm inclined to believe that they really have as limited data as possible, just, you know, other than completion data. I don't believe they probably performed too many buildup tests or anything else.

Q And there's one -- there's a couple of

infill locations in Township 27, 3 West. If these infill locations have probable reserves of greater than 400 MMcf, would you develop those at current prices?

A. Which are the locations with which you are concerned?

Q. There's one in the southeast quarter of 15, Section 15.

A. Okay, in Township 26 --

Q. 27, 3.

A. 27, 3? Well, we would on a risk rate analysis, we would probably assume the recovery in there to be in the order of, maybe, four to -- close to 500-million, and at current prices this would be low economics to the point of not even considering.

MS. UMSCHLER: That's all my questions.

MR. STAMETS: Are there other questions of the witness?

MR. HIGGINS: Yes, sir.

QUESTIONS BY MR. HIGGINS:

Q. On your Exhibit One it's a boundary question. Looking at the main Mesaverde Pool, there is -- you have sort of an island on your map and on the eastern edge of the pool under consideration there are three or four

dry holes. But further east of that another operator has developed Mesaverde wells.

Could this not be a similar case where we have select spots where there is no production but the actual true boundary of this reservoir may well extend eastward or northward, southward, of the current boundary you have?

A. We are going strictly on dry holes that are around here as our limiting factor here to delineate this structure.

Anything in between these dry holes is open for conjecture.

Q. That's my point, that it's not conclusive in all of these areas. There's a limited number of dry holes to delineate the boundaries established here.

A. Right.

MR. HIGGINS: No more questions.

RECROSS EXAMINATION

BY MR. STAMETS:

Q. I presume Mobil would have no objection if we decided to take in a little more acreage than what you have proposed.

A. No.

Q Of course I'm speaking about acreage which would be more or less immediately adjacent to the proposed area.

One thing that crosses my mind is the possibility of the replacement of some of these wells where we've already had infill drilling at the higher price if this area was all designated as a tight reservoir. I can visualize a scenario where an unscrupulous operator would come in and take one of those good wells in the sweet spot and screw it up and run in there and drill himself a replacement well. Obviously that's not Mobil's intention, but how could that be guarded against?

A Well, it's not up to me to define policy; however, we believe that we've sufficiently drained the reserves on sections that are completely developed to the point where we don't believe even a replacement well at this point would be economical, regardless of even tight gas prices.

Q Okay.

MR. STAMETS: Any other questions of the witness? Mr. Padilla?

CROSS EXAMINATION

BY MR. PADILLA:

Q. Mr. Hoffmaster, I have just a couple of questions.

For instance, what is the average productive life of these Mesaverde wells in the subject area?

A. They can produce -- well, so far they've produced for twenty-five years and we expect, well, maybe ten more years or fifteen, or whatever. You know, you can't say. It would have to be on a per well basis.

Q. Are some of these wells designated as stripper wells now, do you know?

A. I'm not familiar if there are any.

Q. Okay. Now you mentioned that possibly one well has been drilled in this area in the last couple of years.

A. Vaguely I recall. I'm not sure. There may not have been. I know it was not an economical well if it was. I just recall in the back of my mind seeing an economic analysis run on it, a well.

Q. Now going to Exhibit B, what is the current price you're basing your analysis on? Would that be Section 103 or would it be possibly some '78 gas price, or what is the gas price?

A. On Exhibit B?

Q. Yes.

A. The current price? That's the Section 103 price escalated.

Q. The most highest price?

A. Right, that is allowed, yes.

Q. If I understand your testimony, you're actually only seeking tight formation designation for the existing infill wells that need to fully develop the area, and also for the, say, Sections 12, 13, and 24 in the northwest area.

A. We're seeking the entire area designated in yellow on your base map as -- as tight gas.

Q. But practically speaking, you'd only be able to collect 107 price for those not fully developed areas?

A. Right, for the undeveloped locations only.

MR. PADILLA: That's all I have, Mr. Examiner.

MR. STAMETS: Are there any other questions of the witness? He may be excused.

Anything further in this case? Mr. Carr?

MR. CARR: Mr. Stamets, Northwest Pipeline Corporation opposes the application of Mobil in this case.

Northwest believes that the subject area as evidenced by their Exhibit Number Twelve and other exhibits, has been substantially developed under existing prices and therefor should not qualify for tight sand designation. under the provisions of FERC Order Number 99.

Northwest further believes that the area can be developed under the existing infill order at the present prices.

Instead of reading a fairly lengthy statement that Northwest Pipeline Company has prepared in opposition to this application, with your permission I'll simply present it to you.

I have nothing further.

MR. STAMETS: That will be fine, Mr. Carr.

Also, I would like to ask Mobil to submit some clarification subsequent to the hearing on any well which may have been drilled in the last two years, well, 1978 and on.

MR. SPERLING: Right, '78 forward.

MR. STAMETS: Including 1978; '78, 79,

'80 and '81, and if there are any indications that those wells are economical or uneconomical.

A. Okay.

MR. STAMETS: And then I'm going to take this case under advisement.

(Hearing concluded.)

BLANCO MESAVERDE

ECONOMIC ANALYSIS

1-21-81

Present Gas Price

Tight Gas Price

EXHIBIT B

PAYOUT (YRS.)

10
8
6
4
2
0

PROFIT INVESTMENT RATIO ($/$)

3.0
2.0
1.0
0
-1

RATE OF RETURN (%)

100
80
60
40
20
0

200 400 600 800 1000 1200

ULTIMATE RESERVES (MMCF)

Case 2154

APPLICATION FOR TIGHT

GAS FORMATION DESIGNATION

MOBIL PRODUCING TEXAS & NEW MEXICO OPERATED LEASES

RIO ARRIBA COUNTY

NEW MEXICO

TABLE OF CONTENTS

Mobil Producing Texas and New Mexico submits an application to designate the Blanco Mesa Verde Pool as a tight formation underlying following tracts:

T27N R3W: Sections 11, 12, 13, 14, S/2 of 15, 22, 23, 24, 25, 26, 27, 35, 36

T26N R3W: Sections 1, 2, 11, 12, 13, 14, 23, 24

T26N R2W: Lot 4 Sec 7, NE/4 and S/2 Sec 8, Sec 17, Sec 18, Lots 1,2,3 Sec 19

All of these tracts are in Rio Arriba County, New Mexico.

It is believed that the Blanco Mesa Verde Pool in the above area exhibits the characteristics of a tight formation as identified in FERC Order No. 99. The guidelines indicated that (1) the average insitu permeability should be less than 0.1 millidarcy, (2) the pre-stimulation production rate to atmosphere of formations whose tops are between 5500' - 6000' may not exceed 188 MCF/D, and (3) the pre- stimulation oil rate should not exceed 5 BOPD.

Geologic Description:

The Geology of the Mesa Verde Group in T26N and T27N, R3W

The Mesa Verde Group lies between two thick formations of shale, the overlying Lewis shale and the underlying Mancos shale. This group is divided into three formations; the Cliff House, Menefee, and Point Lookout.

The Cliff House sandstone is about 100 ft thick in the west side of T26N, R3W; 40 ft thick in the middle, 60 ft thick in the east and becomes thin in T26N, R2W. The porosity of the Cliff House sandstone usually decreases as the sandstone becomes thinner (See Cross section A-C).

The Menefee shale contains some thin sandstone layers. The formation is not an important reservoir unit although some wells are also perforated for natural gas production.

The Point Lookout is the main reservoir of the Mesa Verde Group. The porous sandstone in the upper part of the formation is about 100 ft thick in the west side of T26N, R3W, 40 ft in the middle, and 55 ft in the east, and becomes thinner in T26N, R2W. The porosity of the Point Lookout sandstone usually decreases as the sandstone becomes thinner.

In general, the sandstones of the Mesa Verde Group form a narrow strip of reservoir about 2 miles wide and 9 miles long in a north-south direction in T26N, R3W and T27N, R3W.

History:

The Blanco Mesa Verde Pool in the subject area was developed in the late 1950s on 320 acre proration units. A few wells were tested before stimulation, but were found to produce at non commercial rates. Subsequent wells were stimulated by fracturing without prior production rate testing. As a result of this policy, pre-frac data is sparse and pre-frac conditions must be inferred from post frac data.

An infill drilling program was initiated in the mid 1970s as the rules were amended to allow for a second well on a proration unit. The drilling program met with moderate success, but several units on the eastern edge were economically unfeasible due to insufficient reserves and have remained undeveloped.

Mobil Producing Texas and New Mexico Inc. has received inquiries pertaining to the future development of undeveloped units. As a prudent operator we are willing to comply with the requests provided that price relief can be obtained. The following discussion will attempt to prove that the Blanco Mesa Verde Pool underlying the aforementioned acreage is characteristic of a tight formation and gas sold from future wells should be subject to tight gas pricing.

Discussion:

Exhibit 1 points out that the aforementioned acreage (± 13,920 acres) comprises the bulk of a separate sand body in the Blanco Mesa Verde Pool that produces independently of the main pool. The acreage is located on the eastern fringe of the main pool and is surrounded by dry holes in the Mesa Verde formation. Therefore data submitted from wells in the subject acreage is valid for this area only and may not be representative of the main Blanco Mesa Verde Pool.

Exhibit 2 is a cumulative gas production map. High recoveries have come from a "sweet spot" located in center of the acreage. Recoveries decrease outward in all directions. Undeveloped acreage lies in areas where expected recoveries will be less than 500 MMCF per well. At present gas prices, reserves of this magnitude are unprofitable.

Exhibit 3 is a table of after frac permeabilities calculated from bottom hole pressure buildups run in 1975 and 1976. The calculated permeabilities for 11 wells were averaged and the resultant permeability was 0.146 millidarcy. It should be noted that the buildups were run after fracturing, and the values would be lower had the buildups been run before fracturing.

Exhibits 4 and 5 summarize the computations involved in calculating formation permeability based on a bottom hole pressure buildup. The calculations are a standard in the industry to obtain accurate formation permeability.

Exhibit 5A utilizes a method for determining pre frac permeability if the fracture length is known. In the case of Jicarilla 'H' #2A, employing a 1,000' fracture in a 160 acre drainage area reveals that the prefrac permeability was 28% of the post frac permeability or 0.07 md.

Exhibit 6 is a summary of permeability analyses of whole cores from these wells. This type of analysis results in apparent permeabilities that are greater than actual due to a reduction in overburden pressure. In the case of the Mesa Verde, compaction can result in a reduction in permeability (see chart in Exhibit). The permeability of the core in one well averaged 0.032 md. The other well was cored in only one out of three sections and averaged 0.216 md. This value would have been lower had all sections been cored and analyzed. Another well averaged 0.18 md permeability. However, this well had fewer samples taken, and these were obtained from the better quality portions of the core. This type of spot sampling does not take into account that all of the interval contributes (both good and poor quality) and the actual average permeability is less than what is measured. Therefore this type of analysis is basically qualitative rather than quantitative.

From the date presented in Exhibits 3, 4, 5, 5A, and 6, it can be inferred that the average insitu permeability of the Mesa Verde formation is less than 0.1 md.

Exhibit 7 tabulates all the known prefrac flow rates in the area. Prefrac testing is usually not performed since it is a known fact that the wells will need stimulation. Natural flow rate tests to atmosphere were run on 15 wells. The average rate of thirteen flow rates was 150 MCFPD.

Two rates (11,960 MCFPD and 2083 MCFPD) were not averaged in since they were not representative of the field. It is believed that the 11,960 MCFPD rate came from fractures in the immediate vicinity of the wellbore and not from the formation itself. This is substantiated in that the production rate dropped to 3221 MCFPD after fracturing and the well has only produced 900 MMCF after 22 years. (average = 112 MCFPD) The other rate came from the best well in the field (4.6 BCF recovery) which is in the small "sweet spot" area. This well is an anomaly and is not representative of the area as a whole.

From the data presented in Exhibit 7, it is evident that the average pre stimulation flow rate to atmosphere is less than 188 MCFPD, which is the maximum acceptable rate for a formation 5500' - 6000'deep.

Exhibit 9 shows the average condensate production rate from all wells in the subject area. Total condensate production from each individual well was divided by each well's total producing life to arrive at an average rate. It is evident that, except for the "sweet spot", production has averaged less than 5 BCPD for the entire area. It should be pointed out that the fluid is condensate and not oil. Based on fluid analysis and production tests, it is believed that the condensate is not in a fluid state in the reservoir, but becomes so at surface conditions.

MPTM's present policy is to set 300' of surface casing with cement circulated behind pipe and also to circulate cement behind the production casing also. This casing program should provide adequate protection of fresh water acquifers, as it meets and exceeds requirements as defined in NMOCD Blanco Mesa Verde Pool Rules 26, 27, and 28 (See Below).

RULE 26. Surface Pipe. The surface pipe shall be set to a minimum depth of 100 feet, and where shallow potable water-bearing beds are present, the surface pipe shall be set to such shallow potable water-bearing beds and a sufficient amount of cement shall be used to circulate the cement behind the pipe to the bottom of the cellar. This surface casing shall stand cemented for at least 24 hours before drilling plug or initiating tests. The surface casing shall be tested after drilling plug by bailing the hole dry. The hole shall remain dry for one hour to constitute satisfactory proof of a water shut-off. In lieu of the foregoing test, the cement job shall be tested by building up a pressure of 1000 psi, closing the valves, and allowing to stand thirty minutes. If the pressure does not drop more than 100 pounds during that period, the test shall be considered satisfactory. This test shall be made both before and after drilling the plug. The Commission shall be notified at least 24 hours prior to the conducting of any test.

RULE 27. Production String. The production string shall be set on top of the Cliff House Sand with a minimum of 100 sacks of cement and shall stand cemented not less than 36 hours before testing the casing. This test shall be made by building up a pressure of 1000 psi, closing the valves, and allowing to stand thirty minutes. If the pressure does not drop more than 100 pounds during that period, the test shall be considered satisfactory.

RULE 28. All cementing shall be done by the pump-and-plug method. Bailing tests may be used on all casing and cement tests, and drill stem tests may be used on cement tests in lieu of pressure tests. In making bailing test, the well shall be bailed dry and remain approximately dry for thirty minutes. If any string of casing fails while being tested by pressure or by bailing tests herein required, it shall be recemented and retested or an additional string of casing should be run and cemented. If an additional string is used, the same test shall be made as outlined for the original string. In submitting Form C-101, "Notice of Intention to Drill," the number of sacks of cement to be used on each string of casing shall be stated.

EXHIBIT 3
POST FRAC PERMEABILITIES
CALCULATED FROM BOTTOM HOLE PRESSURE BUILDUPS
BLANCO MESA VERDE FIELD

Lease and Well No.	kh* (md ft)	h (ft)	k (md)
Jicarilla 'E' #2	3.76	141	.027
Jicarilla 'F' #3	2.49	119	.021
Jicarilla 'F' #7	5.9	45	.13
Jicarilla 'G' #1	24.4	151	.162
Jicarilla 'G' #2	1.7	174	.010
Jicarilla 'G' #3	22.2	115	.193
Jicarilla 'H' #2	19.9	104	.191
Jicarilla 'H' #4	0.945	111	.0085
Jicarilla 'H' #7	19.5	84	.232
Cheney Federal #1	75.9	162	.469
Cheney Federal #3	2.44	16	.153
TOTAL	179.1	1222	1.60

$$\text{Avg. } k = \frac{179.1 \text{ md ft}}{1222 \text{ ft}} = 0.146 \text{ md} = \frac{1.60 \text{ md}}{11 \text{ samples}}$$

* k = permeability

h = contributing formation interval

EXHIBIT 4
JICARILLA G NO. 1-A
BLANCO MESA VERDE

CHRONOLOGICAL PRESSURE AND PRODUCTION DATA

Δt (hrs)	$\frac{t + \Delta t}{\Delta t}$	BHP
Flowing		490
.25	1045	530
.50	523	541
.75	349	550
1	262	561
2	131.5	594
3	88	612
4	66.2	630
5	53.2	644
6	44.5	655
7	38.3	664
8	33.6	673
10	27.1	689
12	22.8	705
14	19.6	719
16	17.3	732
18	15.5	744
20	14.0	755
22	17.9	764
24	11.9	773
28	10.3	792
32	9.2	812
36	8.3	828
40	7.5	844
44	6.9	860
48	6.4	871
54	5.8	889
60	5.4	905
66	5.0	921
72	4.6	935
78	4.3	948
84	4.1	960
90	3.9	971
96	3.7	985
102	3.6	996
108	3.4	1007
114	3.3	1016
120	3.2	1026
126	3.1	1035
132	3.0	1044
140	2.9	1055
150	2.7	1069
160	2.6	1080
164	2.59	1085
165	2.58	1087

EXHIBIT 4 (continued)
POST FRAC BOTTOM HOLE PRESSURE BUILDUP ANALYSIS
JICARILLA 'G' #1-A

Production Rate prior to shut-in (Q) = 1000 MCF/D
Time of production prior to shut-in (t) = 261 hours
Net feet of contributing formation (h) = 146 feet
Formation porosity (Ø) = 14%
Formation water saturation (Sw) = 34%
Bottom hole flowing pressure (Pwf) = 490 psia
Gas specific gravity = .688
Formation temperature = 142°F = 602°R
Find: Permeability (k) = millidarcies

From plot of BHP vs. $\frac{t + \Delta t}{t}$: slope of straight line (m) = 710 psi/cycle

Average pressure = $\frac{P^* + Pwf}{2} = \frac{1380 + 490}{2} = 935$ psia

@ 935 psia and 142°F :
gas deviation factor (z) = .8957
gas viscosity (μ) = 0.01372 centipoise

gas formation volume factor (Bg) = $.02829 \frac{zt}{p}$ cu ft/SCF

$= (.02829)\frac{(.8957)(602)}{935}$ cu ft/SCF

$= .0163$ cu ft/SCF

Converting: .0163 cu ft/SCF x 1000 SCF/MCF x $\frac{1 \text{ BBL}}{5.61 \text{ cu ft}}$ = 2.91 reservoir bbls/MCF

$kh = \frac{162.6 \times \text{rate} \times \text{viscosity} \times \text{formation volume factor}}{\text{slope of straight line of buildup plot}}$

$kh = \frac{162.6 \times Q \times \beta}{m} = \frac{162.6 \times 1000 \times 0.01372 \times 2.91}{710} = 9.14$ md ft

$k = \frac{9.14 \text{ md - ft}}{146 \text{ feet}} = .063$ md

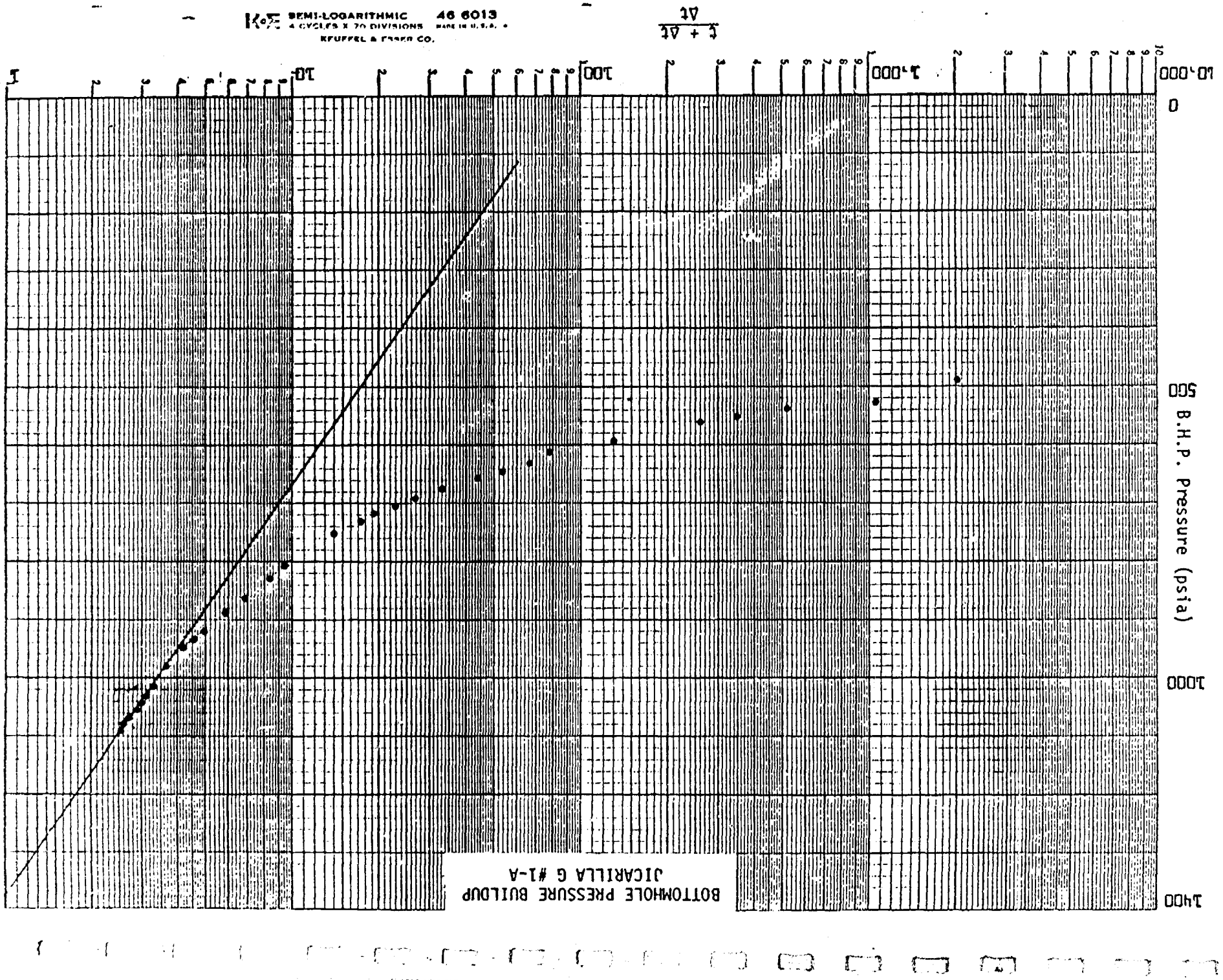

KOSE SEMI-LOGARITHMIC 46 6013
4 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO.
BOTTOMHOLE PRESSURE BUILDUP
JICARILLA G #1-A
B.H.P. Pressure (psia)
0
500
1000
1400
1.000
10.000

EXHIBIT 5
JICARILLA H-2 NO. A
BLANCO MESA VERDE

CHRONOLOGICAL PRESSURE AND PRODUCTION DATA

Δt (hrs)	$\frac{t + \Delta t}{\Delta t}$	BHP
Flowing	680	
.25	1369	762
.5	685	800
.75	457	832
1.0	343	860
1.5	229	894
2	172	932
3	115	964
4	86.5	989
6	58	1030
8	44	1060
10	35	1080
12	30	1101
16	22	1132
20	18	1157
24	15.2	1178
28	13.2	1194
32	11.7	1210
36	10.5	1223
40	9.6	1237
44	8.8	1246
48	8.1	1255
54	7.3	1269
60	6.7	1283
70	5.9	1298
80	5.3	1312
90	4.8	1326
100	4.4	1337
110	4.1	1348
120	3.8	1358
130	3.6	1364
140	3.4	1371
150	3.3	1378
160	3.1	1385
165	3.07	1388

EXHIBIT 5

POST FRAC BOTTOM HOLE PRESSURE BUILDUP ANALYSIS
JICARILLA 'H' #2-A

Q = 1700 MCF PD
t = 342 hrs
h = 122 ft
ø = 14%

Sw = 34%
Pwf = 680 psia
Gas gravity = .688
T = 142°F = 602°R

from BHP vs $\frac{t + \Delta t}{t}$: m = 300 psi/cycle

Average Pressure (P) = $\frac{P^* + Pwf}{2} = \frac{1530 + 680}{2}$ = 1105 psia

@ 1105 psia and 142°F :

z = 0.8814
μ = 0.01410 cp.
Bg = 2.469 reservoir bbl/MCF

$$kh = \frac{162.6 \times Q \times \mu \times Bg}{m} = \frac{162.6 \times 1700 \times 0.01410 \times 2.469}{300}$$

= 32 md-ft

$$k = \frac{32 \text{ md-ft}}{122 \text{ ft}} = 0.262 \text{ md}$$

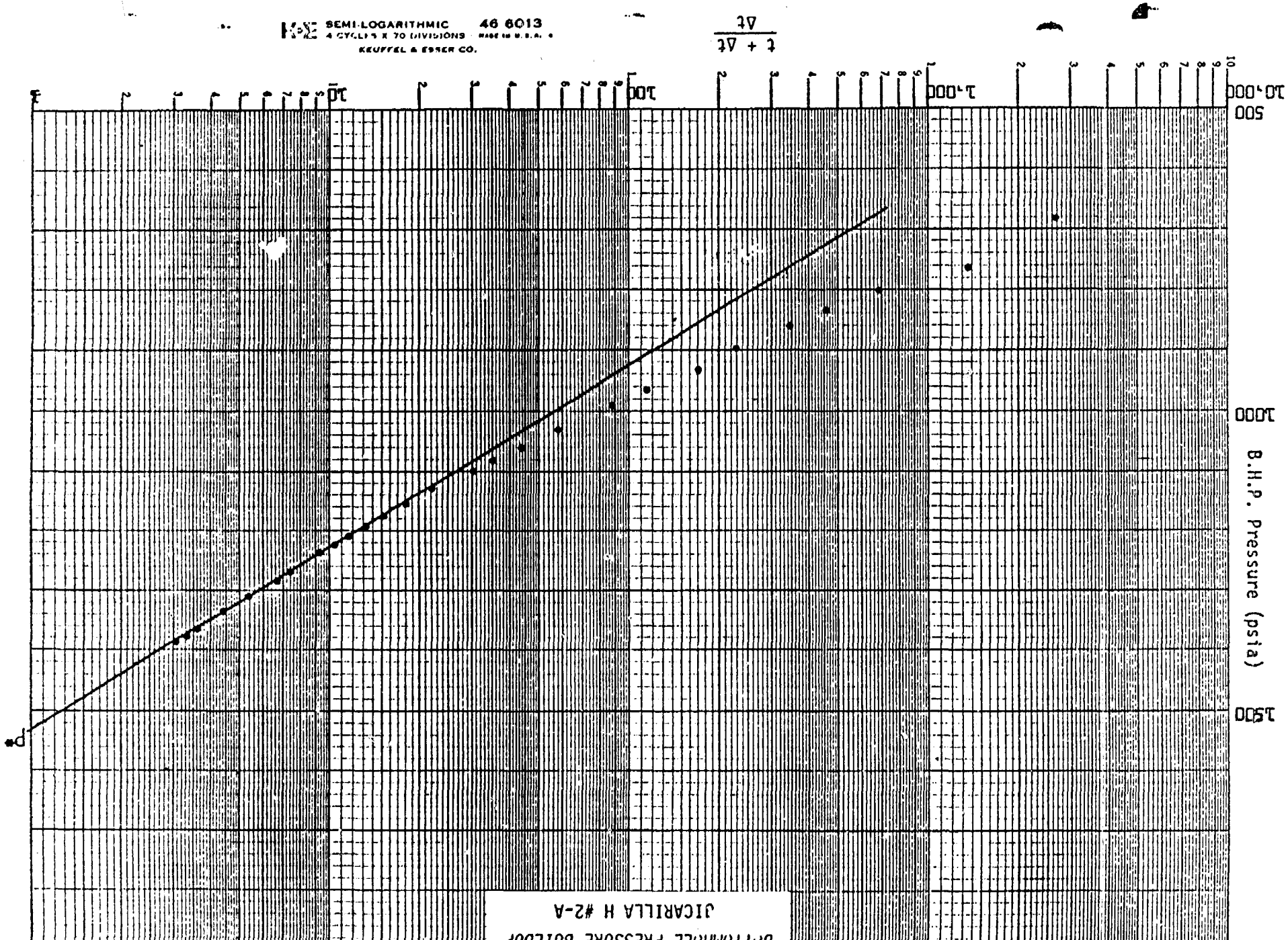

SEMI-LOGARITHMIC 46 6013
4 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO.
$\frac{\Delta t}{\Delta t + t}$
1.000
10,000
500
1000
B.H.P. Pressure (psia)
1500
1900
P*
BOTTOMHOLE PRESSURE BUILDUP
JICARILLA H #2-A

EXHIBIT 5A

CALCULATION OF PRE FRAC PERMEABILITY
JICARILLA 'H' #2A

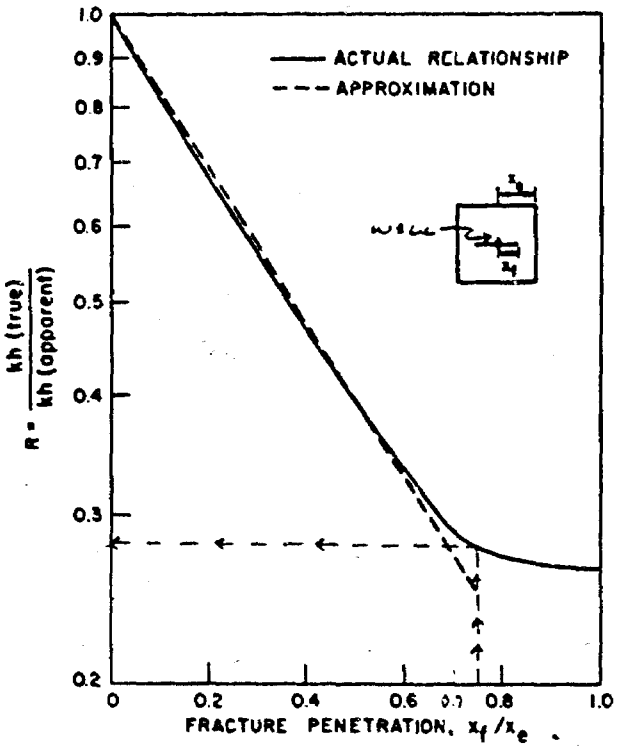


Fig. 10.25 Vertically fractured reservoir, pressure buildup interpretation. (After Russell and Truitt[9])

From SPE Monograph Vol. 1
Pressure Buildup and Flow Tests in Wells p. 108

Given:
Fracture length = 1000' (calculated from frac program)
Proration Unit = 160 acres
kh (apparent) = .262 md x 122 ft = 32 md. ft

Find kh (true):
Xe = $^1/_2$ length of a 160 acre square = $^1/_2$ x 2640' = 1320'
Xf = fracture length = 1000'
fracture penetration = $\frac{Xf}{Xe} = \frac{1000'}{1320'} = 0.76$

from above chart $\frac{Kh\ (true)}{Kh\ apparent} = .28$

Therefore Kh(true) = .28 x Kh apparent = .28 x 32 md ft = 8.96 md ft

$K = \frac{8.96\ md\ ft}{122'} = .0734\ md$

EXHIBIT 5A

HYDRAULIC FRACTURING TREATMENT SCHEDULE
JICARILLA "H", WELL NO. 2-A
BLANCO MESA VERDE FIELD
RIO ARRIBA COUNTY, NEW MEXICO

Formation	Treating Rate (bbls/min)	Base Fluid Type	Treating Fluid Volume and Type	Friction Reducing Agt Type	Conc (#/1000 gals)	Gelling Agt Type	Conc (#/1000 gals)	Fluid Loss Agent Type	Conc (#/1000 gals)	Foaming Agent Type	Conc (#/1000 gals)	Mesh Size	Sand Data Conc (#/gal)	Quantity (Lbs)
Lower Mesa Verde (5754'-5(?)'-166'OA-42 holes)	50	1% KCL	5,000 gals.Prepad	FR-20	3.0	None	0	Ad-Aq	30	Surf	2.0	None	0.0	0
	"	"	10,000 gals.Versagel Pad	None	0.0	WG-11	40	"	"	"	"	None	0.0	0
	"	"	7,500 gals.Versagel	"	"	"	"	"	"	"	"	20-40	1.0	7,500
	"	"	7,500 gals.Versagel	"	"	"	"	"	"	"	"	"	2.0	15,000
	"	"	7,500 gals.Versagel	"	"	"	"	"	"	"	"	"	3.0	22,500
	"	"	22,500 gals.Versagel	"	"	"	"	"	"	"	"	"	4.0	90,000
			DROP 18 BCNBS											
	50	1% KCL	5,000 gals.Prepad	FR-20	3.0	None	0	Ad-Aq	30	Surf	2.0	None	0.0	0
	"	"	10,000 gals.Versagel Pad	None	0.0	WG-11	40	"	"	"	"	None	0.0	0
	"	"	7,500 gals.Versagel	"	"	"	"	"	"	"	"	20-40	1.0	7,500
	"	"	7,500 gals.Versagel	"	"	"	"	"	"	"	"	"	2.0	15,000
	"	"	7,500 gals.Versagel	"	"	"	"	"	"	"	"	"	3.0	22,500
	"	"	22,500 gals.Versagel	"	"	"	"	"	"	"	"	"	4.0	90,000
Middle Mesa Verde (5504'-5680'-176'OA-31 holes)	30	1% KCL	3,500 gals.Prepad	FR-20	3.0	None	0	Ad-Aq	30	Surf	2.0	None	0.0	0
	"	"	6,500 gals.Versagel Pad	None	0.0	WG-11	40	"	"	"	"	None	0.0	0
	"	"	5,000 gals.Versagel	"	"	"	"	"	"	"	"	20-40	1.0	5,000
	"	"	5,000 gals.Versagel	"	"	"	"	"	"	"	"	"	2.0	10,000
	"	"	5,000 gals.Versagel	"	"	"	"	"	"	"	"	"	3.0	15,000
	"	"	15,000 gals.Versagel	"	"	"	"	"	"	"	"	"	4.0	60,000
			DROP 4 BCNBS											
	30	1% KCL	3,500 gals.Prepad	FR-20	3.0	None	0	Ad-Aq	30	Surf	2.0	None	0.0	0
	"	"	6,500 gals.Versagel Pad	None	0.0	WG-11	40	"	"	"	"	None	0.0	0
	"	"	5,000 gals.Versagel	"	"	"	"	"	"	"	"	20-40	1.0	5,000
	"	"	5,000 gals.Versagel	"	"	"	"	"	"	"	"	"	2.0	10,000
	"	"	5,000 gals.Versagel	"	"	"	"	"	"	"	"	"	3.0	15,000
	"	"	15,000 gals.Versagel	"	"	"	"	"	"	"	"	"	4.0	60,000
			DROP 4 BCNBS											
	30	1% KCL	3,500 gals.Prepad	FR-20	3.0	None	0	Ad-Aq	30	Surf	2.0	None	0.0	0
	"	"	6,500 gals.Versagel Pad	None	0.0	WG-11	40	"	"	"	"	None	0.0	0
	"	"	5,000 gals.Versagel	"	"	"	"	"	"	"	"	20-40	1.0	5,000
	"	"	5,000 gals.Versagel	"	"	"	"	"	"	"	"	"	2.0	10,000
	"	"	5,000 gals.Versagel	"	"	"	"	"	"	"	"	"	3.0	15,000
	"	"	15,000 gals.Versagel	"	"	"	"	"	"	"	"	"	4.0	60,000
Upper Mesa Verde (5394'-5480'-86'OA-27 holes)	50	1% KCL	10,000 gals.Prepad	FR-20	3.0	None	0	Ad-Aq	30	Surf	2.0	None	0.0	0
	"	"	20,000 gals.Versagel Pad	None	0.0	WG-11	40	"	"	"	"	None	0.0	0
	"	"	15,000 gals.Versagel	"	"	"	"	"	"	"	"	20-40	1.0	15,000
	"	"	15,000 gals.Versagel	"	"	"	"	"	"	"	"	"	2.0	30,000
	"	"	15,000 gals.Versagel	"	"	"	"	"	"	"	"	"	3.0	45,000
	"	"	45,000 gals.Versagel	"	"	"	"	"	"	"	"	"	4.0	180,000

AD-Aq = Adomite Aqua
Surf = Nowco Sudo

jesmith/jc
6/30/75

EXHIBIT 5A

FRAC6• 5-10-76

FRACPLAN II

JOB TYPE - VERSAGEL FRACTURING PROCESS

MOBIL-DII CO.• JICARPA• MESA VERDE FORMATION

1 % KCL• 30 LBS. ADOMITE AQUA• 2 GALS. PFN-5

Jicarilla "H" Well No. 1
Blanco Mesa Vi...

INJECTION RATE - BBL/MIN	50.0
ASSUMED FRACTURE HEIGHT - FT	100.0
NET FORMATION THICKNESS - FT	40.0
ELASTIC MODULUS - PSI	0.30E+07
FORMATION PERMEABILITY - MD	0.10
FORMATION POROSITY	0.08
BHTP - PSI	3500.
RESERVOIR PRESSURE - PSI	1000.
RESERVOIR FLUID VIS - CP	0.02
CW - FLUID LOSS COEF. - FT/SQRT(MIN)	0.00100
SPURT LOSS - GAL/SQFT	0.
TYPE OF GEL	WG-11
GEL CONCENTRATION	40#/M
N-PRIME	0.4500
K-PRIME(SLOT) - LBF-SEC••N/SQFT	0.100000
WELL SPACING - ACRES	350.
DRAINAGE RADIUS - FT	2000.
WELLBORE RADIUS - FT	0.400
DAMAGE RATIO	1.0
TYPE & CONC NO 1 PROP 20-40 SAND	5.00 LB/GAL AVG

DESIGN NO	PROD INCREASE (T)	PROD INCREASE (M-S)	TOTAL VOL GAL/1000	PAD VOL	PROPPED FRAC LN FT	PROPPED FRAC HT FT	VIS CPS	FRAC WIDTH IN	PROP 1ST SX	PROP 2ND SX
1	3.7	7.3	60.0	15.6	765.	100.0	536.	0.614	2221.	0.
2	4.0	7.3	70.0	18.6	857.	100.0	560.	0.639	2549.	0.
3	4.2	8.9	80.0	21.8	946.	100.0	582.	0.661	2912.	0.
Y_f = 1000' → 4	4.4	8.9	90.0	24.9	1033.	100.0	601.	0.682	3253.	0.
5	4.7	10.1	100.0	28.2	1117.	100.0	619.	0.700	3591.	0.
6	5.0	10.1	110.0	31.5	1198.	100.0	636.	0.717	3926.	0.
7	5.3	10.1	120.0	34.9	1278.	100.0	652.	0.734	4258.	0.
8	5.6	11.0	130.0	38.2	1356.	100.0	667.	0.749	4589.	0.
9	6.0	11.0	140.0	41.7	1433.	100.0	681.	0.763	4917.	0.
10	6.4	11.8	150.0	45.1	1508.	100.0	694.	0.777	5244.	0.

Y_f = 1000'
W_f = 150'
q_i = 50 BPM

CREATED LENGTH	HED	RELATIVE CAP (T)	RELATIVE CAP (M-S)	HF/HI	C-EFF
765.	0.	234.80	415503.	1.00	0.000087
857.	0.	240.25	425140.	1.00	0.000085
946.	0.	244.78	433155.	1.00	0.000084
1033.	0.	248.92	440490.	1.00	0.000083
1117.	0.	252.50	446821.	1.00	0.000082
1198.	0.	255.86	452777.	1.00	0.000081
1278.	0.	258.97	458274.	1.00	0.000081
1356.	0.	261.86	463380.	1.00	0.000080
1433.	0.	264.55	468149.	1.00	0.000079
1508.	0.	267.08	472683.	1.00	0.000078

100 Gal-Prepad.
100 Gal-Linear Pad
100 Gal-Versagel
1 lb/Gal Sand
1000 Gal-Versagel
1.5 lb/Gal Sand.
1000 Gal-Versagel
1.5 lb/Gal Sand
1000 Gal-Versagel
1.5 lb/Gal Sand

= 450,000 lbs Sand Total

John E. Sh...
1.28.7

MOBIL OIL CORPORATION
WELL COST STATEMENT

STATE	COUNTY OR PARISH	FIELD	WKG. INT.
NEW MEXICO	RIO ARRIBA	BLANCO (MESA VERDE)	100

REGION	AREA	LEASE	WELL NO.
HOUSTON	356 JICARILLA	H 75626-00	2-A

DATE COMMENCED	DATE COMPLETED	TOTAL DEPTH	STATUS	AFE NO.	PREPARED BY
5-04-76	7-12-76	6100	GAS	6241	DALLAS ACCOUNTING CENTER

	COSTS /WHOLE DOLLARS/ ACTUAL		ESTIMATED
DRILLING COSTS			
FOOTAGE COST	57,102		
DAY WORK COST	9,578		
OTHER DRILLING COST	19,352		
TOTAL DRILLING COSTS		66,032	
WELL EXPENSES			
LOCATION AND ROADS	3,296		
LOGGING AND TESTING	7,679		
FUEL	97		
WATER	9,239		
MUD AND CHEMICALS	36,666		
CEMENT AND CEMENTING SERVICES	20,181		
TRANSPORTATION	3,603		
PERFORATING AND STIMULATION	162,872		
EQUIPMENT RENTAL	1,297		
MISCELLANEOUS	6,690		
TOTAL WELL EXPENSES		251,842	371,000
TOTAL INTANGIBLE COSTS		337,874	371,000
WELL EQUIPMENT			
CASING	34,655		
OTHER EQUIPMENT	6,976-		
TOTAL TANGIBLE COSTS		27,679	
TOTAL COSTS		365,553	371,000
APPROXIMATE COST TO MOBIL		365,553	

EXHIBIT 6
PERMEABILITY BASED ON CORE ANALYSIS
BLANCO MESA VERDE FIELD

Lease and Well No.	No. of Samples	Summation of All k Values	Average k	Reduced k due to compaction
Jicarilla H-7 *	28	6.04 md	0.216 md	.17 md
Jicarilla G-1	130	4.10 md	0.032 md	.026 md
Jicarilla G-5	56	9.95 md	0.18 md	.14 md

* only one out of three intervals was cored

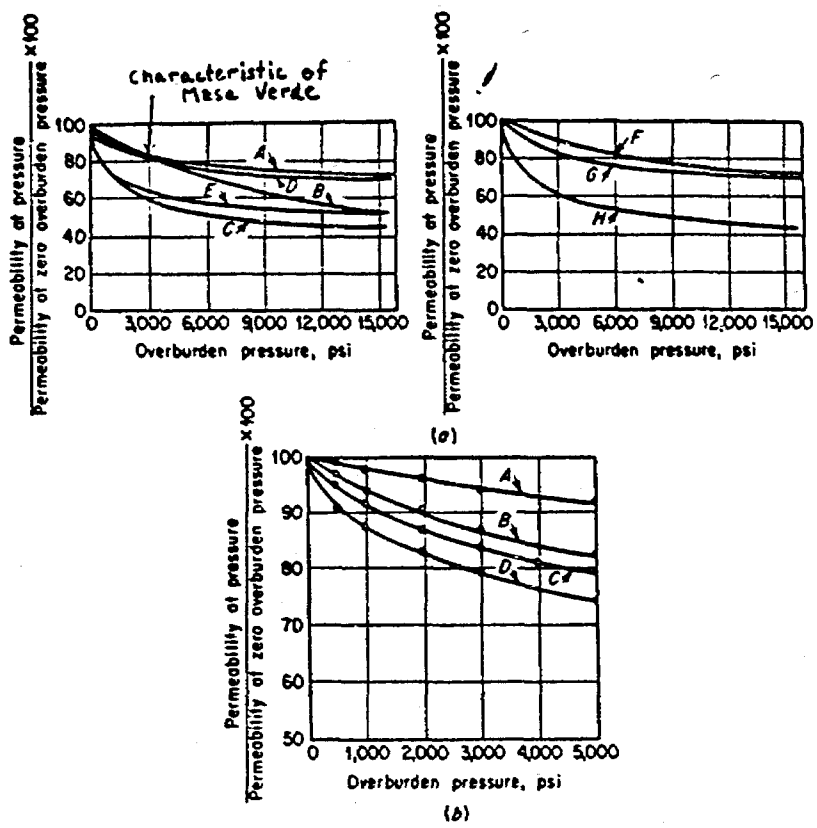


FIG. 2-46. Changes in permeability with overburden pressure. (a) Curve *A*—Colorado; 3.96 millidarcys; *B*—Southern California coast, 40.9; *C*—San Joaquin Valley, Calif., 45.0; *D*—Arizona, 4.36; *E*—Arizona, 632; *F*—San Joaquin Valley, Calif., 40.5; *G*—San Joaquin Valley, Calif., 55.5; *H*—Southern California coast, 318.8. (b) *A*—basal Tuscaloosa, Miss., 229 millidarcys, 15 per cent porosity; *B*—basal Tuscaloosa, Miss., 163, 24; *C*—Southern California coast, 335, 25; *D*—Los Angeles basin, Calif., 110, 22. (*From Fatt and Davis.*[80])

From Petroleum Reservoir Engineering
by AMYX, Bass & Whiting,
page 96

EXHIBIT 7
NATURAL FLOW RATES (C. 1958)
BLANCO MESA VERDE FIELD

Lease and Well No.	Rate (MCFPD)
Jicarilla 'D' #7	12
Jicarilla 'D' #8	69
Jicarilla 'F' #4	258
Jicarilla 'F' #5	7
Jicarilla 'F' #6	32
Jicarilla 'F' #7	44
Jicarilla 'G' #5	293
Jicarilla 'G' #7	7
Jicarilla 'G' #8	15
Jicarilla 'H' #7	325
Jicarilla 'H' #8	7
Cheney Federal #2	11
Featherstone Fed. #1	865

$$\text{Average Rate} = \frac{1955 \text{ MCFPD Total}}{13 \text{ wells}} = 150 \text{ MCFPD}$$

Jicarilla 'G' #6	2083 *
Jicarilla 'E' #5	11,690 *

* See discussion for explanation

EXHIBIT 8

REPORT OF LABORATORY ANALYSIS — FIELD SAMPLE

Form X-6512

Magnolia Petroleum Company

Container No. 4042 Analysis No. 12089
Container Pressure 570 psia @ 70 °F. (Field)
180# @ 90 °F. (Lab.)
Date Sampled 5-20-58
Stream Sampled Separator Liquid
Volume of Stream Sampled 3.21 bbls/day (stock)

Lease Name Jicarilla "E" Well No. 1 M.V.
District Lea State New Mexico
Operator Magnolia Petroleum Co.
Field Blanco Mesaverde County Rio Arriba
Sand Mesaverde Depth 5386-5880
Well Depth 5900' Perf. 5380-5880 Shots 6/ft.

Sample Requested by R. D. Myers Submitted by Lee E. Robinson Analyzed by Peters & Willbanks - 6-11-58

FIELD TESTS AND OPERATING DATA:

Pressures:		Temperatures:	
Bottomhole		Bottomhole	
Shutin Casing		Flowing Wellhead	70 est.
Shutin Tubing	1039	Heater Inlet	none
Flowing Tubing	570	Heater Outlet	none
Flowing Casing		Primary Sep. Gas	70
Primary Separator	570	Primary Sep. Oil	70
Secondary Separator	20	Meter Run	70
Stock Tank	Atm.	Stock Tank	55
		Atmospheric	75

Choke Sizes: Tubing none Casing none Heater none

Production Rate:		Ratios:	
Primary Sep. Gas	486 MCF/D	Sep. Gas/Sep. Water	48.6 MCF/bbl. est.
Primary Sep. Oil		Sep. Gas/Stock Oil	151.4 MCF/bbl
Primary Sep. Water	10 bbl/day (est)	Sep. Gas/Stock Water	
Stock Tank Oil	3.21 bbl/day	Sep. Gas/Sep. Oil	unknown
Stock Tank Water	none	Overall Gas/Liquid	

Potential Rates:		Allowable Rates:	
Gas	5,731 mcf/day pilot	Gas	
Oil		Oil	

Disposition Production: Gas Pan. NW pipeline Oil tank truck

Field Tests: Charcoal 30-32 GPM Air % Gas Gravity
0-32 GPM CO_2 % Oil Gravity @ °F.
0-60 GPM H_2S Gr./100 pH Water

Gas Measurement: Method Orifice Meter Pressure Base 14.65
Sample Method Gas displacement. Liquid Outage

REMARKS:

LABORATORY REPORT:

Component	Mol. %	Vol. %	Content GPM	Vapor Press.
Hydrogen Sulfide				
Carbon Dioxide				
Nitrogen				
Air				
Methane	11.19	4.84		
Ethane	7.41	4.82		
Propane	10.09	7.09		
i-Butane	3.98	3.32		
n-Butane	8.90	7.17		
i-Pentane	6.92	6.47		
n-Pentane	6.50	6.01		
Hexanes (†)	45.02	60.28		
TOTAL	100.00	100.00		

ENGLER: IBP 90 °F. 70% 351 °F.
5% 112 80% 537
10% 126 90%
20% 150 95%
30% 176 EP 674
40% 198 Rec. 86.5 %
50% 226 Res. 9.5 %
60% 267 Loss 4.0 %

Residue Data: °API Gravity @ 60°F.
Mol. Wt. 123.913 Reid Vapor Pressure
CF/Gal. 19.115
Gal./Mol. 19.880 26/70 Equiv.
°API 57.5 Burrell: Air %
Calc. VP 2.14 CO_2 %
Companion Samples

REMARKS:

To: L. E. Robinson (2)

sct RDM ML CTF IBS REC BCB WS file

Signed G. T. McIvar for E. L. Stovall/emm Date 6/30/58

Mobil Producing Texas & New Mexico Inc.

NINE GREENWAY PLAZA-SUITE 2700
HOUSTON, TEXAS 77046

March 27, 1981

State of New Mexico Energy & Minerals Dept.
Oil & Gas Division
P. O. Box 2088
Santa Fe, New Mexico 87501

Attention: Mr. Richard L. Stamets
Technical Support Chief

7.01 MOBIL PRODUCING TX. & N.M., INC.
HEARING DATA - APPLICATION FOR
TIGHT GAS FORMATION
BLANCO MESA VERDE POOL
RIO ARRIBA COUNTY, NEW MEXICO

Gentlemen:

In response to your request of March 25, 1981 to Hap Weaver, we attach the following.

Three copies of the Subject Hearing Data together with a stamped and addressed mailer to FERC.

A copy of the subject Hearing Data for your use.

Four prints of a section (Mesa Verde) type log of a typical well. The log is marked Top MV, Base MV. Also shown on the log are the three zones The Cliff House, The Menefee and the Print Lookout which make up the Mesa Verde Formation.

The average depth to the top of the Mesa Verde Formation is 5563'. This average was based on depths of 25 wells in the Hearing area.

The Hearing Data Folder contains Exhibit "B" the Economic Analysis you requested.

I believe this is all the data you requested, if not or if additional data are required please advise.

Yours very truly,

J. A. Morris
Regulatory Engineering Supervisor

HFWeaver/lcc

Attachments

cc: Mr. Jim Sperling

NEW MEXICO DEPARTMENT OF ENERGY & MINERALS

OIL CONSERVATION DIVISION

IN THE MATTER OF THE APPLICATION OF MOBIL PRODUCING TEXAS & NEW MEXICO INC. FOR DESIGNATION OF TIGHT FORMATION, RIO ARRIBA COUNTY, NEW MEXICO

Case No. 7154

A P P L I C A T I O N

COMES NOW, MOBIL PRODUCING TEXAS & NEW MEXICO INC., by and through its undersigned attorneys and as provided in the Oil Conservation Division's Special Rules and Procedures for Tight Formation Designations under Section 107 of the Natural Gas Policy Act of 1978 promulgated by Oil Conservation Division Order No. R-6388 on June 30, 1980, hereby makes application for an order designating certain portions of the Mesa Verde Formation as a tight formation under Section 107 of the Natural Gas Policy Act of 1978 and in support of its application would show the Division:

1. Applicant is the owner and operator of certain interests in the Mesa Verde Formation underlying the following-described lands situated in Rio Arriba County, New Mexico:

Township 27 North, Range 3 West, N.M.P.M.

Section 11: All
Section 12: All
Section 13: All
Section 14: All
Section 15: S/2
Section 22: All
Section 23: All
Section 24: All
Section 25: All
Section 26: All
Section 27: All
Section 35: All
Section 36: All

Township 26 North, Range 3 West, N.M.P.M.

Section 1: All
Section 2: All
Section 11: All
Section 12: All
Section 13: All
Section 14: All
Section 23: All
Section 24: All

Township 26 North, Range 2 West, N.M.P.M.

Section 7: Lot 4
Section 8: NE/4, S/2
Section 17: All
Section 18: All
Section 19: Lots 1, 2, 3

Containing 13,920 acres, more or less.

2. The Mesa Verde Formation is expected to have an estimated average in situ gas permeability throughout the pay section of less than 0.1 millidarcy per foot.

3. The depth of the top of the Mesa Verde Formation is between 5500 and 6000 feet and the stabilized production rate, against atmospheric pressure, of wells completed for production in said formation, without stimulation, is not expected to exceed 188 mcf per day.

4. No well drilled into the Mesa Verde Formation in the above-described area is expected to produce, without stimulation, more than five barrels of oil per day.

5. Attached to this application and incorporated herein by reference is a complete set of exhibits, as well as a brief geologic description and history of the Blanco Mesa Verde pool, together with a statement of the meaning and purpose of each exhibit. These exhibits cover all aspects of the required evidentiary data described in Section D of the Oil Conservation Division's Special Rules and Procedures for Tight Sand Formation Designation under Section 107 of the Natural Gas Policy Act of 1978.

WHEREFORE, Applicant prays that this application be set for hearing before a duly appointed examiner of the Oil Conservation Division and that after notice and hearing as required by law, the Division enter its order recommending to the Federal Energy Regulatory Commission that pursuant to 18 CFR, Section 271.701-705, the Mesa Verde Formation underlying the above-described land be designated a tight formation, and making such other and further provision as may be proper in the premises.

Respectfully submitted,

MODRALL, SPERLING, ROEHL, HARRIS & SISK, P.A.

By: Original Signed by James E. Sperling

James E. Sperling
P. O. Box 2168
Albuquerque, New Mexico 87103
Telephone: (505) 243-4511

ATTORNEYS FOR APPLICANT

Certificate of Service

IT IS HEREBY CERTIFIED that a copy of this Application and a complete set of all exhibits which Applicant proposes to offer or introduce at hearing, together with the statement of meaning and purpose of each, has been mailed to the United States Geological Survey, at P. O. Box 26124, Albuquerque, New Mexico 87125, on this 19th day of January, 1981.

Original Signed by James E. Sperling

James E. Sperling

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

BRUCE KING
GOVERNOR

LARRY KEHOE
SECRETARY

POST OFFICE BOX 2088
STATE LAND OFFICE BUILDING
SANTA FE, NEW MEXICO 87501
(505) 827-2434

February 24, 1981

Mobil Producing Texas & New Mexico Inc.
Nine Greenway Plaza - Suite 2700
Houston, Texas 77046

case file

Attention: Mr. J. A. Morris

Dear Joe:

Your letter of February 19, 1981, included only a portion of the supplementary material I requested at the February 11 tight sands hearing.

In addition to the listing of wells completed since January 1, 1978, I requested any evidence you had which would show how economic those wells are expected to be.

Because of the ongoing infill drilling program in the Blanco Mesaverde Gas Pool good data on well economics becomes vital to any tight sands determination.

Sincerely,

R. L. STAMETS
Technical Support Chief

RLS/og

Mobil Producing Texas & New Mexico Inc.

NINE GREENWAY PLAZA—SUITE 2700
HOUSTON, TEXAS 77046

February 19, 1981

State of New Mexico
Energy & Minerals Department
Oil Conservation Division
P. O. Box 2088
Santa Fe, New Mexico 87501

Attention: Mr. Richard L. Stamets
Technical Support Chief

7.01 MOBIL PRODUCING TX. & N.M., INC.
APPLICATION FOR TIGHT GAS
FORMATION DESIGNATION
BLANCO MESA VERDE POOL
RIO ARRIBA CO., NEW MEXICO
DOCKET NO. 5-81 CASE NO. 7154

Dear Sir:

You requested information at the subject hearing concerning the completion of wells after 1/1/78 in the hearing area. The information was unavailable at the hearing and you were advised that we would furnish you with the data at a later date.

There were two wells completed after 1/1/78 in the area. These wells are the Jicarilla "E" #2A located in Unit D - Section 14 - T27N - R3W completed 12/4/78, and the Jicarilla "H" #4A located in Unit P - Section 1 - T26N - R3W and was completed 11/20/78 and was plugged and abandoned at completion. The Jicarilla E #2A averaged 54 MDFPD in December 1980.

We also note that the Federal Energy Regulatory Commission has designated the Mesa Verde as a tight formation in Colorado per Order No. 130 issued 2/5/81.

Yours very truly,

J. A. Morris

HFWEaver/lcc

J. A. Morris
Regulatory Engineering Supervisor

cc: Jim Sperling - Albuquerque, N.M.
Gene Daniel - USGS, Box 26124 Albuquerque, N.M. 87125

STATE OF NEW MEXICO
BEFORE THE
OIL CONSERVATION COMMISSION

In the Matter of:

Application of Mobil Producing Texas and New Mexico, Inc. for Designation of a Tight Formation, Rio Arriba County, New Mexico.	)	Case No. 7154

Comments of Northwest
Pipeline Corporation in
Opposition to
Tight Formation Designation

By notice issued in Docket No. 5-81, the Oil Conservation Commission ("Commission") has set for hearing on February 11, 1981, the application of Mobile Producing Texas and New Mexico, Inc. for designation of certain areas of Rio Arriba County as a Tight Formation in the instant docket pursuant to the authority of § 107(c)(5) of the Natural Gas Policy Act of 1978 and 18 CFR § 271.701 et seq. The formation proposed is the Mesaverde Formation underlying certain areas in Townships 26 and 27 North, Ranges 2 and 3 West.

Northwest Pipeline Corporation ("Northwest") hereby requests leave to present comments in this proceeding and to have those comments considered by the Examiner and the Commission in its consideration of this matter. In support of these requests Northwest states as follows:

Northwest is a Natural Gas Company as defined by the Natural Gas Act, 15 U.S.C. §§ 717 et seq. and is engaged inter alia in the production, transportation and sale of natural gas in the states of New Mexico, Colorado, Utah, Idaho, Wyoming, Oregon and Washington. Northwest purchases or produces a significant portion of its gas supply from wells located in the San Juan Basin of Colorado and New Mexico. The acreage proposed for Tight Formation designation herein is located on the north-eastern edge of the San Juan Basin in an area where Northwest has gas purchase interests, and accordingly, Northwest will be affected by the decision of the Examiner and the Commission in this proceeding, and has interests which cannot be adequately represented by any party to this proceeding.

Any designation of Tight Formation under § 107(c)(5) of the NGPA must comply with the provisions of Order No. 99 issued by the Federal Energy Regulatory Commission ("FERC") on August 15, 1980.

Order No. 99 prescribes several criteria which must be met before a formation can be designated "tight" among which are the absence of an infill drilling program and that the area proposed for designation must not be "substantially developed." 1/

Based upon information available to it, Northwest contends that neither of these conditions have been met in the instant case.

There is in effect for the subject areas a well spacing rule which meets the definition established by FERC of an "infill program." The infill program was established by the New Mexico Commission in Order No. R-1670 as amended (Order No. R-1670-U, September 20, 1978) in which the Commission authorized the spacing of a second well on an existing 320-acre proration unit. This order having been promulgated prior to designation of the subject lands as Tight Formations, and numerous wells which having been drilled in response to this infill program, precludes such designation under FERC Order No. 99 to the extent the acreage is presently "substantially developed."

There are at present some 36 wells producing natural gas from the Mesaverde Formation on the 13,920 acres proposed for designation. Fourteen of these wells are "infill wells" having been drilled subsequent to Order No. R-1670-U. The names of these wells and their locations are set forth in Exhibit No. 1 attached hereto. Northwest's information also indicates that the T27N, R3W area wells have an average cumulative production of 1040 MMcf per well with a current rate of 145 Mcf/day per well. The T26N, R2W area wells have an average cumulative production of 1250 MMcf per well with a current average rate of 88 Mcf/day per well. It is the opinion of Northwest that the portion of the Mesaverde Formation proposed for designation as a Tight Formation is "substantially developed" and, therefore, may not be considered for such designation. 2/

Northwest respectfully submits that these facts preclude designation as Tight Formation of the acreage and formation proposed in this docket.

Wherefore, Northwest urges that the Examiner and the Commission deny the application of Mobil Producing Texas and New Mexico, Inc. in this docket, and that the area proposed for designation not be designated as Tight Formation under 18 CFR § 271.701 et seq.

1/ See, 18 CFR §§ 271.703(b)(6) and (c)(2)(1).

2/ See, 18 CFR § 271.703(a)(6) and Order No. 99, mimeo, at 50-52.

Respectfully submitted,

NORTHWEST PIPELINE CORPORATION

Of Counsel:

Donald C. Shepler
Northwest Pipeline Corporation
315 East Second South
Salt Lake City, Utah 84111

EXHIBIT 1

Well Name	Sec	Twp	Rge	Qtr	
Cheney Federal #1	8	26N	2W	M	
Cheney Federal #3	17	26N	2W	B	
Cheney Federal #2A	17	26N	2W	D	(infill)
Cheney Federal #2	17	26N	2W	M	
Featherstone Federal #1*	19	26N	2W	A	
Jicarilla E #4	11	27N	3W	M	
Jicarilla E #5	14	27N	3W	A	
Jicarilla E #2A	14	27N	3W	D	(infill)
Jicarilla E #2	14	27N	3W	L	
Jicarilla E #3	15	27N	3W	M	
Jicarilla F #1	22	27N	3W	B	
Jicarilla F #3A	22	27N	3W	M	(infill)
Jicarilla F #1A	22	27N	3W	P	(infill)
Jicarilla F #4	23	27N	3W	A	
Jicarilla F #5A	23	27N	3W	C	(infill)
Jicarilla F #5	23	27N	3W	M	
Jicarilla F #4A	23	27N	3W	P	(infill)
Jicarilla F #7	24	27N	3W	M	
Jicarilla G #2	25	27N	3W	A	
Jicarilla G #5A	25	27N	3W	D	(infill)
Jicarilla G #5	25	27N	3W	M	
Jicarilla G #8	26	27N	3W	A	
Jicarilla G #4A	26	27N	3W	D	(infill)
Jicarilla G #4	25	27N	3W	M	
Jicarilla G #8A	26	27N	3W	P	(infill)
Jicarilla F #6	27	27N	3W	A	
Jicarilla F #2A	27	27N	3W	D	(infill)
Jicarilla F #2	27	27N	3W	M	
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Jicarilla G #1A	35	27N	3W	P	(infill)
Jicarilla G #7	36	27N	3W	A	
Jicarilla G #7A	36	27N	3W	D	(infill)
Jicarilla G #6	36	27N	3W	M	

* This well is included in the Tight Sands formation if it is in lots one, two or three.

STATE OF NEW MEXICO
BEFORE THE
OIL CONSERVATION COMMISSION

In the Matter of:

Application of Mobil Producing Texas and New Mexico, Inc. for Designation of a Tight Formation, Rio Arriba County, New Mexico.	)	Case No. 7154

Comments of Northwest
Pipeline Corporation in
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Any designation of Tight Formation under § 107(c)(5) of the NGPA must comply with the provisions of Order No. 99 issued by the Federal Energy Regulatory Commission ("FERC") on August 15, 1980.

Order No. 99 prescribes several criteria which must be met before a formation can be designated "tight" among which are the absence of an infill drilling program and that the area proposed for designation must not be "substantially developed." 1/

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Northwest respectfully submits that these facts preclude designation as Tight Formation of the acreage and formation proposed in this docket.

Wherefore, Northwest urges that the Examiner and the Commission deny the application of Mobil Producing Texas and New Mexico, Inc. in this docket, and that the area proposed for designation not be designated as Tight Formation under 18 CFR § 271.701 et seq.

1/ See, 18 CFR §§ 271.703(b)(6) and (c)(2)(1).

2/ See, 18 CFR § 271.703(a)(6) and Order No. 99, mimeo, at 50-52.

Respectfully submitted,

NORTHWEST PIPELINE CORPORATION

Of Counsel:

Donald C. Shepler
Northwest Pipeline Corporation
315 East Second South
Salt Lake City, Utah 84111

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Jicarilla F #1A	22	27N	3W	P	(infill)
Jicarilla F #4	23	27N	3W	A	
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Jicarilla F #5	23	27N	3W	M	
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Jicarilla F #7	24	27N	3W	M	
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Jicarilla G #5	25	27N	3W	M	
Jicarilla G #8	26	27N	3W	A	
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Jicarilla G #7A	36	27N	3W	D	(infill)
Jicarilla G #6	36	27N	3W	M	

* This well is included in the Tight Sands formation if it is in lots one, two or three.

NEW MEXICO DEPARTMENT OF ENERGY & MINERALS

OIL CONSERVATION DIVISION

IN THE MATTER OF THE APPLICATION OF MOBIL PRODUCING TEXAS & NEW MEXICO INC. FOR DESIGNATION OF TIGHT FORMATION, RIO ARRIBA COUNTY, NEW MEXICO

Case No. 7154

A P P L I C A T I O N

COMES NOW, MOBIL PRODUCING TEXAS & NEW MEXICO INC., by and through its undersigned attorneys and as provided in the Oil Conservation Division's Special Rules and Procedures for Tight Formation Designations under Section 107 of the Natural Gas Policy Act of 1978 promulgated by Oil Conservation Division Order No. R-6388 on June 30, 1980, hereby makes application for an order designating certain portions of the Mesa Verde Formation as a tight formation under Section 107 of the Natural Gas Policy Act of 1978 and in support of its application would show the Division:

1. Applicant is the owner and operator of certain interests in the Mesa Verde Formation underlying the following-described lands situated in Rio Arriba County, New Mexico:

Township 27 North, Range 3 West, N.M.P.M.

Section 11: All
Section 12: All
Section 13: All
Section 14: All
Section 15: S/2
Section 22: All
Section 23: All
Section 24: All
Section 25: All
Section 26: All
Section 27: All
Section 35: All
Section 36: All

Township 26 North, Range 3 West, N.M.P.M.

Section 1: All
Section 2: All
Section 11: All
Section 12: All
Section 13: All
Section 14: All
Section 23: All
Section 24: All

Township 26 North, Range 2 West, N.M.P.M.

Section 7: Lot 4
Section 8: NE/4, S/2
Section 17: All
Section 18: All
Section 19: Lots 1, 2, 3

Containing 13,920 acres, more or less.

2. The Mesa Verde Formation is expected to have an estimated average in situ gas permeability throughout the pay section of less than 0.1 millidarcy per foot.

3. The depth of the top of the Mesa Verde Formation is between 5500 and 6000 feet and the stabilized production rate, against atmospheric pressure, of wells completed for production in said formation, without stimulation, is not expected to exceed 188 mcf per day.

4. No well drilled into the Mesa Verde Formation in the above-described area is expected to produce, without stimulation, more than five barrels of oil per day.

5. Attached to this application and incorporated herein by reference is a complete set of exhibits, as well as a brief geologic description and history of the Blanco Mesa Verde pool, together with a statement of the meaning and purpose of each exhibit. These exhibits cover all aspects of the required evidentiary data described in Section D of the Oil Conservation Division's Special Rules and Procedures for Tight Sand Formation Designation under Section 107 of the Natural Gas Policy Act of 1978.

WHEREFORE, Applicant prays that this application be set for hearing before a duly appointed examiner of the Oil Conservation Division and that after notice and hearing as required by law, the Division enter its order recommending to the Federal Energy Regulatory Commission that pursuant to 18 CFR, Section 271.701-705, the Mesa Verde Formation underlying the above-described land be designated a tight formation, and making such other and further provision as may be proper in the premises.

Respectfully submitted,

MODRALL, SPERLING, ROEHL, HARRIS & SISK, P.A.

By: James E. Sperling

James E. Sperling
P. O. Box 2168
Albuquerque, New Mexico 87103
Telephone: (505) 243-4511

ATTORNEYS FOR APPLICANT

Certificate of Service

IT IS HEREBY CERTIFIED that a copy of this Application and a complete set of all exhibits which Applicant proposes to offer or introduce at hearing, together with the statement of meaning and purpose of each, has been mailed to the United States Geological Survey, at P. O. Box 26124, Albuquerque, New Mexico 87125, on this 19th day of January, 1981.

James E. Sperling

James E. Sperling

Dockets Nos. 7-81 and 8-81 are tentatively set for February 25 and March 11, 1981. Applications for hearing must be filed at least 22 days in advance of hearing date.

DOCKET: EXAMINER HEARING - WEDNESDAY - FEBRUARY 11, 1981

9 A.M. - OIL CONSERVATION DIVISION CONFERENCE ROOM,
STATE LAND OFFICE BUILDING, SANTA FE, NEW MEXICO

The following cases will be heard before Richard L. Stamets, Examiner, or Daniel S. Nutter, Alternate Examiner:

ALLOWABLE: (1) Consideration of the allowable production of gas for March, 1981, from fifteen prorated pools in Lea, Eddy, and Chaves Counties, New Mexico.

(2) Consideration of the allowable production of gas for March, 1981, from four prorated pools in San Juan, Rio Arriba, and Sandoval Counties, New Mexico.

(3) Consideration of purchaser's nominations for the one year period beginning April 1, 1981, for both of the above areas.

CASE 7146: Application of Amoco Production Company for a unit agreement, Lea County, New Mexico. Applicant, in the above-styled cause, seeks approval for the Perro Grande Unit Area, comprising 3524 acres, more or less, of State and Federal lands in Townships 25 and 26 South, Range 35 East.

CASE 7135: (Continued and Readvertised)

Application of Celeste C. Grynberg for a unit agreement, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks approval for the South Cottonwood Draw Unit Area, comprising 3,195 acres, more or less, of State lands in Township 16 South, Range 24 East.

CASE 7147: Application of Yates Petroleum Corporation for an unorthodox gas well location and simultaneous dedication, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks approval for the unorthodox location of a Morrow test well to be drilled 1650 feet from the South line and 660 feet from the East line of Section 35, Township 18 South, Range 25 East, the S/2 of said Section 35 to be dedicated to said well and to applicant's "JX" Well No. 2 located in Unit N.

CASE 7140: (Continued from January 28, 1981, Examiner Hearing)

Application of Yates Petroleum Corporation for compulsory pooling and an unorthodox location, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks an order pooling all mineral interests in the Morrow formation underlying the N/2 of Section 26, Township 21 South, Range 26 East, to be dedicated to a well to be drilled at an unorthodox location 660 feet from the North line and 1650 feet from the East line of said Section 26. Also to be considered will be the cost of drilling and completing said well and the allocation of the cost thereof as well as actual operating costs and charges for supervision, designation of applicant as operator of the well, and a charge for risk involved in drilling said well.

CASE 4063: (Reopened and Readvertised)

In the matter of Case No. 4063 being reopened on the motion of the Oil Conservation Division to consider the abolishment of the special rules and regulations for the Four Mile Draw-Morrow Gas Pool, Eddy County, New Mexico, as promulgated by Order No. R-3698. In the absence of objection said rules will be rescinded.

CASE 7148: Application of Twin Montana Oil Company for a non-standard oil proration unit, Lea County, New Mexico. Applicant, in the above-styled cause, seeks approval of an 80-acre Vada-Pennsylvanian oil proration unit comprising the S/2 NE/4 of Section 3, Township 9 South, Range 35 East, to be dedicated to its Webb Federal Well No. 1 located in Unit G of said Section 3.

CASE 7149: Application of John H. Hendrix Corporation for the extension of the vertical limits of the Langlie Mattix Pool, Lea County, New Mexico. Applicant, in the above-styled cause, seeks the contraction of the vertical limits of the Jalmat Pool and the upward extension of the vertical limits of the Langlie Mattix Pool to a depth of 3362 feet, subsurface, underlying Unit O of Section 19, Township 23 South, Range 37 East.

CASE 7150: Application of Cavalcade Oil Corporation for an exception to Order No. R-3221, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks an exception to Order No. R-3221 to permit disposal of produced brine into an unlined surface pit located in Unit K or L of Section 33, Township 18 South, Range 30 East.

CASE 7151: Application of C & E Operators, Inc. for compulsory pooling, San Juan County, New Mexico. Applicant, in the above-styled cause, seeks an order pooling all mineral interests in the Mesaverde formation underlying the N/2 of Section 9, Township 30 North, Range 11 West, to be dedicated to a well to be drilled at a standard location in the NE/4 and a well to be drilled at a previously approved unorthodox location in the NW/4 of said Section 9. Also to be considered will be the cost of drilling and completing said wells and the allocation of the cost thereof as well as actual operating costs and charges for supervision, designation of applicant as operator of the wells, and a charge for risk involved in drilling said wells.

CASE 7152: Application of C & E Operators, Inc. for compulsory pooling and a non-standard proration unit, San Juan County, New Mexico. Applicant, in the above-styled cause, seeks an order pooling all mineral interests in the Mesaverde formation underlying a 158.54-acre non-standard gas proration unit comprising the SW/4 of Section 9, Township 30 North, Range 11 West, to be dedicated to a well to be drilled at a standard location thereon. Also to be considered will be the cost of drilling and completing said well and the allocation of the cost thereof as well as actual operating costs and charges for supervision, designation of applicant as operator of the well, and a charge for risk involved in drilling said well.

CASE 7153: Application of C & E Operators, Inc. for compulsory pooling and a non-standard proration unit, San Juan County, New Mexico. Applicant, in the above-styled cause, seeks an order pooling all mineral interests in the Mesaverde formation underlying a 158.54-acre non-standard gas proration unit comprising the SW/4 of Section 8, Township 30 North, Range 11 West, to be dedicated to a well to be drilled at a standard location thereon. Also to be considered will be the cost of drilling and completing said well and the allocation of the cost thereof as well as actual operating costs and charges for supervision, designation of applicant as operator of the well, and a charge for risk involved in drilling said well.

CASE 7129: (Continued from January 28, 1981, Examiner Hearing)

Application of Koch Exploration Company for compulsory pooling, San Juan County, New Mexico. Applicant, in the above-styled cause, seeks an order pooling all mineral interests in the Dakota formation underlying the N/2 of Section 28, Township 28 North, Range 8 West, to be dedicated to a well to be drilled at a standard location thereon. Also to be considered will be the cost of drilling and completing said well and the allocation of the cost thereof as well as actual operating costs and charges for supervision, designation of applicant as operator of the well, and a charge for risk involved in drilling said well.

CASE 6670: (Continued from January 14, 1981, Examiner Hearing)

In the matter of Case 6670 being reopened and pursuant to the provisions of Order No. R-6183 which order promulgated temporary special rules and regulations for the Red Hills-Devonian Gas Pool in Lea County, New Mexico, including a provision for 640-acre spacing units. Operators in said pool may appear and show cause why the pool should not be developed on 320-acre spacing units.

CASE 7154: Application of Mobil Producing Texas and New Mexico, Inc. for designation of a tight formation, Rio Arriba County, New Mexico. Applicant, in the above-styled cause, seeks the designation of the Mesaverde formation underlying portions of Townships 26 and 27 North, Ranges 2 and 3 West. containing 13,920 acres, more or lese, as a tight formation pursuant to Section 107 of the Natural Gas Policy Act and 18 CFR Section 271.701-705.

CASE 7134: (Continued and Readvertised)

Application of Read & Stevens, Inc. for an unorthodox gas well location and two non-standard gas proration units, Chaves County, New Mexico. Applicant, in the above-styled cause, seeks approval of two 160-acre non-standard proration units in the Buffalo Valley-Pennsylvanian Gas Pool, the first being the NW/4 of Section 13, Township 15 South, Range 27 East, to be dedicated to its Langley "Com" Well No. 1 in Unit C, and the other being the NE/4 of said Section 13 to be dedicated to a well to be drilled at an unorthodox location 1315 feet from the North and East lines of the section.

DOCKET: COMMISSION HEARING - WEDNESDAY - FEBRUARY 18, 1981

OIL CONSERVATION COMMISSION - 9 A.M. - ROOM 205
STATE LAND OFFICE BUILDING, SANTA FE, NEW MEXICO

CASE 7155: Application of Southland Royalty Company for compulsory pooling, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks an order pooling all mineral interests in the Pennsylvanian formation underlying the E/2 of Section 35, Township 18 South, Range 29 East, to be dedicated to a well to be drilled at a standard location thereon. Also to be considered will be the cost of drilling and completing said well and the allocation of the cost thereof as well as actual operating costs and charges for supervision, designation of applicant as operator of the well, and a charge for risk involved in drilling said well.

CASE 7057: (DE NOVO)

Application of Doyle Hartman for the extension of the vertical limits of the Langlie Mattix Pool, Lea County, New Mexico. Applicant, in the above-styled cause, seeks the contraction of the Langlie Mattix Pool to the following depths underlying the following 40-acre tracts in Township 24 South, Range 37 East: SE/4 SE/4 of Section 30: 3364 feet; NE/4 SE/4 of Section 30: 3389 feet; and SE/4 SW/4 of Section 20: 3390 feet.

Upon application of ARCO Oil and Gas Company this case will be heard De Novo pursuant to the provisions of Rule 1220.

CASE 7156: Application of Parabo, Inc. for amendment of Order No. R-5516, Lea County, New Mexico. Applicant, in the above-styled cause, seeks the amendment of Order No. R-5516 which authorized the disposal of produced salt water in unlined surface pits in Section 29, Township 21 South, Range 38 East. Applicant proposes modification of the Commission's requirements for the number, location, and depths of monitor wells, casing and perforating monitor wells, and a change in maximum depths of water permitted in the pits.

JAMES E. SPERLING
JOSEPH R. ROEHL
GEORGE T. HARRIS, JR.
DANIEL A. SISK
LELAND S. SEOBERRY, JR.
ALLEN C. DEWEY, JR.
JAMES A. PARKER
JOHN R. COONEY
KENNETH L. HARRIGAN
PETER J. ADANG
DALE W. EK
DENNIS J. FALK
JOE R. G. FULCHER
ARTHUR D. MELENDRES
JAMES P. HOUGHTON

LAW OFFICES
MODRALL, SPERLING, ROEHL, HARRIS & SISK
A PROFESSIONAL ASSOCIATION
PUBLIC SERVICE BUILDING
P. O. BOX 2168
ALBUQUERQUE, NEW MEXICO 87103
505-243-4511

JOHN F. SIMMS (1885-1954)
J. R. MODRALL (1902-1977)
AUGUSTUS T. SEYMOUR (1907-1965)

JUDY A. FRY
PAUL M. FISH
MARK B. THOMPSON III
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RUTH M. SCHIFANI
THOMAS L. JOHNSON
LYNN H. SLADE
ZACHARY L. McCORMICK
CLIFFORD K. ATKINSON
DOUGLAS A. BAKER
LARRY P. AUSHERMAN
CHARLES E. STUCKEY
DOUGLAS R. VADNAIS

February 13, 1981

Mr. Richard L. Stamets, Examiner
Department of Energy & Minerals
Oil Conservation Division
P. O. Box 2088
Santa Fe, New Mexico 87501

Re: Case No. 7154 - Docket No. 5-81

Dear Dick:

This is to advise that I sent two additional copies of Mobil's application and supporting exhibits and statement for transmittal by the OCD to the DOE with the OCD's order when issued when I originally forwarded the application on January 19, 1981, as evidenced by copy of my letter enclosed. Let me know if you cannot find these additional copies of the application, so I can notify Mobil who will produce more copies.

Very truly yours,

James E. Sperling

James E. Sperling

/jev
Enclosure

January 19, 1981

Mr. Joe D. Ramey
Secretary-Director
Department of Energy & Minerals
Oil Conservation Division
P. O. Box 2088
Santa Fe, New Mexico 87501

Re: Application of Mobil Producing Texas and New Mexico, Inc. for Designation of Tight Formation, Rio Arriba County, New Mexico

Dear Mr. Ramey:

Enclosed is original Application, plus supporting exhibits, prepared on behalf of Mobil Producing Texas and New Mexico, Inc. seeking the order of the Oil Conservation Division determining that within a certain area the Mesa Verde gas producing formation should be designated as a tight gas formation. Also enclosed are two copies of the Application and the supporting exhibits and statement for transmittal by the Oil Conservation Division to the Department of Energy with the OCD's order when issued.

It is requested that the matter be set for hearing before an examiner at the next appropriate examiner's hearing after publication.

As shown by the certificate of service, copies of the Application and the supporting exhibits have been forwarded to the United States Geological Survey, Albuquerque, New Mexico.

Very truly yours,

James E. Sperling

JES/jev
Enclosures

cc: J. A. Morris, w/o encl. (except Application)

JAMES E. SPERLING
JOSEPH E. ROEHL
GEORGE T. HARRIS, JR.
DANIEL A. SISK
LELAND S. SEDBERRY, JR.
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DEBORAH J. HERZBERG
LARRY P. AUSHERMAN
CHARLES E. STUCKEY
DOUGLAS R. VADNAIS

January 19, 1981

Mr. Joe D. Ramey
Secretary-Director
Department of Energy & Minerals
Oil Conservation Division
P. O. Box 2088
Santa Fe, New Mexico 87501

Case 7154

Re: Application of Mobil Producing Texas and New Mexico, Inc. for Designation of Tight Formation, Rio Arriba County, New Mexico

Dear Mr. Ramey:

Enclosed is original Application, plus supporting exhibits, prepared on behalf of Mobil Producing Texas and New Mexico, Inc. seeking the order of the Oil Conservation Division determining that within a certain area the Mesa Verde gas producing formation should be designated as a tight gas formation. Also enclosed are two copies of the Application and the supporting exhibits and statement for transmittal by the Oil Conservation Division to the Department of Energy with the OCD's order when issued.

It is requested that the matter be set for hearing before an examiner at the next appropriate examiner's hearing after publication.

As shown by the certificate of service, copies of the Application and the supporting exhibits have been forwarded to the United States Geological Survey, Albuquerque, New Mexico.

Very truly yours,

James E. Sperling

JES/jev
Enclosures

cc: J. A. Morris, w/o encl. (except Application)

ROUGH

dr/

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
DIVISION FOR THE PURPOSE OF
CONSIDERING:

CASE NO. 7154

Order No. R-6678

APPLICATION OF MOBIL PRODUCING TEXAS

AND NEW MEXICO, INC. FOR DESIGNATION OF A
TIGHT FORMATION, RIO ARRIBA COUNTY, NEW MEXICO.

ORDER OF THE DIVISION

BY THE DIVISION:

This cause came on for hearing at 9 a.m. on February 11, 19 81, at Santa Fe, New Mexico, before Examiner Richard L. Stamets

NOW, on this _____ day of April, 19 81, the Division Director, having considered the testimony, the record, and the recommendations of the Examiner, and being fully advised in the premises,

FINDS:

(1) That due public notice having been given as required by law, the Division has jurisdiction of this cause and the subject matter thereof.

(2) That the applicant, Mobil Producing Texas and New Mexico, Inc., requests that the Division in accordance with Section 107 of the Natural Gas Policy Act, and 18 C.F.R. §271.703 recommend to the Federal Energy Regulatory Commission that the Mesaverde formation underlying the following lands situated in Rio Arriba County, approximately 30 miles south of the city of Dulce, New Mexico, hereinafter referred to as the Mesaverde formation, be designated as a tight formation in said Federal Energy Regulatory Commission's regulations:

TOWNSHIP 26 NORTH, RANGE 2 WEST, NMPM
Section 7: Lot 4
Section 8: NE/4 and S/2
Sections 17 and 18: All
Section 19: Lots 1, 2, and 3

TOWNSHIP 26 NORTH, RANGE 3 WEST, NMPM
Sections 1 and 2: All
Sections 11 through 14: All
Sections 23 and 24: All

TOWNSHIP 27 NORTH, RANGE 3 WEST, NMPM
Sections 11 through 14: All
Section 15: S/2
Sections 22 through 27: All
Sections 35 and 36: All

(3) That the area proposed for tight formation designation lies within the horizontal limits of the Blanco-Mesaverde Gas Pool as previously defined and described in San Juan and Rio Arriba Counties, New Mexico.

(4) That the area proposed is an isolated sand development separated from the main body of the Blanco-Mesaverde reservoir.

(5) That there is additional acreage within the horizontal limits of this isolated sand body including at least the following:

Section 6: All →
TOWNSHIP 26 NORTH, RANGE 2 WEST, NMPM
Section 7: Lots 1, 2, and 3
Section 19: Lot 4
Section 20: W/2

TOWNSHIP 26 NORTH, RANGE 3 WEST, NMPM
Section 3: E/2
Section 10: E/2
Section 15: E/2

TOWNSHIP 27 NORTH, RANGE 3 WEST, NMPM
Sections 9 and 10: All
Section 16: E/2
Section 21: E/2
Section 28: E/2
Section 34: All

(6) That there is no evidence of significant geologic difference between the Mesaverde formation underlying the lands described in Findings Nos. (2) and (5) above and the entire area should be considered in any recommendation to the FERC.

(7) That the Mesaverde formation underlies all of the above-described lands; that the formation consists of two 40 to 100 foot thick sand intervals (the Cliff House and the Point Lookout) separated by approximately 300 feet of shale which may contain thin sandstone layers; that the top of such formation is found at an average depth of 5563 feet below the surface of said area.

(8) That the type section for the Mesaverde formation for the proposed tight formation designation is found at a depth of from approximately 5484 feet to 6018 feet on the Induction Electric log of the Mobil Jicarilla "H" Well No 7 A located in Unit D of Section 1, Township 26 North, Range 3 West, NMPM, run on July 15, 1976.

(9) That the Mesaverde formation underlying the above-described lands has been penetrated by numerous wells at least 69 of which produce or have produced gas therefrom.

(10) That 24 infill wells have been drilled to the Mesaverde formation underlying the above-described lands 22 of which are or were producers therefrom.

(11) That the designation of a tight formation is not necessary for development of those proration units already fully developed by successful infill drilling.

(12) That any tight formation recommendation in this case should apply only to proration units not developed and/or not developed by an infill well capable of production on or before February 11, 1981, such acreage being as described on Exhibit "A" attached hereto.

(13) That the evidence presented in this case demonstrated that the predominant percentage of wells which may be completed in the Mesaverde formation within the undeveloped areas of the proposed tight formation may reasonably be presumed to exhibit

permeability, gas productivity, or crude oil productivity not in excess of the following parameters:

(a) average in situ gas permeability throughout the pay section of 0.1 millidarcy; and

(b) stabilized production rates, without stimulation, against atmospheric pressure, as found in the table set out in 18 C.F.R. §271.703(c)(2)(B) of the regulations; and

(c) production of more than five barrels of crude oil per day.

(14) That the evidence presented in this case demonstrated that the application of incentive pricing is reasonably necessary to stimulate further development in that portion of the proposed tight formation area described on Exhibit "A" to this order.

(15) That existing State of New Mexico and Federal Regulations relating to casing and cementing of wells will assure that development of the Mesaverde formation will not adversely affect any overlying aquifers.

(16) That the Mesaverde formation within the area described on Exhibit "A" to this order should be recommended to the Federal Energy Regulatory Commission for designation as a tight formation.

IT IS THEREFORE ORDERED:

(1) That it be and hereby is recommended to the Federal Energy Regulatory Commission pursuant to Section 107 of the Natural Gas Policy Act of 1978, and 18 C.F.R. §271.703 of the regulations that the Mesaverde formation underlying those lands in Rio Arriba County, New Mexico, described on Exhibit "A" to this order, be designated as a tight formation.

(2) That jurisdiction of this cause is hereby retained for the entry of such further orders as the Division may deem necessary.

DONE at Santa Fe, New Mexico, on the day and year hereinabove designated.

CASE NO. 7154

TOWNSHIP 26 NORTH, RANGE 2 WEST, NMPM
Sections 6 and 7: All
Section 17: E/2
Sections 18 and 19: All

TOWNSHIP 26 NORTH, RANGE 3 WEST, NMPM
~~Section 1: E/2~~
Section 3: ~~All~~ E/2
Section 10: ~~All~~ E/2
Section 12: E/2
Sections 13 and 14: All
Section 15: E/2
Sections 23 and 24: All

TOWNSHIP 27 NORTH, RANGE 3 WEST, NMPM
Section 9: All
Section 11 through 13: All
Section 14: E/2
Section 15: S/2
Section 16: E/2
~~Section 21: E/2~~
~~Section 23: E/2~~
Section 24: All
Section 25: E/2
Section 28: E/2
~~Section 33: E/2~~
Section 34: ~~All~~ E/2
Section 36: S/2

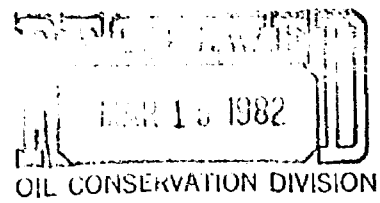
ORDER NO. R-
EXHIBIT "A"

Mobil Producing Texas & New Mexico Inc.

NINE GREENWAY PLAZA—SUITE 2700
HOUSTON, TEXAS 77046

March 11, 1982

Mr. Joe D. Ramey
Department of Energy & Minerals
Oil Conservation Division
P. O. Box 2088
Santa Fe, New Mexico 87501



7.01 MOBIL PRODUCING TX & NM INC. (MPTM)
ADDITIONAL ECONOMIC DATA PER
FERC REQUEST OF NOVEMBER 18, 1981,
TIGHT FORMATION RECOMMENDATION
MESAVERDE FORMATION
NEW MEXICO CASE NO. 7154

Dear Mr. Ramey:

Enclosed are five copies of the captioned economic data. Three copies are to be transmitted to FERC. One copy is for your file and the other may be transmitted to the Department of the Interior, Minerals Management Service in Albuquerque, New Mexico.

Yours very truly,

J. A. Morris

J. A. Morris
Regulatory Engineering Supervisor

HFWeaver:lmd
Enclosures

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON 20426

NOV 1 8 1981

IN REPLY REFER TO: N840-A

Mr. Joe D. Ramey
Department of Energy and Minerals
Oil Conservation Division
P.O. Box 2088
Santa Fe, New Mexico 87501

Case File

In Re: Docket No. RM79-76
(New Mexico-5)
Tight Formation Recommendation
Mesaverde Formation
N.M. Case No. 7154

cc: Mobil

Dear Mr. Ramey:

On July 30, 1981, the Commission received the New Mexico Oil Conservation Division's recommendation that the Mesaverde Formation in portions of Rio Arriba County, New Mexico, be designated a tight formation pursuant to section 271.703(c) of the Commission's regulations.

The recommended area is contained within the Blanco Mesaverde Gas Pool and is subject to New Mexico Order No. R-1670-T which authorizes infill drilling. The order, issued November 14, 1974, finds in article (12) that Mesaverde producing sands "... are not being efficiently drained by existing wells in the pool but which could be more efficiently and economically drained and developed by the drilling of additional wells..." Section 271.703(c)(2)(D) of the Commission's regulations states:

> (D) If the formation or any portion thereof was authorized to be developed by infill drilling prior to the date of recommendation and the jurisdictional agency has information which in its judgement indicates that such formation or portion subject to infill drilling can be developed absent the incentive price established in paragraph (a) of this section then the jurisdictional agency shall not include such formation or portion thereof in its recommendation.

Our review of your submittal shows the Mesaverde Formation had been substantially developed prior to issuance of the infill drilling order. This substantial development, in addition to the economic finding quoted above, indicates that the incentive price established in section 271.703(a) may not be necessary to encourage drilling in this infill area.

In Order No. 137-A the Commission addressed an infill drilling situation similar to that described above. In this order (copy enclosed) the Commission indicated that where drilling was previously found to be economic at existing prices additional economic data must be presented which clearly shows that the proposed area cannot be developed absent the incentive price. While the New Mexico submission contains some economic data, we believe that such data is insufficient.

Accordingly, pursuant to section 271.703(c)(3)(vii) of the Commission's regulations, we request that you supplement your recommendation with additional economic data sufficient to clearly demonstrate that the proposed area cannot be developed absent the incentive price.

If we can be of further assistance, please call either me (202) 357-8585 or Victor Zabel (202) 357-8616.

Very truly yours,

Howard Kilchrist

Howard Kilchrist, Director
Division of NGPA Compliance

Attachment

15 FERC ¶61,277

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Before Commissioners: C. M. Butler III, Chairman;
Georgiana Sheldon and Matthew Holden, Jr.

High-Cost Gas Produced From Tight Formations	)	Docket No. RM79-76 (Colorado - 3)

ORDER NO. 137-A
ORDER DENYING APPLICATION FOR REHEARING OF ORDER NO. 137

(Issued June 17, 1981)

On March 30, 1981, the Commission issued a final rule in Docket No. RM79-76 (Colorado - 3), Order No. 137, (46 F.R. 20669, April 7, 1981) which generally adopted a recommendation submitted by the Colorado Oil and Gas Conservation Commission (Colorado) that the Niobrara Formation be designated as a tight formation. The Commission, in designating the Niobrara as a tight formation, excluded from the designation three fields which had been part of Colorado's recommendation. These fields, the Waverly, Beecher Island 1/ and Mildred Fields, were excluded. The Commission found that information in Colorado's submittal indicated that the excluded areas had been substantially developed at the time that infill drilling orders for those fields were issued. The Commission's regulations at § 271.703(c)(2)(i)(D) provide that such areas be deleted from tight formation designations where information exists to indicate portions of the formation can be developed absent the incentive price provided through section 107(c)(5). Because the excluded areas had been substantially developed and Colorado had made findings of an economic nature in its infill drilling orders for these fields, that one well can economically drain

1/ Twenty-eight sections of the Beecher Island Field were excluded from the designation. Staff had counted forty sections in all as comprising the Beecher Island Field.

an area of not more than 160 acres, the Commission found that the incentive price was not necessary to encourage development in these fields. See, NGPA section 107(b). In sum, substantial development prior to the issuance of infill drilling orders and economic information concerning the viability of the wells, created the basis upon which the Commission deleted the three fields from the designation in the final rule.

On April 29, 1981, Mountain Petroleum Corporation, along with J-W Operating Company and H. G. Westerman (hereinafter "Mountain"), filed an application for rehearing of Order No. 137 on the ground that the Waverly, Beecher Island and Mildred Fields were erroneously excluded from the Niobrara Formation's designation as a tight formation by the Commission. Although Mountain did not file comments to the Commission's Notice of Proposed Rulemaking in this docket issued on September 23, 1981, Mountain originally filed a petition with Colorado which led to Colorado's recommendation of the Niobrara as a tight formation.

In its application for rehearing, Mountain presents several arguments which allegedly support inclusion of the excluded areas in the designated tight formation. The first case wherein the Commission excluded areas from a recommended formation was in Order No. 124, Docket No. RM79-76 (Colorado - 1), issued January 23, 1981, (46 F.R. 9921, January 30, 1981), pertaining to the Wattenberg J Sand Formation. Mountain contends that the Wattenberg J Sand case is different than the Niobrara case because the Wattenberg J Sand Formation was substantially developed after its infill drilling order was issued, to a much greater extent than the Niobrara was or is developed. Accordingly, Mountain argues that reliance on the Wattenberg case is misplaced in this situation. While Order No. 137 did not rely on the Wattenberg case, it is consistent with its facts and result. In both the Wattenberg J Sand case and the instant one, the portions of the formations that were excluded were

those portions that were substantially developed at the time the infill drilling orders were issued. Subsequent development is not considered because the key to the Commission's review is to first determine if an area has been developed in the primary stage. The Commission believes that where an infill drilling order follows substantial development of a field, the request for an infill drilling order establishes that secondary drilling is both planned and is economically feasible. The requirement that substantial development precede the infill drilling order is a check on the exclusion process by avoiding the exclusion of areas which may have received infill drilling orders for reasons other than carrying out planned secondary drilling, and this would be obvious where substantial development had not occurred prior to the infill drilling order. In the instant case, at the time of the issuance of the infill drilling order, two of the three fields had been 100% developed on existing spacing, and the third field had been 78% developed.

Mountain compares the excluded fields to the Eckley Field, one which was included in the designation. Mountain asserts that the Eckley Field wells produce gas at much higher rates than, for example, wells in the Beecher Island Field. Since Colorado found that the stabilized production rate for the wells in the formation would not exceed the guideline established in §271.703(c)(2)(i)(B), the fact that certain wells produce more than others (and Mountain did not state that production in the Eckley wells was exceeding the guideline), is not relevant to the designation.

Finally, Mountain contends that the areas which the Commission has excluded in Order No. 137 are similar in both physical and economic characteristics to the areas which were designated as tight. Although Mountain on the one hand states that the excluded areas are similar to the included areas, elsewhere in its application it makes a contrary statement. Mountain asserts that when it initially received its 640-acre unit spacing from Colorado,

all the units were considered by the operators to be gas-productive. Other areas, which were included in the tight formation designation, such as the Vernon field, had included units in their spaced area units which at the time did not appear to have gas-bearing potential. This difference between the fields is significant for the reason that under section 107(c)(5) of the NGPA, the Commission extends the incentive price to areas where drilling presents extraordinary risks or costs. Clearly the operators in the excluded areas do not incur the same risks as the operators in the included areas described above, as evidenced by Mountain's statement that all of the units in the excluded areas were ,to the best of their knowledge, gas-productive. The included areas obviously present greater risks, from a geological perspective, and therefore should be eligible for an incentive price. If the excluded areas should get the incentive price, it would have to be based on the fact that drilling therein involves extraordinary costs. There has not as yet been any economic data presented by the applicants to support a conclusion that extraordinary costs are involved, although this was specifically requested in Order No. 137.

In Order No. 137, the Commission stated that exclusion of the Mildred, Waverly and Beecher Island Fields in that order did not "preclude them from future designation if economic data should demonstrate that all or part of the excluded area cannot be further developed without the tight formation incentive price." [emphasis added.] Mountain's application for rehearing seeking inclusion of the three fields in the designated Niobrara Formation does not contain economic data addressing the issue of whether the excluded

area can be further developed without the tight formation incentive price. 2/ Mountain rests its case on arguments, not economic facts.

In order for Mountain to obtain reconsideration of the excluded Waverly, Beecher Island and Mildred Fields as tight formations, it must present to the Commission, by proper administrative channels through the jurisdictional agency, appropriate economic data. This data should address factors such as the actual impact that the incentive price would have on encouraging production from the excluded areas and why currently available prices 3/ are not adequate to provide economic incentives to produce from these fields. In addition, if there are any identifiable factors which made drilling economical prior to the infill drilling order (as evidenced by the fact that most 640-acre units in the excluded areas contained one well at the issuance of the infill order), but failed to make further drilling on the 160-acre units economical, these would be relevant to the case.

2/ Mountain does state that since issuance of the infill drilling order in August, 1978, a total of five wells have been drilled in the excluded areas. However, Mountain fails to show that further drilling was not undertaken because of economic factors.

3/ In order for new tight formation gas to receive the tight formation incentive price, the well must also, inter alia, qualify as a section 102 or section 103 well, and so these prices would be available to the much of gas in question, even if the section 107 price was not.

The Commission orders:

Based upon the foregoing discussion, the application for rehearing filed by Mountain in this docket is denied.

By the Commission.

(S E A L)

Kenneth F. Plumb,
Secretary.

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

NGPA SECTION 107 TIGHT FORMATION RECOMMENDATION	)	
STATE OF NEW MEXICO OIL CONSERVATION DIVISION OF THE ENERGY AND MINERALS DEPARTMENT	)	Docket No. _____

RECOMMENDATION FOR TIGHT
FORMATION DESIGNATION UNDER
SECTION 107 OF THE NGPA

Mobil Producing Texas and New Mexico, Inc., pursuant to Section 107 of the Natural Gas Policy Act, 18 CFR §271.703 of the FERC regulations, and the Special Rules and Procedures for Tight Formation Designations under Section 107 of the Natural Gas Policy Act of 1978 of the Oil Conservation Division, petitioned the Oil Conservation Division for tight formation designation of a portion of the Mesaverde formation in Rio Arriba County, New Mexico.

After notice and hearing on the application of Mobil Producing Texas and New Mexico, Inc., the Oil Conservation Division hereby recommends designation of a portion of the Mesaverde formation in Rio Arriba County, New Mexico, as recommended in Exhibit A, being Oil Conservation Division Order No. R-6678, attached hereto and incorporated by reference. Additionally, the Oil Conservation Division, submits herewith Exhibits B and C, attached hereto and incorporated herein by reference, which are supporting data required under 18 CFR §271.703 (c)(3) of the FERC regulations and partial United States Geological Survey concurrence of this recommendation, respectively. By way of further explanation, Exhibit C would essentially enlarge the area recommended by the Division.

Respectfully submitted,

ERNEST L. PADILLA
Attorney for the
Oil Conservation Division

VERIFICATION

STATE OF NEW MEXICO)
)ss.
COUNTY OF SANTA FE)

ERNEST L. PADILLA, being first duly sworn, on oath, states that he is an attorney for the Oil Conservation Division of the Energy and Minerals Department of the State of New Mexico; that he has executed the foregoing document with full power and authority to do so; and that the matters and facts set forth therein are true to the best of his information, knowledge and belief.

ERNEST L. PADILLA

Subscribed and sworn to before me, this _____ day of July, 1981.

NOTARY PUBLIC

My Commission Expires:

October 28, 1981

CERTIFICATE OF SERVICE

I hereby certify that I have this day served a copy of the foregoing Recommendation to James E. Sperling, Attorney for Mobil Producing Texas and New Mexico, Inc., in accordance with the requirements of Section 1.17 of the Rules of Practice and Procedure.

Dated this _____ day of July, 1981.

ERNEST L. PADILLA

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

BRUCE KING
GOVERNOR

LARRY KEHOE
SECRETARY

July 24, 1981

POST OFFICE BOX 2088
STATE LAND OFFICE BUILDING
SANTA FE, NEW MEXICO 87501
(505) 827-2434

Federal Energy Regulatory Comm.
Department of Energy
825 North Capitol Street, N.E.
Washington, D. C. 20426

Attention: Mr. Howard Kilchrist

Dear Mr. Kilchrist:

Enclosed is a tight formation recommendation for the Commission's consideration which I am sending to you for your handling. Let me know if additional information is required.

In addition, let me remind you that this is the recommendation which we recently discussed where the USGS enlarged the Division's recommendation.

Very truly yours,

ERNEST L. PADILLA
General Counsel

ELP/dr
enc.

cc: James E. Sperling, Esq.
Modrall, Sperling, Roehl, Harris & Sisk
P. O. Box 2168
Albuquerque, New Mexico 87103

United States Department of the Interior
GEOLOGICAL SURVEY
South Central Region
P. O. Box 26124
Albuquerque, New Mexico 87125

JUL 02 1981

Mr. Ernest L. Padilla
Oil Conservation Division
State of New Mexico
P. O. Box 2088
Santa Fe, New Mexico 87501

Dear Mr. Padilla:

The purpose of this letter is to propose revisions to the State of New Mexico, Case No. 7154, Order No. R-6678, dated May 4, 1981, concerning designation of the Mesaverde formation underlying certain described lands in Rio Arriba County, New Mexico, as a Section 107 tight formation pursuant to application by Mobil Producing Texas and New Mexico, Inc.

The United States Geological Survey (USGS), Conservation Division, South Central Region, proposes that the tight gas sand area under consideration for the Mesaverde formation, as proposed by Mobil, be enlarged to include a logical area for step-out development with the exclusion of areas that have been fully developed. In addition infill locations have been identified for review and possible exclusion in the tight gas area designation.

The following is a list of legal descriptions of the areas the USGS has identified for the tight gas sand designation with the infill locations included.

The proposed boundary of the designated area is as follows:

TOWNSHIP 26 NORTH, RANGE 2 WEST, NMPM
Sections 3,4,5,6,7,8,9 and 10: All
Sections 15, 16, 17, 18, 19, 20, 21 and 22: All
Sections 27, 28, 29, 30, 31, 32, 33 and 34: All

TOWNSHIP 26 NORTH, RANGE 3 WEST, NMPM
Sections 1,2 and 3: All
Section 4: E½
Sections 10, 11,12,13, 14 and 15: All
Section 22: E½
Sections 23, 24, 25 and 26: All
Sections 35 and 36: All

Exhibit C

TOWNSHIP 27 NORTH, RANGE 2 WEST, NMPM
Sections 6, 7 and 8: All
Sections 16, 17, 18, 19, 20 and 21: All
Sections 28, 29 and 30: All

TOWNSHIP 27 NORTH, RANGE 3 WEST, NMPM
Section 8: E½
Sections 9, 10, 11, 12, 13, 14, 15 and 16: All
Section 17: E½
Section 20: E½
Sections 21, 22, 23, 24, 25, 26, 27 and 28: All
Sections 33, 34, 35 and 36: All

TOWNSHIP 28 NORTH, RANGE 2 WEST, NMPM
Section 31: All

TOWNSHIP 28 NORTH, RANGE 3 WEST, NMPM
Sections 34, 35 and 36: All

The designation of a tight formation is not necessary for development of the following areas within the boundary already developed by successful drilling:

TOWNSHIP 26 NORTH, RANGE 2 WEST, NMPM
Section 4: NW¼
Section 8: S½
Section 9: NE¼
Section 10: NW¼
Section 16: NE¼
Section 17: NE¼, W½
Section 19: N½
Section 20: W½
Section 30: N½

TOWNSHIP 26 NORTH, RANGE 3 WEST, NMPM
Section 1: N½, SW¼
Section 2: All
Sections 3 and 10: NE¼
Section 11: All
Section 12: N½, SW¼
Sections 13 and 14: NE¼, SW¼
Section 23: NE¼
Section 24: NE¼, SW¼

TOWNSHIP 27 NORTH, RANGE 2 WEST, NMPM
Section 17: SE¼
Section 20: SE¼
Section 21: SW¼
Section 28: W½
Section 29: E½

TOWNSHIP 27 NORTH, RANGE 3 WEST, NMPM
Section 9: E½
Section 10: All
Section 11: W½
Sections 14 and 15: N½, SW¼
Section 16: NE¼
Section 21: E½
Sections 22 and 23: All
Section 24: SW¼
Section 25: N½, SW¼
Sections 26 and 27: All
Section 28: NE¼
Section 34: NE¼
Section 35: All
Section 36: N½, SW¼

The following are infill locations and should not be included in the tight formation area designation unless economic considerations preclude development at Section 103 prices.

Definite infill locations that should be subject to review before inclusion in the designated area.

TOWNSHIP 26 NORTH, RANGE 2 WEST,NMPM
Section 17: SE¼
Section 19: S½

TOWNSHIP 26 NORTH, RANGE 3 WEST, NMPM
Section 12: SE¼
Section 13: SE¼, NW¼
Section 14: SE¼, NW¼
Section 24: NW¼

TOWNSHIP 27 NORTH, RANGE 3 WEST, NMPM
Section 15: SE¼

Infill locations that could be considered as step-out well locations and could logically be included in the designated area.

TOWNSHIP 26 NORTH, RANGE 2 WEST, NMPM
Section 4: SW¼
Section 9: SE¼
Section 10: SW¼
Section 16: SE¼
Section 30: S½

TOWNSHIP 26 NORTH, RANGE 3 WEST, NMPM
Section 1: SE¼
Section 3: SE¼
Section 10: SE¼
Section 23: SE¼
Section 24: SE¼

TOWNSHIP 27 NORTH, RANGE 2 WEST, NMPM
Section 17: NE ¼
Section 20: NE¼
Section 21: NW¼
Section 28: E½
Section 29: W½

TOWNSHIP 27 NORTH, RANGE 3 WEST, NMPM
Section 11: E½
Section 14: SE¼
Section 16: SE¼
Section 24: NW¼
Section 25: SE¼
Section 28: SE¼
Section 34: SE¼
Section 36: SE¼

The evidence presented in this case demonstrated that the predominant percentage of wells which may be completed in the Mesaverde formation within the areas not substantially developed by infill drilling in the confines of the proposed tight formation may reasonably be presumed to exhibit permeability, gas productivity, or crude oil productivity not in excess of the parameters contained in the Federal Energy Regulatory Commission's Regulations, 18 CFR, Section 271.703.

It is requested that this concurrence with changes indicated be included with the recommendation submitted to the Federal Energy Regulatory Commission.

Sincerely yours,

Gene F. Daniel

Gene F. Daniel
Deputy Conservation Manager,
Oil and Gas

United States Department of the Interior
GEOLOGICAL SURVEY
South Central Region
P. O. Box 26124
Albuquerque, New Mexico 87125

JUL 02 1981

Mr. Ernest L. Padilla
Oil Conservation Division
State of New Mexico
P. O. Box 2088
Santa Fe, New Mexico 87501

Dear Mr. Padilla:

The purpose of this letter is to propose revisions to the State of New Mexico, Case No. 7154, Order No. R-6678, dated May 4, 1981, concerning designation of the Mesaverde formation underlying certain described lands in Rio Arriba County, New Mexico, as a Section 107 tight formation pursuant to application by Mobil Producing Texas and New Mexico, Inc.

The United States Geological Survey (USGS), Conservation Division, South Central Region, proposes that the tight gas sand area under consideration for the Mesaverde formation, as proposed by Mobil, be enlarged to include a logical area for step-out development with the exclusion of areas that have been fully developed. In addition infill locations have been identified for review and possible exclusion in the tight gas area designation.

The following is a list of legal descriptions of the areas the USGS has identified for the tight gas sand designation with the infill locations included.

The proposed boundary of the designated area is as follows:

TOWNSHIP 26 NORTH, RANGE 2 WEST, NMPM
Sections 3,4,5,6,7,8,9 and 10: All
Sections 15, 16, 17, 18, 19, 20, 21 and 22: All
Sections 27, 28, 29, 30, 31, 32, 33 and 34: All

TOWNSHIP 26 NORTH, RANGE 3 WEST, NMPM
Sections 1,2 and 3: All
Section 4: E½
Sections 10, 11,12,13, 14 and 15: All
Section 22: E½
Sections 23, 24, 25 and 26: All
Sections 35 and 36: All

TOWNSHIP 27 NORTH, RANGE 2 WEST, NMPM
Sections 6, 7 and 8: All
Sections 16, 17, 18, 19, 20 and 21: All
Sections 28, 29 and 30: All

TOWNSHIP 27 NORTH, RANGE 3 WEST, NMPM
Section 8: E½
Sections 9, 10, 11, 12, 13, 14, 15 and 16: All
Section 17: E½
Section 20: E½
Sections 21, 22, 23, 24, 25, 26, 27 and 28: All
Sections 33, 34, 35 and 36: All

TOWNSHIP 28 NORTH, RANGE 2 WEST, NMPM
Section 31: All

TOWNSHIP 28 NORTH, RANGE 3 WEST, NMPM
Sections 34, 35 and 36: All

The designation of a tight formation is not necessary for development of the following areas within the boundary already developed by successful drilling:

TOWNSHIP 26 NORTH, RANGE 2 WEST, NMPM
Section 4: NW¼
Section 8: S½
Section 9: NE¼
Section 10: NW¼
Section 16: NE¼
Section 17: NE¼, W½
Section 19: N½
Section 20: W½
Section 30: N½

TOWNSHIP 26 NORTH, RANGE 3 WEST, NMPM
Section 1: N½, SW¼
Section 2: All
Sections 3 and 10: NE¼
Section 11: All
Section 12: N½, SW¼
Sections 13 and 14: NE¼, SW¼
Section 23: NE¼
Section 24: NE¼, SW¼

TOWNSHIP 27 NORTH, RANGE 2 WEST, NMPM
Section 17: SE¼
Section 20: SE¼
Section 21: SW¼
Section 28: W½
Section 29: E½

TOWNSHIP 27 NORTH, RANGE 3 WEST, NMPM
Section 9: E½
Section 10: All
Section 11: W½
Sections 14 and 15: N½, SW¼
Section 16: NE¼
Section 21: E½
Sections 22 and 23: All
Section 24: SW¼
Section 25: N½, SW¼
Sections 26 and 27: All
Section 28: NE¼
Section 34: NE¼
Section 35: All
Section 36: N½, SW¼

The following are infill locations and should not be included in the tight formation area designation unless economic considerations preclude development at Section 103 prices.

Definite infill locations that should be subject to review before inclusion in the designated area.

TOWNSHIP 26 NORTH, RANGE 2 WEST,NMPM
Section 17: SE¼
Section 19: S½

TOWNSHIP 26 NORTH, RANGE 3 WEST, NMPM
Section 12: SE¼
Section 13: SE¼, NW¼
Section 14: SE¼, NW¼
Section 24: NW¼

TOWNSHIP 27 NORTH, RANGE 3 WEST, NMPM
Section 15: SE¼

Infill locations that could be considered as step-out well locations and could logically be included in the designated area.

TOWNSHIP 26 NORTH, RANGE 2 WEST, NMPM
Section 4: SW¼
Section 9: SE¼
Section 10: SW¼
Section 16: SE¼
Section 30: S½

TOWNSHIP 26 NORTH, RANGE 3 WEST, NMPM
Section 1: SE¼
Section 3: SE¼
Section 10: SE¼
Section 23: SE¼
Section 24: SE¼

TOWNSHIP 27 NORTH, RANGE 2 WEST, NMPM
Section 17: NE ¼
Section 20: NE¼
Section 21: NW¼
Section 28: E½
Section 29: W½

TOWNSHIP 27 NORTH, RANGE 3 WEST, NMPM
Section 11: E½
Section 14: SE¼
Section 16: SE¼
Section 24: NW¼
Section 25: SE¼
Section 28: SE¼
Section 34: SE¼
Section 36: SE¼

The evidence presented in this case demonstrated that the predominant percentage of wells which may be completed in the Mesaverde formation within the areas not substantially developed by infill drilling in the confines of the proposed tight formation may reasonably be presumed to exhibit permeability, gas productivity, or crude oil productivity not in excess of the parameters contained in the Federal Energy Regulatory Commission's Regulations, 18 CFR, Section 271.703.

It is requested that this concurrence with changes indicated be included with the recommendation submitted to the Federal Energy Regulatory Commission.

Sincerely yours,

Gene F. Daniel
Deputy Conservation Manager,
Oil and Gas

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

IN THE MATTER OF THE HEARING CALLED BY THE OIL CONSERVATION DIVISION FOR THE PURPOSE OF CONSIDERING:

CASE NO. 7154
Order No. R-6678

APPLICATION OF MOBIL PRODUCING TEXAS AND NEW MEXICO, INC. FOR DESIGNATION OF A TIGHT FORMATION, RIO ARRIBA COUNTY, NEW MEXICO.

ORDER OF THE DIVISION

BY THE DIVISION:

This cause came on for hearing at 9 a.m. on February 11, 1981, at Santa Fe, New Mexico, before Examiner Richard L. Stamets.

NOW, on this 4th day of May, 1981, the Division Director, having considered the testimony, the record, and the recommendations of the Examiner, and being fully advised in the premises,

FINDS:

(1) That due public notice having been given as required by law, the Division has jurisdiction of this cause and the subject matter thereof.

(2) That the applicant, Mobil Producing Texas and New Mexico, Inc., requests that the Division in accordance with Section 107 of the Natural Gas Policy Act, and 18 C.F.R. §271.703 recommend to the Federal Energy Regulatory Commission that the Mesaverde formation underlying the following lands situated in Rio Arriba County, approximately 30 miles south of the city of Dulce, New Mexico, hereinafter referred to as the Mesaverde formation, be designated as a tight formation in said Federal Energy Regulatory Commission's regulations:

TOWNSHIP 26 NORTH, RANGE 2 WEST, NMPM
Section 7: Lot 4
Section 8: NE/4 and S/2
Sections 17 and 18: All
Section 19: Lots 1, 2, and 3

TOWNSHIP 26 NORTH, RANGE 3 WEST, NMPM
Sections 1 and 2: All
Sections 11 through 14: All
Sections 23 and 24: All

TOWNSHIP 27 NORTH, RANGE 3 WEST, NMPM
Sections 11 through 14: All
Section 15: S/2
Sections 22 through 27: All
Sections 35 and 36: All

(3) That the area proposed for tight formation designation lies within the horizontal limits of the Blanco Mesaverde Gas Pool as previously defined and described in San Juan and Rio Arriba Counties, New Mexico.

(4) That the area proposed is an isolated sand development separated from the main body of the Blanco Mesaverde reservoir.

(5) That there is additional acreage within the horizontal limits of this isolated sand body including at least the following:

TOWNSHIP 26 NORTH, RANGE 2 WEST, NMPM
Section 6: All
Section 7: Lots 1, 2, and 3
Section 19: Lot 4
Section 20: W/2

TOWNSHIP 26 NORTH, RANGE 3 WEST, NMPM
Section 3: E/2
Section 10: E/2
Section 15: E/2

TOWNSHIP 27 NORTH, RANGE 3 WEST, NMPM
Sections 9 and 10: All
Section 16: E/2
Section 21: E/2
Section 28: E/2
Section 34: All

(6) That there is no evidence of significant geologic difference between the Mesaverde formation underlying the lands described in Findings Nos. (2) and (5) above and the entire area should be considered in any recommendation to the FERC.

(7) That the Mesaverde formation underlies all of the above-described lands; that the formation consists of two 40 to 100 foot thick sand intervals (the Cliff House and the Point

Lookout) separated by approximately 300 feet of shale which may contain thin sandstone layers; that the top of such formation is found at an average depth of 5563 feet below the surface of said area.

(8) That the type section for the Mesaverde formation for the proposed tight formation designation is found at a depth of from approximately 5484 feet to 6018 feet on the Induction Electric log of the Mobil Jicarilla "H" Well No. 7A located in Unit D of Section 1, Township 26 North, Range 3 West, NMPM, run on July 15, 1976.

(9) That the Mesaverde formation underlying the above-described lands has been penetrated by numerous wells at least 69 of which produce or have produced gas therefrom.

(10) That 24 infill wells have been drilled to the Mesaverde formation underlying the above-described lands 22 of which are or were producers therefrom.

(11) That the designation of a tight formation is not necessary for development of those proration units already fully developed by successful infill drilling.

(12) That any tight formation recommendation in this case should apply only to proration units not developed and/or not developed by an infill well capable of production on or before February 11, 1981, such acreage being as described on Exhibit "A" attached hereto.

(13) That the evidence presented in this case demonstrated that the predominant percentage of wells which may be completed in the Mesaverde formation within the undeveloped areas of the proposed tight formation may reasonably be presumed to exhibit permeability, gas productivity, or crude oil productivity not in excess of the following parameters:

(a) average in situ gas permeability throughout the pay section of 0.1 millidarcy; and

(b) stabilized production rates, without stimulation, against atmospheric pressure, as found in the table set out in 18 C.F.R. §271.703(c)(2)(B) of the regulations; and

(c) production of more than five barrels of crude oil per day.

(14) That the evidence presented in this case demonstrated that the application of incentive pricing is reasonably necessary to stimulate further development in that portion of the proposed tight formation area described on Exhibit "A" to this order.

(15) That existing State of New Mexico and Federal Regulations relating to casing and cementing of wells will assure that development of the Mesaverde formation will not adversely affect any overlying aquifers.

(16) That the Mesaverde formation within the area described on Exhibit "A" to this order should be recommended to the Federal Energy Regulatory Commission for designation as a tight formation.

IT IS THEREFORE ORDERED:

(1) That it be and hereby is recommended to the Federal Energy Regulatory Commission pursuant to Section 107 of the Natural Gas Policy Act of 1978, and 18 C.F.R. §271.703 of the regulations that the Mesaverde formation underlying those lands in Rio Arriba County, New Mexico, described on Exhibit "A" to this order, be designated as a tight formation.

(2) That jurisdiction of this cause is retained for the entry of such further orders as the Division may deem necessary.

DONE at Santa Fe, New Mexico, on the day and year hereinabove designated.

STATE OF NEW MEXICO
OIL CONSERVATION DIVISION

JOE D. RAMEY
Director

S E A L

fd/

CASE NO. 7154
ORDER NO. R-6678
EXHIBIT "A"

TOWNSHIP 26 NORTH, RANGE 2 WEST, NMPM
Sections 6 and 7: All
Section 17: E/2
Sections 18 and 19: All

TOWNSHIP 26 NORTH, RANGE 3 WEST, NMPM
Section 3: E/2
Section 10: E/2
Section 12: E/2
Sections 13 and 14: All
Section 15: E/2
Sections 23 and 24: All

TOWNSHIP 27 NORTH, RANGE 3 WEST, NMPM
Section 9: All
Sections 11 through 13: All
Section 14: E/2
Section 15: S/2
Section 16: E/2
Section 24: All
Section 25: E/2
Section 28: E/2
Section 34: E/2
Section 36: S/2

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

BRUCE KING
GOVERNOR

LARRY KEHOE
SECRETARY

POST OFFICE BOX
STATE LAND OFFICE
SANTA FE, NEW MEXICO
(505) 827-2434

May 6, 1981

Re: CASE NO. 7154
ORDER NO. R-6678

Mr. James Sperling
Modrall, Sperling, Roehl,
Harris & Sisk
Attorneys at Law
Post Office Box 2168
Albuquerque, New Mexico 87103

Applicant:

Mobil Producing Texas and New Mexico, Inc.

Dear Sir:

Enclosed herewith are two copies of the above-referenced Division order recently entered in the subject case.

Yours very truly,

JOE D. RAMEY
Director

JDR/fd

Copy of order also sent to:

Hobbs OCD X
Artesia OCD X
Aztec OCD X

Other William F. Carr

NEW MEXICO DEPARTMENT OF ENERGY & MINERALS

OIL CONSERVATION DIVISION

IN THE MATTER OF THE APPLICATION OF MOBIL PRODUCING TEXAS & NEW MEXICO INC. FOR DESIGNATION OF TIGHT FORMATION, RIO ARRIBA COUNTY, NEW MEXICO

Case No. 7154

A P P L I C A T I O N

COMES NOW, MOBIL PRODUCING TEXAS & NEW MEXICO INC., by and through its undersigned attorneys and as provided in the Oil Conservation Division's Special Rules and Procedures for Tight Formation Designations under Section 107 of the Natural Gas Policy Act of 1978 promulgated by Oil Conservation Division Order No. R-6388 on June 30, 1980, hereby makes application for an order designating certain portions of the Mesa Verde Formation as a tight formation under Section 107 of the Natural Gas Policy Act of 1978 and in support of its application would show the Division:

1. Applicant is the owner and operator of certain interests in the Mesa Verde Formation underlying the following-described lands situated in Rio Arriba County, New Mexico:

Township 27 North, Range 3 West, N.M.P.M.

Section 11: All
Section 12: All
Section 13: All
Section 14: All
Section 15: S/2
Section 22: All
Section 23: All
Section 24: All
Section 25: All
Section 26: All
Section 27: All
Section 35: All
Section 36: All

Township 26 North, Range 3 West, N.M.P.M.

Section 1: All
Section 2: All
Section 11: All
Section 12: All
Section 13: All
Section 14: All
Section 23: All
Section 24: All

Township 26 North, Range 2 West, N.M.P.M.

Section 7: Lot 4
Section 8: NE/4, S/2
Section 17: All
Section 18: All
Section 19: Lots 1, 2, 3

Containing 13,920 acres, more or less.

2. The Mesa Verde Formation is expected to have an estimated average in situ gas permeability throughout the pay section of less than 0.1 millidarcy per foot.

3. The depth of the top of the Mesa Verde Formation is between 5500 and 6000 feet and the stabilized production rate, against atmospheric pressure, of wells completed for production in said formation, without stimulation, is not expected to exceed 188 mcf per day.

4. No well drilled into the Mesa Verde Formation in the above-described area is expected to produce, without stimulation, more than five barrels of oil per day.

5. Attached to this application and incorporated herein by reference is a complete set of exhibits, as well as a brief geologic description and history of the Blanco Mesa Verde pool, together with a statement of the meaning and purpose of each exhibit. These exhibits cover all aspects of the required evidentiary data described in Section D of the Oil Conservation Division's Special Rules and Procedures for Tight Sand Formation Designation under Section 107 of the Natural Gas Policy Act of 1978.

WHEREFORE, Applicant prays that this application be set for hearing before a duly appointed examiner of the Oil Conservation Division and that after notice and hearing as required by law, the Division enter its order recommending to the Federal Energy Regulatory Commission that pursuant to 18 CFR, Section 271.701-705, the Mesa Verde Formation underlying the above-described land be designated a tight formation, and making such other and further provision as may be proper in the premises.

Respectfully submitted,

MODRALL, SPERLING, ROEHL, HARRIS & SISK, P.A.

By: Original Signed by James E. Sperling

James E. Sperling
P. O. Box 2168
Albuquerque, New Mexico 87103
Telephone: (505) 243-4511

ATTORNEYS FOR APPLICANT

Certificate of Service

IT IS HEREBY CERTIFIED that a copy of this Application and a complete set of all exhibits which Applicant proposes to offer or introduce at hearing, together with the statement of meaning and purpose of each, has been mailed to the United States Geological Survey, at P. O. Box 26124, Albuquerque, New Mexico 87125, on this 19th day of January, 1981.

Original Signed by James E. Sperling

James E. Sperling

APPLICATION FOR TIGHT

GAS FORMATION DESIGNATION

MOBIL PRODUCING TEXAS & NEW MEXICO OPERATED LEASES

RIO ARRIBA COUNTY

NEW MEXICO

TABLE OF CONTENTS

Mobil Producing Texas and New Mexico submits an application to designate the Blanco Mesa Verde Pool as a tight formation underlying following tracts:

T27N R3W: Sections 11, 12, 13, 14, S/2 of 15, 22, 23, 24, 25, 26, 27, 35, 36

T26N R3W: Sections 1, 2, 11, 12, 13, 14, 23, 24

T26N R2W: Lot 4 Sec 7, NE/4 and S/2 Sec 8, Sec 17, Sec 18, Lots 1,2,3 Sec 19

All of these tracts are in Rio Arriba County, New Mexico.

It is believed that the Blanco Mesa Verde Pool in the above area exhibits the characteristics of a tight formation as identified in FERC Order No. 99. The guidelines indicated that (1) the average insitu permeability should be less than 0.1 millidarcy, (2) the pre-stimulation production rate to atmosphere of formations whose tops are between 5500' - 6000' may not exceed 188 MCF/D, and (3) the pre- stimulation oil rate should not exceed 5 BOPD.

Geologic Description:

The Geology of the Mesa Verde Group in T26N and T27N, R3W

The Mesa Verde Group lies between two thick formations of shale, the overlying Lewis shale and the underlying Mancos shale. This group is divided into three formations; the Cliff House, Menefee, and Point Lookout.

The Cliff House sandstone is about 100 ft thick in the west side of T26N, R3W; 40 ft thick in the middle, 60 ft thick in the east and becomes thin in T26N, R2W. The porosity of the Cliff House sandstone usually decreases as the sandstone becomes thinner (See Cross section A-C).

The Menefee shale contains some thin sandstone layers. The formation is not an important reservoir unit although some wells are also perforated for natural gas production.

The Point Lookout is the main reservoir of the Mesa Verde Group. The porous sandstone in the upper part of the formation is about 100 ft thick in the west side of T26N, R3W, 40 ft in the middle, and 55 ft in the east, and becomes thinner in T26N, R2W. The porosity of the Point Lookout sandstone usually decreases as the sandstone becomes thinner.

In general, the sandstones of the Mesa Verde Group form a narrow strip of reservoir about 2 miles wide and 9 miles long in a north-south direction in T26N, R3W and T27N, R3W.

History:

The Blanco Mesa Verde Pool in the subject area was developed in the late 1950s on 320 acre proration units. A few wells were tested before stimulation, but were found to produce at non commercial rates. Subsequent wells were stimulated by fracturing without prior production rate testing. As a result of this policy, pre-frac data is sparse and pre-frac conditions must be inferred from post frac data.

An infill drilling program was initiated in the mid 1970s as the rules were amended to allow for a second well on a proration unit. The drilling program met with moderate success, but several units on the eastern edge were economically unfeasible due to insufficient reserves and have remained undeveloped.

Mobil Producing Texas and New Mexico Inc. has received inquiries pertaining to the future development of undeveloped units. As a prudent operator we are willing to comply with the requests provided that price relief can be obtained. The following discussion will attempt to prove that the Blanco Mesa Verde Pool underlying the aforementioned acreage is characteristic of a tight formation and gas sold from future wells should be subject to tight gas pricing.

Discussion:

Exhibit 1 points out that the aforementioned acreage (± 13,920 acres) comprises the bulk of a separate sand body in the Blanco Mesa Verde Pool that produces independently of the main pool. The acreage is located on the eastern fringe of the main pool and is surrounded by dry holes in the Mesa Verde formation. Therefore data submitted from wells in the subject acreage is valid for this area only and may not be representative of the main Blanco Mesa Verde Pool.

Exhibit 2 is a cumulative gas production map. High recoveries have come from a "sweet spot" located in center of the acreage. Recoveries decrease outward in all directions. Undeveloped acreage lies in areas where expected recoveries will be less than 500 MMCF per well. At present gas prices, reserves of this magnitude are unprofitable.

Exhibit 3 is a table of after frac permeabilities calculated from bottom hole pressure buildups run in 1975 and 1976. The calculated permeabilities for 11 wells were averaged and the resultant permeability was 0.146 millidarcy. It should be noted that the buildups were run after fracturing, and the values would be lower had the buildups been run before fracturing.

Exhibits 4 and 5 summarize the computations involved in calculating formation permeability based on a bottom hole pressure buildup. The calculations are a standard in the industry to obtain accurate formation permeability.

Exhibit 5A utilizes a method for determining pre frac permeability if the fracture length is known. In the case of Jicarilla 'H' #2A, employing a 1,000' fracture in a 160 acre drainage area reveals that the prefrac permeability was 28% of the post frac permeability or 0.07 md.

Exhibit 6 is a summary of permeability analyses of whole cores from these wells. This type of analysis results in apparent permeabilities that are greater than actual due to a reduction in overburden pressure. In the case of the Mesa Verde, compaction can result in a reduction in permeability (see chart in Exhibit). The permeability of the core in one well averaged 0.032 md. The other well was cored in only one out of three sections and averaged 0.216 md. This value would have been lower had all sections been cored and analyzed. Another well averaged 0.18 md permeability. However, this well had fewer samples taken, and these were obtained from the better quality portions of the core. This type of spot sampling does not take into account that all of the interval contributes (both good and poor quality) and the actual average permeability is less than what is measured. Therefore this type of analysis is basically qualitative rather than quantitative.

From the date presented in Exhibits 3, 4, 5, 5A, and 6, it can be inferred that the average insitu permeability of the Mesa Verde formation is less than 0.1 md.

Exhibit 7 tabulates all the known prefrac flow rates in the area. Prefrac testing is usually not performed since it is a known fact that the wells will need stimulation. Natural flow rate tests to atmosphere were run on 15 wells. The average rate of thirteen flow rates was 150 MCFPD.

Two rates (11,960 MCFPD and 2083 MCFPD) were not averaged in since they were not representative of the field. It is believed that the 11,960 MCFPD rate came from fractures in the immediate vicinity of the wellbore and not from the formation itself. This is substantiated in that the production rate dropped to 3221 MCFPD after fracturing and the well has only produced 900 MMCF after 22 years. (average = 112 MCFPD) The other rate came from the best well in the field (4.6 BCF recovery) which is in the small "sweet spot" area. This well is an anomaly and is not representative of the area as a whole.

From the data presented in Exhibit 7, it is evident that the average pre stimulation flow rate to atmosphere is less than 188 MCFPD, which is the maximum acceptable rate for a formation 5500' - 6000'deep.

Exhibit 9 shows the average condensate production rate from all wells in the subject area. Total condensate production from each individual well was divided by each well's total producing life to arrive at an average rate. It is evident that, except for the "sweet spot", production has averaged less than 5 BCPD for the entire area. It should be pointed out that the fluid is condensate and not oil. Based on fluid analysis and production tests, it is believed that the condensate is not in a fluid state in the reservoir, but becomes so at surface conditions.

MPTM's present policy is to set 300' of surface casing with cement circulated behind pipe and also to circulate cement behind the production casing also. This casing program should provide adequate protection of fresh water acquifers, as it meets and exceeds requirements as defined in NMOCD Blanco Mesa Verde Pool Rules 26, 27, and 28 (See Below).

RULE 26. Surface Pipe. The surface pipe shall be set to a minimum depth of 100 feet, and where shallow potable water-bearing beds are present, the surface pipe shall be set to such shallow potable water-bearing beds and a sufficient amount of cement shall be used to circulate the cement behind the pipe to the bottom of the cellar. This surface casing shall stand cemented for at least 24 hours before drilling plug or initiating tests. The surface casing shall be tested after drilling plug by bailing the hole dry. The hole shall remain dry for one hour to constitute satisfactory proof of a water shut-off. In lieu of the foregoing test, the cement job shall be tested by building up a pressure of 1000 psi, closing the valves, and allowing to stand thirty minutes. If the pressure does not drop more than 100 pounds during that period, the test shall be considered satisfactory. This test shall be made both before and after drilling the plug. The Commission shall be notified at least 24 hours prior to the conducting of any test.

RULE 27. Production String. The production string shall be set on top of the Cliff House Sand with a minimum of 100 sacks of cement and shall stand cemented not less than 36 hours before testing the casing. This test shall be made by building up a pressure of 1000 psi, closing the valves, and allowing to stand thirty minutes. If the pressure does not drop more than 100 pounds during that period, the test shall be considered satisfactory.

RULE 28. All cementing shall be done by the pump-and-plug method. Bailing tests may be used on all casing and cement tests, and drill stem tests may be used on cement tests in lieu of pressure tests. In making bailing test, the well shall be bailed dry and remain approximately dry for thirty minutes. If any string of casing fails while being tested by pressure or by bailing tests herein required, it shall be recemented and retested or an additional string of casing should be run and cemented. If an additional string is used, the same test shall be made as outlined for the original string. In submitting Form C-101, "Notice of Intention to Drill," the number of sacks of cement to be used on each string of casing shall be stated.

EXHIBIT 3
POST FRAC PERMEABILITIES
CALCULATED FROM BOTTOM HOLE PRESSURE BUILDUPS
BLANCO MESA VERDE FIELD

Lease and Well No.	kh* (md ft)	h (ft)	k (md)
Jicarilla 'E' #2	3.76	141	.027
Jicarilla 'F' #3	2.49	119	.021
Jicarilla 'F' #7	5.9	45	.13
Jicarilla 'G' #1	24.4	151	.162
Jicarilla 'G' #2	1.7	174	.010
Jicarilla 'G' #3	22.2	115	.193
Jicarilla 'H' #2	19.9	104	.191
Jicarilla 'H' #4	0.945	111	.0085
Jicarilla 'H' #7	19.5	84	.232
Cheney Federal #1	75.9	162	.469
Cheney Federal #3	2.44	16	.153
TOTAL	179.1	1222	1.60

$$\text{Avg. } k = \frac{179.1 \text{ md ft}}{1222 \text{ ft}} = 0.146 \text{ md} = \frac{1.60 \text{ md}}{11 \text{ samples}}$$

* k = permeability

h = contributing formation interval

EXHIBIT 4
JICARILLA G NO. 1-A
BLANCO MESA VERDE

CHRONOLOGICAL PRESSURE AND PRODUCTION DATA

Δt (hrs)	$\frac{t + \Delta t}{\Delta t}$	BHP
Flowing		490
.25	1045	530
.50	523	541
.75	349	550
1	262	561
2	131.5	594
3	88	612
4	66.2	630
5	53.2	644
6	44.5	655
7	38.3	664
8	33.6	673
10	27.1	689
12	22.8	705
14	19.6	719
16	17.3	732
18	15.5	744
20	14.0	755
22	17.9	764
24	11.9	773
28	10.3	792
32	9.2	812
36	8.3	828
40	7.5	844
44	6.9	860
48	6.4	871
54	5.8	889
60	5.4	905
66	5.0	921
72	4.6	935
78	4.3	948
84	4.1	960
90	3.9	971
96	3.7	985
102	3.6	996
108	3.4	1007
114	3.3	1016
120	3.2	1026
126	3.1	1035
132	3.0	1044
140	2.9	1055
150	2.7	1069
160	2.6	1080
164	2.59	1085
165	2.58	1087

EXHIBIT 4 (continued)
POST FRAC BOTTOM HOLE PRESSURE BUILDUP ANALYSIS
JICARILLA 'G' #1-A

Production Rate prior to shut-in (Q) = 1000 MCF/D
Time of production prior to shut-in (t) = 261 hours
Net feet of contributing formation (h) = 146 feet
Formation porosity (ϕ) = 14%
Formation water saturation (Sw) = 34%
Bottom hole flowing pressure (Pwf) = 490 psia
Gas specific gravity = .688
Formation temperature = 142°F = 602°R
Find: Permeability (k) = millidarcies

From plot of BHP vs. $\frac{t + \Delta t}{t}$: slope of straight line (m) = 710 psi/cycle

Average pressure = $\frac{P^* + Pwf}{2} = \frac{1380 + 490}{2}$ = 935 psia

@ 935 psia and 142°F :
gas deviation factor (z) = .8957
gas viscosity (μ) = 0.01372 centipoise

gas formation volume factor (Bg) = $.02829 \frac{zt}{p}$ cu ft/SCF

$= (.02829)\frac{(.8957)(602)}{935}$ cu ft/SCF

= .0163 cu ft/SCF

Converting: .0163 cu ft/SCF x 1000 SCF/MCF x $\frac{1 \text{ BBL}}{5.61 \text{ cu ft}}$ = 2.91 reservoir bbls/MCF

$$kh = \frac{162.6 \times \text{rate} \times \text{viscosity} \times \text{formation volume factor}}{\text{slope of straight line of buildup plot}}$$

$$kh = \frac{162.6 \times Q \times}{m} = \frac{162.6 \times 1000 \times 0.01372 \times 2.91}{710} = 9.14 \text{ md ft}$$

$$k = \frac{9.14 \text{ md - ft}}{146 \text{ feet}} = .063 \text{ md}$$

KEUFFEL & ESSER CO. SEMI-LOGARITHMIC 46 6013 4 CYCLES X 70 DIVISIONS MADE IN U.S.A.

BOTTOMHOLE PRESSURE BUILDUP
JICARILLA G #1-A

B.H.P. Pressure (psia)

$\frac{t + \Delta t}{\Delta t}$

EXHIBIT 5
JICARILLA H-2 NO. A
BLANCO MESA VERDE

CHRONOLOGICAL PRESSURE AND PRODUCTION DATA

Δt (hrs)	$\frac{t + \Delta t}{\Delta t}$	BHP
Flowing	680	
.25	1369	762
.5	685	800
.75	457	832
1.0	343	860
1.5	229	894
2	172	932
3	115	964
4	86.5	989
6	58	1030
8	44	1060
10	35	1080
12	30	1101
16	22	1132
20	18	1157
24	15.2	1178
28	13.2	1194
32	11.7	1210
36	10.5	1223
40	9.6	1237
44	8.8	1246
48	8.1	1255
54	7.3	1269
60	6.7	1283
70	5.9	1298
80	5.3	1312
90	4.8	1326
100	4.4	1337
110	4.1	1348
120	3.8	1358
130	3.6	1364
140	3.4	1371
150	3.3	1378
160	3.1	1385
165	3.07	1388

EXHIBIT 5

POST FRAC BOTTOM HOLE PRESSURE BUILDUP ANALYSIS
JICARILLA 'H' #2-A

Q = 1700 MCF PD
t = 342 hrs
h = 122 ft
ϕ = 14%

Sw = 34%
Pwf = 680 psia
Gas gravity = .688
T = 142°F = 602°R

from BHP vs $\frac{t + \Delta t}{t}$: m = 300 psi/cycle

Average Pressure (P) = $\frac{P^* + Pwf}{2} = \frac{1530 + 680}{2}$ = 1105 psia

@ 1105 psia and 142°F :

B = 0.8814
μ = 0.01410 cp.
Bg = 2.469 reservoir bbl/MCF

$$kh = \frac{162.6 \times Q \times \mu \times Bg}{m} = \frac{162.6 \times 1700 \times 0.01410 \times 2.469}{300}$$

= 32 md-ft

$$k = \frac{32 \text{ md-ft}}{122 \text{ ft}} = 0.262 \text{ md}$$

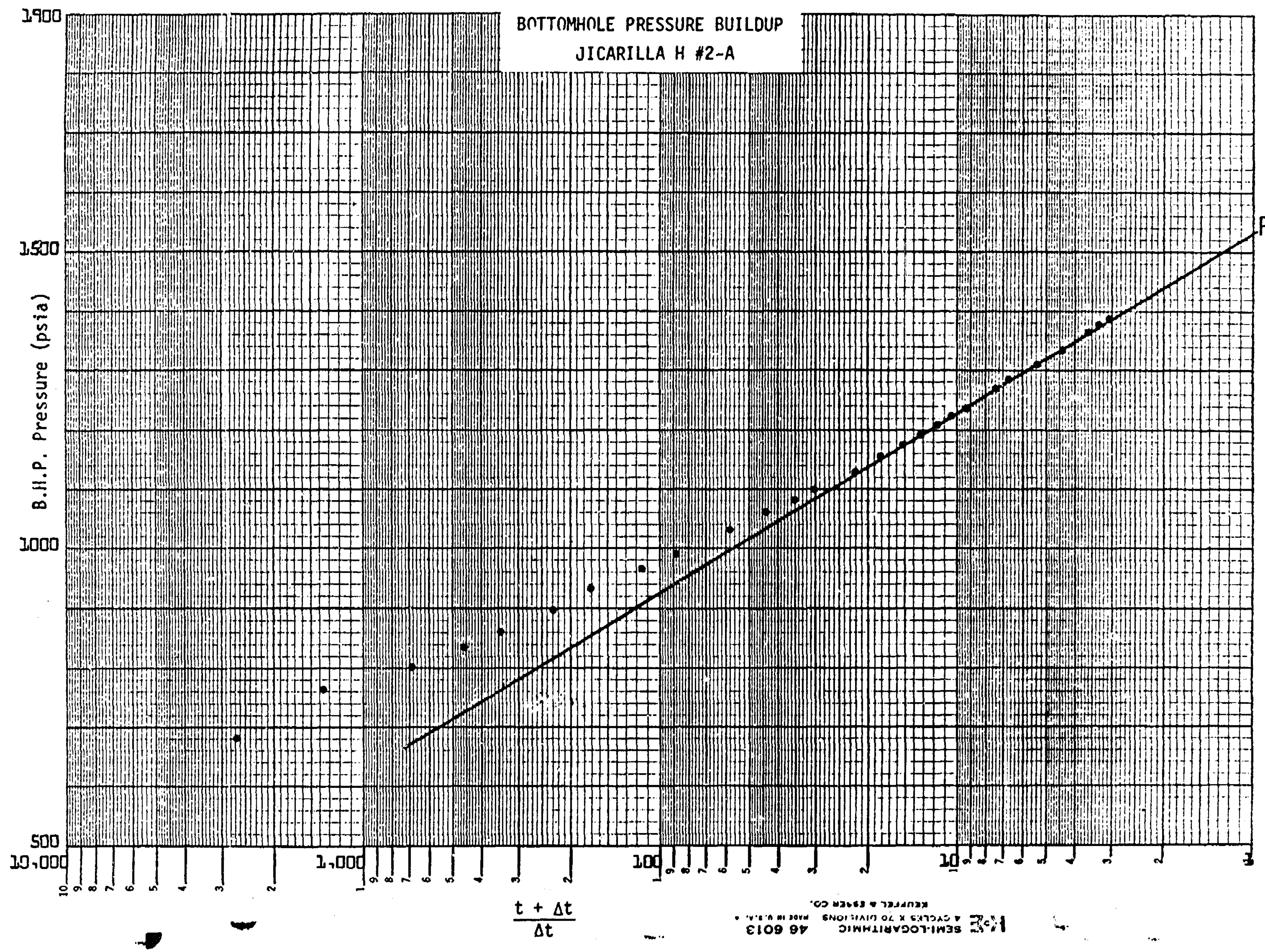

BOTTOMHOLE PRESSURE BUILDUP
JICARILLA H #2-A
B.H.P. Pressure (psia)
1900
1500
1000
500
P*
10,000
1,000
100
10
1
t + Δt
Δt
46 6013
SEMI-LOGARITHMIC
4 CYCLES X 70 DIVISIONS
MADE IN U.S.A.
KEUFFEL & ESSER CO.

EXHIBIT 5A

CALCULATION OF PRE FRAC PERMEABILITY
JICARILLA 'H' #2A

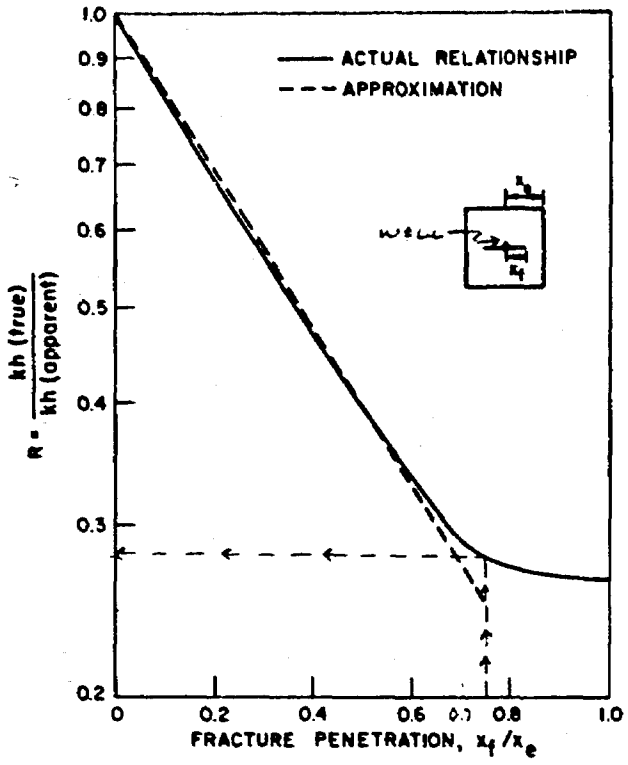


Fig. 10.25 Vertically fractured reservoir, pressure buildup interpretation. (After Russell and Truitt.[11])

From SPE Monograph Vol. 1
Pressure Buildup and Flow Tests in Wells p. 108

Given:
Fracture length = 1000' (calculated from frac program)
Proration Unit = 160 acres
kh (apparent) = .262 md x 122 ft = 32 md. ft

Find kh (true):
Xe = $^1/_2$ length of a 160 acre square = $^1/_2$ x 2640' = 1320'
Xf = fracture length = 1000'
fracture penetration = $\frac{Xf}{Xe} = \frac{1000'}{1320'} = 0.76$

from above chart $\frac{Kh\ (true)}{Kh\ apparent} = .28$

Therefore Kh(true) = .28 x Kh apparent = .28 x 32 md ft = 8.96 md ft

$K = \frac{8.96\ md\ ft}{122'} = .0734\ md$

EXHIBIT 5A

HYDRAULIC FRACTURING TREATMENT SCHEDULE
JICARILLA "H", WELL NO. 2-A
BLANCO MESA VERDE FIELD
RIO ARRIBA COUNTY, NEW MEXICO

Formation	Treating Rate (bbls/min)	Base Fluid Type	Treating Fluid Volume and Type	Friction Reducing Agt Type	Friction Reducing Agt Conc (#/1000 gals)	Gelling Agt Type	Gelling Agt Conc (#/1000 gals)	Fluid Loss Agent Type	Fluid Loss Agent Conc (#/1000 gals)	Foaming Agent Type	Foaming Agent Conc (#/1000 gals)	Mesh Size	Sand Data Conc (#/gal)	Sand Data Quantity (Lbs)
Lower Mesa Verde (5754'-5920'-166'GA-42 holes)	50	1% KCL	5,000 gals.Prepad	FR-20	3.0	None	0	Ad-Aq	30	Surf	2.0	None	0.0	0
	"	"	10,000 gals.Versagel Pad	None	0.0	MG-11	40	"	"	"	"	None	0.0	0
	"	"	7,500 gals.Versagel	"	"	"	"	"	"	"	"	20-40	1.0	7,500
	"	"	7,500 gals.Versagel	"	"	"	"	"	"	"	"	"	2.0	15,000
	"	"	7,500 gals.Versagel	"	"	"	"	"	"	"	"	"	3.0	22,500
	"	"	22,500 gals.Versagel	"	"	"	"	"	"	"	"	"	4.0	90,000
			DROP 18 RCNBS											
	50	1% KCL	5,000 gals.Prepad	FR-20	3.0	None	0	Ad-Aq	30	Surf	2.0	None	0.0	0
	"	"	10,000 gals.Versagel Pad	None	0.0	MG-11	40	"	"	"	"	None	0.0	0
	"	"	7,500 gals.Versagel	"	"	"	"	"	"	"	"	20-40	1.0	7,500
	"	"	7,500 gals.Versagel	"	"	"	"	"	"	"	"	"	2.0	15,000
	"	"	7,500 gals.Versagel	"	"	"	"	"	"	"	"	"	3.0	22,500
	"	"	22,500 gals.Versagel	"	"	"	"	"	"	"	"	"	4.0	90,000
Middle Mesa Verde (5504'-5680'-176'GA-31 holes)	50	1% KCL	3,500 gals.Prepad	FR-20	3.0	None	0	Ad-Aq	30	Surf	2.0	None	0.0	0
	"	"	6,500 gals.Versagel Pad	None	0.0	MG-11	40	"	"	"	"	None	0.0	0
	"	"	5,000 gals.Versagel	"	"	"	"	"	"	"	"	20-40	1.0	5,000
	"	"	5,000 gals.Versagel	"	"	"	"	"	"	"	"	"	2.0	10,000
	"	"	5,000 gals.Versagel	"	"	"	"	"	"	"	"	"	3.0	15,000
	"	"	15,000 gals.Versagel	"	"	"	"	"	"	"	"	"	4.0	60,000
			DROP 4 RCNBS											
	50	1% KCL	3,500 gals.Prepad	FR-20	3.0	None	0	Ad-Aq	30	Surf	2.0	None	0.0	0
	"	"	6,500 gals.Versagel Pad	None	0.0	MG-11	40	"	"	"	"	None	0.0	0
	"	"	5,000 gals.Versagel	"	"	"	"	"	"	"	"	20-40	1.0	5,000
	"	"	5,000 gals.Versagel	"	"	"	"	"	"	"	"	"	2.0	10,000
	"	"	5,000 gals.Versagel	"	"	"	"	"	"	"	"	"	3.0	15,000
	"	"	15,000 gals.Versagel	"	"	"	"	"	"	"	"	"	4.0	60,000
			DROP 4 RCNBS											
	50	1% KCL	3,500 gals.Prepad	FR-20	3.0	None	0	Ad-Aq	30	Surf	2.0	None	0.0	0
	"	"	6,500 gals.Versagel Pad	None	0.0	MG-11	40	"	"	"	"	None	0.0	0
	"	"	5,000 gals.Versagel	"	"	"	"	"	"	"	"	20-40	1.0	5,000
	"	"	5,000 gals.Versagel	"	"	"	"	"	"	"	"	"	2.0	10,000
	"	"	5,000 gals.Versagel	"	"	"	"	"	"	"	"	"	3.0	15,000
	"	"	15,000 gals.Versagel	"	"	"	"	"	"	"	"	"	4.0	60,000
Upper Mesa Verde (5394'-5480'-86'GA-27 holes)	50	1% KCL	10,000 gals.Prepad	FR-20	3.0	None	0	Ad-Aq	30	Surf	2.0	None	0.0	0
	"	"	20,000 gals.Versagel Pad	None	0.0	MG-11	40	"	"	"	"	None	0.0	0
	"	"	15,000 gals.Versagel	"	"	"	"	"	"	"	"	20-40	1.0	15,000
	"	"	15,000 gals.Versagel	"	"	"	"	"	"	"	"	"	2.0	30,000
	"	"	15,000 gals.Versagel	"	"	"	"	"	"	"	"	"	3.0	45,000
	"	"	45,000 gals.Versagel	"	"	"	"	"	"	"	"	"	4.0	180,000

Ad-Aq = Adomite Aqua
Surf = Howco Suds

JESmith/jc
6/30/76

EXHIBIT 5A

FRACPLAN II — FRACG♦ 5-10-76

JOB TYPE - VERSAGEL FRACTURING PROCESS

MOBIL OIL CO.♦ JICARPA♦ MESA VERDE FORMATION

1 % KCL♦ 30 LBS. ADOMITE AQUA♦ 2 GALS. PFN-5

Jicarilla "H" Well No. 1
Blanco Mesa V...

INJECTION RATE - BBL/MIN		50.0
ASSUMED FRACTURE HEIGHT - FT		100.0
NET FORMATION THICKNESS - FT		40.0
ELASTIC MODULUS - PSI		0.30E+07
FORMATION PERMEABILITY - MD		0.10
FORMATION POROSITY		0.08
BHTP - PSI		3500.
RESERVOIR PRESSURE - PSI		1000.
RESERVOIR FLUID VIS - CP		0.02
CW - FLUID LOSS COEF. - FT/SQRT(MIN)		0.00100
SPURT LOSS - GAL/SQFT		0.
TYPE OF GEL		WG-11
GEL CONCENTRATION		40#/M
N-PRIME		0.4500
K-PRIME(SLOT) - LBF-SEC♦♦N/SQFT		0.100000
WELL SPACING - ACRES		350.
DRAINAGE RADIUS - FT		2000.
WELLBORE RADIUS - FT		0.400
DAMAGE RATIO		1.0
TYPE & CONC NO 1 PROP	20-40 SAND	5.00 LB/GAL AVG

DESIGN NO	PROD INCREASE (T)	PROD INCREASE (M-S)	TOTAL VOL GAL/1000	PAD VOL	PROPPED FRAC LN FT	PROPPED FRAC HT FT	VIS CPS	FRAC WIDTH IN	PROP 1ST SX	PROP 2ND SX
1	3.7	7.3	60.0	15.6	765.	100.0	536.	0.614	2221.	0.
2	4.0	7.3	70.0	18.6	857.	100.0	560.	0.639	2548.	0.
3	4.2	8.9	80.0	21.8	946.	100.0	582.	0.661	2918.	0.
Y_f = 1000' →	4.3	8.9	86.0	23.7	1000	100.0	594	0.674	3129.	0.
4	4.4	8.9	90.0	24.9	1033.	100.0	601.	0.682	3253.	0.
5	4.7	10.1	100.0	28.2	1117.	100.0	619.	0.700	3591.	0.
6	5.0	10.1	110.0	31.5	1198.	100.0	636.	0.717	3926.	0.
7	5.3	10.1	120.0	34.8	1278.	100.0	652.	0.734	4258.	0.
8	5.6	11.0	130.0	38.2	1356.	100.0	667.	0.749	4589.	0.
9	6.0	11.0	140.0	41.7	1433.	100.0	681.	0.763	4917.	0.
10	6.4	11.8	150.0	45.1	1508.	100.0	694.	0.777	5244.	0.

Y_f = 1000'
Y_f = 150'
q_c = 50 BPM
30,000 Gal-Prepad
[illegible] Gal-Versagel Pad
[illegible] Gal-Versagel + 1 lb/gal Sand
[illegible] Gal-Versagel + 3 lb/gal Sand
15,000 Gal-Versagel + 5 lb/gal Sand
[illegible] Gal-Versagel + 7 lb/gal Sand

CREATED LENGTH	HED	RELATIVE CAP (T)	RELATIVE CAP (M-S)	HF/HI	C-EFF
765.	0.	234.80	415503.	1.00	0.000087
857.	0.	240.25	425140.	1.00	0.000085
946.	0.	244.78	433155.	1.00	0.000084
1033.	0.	248.82	440320.	1.00	0.000083
1117.	0.	252.50	446821.	1.00	0.000082
1198.	0.	255.86	452777.	1.00	0.000081
1278.	0.	258.97	458274.	1.00	0.000081
1356.	0.	261.86	463380.	1.00	0.000080
1433.	0.	264.55	468148.	1.00	0.000079
1508.	0.	267.08	472623.	1.00	0.000078

450,000 lbs Sand Total

John E. Sti...
1. 2. 7

MOBIL OIL CORPORATION
WELL COST STATEMENT

STATE	COUNTY OR PARISH	FIELD	WKG. INT.
NEW MEXICO	RIO ARRIBA	BLANCO (MESA VERDE)	100

REGION	AREA	LEASE	WELL NO.
HOUSTON	356 JICARILLA H	75626-00	2-A

DATE COMMENCED	DATE COMPLETED	TOTAL DEPTH	STATUS	AFE NO.	PREPARED BY
5-04-76	7-12-76	6100	GAS	6241	DALLAS ACCOUNTING CENTER

	COSTS /WHOLE DOLLARS/ ACTUAL		ESTIMATED
DRILLING COSTS			
FOOTAGE COST	57,102		
DAY WORK COST	9,578		
OTHER DRILLING COST	19,352		
TOTAL DRILLING COSTS		66,032	
WELL EXPENSES			
LOCATION AND ROADS	3,296		
LOGGING AND TESTING	7,679		
FUEL	97		
WATER	9,239		
MUD AND CHEMICALS	36,688		
CEMENT AND CEMENTING SERVICES	20,181		
TRANSPORTATION	3,603		
PERFORATING AND STIMULATION	162,872		
EQUIPMENT RENTAL	1,297		
MISCELLANEOUS	6,690		
TOTAL WELL EXPENSES		251,842	371,000
TOTAL INTANGIBLE COSTS		337,874	371,000
WELL EQUIPMENT			
CASING	34,655		
OTHER EQUIPMENT	6,976-		
TOTAL TANGIBLE COSTS		27,679	
TOTAL COSTS		365,553	371,000
APPROXIMATE COST TO MOBIL		365,553	

EXHIBIT 6
PERMEABILITY BASED ON CORE ANALYSIS
BLANCO MESA VERDE FIELD

Lease and Well No.	No. of Samples	Summation of All k Values	Average k	Reduced k due to compaction
Jicarilla H-7 *	28	6.04 md	0.216 md	.17 md
Jicarilla G-1	130	4.10 md	0.032 md	.026 md
Jicarilla G-5	56	9.95 md	0.18 md	.14 md

* only one out of three intervals was cored

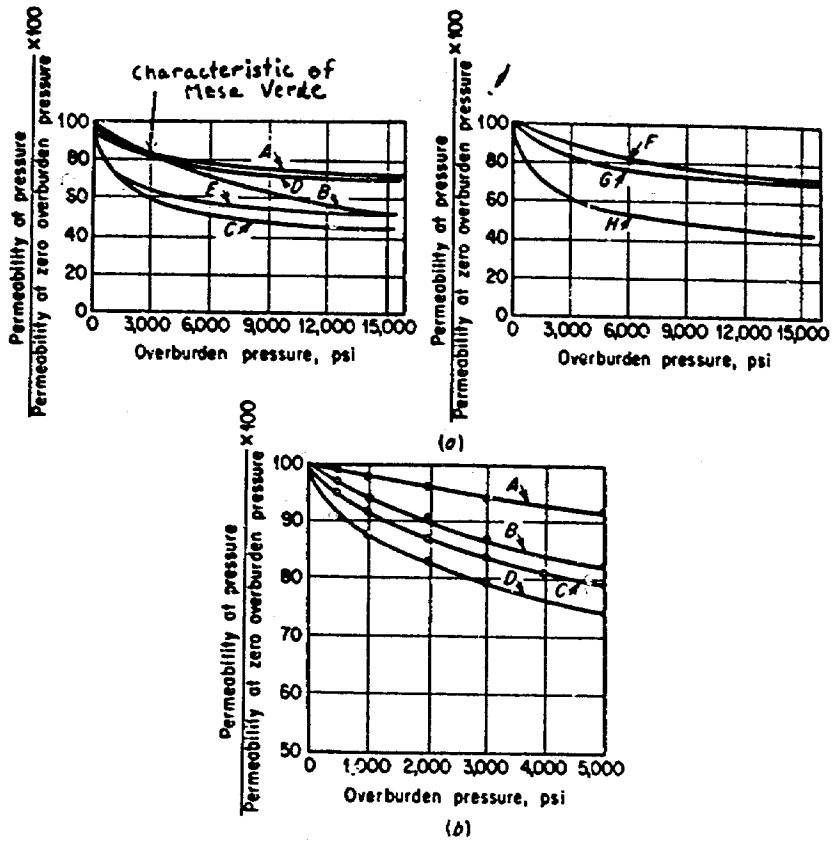


FIG. 2-46. Changes in permeability with overburden pressure. (*a*) Curve *A*—Colorado; 3.96 millidarcys; *B*—Southern California coast, 40.9; *C*—San Joaquin Valley, Calif., 45.0; *D*—Arizona, 4.36; *E*—Arizona, 632; *F*—San Joaquin Valley, Calif., 40.5; *G*—San Joaquin Valley, Calif., 55.5; *H*—Southern California coast, 318.8. (b) *A*—basal Tuscaloosa, Miss., 229 millidarcys, 15 per cent porosity; *B*—basal Tuscaloosa, Miss., 163, 24; *C*—Southern California coast, 335, 25; *D*—Los Angeles basin, Calif., 110, 22. (*From Fatt and Davis.*[20])

From Petroleum Reservoir Engineering
by AMYX, Bass & Whiting,
page 96

EXHIBIT 7
NATURAL FLOW RATES (C. 1958)
BLANCO MESA VERDE FIELD

Lease and Well No.	Rate (MCFPD)
Jicarilla 'D' #7	12
Jicarilla 'D' #8	69
Jicarilla 'F' #4	258
Jicarilla 'F' #5	7
Jicarilla 'F' #6	32
Jicarilla 'F' #7	44
Jicarilla 'G' #5	293
Jicarilla 'G' #7	7
Jicarilla 'G' #8	15
Jicarilla 'H' #7	325
Jicarilla 'H' #8	7
Cheney Federal #2	11
Featherstone Fed. #1	865

$$\text{Average Rate} = \frac{\text{1955 MCFPD Total}}{\text{13 wells}} = \text{150 MCFPD}$$

Jicarilla 'G' #6	2083 *
Jicarilla 'E' #5	11,690 *

* See discussion for explanation

EXHIBIT 8

REPORT OF LABORATORY ANALYSIS — FIELD SAMPLE

Form X-6312

Magnolia Petroleum Company

Container No. 4042 Analysis No. 12089
Container Pressure 570 psia @ 70 °F. (Field)
480# @ 90 °F. (Lab.)
Date Sampled 5-20-58
Stream Sampled Separator Liquid
Volume of Stream Sampled 3.21 bbls/day (stock)

Lease Name Jicarilla "E" Well No. 1 M.V.
District Lea State New Mexico
Operator Magnolia Petroleum Co.
Field Blanco Mesaverde County Rio Arriba
Sand Mesaverde Depth 5386-5880
Well Depth 5900' Perf. 5380-5880 Shots 6/ft.

Sample Requested by R. D. Myers Submitted by Lee E. Robinson Analyzed by Peters & Willbanks-6-11-58

FIELD TESTS AND OPERATING DATA:

Pressures: Bottomhole		**Temperatures:** Bottomhole	
Shutin Casing		Flowing Wellhead	70 est.
Shutin Tubing	1039	Heater Inlet	none
Flowing Tubing	570	Heater Outlet	none
Flowing Casing		Primary Sep. Gas	70
Primary Separator	570	Primary Sep. Oil	70
Secondary Separator	20	Meter Run	70
Stock Tank	Atm.	Stock Tank	55
		Atmospheric	75

Choke Sizes: Tubing none Casing none Heater none

Production Rate: Primary Sep. Gas	486 MCF/D	**Ratios:** Sep. Gas/Sep. Water	48.6 MCF/bbl. est.
Primary Sep. Oil		Sep. Gas/Stock Oil	151.4 MCF/bbl
Primary Sep. Water	10 bbl/day (est)	Sep. Gas/Stock Water	
Stock Tank Oil	3.21 bbl/day	Sep. Gas/Sep. Oil	unknown
Stock Tank Water	none	Overall Gas/Liquid	
Potential Rates: Gas	5,731 mcf/day pilot	**Allowable Rates:** Gas	
Oil		Oil	
Disposition Production: Gas	Pan. NW pipeline	Oil	tank truck

Field Tests: Charcoal 80-32 ____ GPM Air ____ % Gas Gravity ____
0-32 ____ GPM CO_2 ____ % Oil Gravity ____ @ ____ °F.
0-60 ____ GPM H_2S ____ Gr./100 pH Water ____

Gas Measurement: Method Orifice Meter Pressure Base 14.65
Sample Method Gas displacement. Liquid Outage

REMARKS:

LABORATORY REPORT:

Component	Mol. %	Vol. %	Content GPM	Vapor Press.
Hydrogen Sulfide				
Carbon Dioxide				
Nitrogen				
Air				
Methane	11.19	4.84		
Ethane	7.41	4.82		
Propane	10.09	7.09		
i-Butane	3.98	3.32		
n-Butane	8.90	7.17		
i-Pentane	6.92	6.47		
n-Pentane	6.50	6.01		
Hexanes (+)	45.01	60.28		
TOTAL	100.00	100.00		

ENGLER: IBP 90 °F. 70% 351 °F.
5% 112 80% 537
10% 126 90% ____
20% 150 95% ____
30% 176 EP 674
40% 198 Rec. 86.5 %
50% 226 Res. 9.5 %
60% 267 Loss 4.0 %

Residue Data: °API Gravity @ 60°F. ____
Mol. Wt. 123.913 Reid Vapor Pressure ____
CF/Gal. 19.115
Gal./Mol. 19.880 26/70 Equiv. ____
°API 57.5 Burrell: Air ____ %
Calc. VP 2.14 CO_2 ____ %
Companion Samples ____

REMARKS:

To: L. E. Robinson (2)

cc: RDM ML GTE IRS REC BCB WS file

Signed C. E. McIver for E. L. Stovall/sam Date 6/30/58