



STATE OF NEW MEXICO ENERGY AND MINERALS DEPARTMENT OIL CONSERVATION DIVISION

BAUCE KING

July 20, 1982

POST DFFICE BOX 2088 STATE LAND OFFICE 8UILDING SANTA FE, NEW MEXICO 87501 (505) 827-2434

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that if the application, with the supplemental economic information, cannot be approved, they would request it be withdrawn.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

1 .

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.

June 29, 1982

NINE GREENWAY PLAZA—SUITE 2700 HOUSTON, TEXAS 77046

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

JAM/mma

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 explication.

ALL Vours very truly,

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J. A. Morris

Regulatory Engineering Supervisor

ECONOMIC JUSTIFICATION

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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.

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

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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 mecessary 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

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	Jicarilla Lease	Well#	Cumulative As of 11/81 MMCF
Year	Jicarilla Lease		
1975	G	78	476.4
		6A	903.3
1976	н	3A	944.2
	G	2A	1028.0
	н	1A	563.3
	G H	7A	767.6
	n F	6A	799.2
	r H	5A	497.2
		4A	695.7
	G H	iÅ	157.0
	н Н	8A	330.5
	G	8A	414.5
	Cheney Federal	2A	189.0
	Cheney Federal		Dry
	Cheney Federal F	5A	502.9
	F	1A	548.ú
	F	Average Per Well	556.0
		5A	187.1
1977	G	4A	376.2
	F	3A	326.7
	F	2A	137.7
5	F	Average Per Well	
1070	н	4A	Dry
1978	E	2A	68.8
	E .	Average Per Wel	1 34.4



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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			Wells		
		<u>G-5A</u>	<u>F-4A</u>	<u>F-3A</u>	<u>F-2A</u>	
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	



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

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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.

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Mobil Producing Texas & New Mexico Inc.

NINE GREENWAY PLAZA --- SUITE 2700 HOUSTON TEXAS 22046

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March 5, 1981

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

REALTER FARMAGE STATE

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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:

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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.

....

	<u>Jicarilla 'E' #2A</u>	<u>Jicarilla 'H' #4A</u>
Initial cost (M\$)	402	⁶ 357
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 Regulatory Engineering Supervisor

RCH/1j.

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



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

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		UNITED STATES			
		DEPARTMENT OF THE INTER	IOR NUV	2 5 1981	
		GEOLOGICAL SURVEY	PEO		OTTEE OR TRIBE NAME
	CUNDD	NOTICES AND REPORTS	ON WELL ACCO	ULATOLICATILLA UNTIANIT AGREEM	ENT NAME
		form for proposals to drill or to deepen or	Dive back to a different		•
	reservo r. Use Fo	form for proposals to drill or to deepen or m. 9–331–C for such proposals.)		8. FARM OR LEAS	
	1. 0 ¹¹	well the other	•	Jicarilla	H
	2. NAME OF			9. WELL NO. 4-A	
		Dil Corporation		10. FIELD OR WILL	
• • • •	3. ADDRESS	OF OPERATOR		Blanco Mes	
	<u> </u>	way Plaza, Suite 2700, H	ous. TX 77046	21. SEC., T., R., M AREA	., OR BLK. AND SURVEY OR
	4. LOCATION below.)	OF WELL (REPORT LOCATION CLE)	INCT. See space 27	Sec. 1, T2	6N. R3W
	AT SURFA	CE: 874 FSL & 732 FEL		12. COUNTY OR P	ARISH 13. STATE
		ROD. INTERVAL: Same as surf DEPTH: Same as surface	ace	Rio Arriba	New Mexico
		PPROPRIATE BOX TO INDICATE NA	TUPE OF NOTICE	14. API NO.	
		OR OTHER DATA	NORE OF NOTICE,	15. ELEVATIONS	SHOW DF, KDB, AND WD)
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	including measured TD 6250	estimated date of starting any propo- i and true vertical depths for all marke PBTD 6106 Hesaverde			ve subsurface locations and
		79 - Prep MIPU			
-	10/10/7	79 - Kill well. GIH w/ 17			
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•		tety Valve: Manu. and Type	<u> </u>		
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	SIGNED_M	the pay TITLE	Authorized Ag	ent DATE 11	27/79
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STATEMENT OF SURFACE RESTORATION INTENTION ATTACHMENT TO USGS FORM 9-331, SUNDRY NOTICE OF INTENT TO APANDON

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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. 16

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 O 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. 17

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.

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FIGURE 3



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FIGURE 4

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

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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	MŞ	732
Net Cash Recovery	M\$	439
Rate of Return	%	16
Profit/Investment Ratio	\$/\$	0.60 -
Fayout	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 1778 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.

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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, it h FrU 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.

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.) Operating Cost (1982 value)	\$	732,000
	\$/year	3,500
	\$	50,000
Workover Cost through life of well	Z	12.5
Royalty Interest	\$/mmbtu	2.66
Gas Prices (1982 values)	\$/MCF	3.19
an tela Value	BTU/SCF	1200
Gas Calorific Value	z	7.0
Rate of Escalation - Gas Prices Expenses	× %	9.0
State and Local Tax Rate	x	7.8
Indian Severance Tax Rate	\$/MCF	.05
Minimum Production Rate	MCFPD	5
TILLILIUGU A CONTRACTOR AND A		





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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.



FIGURE 7

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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	38661
15	04/26/69	3892	7"	to	270'	;	3	1/2"	to	3891'

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STATE OF NEW MEXICO ENERGY AND MINERALS DEPARTMENT OIL CONSERVATION DIVISION

BRUCE KING GOVERNOR LARRY KEHOE SECRETARY

June 24, 1982

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

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 COMMISSIO WASHINGTON, D.C. 20426

IN REPEY REFER TO: N840-A

MAY 2 6 1982

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

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 should \$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 qas well.

Mr. Joe Ramey

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, 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 <u>1980</u> Joint Association Survey on <u>Drilling Costs</u> 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,

U.R. Dartafield

H.R. Hartsfield Reservoir Engineer

HRH/mm Attachment

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APR 28 1982

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EW & COMERCANCE F
DATE April 27, 1982

R.J. Boriskie

c.c 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.

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HRHartsfield/mm Attachment

J.W. Tucker Drilling Engineering Manager

SUPPORTING DATA - EXPLORATION & PRODUCING

WELL COST ESTIMATE

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April 27, 1982

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

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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,

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J. A. Morris Regulatory Engineering Supervisor

HFWeaver:mma Attachments

รกษณ Mobil Producing Texas & New Mexico Inconservation U.V.SION MAY 0 3 1982

> NINE GREENWAY PLAZA-SUITE 2700 HOUSTON, TEXAS 77046

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April 27, 1982

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

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U. R. Dartsfield H.R. Kartsfield Reservoir Engineer

HRH/mm Attachment

DATE	April 27, 1982
C.C	L.W. Randerson

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J.W. Tucker Drilling Engineering Manager

SUPPORTING DATA - EXPLORATION & PRODUCING

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APPLICATION FOR TIGHT GAS FORMATION DESIGNATION MOBIL PRODUCING TEXAS & NEW MEXICO OPERATED LEASES RIO ARRIBA COUNTY

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EXHIBIT 13	Mesa Verde Structure Map	Map folder

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 sindstone 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.

<u>History</u>:

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:

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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.

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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.

- 3 -

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.

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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 waterbearing 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 balling test, the well shall be bailed dry and remain approximately dry for thirty minutes. If any string of casing falls 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.	<u>kh* (md ft)</u>	<u>h (ft)</u>	<u>k (md)</u>
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 = $\frac{179}{1222}$		$146 \text{ md} = \frac{1.60}{11 \text{ s}}$	<u>) md</u> samples

permeability k

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contributing formation interval h ----

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

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CHRONOLOGICAL PRESSURE AND PRODUCTION DATA

∆t (hrs)		$t + \Delta t$	BHP
		Δt	
Flowing			490
.25		1045	530
.50		523	541
.75		349	550
		262	561
2		131.5	594
1 2 3 4		88	612
Д		66.2	630
5		53.2	644
5 6		44.5	655
0			
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
40		6.9	860
48	and the second s	6.4	871
54	and the second	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
1.08		3.4	1007
114		3.3	1016
120		3.2	1026
126		3.1	1035
132		3.0	1044
140		2.9	1055
		2.5	
150			1069
160		2.6	1080
164		2.59	1085
165		2.58	1087
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EXHIBIT 4 (continued) POST FRAC BOTTOM HOLE PRESSURE BUILDUP ANALYSIS JICARILLA 'G' #1-A

Production Rate prior to shut-in (Q) = 1000 MCF/DTime of production prior to shut-in (t) = 261 hoursNet feet of contributing formation (h) = 146 feet Formation porosity (\emptyset) = 14% Formation water saturation (Sw) = 34% Bottom hole flowing pressure (Pwf) = 490 psia Gas specific gravity = .688Formation temperature = $142^{\circ}F$ = $602^{\circ}R$ 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 $142^{\circ}F$: gas deviation factor (g) = .8957 gas viscosity (μ) = 0.01372 centipoise gas formation volume factor (Bg) = .02829 \underline{Bt} cu ft/SCF = (.02829)(.8957)(602) cu ft/_{SCF} 935 = .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} $kh = \frac{162.6 \text{ x rate x viscosity x formation volume factor}}{\text{slope of straight line of buildup plot}}$ $kh = 162.6 \times Q \times = 162.6 \times 1000 \times 0.01372 \times 2.91 = 9.14 \text{ md ft}$ 710 9.14 md - ft = .063 md

146 feet



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

CHRONOLOGICAL PRESSURE AND PRODUCTION DATA

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∆t (hrs)	$\frac{\mathbf{t} + \Delta \mathbf{t}}{\Delta \mathbf{t}}$	внр	
Flowing .25	680 1369	762	
.5	685	800	
.75	457	832	
1.0	343	860	
1.5	229		
1.5		894	
2 3 4 6 8	172	932	
3	115	964	
4	86.5	989	
6	58	1030	
	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	10.5	1007	
	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	1358	
140	3.4		
		1371	
150	3.3	1378	
160 165	3.1 3.07	1385 1388	
165	3.07	1388	
	•		
	- 7 -		

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 = $142^{\circ}F = 602^{\circ}K$
from BHP vs $\frac{t + \Delta t}{t}$: m = 30	0 psi/cycle
Average Pressure (P) = $\frac{P* + Pwf}{2}$	$=\frac{1530+680}{2}=1105$ psia
M	= 0.8814 = 0.01410 cp. = 2.469 reservoir bbl/MCF
$kh = \frac{162.6 \times Q \times \mu \times Bg}{m} =$	<u>162.6 x 1700 x 0.01410 x 2.469</u> 300
= 32 md-ft	
$k = \frac{32}{122} \text{ md-ft} = 0.262 \text{ m}$ 122 ft	d and a second sec

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EXHIBIT 5A

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

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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 $Kh(true) = .28 \times Kh$ apparent = .28 x 32 md ft = 8.96 md ft

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

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EXHIBIT 5A

HYDRAULIC PRACTIREING TAPATHENT SCHERULE JICARILIA "II" WELE": 0, 2-A BIANCO NESA VERDE FIFLD RIO ARRIBA COUNTY, NYN HERICO

	.		*					Flutd						
	Treating Bate	-Baoo Fluid	Treating Fluid Volume and	Type	Reducing Agt Conc	Gellin Type	Cone	Agen Type	t Conc	Type	ing Agent Conc	Mash	Band Data Conc	Quantity
ormetion	(bble/sta)	Туре		1754	(#/1000 gala)		#/1000 gale)(#/1000 gate)		(#/1000 gals)	<u>\$1.00</u>	(//gal)	(Lbe)
over Hess Verde														
(5754'-5+20'-166'0A-42 heles)	50	IX RCL	5,000 gale, Prepad	PR-20	3.0	None	0	Ad-Aq	30	Swel	2.0 🧹	None	0.0	0
		•	10,000 gals.Versegel 1	ad None	0.0	WC-11	40		•		*	Hone	0.0	0
	•		7,500 gals.Versagel		н	*	-		•	-	•	20-60	1.0	7,500
	•		7,500 gals.Versagel	*		*	-	м	•		•	H	2.0	15,000
	•	•	7,500 gels.Versagel	••	-			м	•	•	•		3.0	22,500
	•	-	22,500 gals.Versagel		•	•	•	•	•		•	•	4,0	90,000
				DROP 1	8 RCHBS									
	50	IT RCL	5,000 gals. Propad	PR-20	3.0	Hone	0	M-M	30	Sut f	2,0 .	Hene	0.0	
			10,000 gals, Versegel		0,0	¥C-11	40		ĩ	*		lone	0,0	· .
	· ·		7,500 gals.Versegel						-		-	20-40	1,0	7,500
			7,500 gals,Versagel	**								20-40	2.0	15,000
			7,500 gals. Yersagel	-									3.0	22,500
		*	22,500 gate,Versagel		•	-	*	-			•		4,0	90,000
Middle Huse Verde														
(5504'-5680'-176'0A-31 holes)	50	IT KCL	3,500 gale, Prepad	PR-20	3.0	None	0	M-Mq	30	Swet	2.0	lions	0.0	0
	m		6,500 gels. Versagel		0.0	VC-11	40					None	0.0	ŏ
			5,000 gals.Versegel				**	*				20-40	1.0	5,000
	•	#3	5,000 gals.Vereagel							-			2.0	10,000
			5,000 gals.Versegel	-		м							3.0	15,000
	•	-	15,000 gals. Versagel	-	•	-	-	•	•		-		4.0	60,000
				DROP 4	ROIBS									
	50	IT RCL	3,500 gals.Propod	PR-20	3.0	None	0	Ad-Aa	30	Suct	2.0	None	0.0	Ó
			6,500 gals.Versagel		0.0	WG-11	40	Ang	ĩ			None	0.0	ă
			5,000 gals.Versegel									20-40	T.0	5,000
		-	5,000 gals.Versagel	-	· •			-					2.0	10,000
•	-	+	5,000 gals.Versagel								a 2		3.0	15,000
	· · ·	-	15,000 gals,Versegel	-	•	-	-	, H	•		-	•	4.0	60,000
				DROP 4	RCNBS									
	50	11, KCL	3,500 gals, Propad	PR-20	3,0	None	0	Ad-Aa	30	Surf	2.0	Hone	0,0	0
			6,500 gals, Versagel		U.O	VC-11	40					None	0,0	ō
		н	5,900 gals, Versage1					N	-		a .	20-40	1.0	5,000
	-		5,000 gals.Versagal										2,0	10,000
			5,000 gale.Versagel					-				-	3.0	15,000
	-	-	15,000 gale.Versagel		-				-	-		•	4.0	60,000
Upper Hase Verde												-		
(53941-54801-8610A-27 holes)	50	IT KCL	10,000 gals, Prepad	PR-20	3,0	None	0	Ad-Aq	30	Surl	2.0	None	0,0	0
	•		20,000 gels.Versagel	Pad Home	0.0	WC-11	40		2 N			Hone	0.0	Ō
			15,000 gels, Versegel						•	*		20-40	1.0	15,000
			15,000 gals, Verangel	-			н			н			2.0	30,000
			15,000 gals, Versagel	-			н.			-			3.0	45,000
			45,000 gals.Versagel						_				4.0	180,000

AD-Aq = Adomite Aque Surf = Howco Sude

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JESmith/jc 6/30/76

PRACELENT II JID: TYPE - VERSAGEL FRACTURING PROCESS: NOPIL DII CD JICAPPA, MESA VERDE FORMATION 1 % MCL. 20 I BS. ANDHITE ACUA: 2 GALS. PFN-5 NESCHED REPTIGE PERMENT - FT NET - PROTURE PERMENT - FT POPMATION PERMENTAL POPMATION PERMENTAL<	•	•	EXH	IBIT 5A			FRAC6+ 5-10-	76	4
JUD TYPE - VEPSAGEL FRACTURING PROCESS MDRIL DIL CD.+ JUCAPPA, MESA VERDE FORMATION 1 % FCI.+ 20 ISS. GROWTTE ROUA: 2 GALS. PFN-5 INJECTION RATE - FRLAMIN ACL + 20 ISS. GROWTTE ROUA: 2 GALS. PFN-5 INJECTION RATE - FRLAMIN ACL + 20 ISS. GROWTTE ROUA: 2 GALS. PFN-5 INJECTION RATE - FRLAMIN ACL + 20 ISS. GROWTTE TOTAL MET FORMATION ISS. CEF FT/SOFT (MIN) PERFECTION FEDERSITY				FRACPLAN II					¥
HDF1L D11 CD JICAPPA, HESR VERPE FORMATION 1 % FCL. 20 1 BS. ADDNITE AQUA. 2 GALS. PFN=5 Huschink PATE - PKLATIN HUST EDRAFTION THEVRENSS FT LEASTIC HORULY - PS1 FORMATION FETCHARE NOTANESS FT BORDATION THEVENESS FT BORDATION THEVENESS FT BORDATION FETCHARE NOTANESS FT BORDATION FETCHARE NOTANESS FT BORDATION FETCHARE NOTANESS FT BORDATION FETCHARE NOTANESS FT BORDATION FETCHARE NOTANESS. PETERSENDE PODES PETERSENDE FUND FUND VIS - (FP PETERSENDE FORDING FUND - LEF-SECCHARCOFT WELLSSAF FARJAS - ARCHS WELLSSAF FARJAS - ARCHS MELL CHART FARTING DESIGN FARJAS - ARCHS MELL CHART FART (MELLS) DESIGN FARJAS - ARCHS MELL CHART FART (MELLS) MELL CREATING - FT MELL CREATING - FT <td< td=""><td>•••</td><td></td><td>TYPE -</td><td>VERSAGEL</td><td>FRACTURI</td><td>NG PRDCI</td><td></td><td></td><td>× ·</td></td<>	•••		TYPE -	VERSAGEL	FRACTURI	NG PRDCI			× ·
$ \begin{array}{c} 1 & x \ CL. \ 90 \ I \ SS. \ ADGMITE AQUA. 2 \ GALS. \ FFN-5 \\ \hline H_{UECTION \ FATE - FRLMIN \ MICRAESS. \ FF \ 0.0 \ 0.30E+67 \ 0.40 $		MORIL DIL CD. + .IIC	APPA MES	A VERDE FORM	ATION			(4 s	•
NET FORMATION THICKNESS = F1 0.300+07 ELATIC MOULUS = PEI, FORMATION FERFERENTY 0.08 PERFECTION FORMATION FERFERENTY 3500. MATP - F21 0.08 PERFECTION FORMATION FERFERENTY 3500. MATP - F21 0.08 PERFECTION FORMATION FERFENCE 0.000. PERFECTION FORMATION FORMATION FORMATION FORMATION FERFECT 0.00100 CM - FULTI DISS COFF FT/SOFT(MIN) 0.00100 STUPT LOSS - GAL /SOFT 0.00000 TWFE DF SET 0.100000 CM - FULTI DISS COFF FT/SOFT(MIN) 0.00100 STUPT LOSS - GAL /SOFT 2000. MEL START MARK COFF 2000. DESTEN PETT DISS COFF FT/SOFT(MIN) 0.00100 MEL START MARK COFF 2000. TYPE & CONT ND 1 FROLP 2000. TYPE & CONT ND 1 FROLP PERFECTION TYPE & CONT ND 1 FROLP PERFECTION ND INFERSE VDL PROPERED PERFECTION TYPE & CONT ND 1 FROLP PERFECTION TYPE & CONT ND 1 FROLP PERFECTION ND INFERSE VDL PROPERENT PERFECTION TYPE & CONT ND 1 FROLP ND FERECTINE FROLP FORMEDIC VIS FFORCE PERFECTIN							-		. B
RESERVOIR FLUTD VIS - GP 0.00100 CH - FLUTD IDSS - CDEF FT/SOPT (HIN) 0.00100 Studt IDSS - FRI 0.00100 FL COS COMENTATION 0.100000 H-PRIME 0.100000 HIL SPECTAR - RCPES 2000 MELL SPECTAR - RCPES <td></td> <td>INJECTION RATE - R ASSUMED FRACTURE H NET FORMATION THIC ELASTIC MODULUS - I FORMATION PERMEABI FORMATION PERMEABI</td> <td>RL/MIN FIGHT - FT KNESS - FT PSI LITY - MD</td> <td>•</td> <td></td> <td>3</td> <td>100.0 40.0 0.30E+07 0.10 0.08 8500.</td> <td>U. 2. 1/18</td> <td></td>		INJECTION RATE - R ASSUMED FRACTURE H NET FORMATION THIC ELASTIC MODULUS - I FORMATION PERMEABI FORMATION PERMEABI	RL/MIN FIGHT - FT KNESS - FT PSI LITY - MD	•		3	100.0 40.0 0.30E+07 0.10 0.08 8500.	U. 2. 1/18	
$ \begin{array}{c} (\mu - FLUID BSS CDEF FT/SORT (HIN) & 0.00100 \\ SPURT LDSS - Rel /SOFT & 0.00100 \\ TYPE TD S = Rel /SOFT & 0.00000 \\ FF = CDACENTRETITION & 0.4500 \\ FF = CDACENTRETITION & FF = FF \\ FF = FF = FF \\ FF = FF = FF$	•	PROCESSIE PRESSUPE	- P\$1					¥۲.	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	•	RESERVOIR FLUID VI CW - FLUID (DSS-CC SPURT LDSS - GAL /S TYPE OF SEL SEL CONCENTRATION N-PRIME V-PRIME (SLDT) - LI WELL SPACING - ACP DEBINGGE FADIUS -	S - 1.P 16F FT/S 16FT 8F-SEC++M/ PES FT		•		0. WG-11 400/M 0.4500 0.100000 350. 2000. 0.400	••	
$ \begin{array}{c} \begin{array}{c} \text{DESIGN} & \text{PPOD} \\ \text{ND} & \text{INFREASE} & \text{OIL} & \text{VOL} & \text{VOL} & \text{FRAC} \ \text{H} & \text{FRAC} \ \text{H} & \text{CPS} & \text{WINTH} & \text{IST} & \text{2ND} \\ \text{IN} & \text{SX} & \text{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 & 2568. & 0. \\ 2 & 4.0 & 7.3 & 70.0 & 18.6 & 857. & 100.0 & 560. & 0.639 & 2568. & 0. \\ 2 & 4.0 & 7.3 & 70.0 & 18.6 & 857. & 100.0 & 560. & 0.639 & 2568. & 0. \\ 2 & 4.0 & 7.3 & 70.0 & 18.6 & 857. & 100.0 & 560. & 0.639 & 2568. & 0. \\ 2 & 4.0 & 7.3 & 70.0 & 18.6 & 857. & 100.0 & 560. & 0.639 & 2568. & 0. \\ 2 & 4.0 & 7.3 & 70.0 & 18.6 & 946. & 100.0 & 560. & 0.639 & 2558. & 0. \\ 3 & 4.7 & 8.9 & 90.0 & 24.9 & 1033. & 100.0 & 6612 & 0.6612 & 2573. & 0. \\ 5 & 4.7 & 10.1 & 100.0 & 28.2 & 1117. & 100.0 & 619. & 0.700 & 2591. & 0. \\ 6 & 5.0 & 10.1 & 110.0 & 215.2 & 1117. & 100.0 & 636. & 0.717 & 3926. & 0. \\ 6 & 5.0 & 10.1 & 110.0 & 31.5 & 1198. & 100.0 & 652. & 0.734 & 4258. & 0. \\ 8 & 5.6 & 11.0 & 130.0 & 38.2 & 1356. & 100.0 & 652. & 0.734 & 4258. & 0. \\ 9 & 6.0 & 11.0 & 140.0 & 41.7 & 1433. & 100.0 & 661. & 0.763 & 4917. & 0. \\ 9 & 6.0 & 11.0 & 140.0 & 45.1 & 1508. & 100.0 & 664. & 0.777 & 5244. & 0. \\ 10 & 6.4 & 11.8 & 150.0 & 45.1 & 1508. & 100.0 & 694. & 0.777 & 5244. & 0. \\ 11 & 6.4 & 11.8 & 150.0 & 45.1 & 1508. & 100.0 & 0.000087 \\ 765. & 0. & 244.80 & 415103. & 1.00 & 0.000087 \\ 765. & 0. & 244.86 & 445103. & 1.00 & 0.000087 \\ 765. & 0. & 244.82 & 433155. & 1.00 & 0.000083 \\ 766. & -765. & 0. & 244.82 & 433155. & 1.00 & 0.000087 \\ 765. & 0. & 244.82 & 433155. & 1.00 & 0.000083 \\ 765. & 0. & 244.82 & 433155. & 1.00 & 0.000083 \\ 765. & 0. & 244.82 & 433155. & 1.00 & 0.000083 \\ 765. & 677. & 0. & 255.85 & 45777. & 1.00 & 0.000083 \\ 765. & 674.84 & 453260. & 1.00 & 0.000083 \\ 775. & 0. & 255.85 & 45777. & 1.00 & 0.000083 \\ 775. & 0. & 255.85 & 45777. & 1.00 & 0.000083 \\ 775. & 0. & 255.85 & 45777. & 1.00 & 0.000083 \\ 775. & 0. & 255.85 & 45777. & 1.00 & 0.000083 \\ 775. & 0. & 255.85 & 45777. & 1.00 & 0.00008$	1	DJANAGE FAT10			₽ ∩-40	Sani	110 5.00 LB/6(AL AVG	
$\begin{array}{c} 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 & 2568. & 0. \\ 2 & 4.0 & 7.3 & 70.0 & 18.6 & 857. & 100.0 & 560. & 0.639 & 2568. & 0. \\ 3 & 4.9 & 6.9 & 90.0 & 24.9 & 1033. & 100.0 & 601. & 0.662 & 253. & 0. \\ 4 & 4.4 & 8.9 & 90.0 & 24.9 & 1033. & 100.0 & 611. & 0.662 & 2553. & 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. \\ 6 & 5.0 & 10.1 & 110.0 & 34.8 & 1278. & 100.0 & 652. & 0.734 & 4258. & 0. \\ 8 & 5.6 & 11.0 & 130.0 & 38.2 & 1356. & 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. \\ 11 & 6.4 & 11.8 & 150.0 & 45.1 & 1508. & 100.0 & 694. & 0.777 & 5244. & 0. \\ 12 & - 50 & 5771 & - 55. & 0. & 234.80 & 415503. & 1.00 & 0.00085 \\ 12 & - 50 & 5771 & 0. & 234.80 & 415503. & 1.00 & 0.00085 \\ 10 & - 577. & 0. & 244.78 & 433155. & 1.00 & 0.00085 \\ 10 & - 64.78 & 433155. & 1.00 & 0.00085 \\ 10 & - 64.78 & 433155. & 1.00 & 0.00085 \\ 11 & - 6.8 & - 6. & 248.92 & 440577. & 1.00 & 0.00085 \\ 11 & - 56. & 0. & 246.92 & 440577. & 1.00 & 0.00085 \\ 11 & - 6.& 256.86 & 459777. & 1.00 & 0.00085 \\ 11 & - 6.& 256.86 & 459777. & 1.00 & 0.00085 \\ 11 & - 6.& 256.86 & 459777. & 1.00 & 0.00085 \\ 11 & - 6.& 256.86 & 459777. & 1.00 & 0.00085 \\ 12 & - 56.86 & 459777. & 1.00 & 0.00085 \\ 13 & - 6.86 & - 6.86 & 459380. & 1.00 & 0.00085 \\ 13 & - 6.86 & - 6.86 & 459380. & 1.00 & 0.00085 \\ 14 & - 6.86 & - 6.86 & 459380. & 1.00 & 0.00085 \\ 14 & - 6.86 & - 6.86 & 459380. & 1.00 & 0.00085 \\ 15 & - 6.86 & - 6.86 & 459380. & 1.00 & 0.00085 \\ 15 & - 6.86 & - 6.85 & 463880. & 1.00 & 0.00085 \\ 15 & - 6.86 & - 6.85 & - 6.86 & 459380. & 1.00 & 0.00085 \\ 15 & - 6.86 & - 6.86 & - 6.85 & - 6.86 & - 6.85 & - 6.86 \\ 15 & - 6.86 & - 6.85 & - 6.86 & - 6.85$]	NO INCREASE	VAL VI	JE FRAC LN	FRAC HT		иллтн 15T	2ND	
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$\begin{array}{c} 2 & 4.0 & 7.3 & 70.0 & 100.0 & 100.0 & 100.0 & 562. & 0.661 & 2012. & 0. \\ 3 & 4.9 & 8.9 & 80.0 & 23.7 & 1000 & 100.0 & 574 & 0.674 & 3124 & 0. \\ 4 & 4 & 8.9 & 90.0 & 24.9 & 1033. & 100.0 & 601. & 0.682 & 2253. & 0. \\ 5 & 4.7 & 10.1 & 100.0 & 28.2 & 1117. & 100.0 & 619. & 0.700 & 3591. & 0. \\ 6 & 5.0 & 10.1 & 110.0 & 31.5 & 1198. & 100.0 & 636. & 0.717 & 3926. & 0. \\ 7 & 5.3 & 10.1 & 120.0 & 34.8 & 1278. & 100.0 & 632. & 0.734 & 4258. & 0. \\ 8 & 5.6 & 11.0 & 130.0 & 38.2 & 1356. & 100.0 & 652. & 0.734 & 4258. & 0. \\ 8 & 5.6 & 11.0 & 130.0 & 38.2 & 1356. & 100.0 & 667. & 0.749 & 4589. & 0. \\ 9 & 6.0 & 11.0 & 140.0 & 41.7 & 1433. & 100.0 & 681. & 0.763 & 4917. & 0. \\ 9 & 6.0 & 11.0 & 140.0 & 45.1 & 1508. & 100.0 & 694. & 0.777 & 5244. & 0. \\ 10 & 6.4 & 11.8 & 150.0 & 45.1 & 1508. & 100.0 & 694. & 0.777 & 5244. & 0. \\ 11 & 6.4 & 11.8 & 150.0 & 45.1 & 1508. & 100.0 & 694. & 0.777 & 5244. & 0. \\ 12 & 150 & 100 & 100.0 & 100.0 & 694. & 0.777 & 5244. & 0. \\ 11 & 6.4 & 11.8 & 150.0 & 45.1 & 1508. & 100.0 & 0.00097 \\ 12 & 100 & 100.0 & 1100 & 0.000083 & 0. & 234.80 & 415503. & 1.00 & 0.000087 \\ 10 & 6.4 & 11.8 & 150.0 & 45.1 & 1508. & 100.0 & 0.000087 \\ 10 & 6.4 & 11.8 & 150.0 & 45.1 & 1508. & 100.0 & 0.000087 \\ 10 & 6.4 & 11.8 & 150.0 & 45.1 & 1508. & 1.00 & 0.000087 \\ 10 & 6.4 & 11.8 & 150.0 & 45.1 & 1508. & 1.00 & 0.000087 \\ 10 & 6.4 & 11.8 & 150.0 & 254.80 & 416503. & 1.00 & 0.000087 \\ 10 & 6.4 & 11.8 & 150.0 & 265.85 & 425140. & 1.00 & 0.000083 & 0. \\ 10 & 6.4 & 11.8 & 0. & 246.82 & 440820. & 1.00 & 0.000083 & 0. \\ 10 & 6.4 & 0. & 246.82 & 440820. & 1.00 & 0.000083 & 0. \\ 10 & 6.4 & 0. & 256.85 & 456777. & 1.00 & 0.000081 \\ 10 & 6.8 & 6.8 & 5.$	• •	•		· · -	100.0	560.	N.639 2568.	0.	
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7 5.3 10.1 120.0 34.8 1276. 1000 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. 9 6.0 11.0 140.0 41.7 1433. 100.0 681. 0.763 4917. 0. 9 6.4 11.8 150.0 45.1 1508. 100.0 694. 0.777 5244. 0. 10 6.4 11.8 150.0 45.1 1508. 100.0 694. 0.777 5244. 0. 10 6.4 11.8 150.0 45.1 1508. 100.0 694. 0.777 5244. 0. 10 6.4 11.8 150.0 45.1 1508. 100.0 694. 0.777 5244. 0. 10 6.4 11.8 150.0 45.1 1508. 100.0 694. 0.777 5244. 0. 10 6.4 11.8 150.0 45.1 1508. 100.0 0.00097 10 (M-S) 10 (M-S) 10 (M-S) 10 0. 200097 765. 0. 234.80 415503. 1.00 0.00097 765. 0. 240.25 425140. 1.00 0.00097 944.78 433155. 1.00 0.00094 10 33. 0. 248.92 440320. 1.00 0.00093 10 33. 0. 248.92 440320. 1.00 0.00093 10 33. 0. 248.92 440320. 1.00 0.00093 11 17. 0. 255.86 458777. 1.00 0.00091 11 198. 0. 255.87 45874. 1.00 0.00091 11 98. 0. 258.97 458274. 1.00 0.00091 11 978. 0. 258.97 458274. 1.00 0.00092 (peo Gr/-/r sayr) 1356. 0. 261.86 463360. 1.00 0.000020									
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$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		9 A.O 11.0	140.0 4	•				-	
$I_{1}: ISO$ HEOPELATIVE CAPHF/HIC-EFF $I_{1}c = CO BPM$ CREATEDHEO CTD $(M-S)$ 1.000.000097 $I_{1}ccc Grl - Preprid.765.0.234.80415503.1.000.000084I_{1}ccc Grl - Preprid.765.0.240.25425140.1.000.000084I_{1}ccc Grl - Preprid.857.0.248.82440320.1.000.000084I_{1}ccc Grl - Preprid.1033.0.248.82440320.1.000.000083I_{1}ccc Grl - Preprid.1033.0.252.50446821.1.000.000851I_{1}ccc Grl - Preprid.1198.0.255.86458777.1.000.000851I_{1}ccc Grl - Preprid.1198.0.258.97458274.1.000.000851I_{1}ccc Grl - Preprid.1198.0.258.97458274.1.000.000851I_{1}ccc Grl - Preprid.1356.0.261.86463360.1.000.000850$	-	10 6.4 11.8	150.0	45.1 1508.	106.0	694,	U./// J244		
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NEW MEXICO		OR PARISH		FIELD BLANC	D (MESA	VERDE)			wnko. BUC
REGION HUUSTON	ARKA 356	JICARIL	LA H			•	7562	6-00	WELL NO.
DATE COMMENCED	DATE COMPLETED	TOTAL DEPTH	STATUS GAS	AFE NO. 5241	PREPARED DALLAS	ACCOUNTING CE	NTER		
			2 						
						COSTS	WHOLE DOL	LARS/	1
						«ACTUAL		EST1	MATED
RILLING CO)STS								
FUDTAGE						57,102			
DAY HORN		+				9+578			
	ILLING COS DRILLING					19,352	56,032		
ELL EXPENS						5 5 6 6			
	AND ROADS					3,246 7,679			
FUEL	ANU IESIIA	U				97			-
HATER	· · · · · · · · · · · · · · · · · ·					9,239			
	CHEMICALS					36,888			
	AND CEMENTI	ING SERV	VICES			20,181			
TRANSPUR	(TATION FING AND ST	TM116 AT 1	1 Cold			3+603 162 + 872			
EQUIPHEN		THORAT			,	1,297			
MISCELLA				•		6,690			
TOTAL	L WELL EXPE	NSES					251,842	3	71,00
TOTAL	LINTANGIB	E COST	S				337 + 874	3	71+00
ELL EQUIP	HENT	Ţ.							
CASING						34,655			
OTHER E	QUIPMENT					6,976-			
TOTA	L TANGIBLE	COSTS					27 , 679		
TOTA	L COSTS						365,553	3	871,00
	DXIMATE COS		_				365 . 553		

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EXHIBIT 6 PERMEABILITY BASED ON CORE ANALYSIS BLANCO MESA VERDE FIELD

Langerer (h. 1997)

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

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F10. 2-46. Changes in permeability with overburden pressure. (a) <u>Curve A--Colc-rado; 3.96 millidarcys;</u> B-Southern California coast, 40.9; C-San Joaquin Valley, Calif., 45.0; D-Arizona, 436; 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.^m)

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

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

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

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

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* See discussion for explanation

Container No. 1012		helveis No. 1	2089	Lesse Nama	Jicarille ""	Well No. 1 X
Container Pressure_570) DAIA	@ 70	*F. (Field)	District	Lea	State Nev Mexico
8)#	_@_ 90	*F. (Lab.)		Magnolis Petro	Loum Co.
Date Sampled 5-2	10-58			Field	Blanco Mesaver	decounty Rio Arriba
Stream SampledBer	varator_	Liquid		Sand	Mesaverde	Depth 5386-5880
Volume of Stream Bam	p od 3.21	bbls/day	(stock)	Well Depth	5900' Perf.5	380-5880 Shots 6/11
	5 D M.			ee E. Robin	non P	otors & Willbanks.
FIELD TESTS AND OF			Submitted by		ADAIYEN DY_	6-11-58
Pressures: Bottombole		J DALA:		Tomportune	s: Bottombols	
Shutin Cas					Flowing Wellhead	70 est.
Shutin Tub		1039	•	-	Heater Inlet	BODS
Flowing Tu		570			Heater Outlet	BODe
Flowing Co	-	•			Primary Sep. Gas_	. 70
Primary Se	-	570	1 - 1 - 10 - 10 - 10 - 10 - 10 - 10 - 1		Primary Sep. Oil	70
Secondary	•	20		<u> </u>	Meter Run	70
Stock Tank		· Atm.			Stock Tank	25
				•	Atmospheric	
Choke Sizes: Tubing	¥		Casing 202		Heater	DODE
Production Rate: Prim	iary Sep. (Ges886_M	T/D	_Ratios: Sep. G		6 MCF/Dbl. est.
Prim	ary Sep. O	N1			as/Stock Oil	
Prim	ary Sep. '	Water 10 bb	Vday (ant)		ias/Stock Water	
		3.21	• •	-	as/Sep. Oll	wakaowa
Stock	: Tank We	ater 2000			I Ges/Liquid	
Potential Rates: Gas_	-2+731	BCI/day p	101	_Allowable Rate		
Oil_				-	011	tank truck
Disposition Production		Pao. IV pi	- '	······································	Oil	
Field Tests: Charcoal		·			% Gas Gravity	
	0-32	·····			% Oil Gravity	
	0-60	Orifice M		Gr./1	-	14.65
Gas Measurement: M	sthod	Ges displ			essure Base	
Sample Method	·	AND LIND		l.iq	uid Outage	
REMARKS:						
						· · · · · · · · · · · · · · · · · · ·
······						· · · · · · · · · · · · · · · · · · ·
LABORATORY REPOR	 T:		Content	Vapor E)°F. 70%351
Component	T: 	Vol. %	Content GPM	Vapor E Press.	5%_112	80% 537
Component Hydrogen Salfide		Vol. %			5%_11 10%_12	80%. <u>537</u>
Component Hydrogen Salfide Carbon Dioxide		Vol. %			5%_112 10%_126 20%_150	80% <u>537</u> 5
Component Hydrogen Salfide Carbon Dioxide Nitrogen		Vol. %			5%_11 10%_12(20%_15) 80%_17	80%_537_ 90% 90% 95% EP675_
Component Hydrogen Salfide Carbon Dioxide Nitrogen Air	.40L %				5%_112 10%_121 20%_155 80%_176 40%_19	80% 537 90% 90% 90% 95% 90% 95% 90% 95% 95% 95% 95% 95% 95% 95% 95% 95% 95
Component Hydrogen Salfide Carbon Dioxide Nitrogen Air Methane					5%_112 10%_121 20%_150 80%_176 40%_19 50%_221	80% 537 90% 90% 90% 90% 90% 90% 90% 90% 90% 90% 90% 90% 90% 90% 90% 90% 90% 90% 90% 90% 90% 67% 80% 67% 80% 67% 80% 67% 80% 67% 80% 67% 80% 67% 80% 67% 80% 80% 80% 80% 80% 80% 80% 80% 80% 80% 80% 80% 80% 80% 80% 80% 80% 80% 80% 80% 80% 80% 80% 80%
Component Hydrogen Saliide Carbon Dioxide Nitrogen Air Methane Ethane	11.19 7.41	4.84 4.82		Press.	5%_112 10%_221 20%_151 80%_171 40%_195 50%_221 60%_265	80% 537 90% 90% 90% 95% EP 675 Rec. B6 Res. 9 Loss 4
Component Hydrogen Salfide Carbon Dioxide Nitrogen Air Methane Ethane Propane	11.19 7.41 10.09	<u> </u>		Press.	5%_11 10%_22 20%_15 80%_17 40%_19 50%_22 60%_26 tesidue Data:	80% 537 90% 90% 90% 90% 90% 67% EP 67% Rec. B6 Res. 90 Loss 4 *API Gravity @ 60°F 60°F
Component Hydrogen Salfide Carbon Dioxide Nitrogen Air Methane Ethans Propane i-Butane	11.19 7.41 20.09 3.98	4.84 4.82 7.09 9.32		Press.	5%_11 10%_24 20%_15 80%_17 40%_19 50%_22 60%_26 cesidue Data: Mol. Wt_123_913	80% 537 90% 90% 90% 90% 90% 90% 90% 90% 90% 90% 90% 90% 90% 90% 90% 90% 90% 90% 90% 90% 90% 60°F Keid Vapor Pressura 60°F
Component Hydrogen Sulfide Carbon Dioxide Nitrogen Air Methane Ethans Propane i-Butane is-Butane	11.19 7.41 10.09 3.98 8.90	4.84 4.82 7.09 9.32 7.17		Press.	5%_11 10%_12 20%_15 80%_17 40%_19 50%_22 60%_26 cesidue Data: Mol. Wt123.913 CF/Ga1_19.115	80% 537 90% 90% 90% 90% EP 675 EP 675 Rec. B6 Loss 4 *API Gravity @ 60°F Keid Vapor Pressura
Component Hydrogen Salfide Carbon Dioxide Nitrogen Air Methane Ethans Propane i-Butane i-Butane i-Pentane	11.19 7.41 10.09 3.98 8.90 6.92	4.84 4.82 7.09 3.32 7.17 6.47		Press.	5%_112 10%_124 20%_155 80%_176 40%_19 50%_226 60%_265 cesidue Data: Mol. Wt_123.913 CF/Ge1_19.115 Gal./Mol:_19.880	80% 537 90% <
Component Hydrogen Salfide Carbon Dioxide Nitrogen Air Methane Ethane Ethane i-Butane i-Butane i-Pentane 2-Pentane	11.19 7.41 10.09 3.98 8.90 6.92 6.50	4.84 4.82 7.09 3.32 7.17 6.47 6.01		Press.	5%_112 10%_124 20%_156 80%_176 40%_195 50%_226 50%_226 50%_265 cesidue Data: Mol. Wt_123_913 CF/Ga1_19_115 Gal./Mol:_19.880 *API57.5	80% 537 90% <
Component Hydrogen Salfide Carbon Dioxide Nitrogen Air Methane Ethans Propane i-Butane i-Butane i-Pentane P-Pentane	11.19 7.41 10.09 3.98 8.90 6.92	4.84 4.82 7.09 3.32 7.17 6.47		Press.	5%_112 10%_124 20%_156 80%_176 40%_198 50%_226 60%_265 cesidue Data: Mol. Wt_123.913 CF/Ga1_19.115 Ga1/Mol_19.880 API_57.5 Calc. VP_2.14	80% 537 90% <
Component Hydrogen Salfide Carbon Dioxide Nitrogen Air Methane Ethane Fropane i-Butane i-Pentane Pentane Heranes (†)	11.19 7.41 10.09 3.98 8.90 6.92 6.50 45.01	4.84 4.82 7.09 3.32 7.17 6.47 6.01 60.28		Press.	5%_112 10%_124 20%_156 80%_176 40%_195 50%_226 50%_226 50%_265 cesidue Data: Mol. Wt_123_913 CF/Ga1_19_115 Gal./Mol:_19.880 *API57.5	80% 537 90% <
Component Hydrogen Salfide Carbon Dioxide Nitrogen Air Methane Ethane Fropane i-Butane i-Butane pentane Heranes (†)	11.19 7.41 10.09 3.98 8.90 6.92 6.50	4.84 4.82 7.09 3.32 7.17 6.47 6.01 60.28		Press.	5%_112 10%_124 20%_156 80%_176 40%_198 50%_226 60%_265 cesidue Data: Mol. Wt_123.913 CF/Ga1_19.115 Ga1/Mol_19.880 API_57.5 Calc. VP_2.14	80% 537 90% <
Component Hydrogen Salide Carbon Dioride Nitrogen Air Methane Ethane Fropane i-Butane i-Butane p-Pentane Heranes (†) TOTAL REMARKS:	11.19 7.41 10.09 3.98 8.90 6.92 6.50 45.01	4.84 4.82 7.09 3.32 7.17 6.47 6.01 60.28 100.00		Press.	5%_112 10%_124 20%_156 80%_176 40%_198 50%_226 60%_265 cesidue Data: Mol. Wt_123.913 CF/Ga1_19.115 Ga1/Mol_19.880 API_57.5 Calc. VP_2.14	80% 537 90% 90% 90% 90% 90% 90% 90% 90% 90% 90% 90% 90% 90% 90% 90% 90% 90% 90% 90% 90% 90% 60% 90% 9
Component Hydrogen Salide Carbon Dioride Nitrogen Air Methane Ethane Fropane i-Butane i-Butane p-Pentane Heranes (†) TOTAL REMARKS:	11.19 7.41 10.09 3.98 8.90 6.92 6.50 45.01	4.84 4.82 7.09 3.32 7.17 6.47 6.01 60.28	GPM	Press.	5%_112 10%_124 20%_156 80%_176 40%_198 50%_226 60%_265 cesidue Data: Mol. Wt_123.913 CF/Ge1_19.115 Gal./Mol_19.680 *API_57.5 Calc VP_2.14 companion Eamples_	80% 537 90% 90% 90% 90% 90% 90% 90% 90% 90% 90%
Component Hydrogen Salide Carbon Dioxide Nitrogen Air Methane Ethane Fropane i-Butane i-Butane i-Pentane Pentane Heranes (†) TOTAL I EEMARKS:	11.19 7.41 10.09 3.98 8.90 6.92 6.50 45.01 00.00 E. Rot	4.84 4.82 7.09 3.32 7.17 6.47 6.01 60.28 100.00 100.00	GPM	Press.	5%_112 10%_124 20%_154 20%_154 80%_174 40%_192 50%_224 60%_265 Cesidue Data: Mol. Wt_123.913 CF/Ge1_19.115 Gal./Mol:_19.880 *API57.5 Calc VP2.14 companion Samples	80% 537 90% 90% 90% 90% 90% 90% 90% 90% 90% 90%
Component Hydrogen Salide Carbon Dioxide Nitrogen Air Methane Ethane Fropane i-Butane i-Butane i-Pentane Pentane Heranes (†) TOTAL I EEMARKS:	11.19 7.41 10.09 3.98 8.90 6.92 6.50 45.01 00.00 E. Rot	4.84 4.82 7.09 3.32 7.17 6.47 6.01 60.28 100.00 100.00	GPM	Press.	5%_112 10%_124 20%_156 80%_176 40%_195 50%_226 50%_226 50%_226 50%_26 cesidue Data: Mol. Wt_123.913 CF/Ge1_19.115 Gal./Mol: 19.880 *API_57.5 Calc VP_2.14 companion Samples	80% 537 90% 90% 90% 90% 90% 90% 90% 90% 90% 90%

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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

Gentlement

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. marini

HFWeaver/lcc

J. A. Morris Regulatory Engineering Supervisor

Attachments

cc: Mr. Jim Sperling

Mobil Producing Texas & New Mexico In

IL COMSTRVATION DIVISION 2700 NING GREENVAL PAZAISUGIN2700 HOUSTON, TEXES 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.

Jic	arilla 'E'	120 14-27N-	gw Carilla 'H!	14A SE 1-26N-3W
Initial cost (M\$)		SP"d 11-2-78 SP"d 11-2-78 SP"d LAOF 1860 MCF	357	spid 10-22-78
Est. Ultimate reserves (MMCF) Life (yrs.)	100 11	SP LAOF	0	
Est. Net cash recovery (M\$)	-90	1860 11	-193	Dry hok
Rate of return (%) Pay out (yrs.)	-	^م ا~ا	-	
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, a.m. A. Morris

Regulatory Engineering Supervisor

RCH/1j

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

STATE OF NEW MEXICO ENERGY AND MINERALS DEPARTMENT DIL 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 HOBIL PRODUCING TEXAS AND NEW MEXICO, INC. FOR DESIGNATION OF A TIGHT FORMATION, RID 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 <u>4th</u> 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

-2-Case No. 7154 Order No. R-6678

> 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 Sections 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 asparated from the main body of the Blanco Mesaverde reservoir.

(5) That there is additional acreage within the horizontal limits of this isclated 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

+3-Case No. 7154 Order No. R-6678

tookout) 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 appreximately 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 abovedescribed lands has been penetrated by numerous wells at least 59 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)(8) of the regulations; and
- (c) production of more than five barrels of crude oil per day.

44-Case No. 7154 Order No. R-6678

(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 comenting 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.



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CASE	NO.	7154
ORDER	NO.	R-6678
EXHI	BIT	^H A ⁿ

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

TOWNSHIP 26 NORTH, RANGE 3 WEST, NMPH Section 3: E/2 Section 10: E/2 Section 12: E/2 Sections 13 and 14: All Sections 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
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			Page1	
	1 2 3	ENERGY AND I OIL CONSE STATE LA	OF NEW MEXICO MINERALS DEPARTMENT RVATION DIVISION ND OFFICE BLDG. E, NEW MEXICO bruary 1981	
	4		NER HEARING	
	5			
	6 7	IN THE MATTER OF: Application of Mobil)) L Producing Texas)	
с. С	8	and New Mexico, Inc. tion of a tight for Arriba County, New 1	nation, Rio) 7154	
	10 11	BEFORE: Richard L. Stamets		n na
	12	TRANSCRI	PT OF HEARING	
	14 15	APPE	ARANCES	
•	16 17 18	For the Oil Conservation Division:	Ernest L. Padilla, Esq. Legal Counsel to the Division State Land Office Bldg. Santa Fe, New Mexico 37501	
	19 20 21 22	For the Applicant:	James E. Sperling, Esq. MODRALL, SPERLING, ROEHL, HARRIS, & SISK P. O. Box 2168 Albuquerque, New Mexico 8710	3
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	25			
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APPEARANCES William F. Carr, Esq. CAMPBELL, BYRD, AND BLACK For Northwest Pipeline Corporation: Jefferson Place Santa Fe, New Mexico 87501 INDEX RAYMOND C. HOFFMASTER Direct Examination by Mr. Sperling Cross Examination by Mr. Stamets Statement by Mr. Buckingham Questions by Ms. Umschler Questions by Mr. Higgens Recross Examination by Mr. Stamets Cross Examination by Mr. Padilla Statement by Mr. Carr

EXHIBITS Mobil Exhibit A, Booklet Mobil Exhibit One, Map Mobil Exhibit Two, Map Mobil Exhibit Three, Table Mobil Exhibit Four, Plot and Data Mobil Exhibit Five, Calculation Mobil Exhibit Six, Summary Mobil Exhibit Seven, Data Mobil Exhibit Eight, Analysis Mobil Exhibit Nine, Plat Mobil Exhibit Ten, Plat Mobil Exhibit Eleven, Cross Section Mobil Exhibit Twelve, Map Mobil Exhibit Thirteen, Contour Map Mobil Exhibit B, Economic Plot

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2	MR. STAMETS: We'll call next Case Number
3	7154.
4	MR. PADILLA: Application of Mobil
5	Producing Texas and New Mexico, Inc., for designation of a
6	tight formation, Rio Arriba County, New Mexico.
7	MR. SPERLING: James E. Sperling, Albu-
8	querque, New Mexico, appearing for the applicant, Mobil.
9	We have one witness.
10	MR. CARR: William F. Carr, with the
11	law firm Campbell, Byrd, & Black, Santa Fe, appearing on
12	behalf of Northwest Pipeline Corporation.
13	We do not intend to call a witness.
14	
15	(Witness sworn.)
16	
17	RAYMOND C. HOFFMASTER
18	being called as a witness and being duly sworn upon his oath,
19	testified as follows, to-wit:
20	
21	DIRECT EXAMINATION
22	BY MR. SPERLING:
23	Q. Mr. Hoffmaster, have you on any prior
24	occasion testified before the Oil Conservation Division so
25	that your qualifications are a matter of record?

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2	A. No, sir.
3	Q. That being the case, would you please
4	give us a brief description of your educational and experience
5	background with respect to your profession?
6	A. I graduated from Texas A & M with a BS
 7	in geological engineering in 1974.
8	I was employed by Mobil immediately out
9	of school. I worked as a field engineer for 4-1/2 years; was
10	transferred to our company office in Houston as a reservoir
11	engineer, where I spent the last year and a half, with re-
12	sponsibility of fields in New Mexico and West Texas.
13	Q Have you had in addition to your edu-
14	cational and experience background any other experience in
15	the oil fields that would enhance your qualifications?
16	A. Yes, I'm a Registered Professional En-
17	gineer in the State of Texas.
18	MR. SPERLING: Are the witness' qualifi-
19	cations acceptable?
20	MR. STAMETS: They are.
21	Q. Mr. Hoffmaster, would you tell us briefly
22	the purpose of the application filed by Mobil in this matter?
23	A. Well, Mobil would like to submit an
24	application to designate the Mesaverde Pool under certain
25	sections as a tight formation. We believe that we can

6 1 that the guidelines established by FERC Order Number 99 can 2 be proved to -- in the Mesaverde formation. 3 This application relates to the Blanco Ö, 5 Mesaverde Pool in northwest New Mexico? Yes. б A. Would you give us a very brief descrip-7 0 8 tion of the geology encountered in the Mesaverde Pool with 9 which this -- a portion of which this application is con-10 cerned? 11 A. Well, the --12 You're referring now to Exhibit Number Q. 13 One? 14 Yes, I am. Okay, the -- we believe A. 15 that this is a separate sand body located to the east of the 16 Blanco Mesaverde main pool. It's delineated by dry holes 17 surrounding this area, and we believe it to be a separate sand body that has producing characteristics that are not 18 19 similar to the Blanco Mesaverde. 20 We believe it to be a near shore bar 21 type deposit, whereby the center part of the sand body is 22 the thickest, the most permeable. As the sand thins out on 23 to the east or to the west, we believe that the permeability 24 decreases. 25 It might be well at this time, Mr. Q,

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1	which we
2	Examiner, to for the record describe the method in which we
3	have identified the exhibits which are to be before the
4	Examiner in this matter.
5	With the application we have submitted
6	a bound booklet which contains essentially all of the ex-
7	hibits which support the application. In addition to that,
8	the same bound booklet has been marked for identification
	here at this hearing as Exhibit A, with Exhibits numbered
9	while while A. One through Thirteen.
10	with that explanation, would you now
11	the second parked for identification as Exhibit
12	refer to what's been marked for a
13	Two of A? A. Okay. Exhibit Two is a cumulative pro-
1	A. Okay. Exhibit wo is a continue of wells
1	duction map. We have plotted cumulative production of wells
1	6 that were completed in the mid to late '50s.
1	As you can see in Section 36, Township
	18 27 Range 3 West, that is a sweet spot whereby we have had
	19 the highest cumulative production. As you trend in either
	active productions decrease and as you
	the twore dry holes surrounding this
	 field, that the production stops. 0. Now the colored area, or the outlined
	23 0. Now the colored dida, a
	24 area, represents the approximately 13,000 acre area which is
	25 designated in the application as the area which Mobil seeks

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1	8
2	to have designated as tight formation area?
3	A. Yes.
4	Q. All right. Would you now refer to what
5	has been marked as Exhibit Three and explain the purpose of
6	that exhibit and what it shows?
7	A. Okay, Exhibit Three
8	Q. This is in the bound volume?
9	A. Yes.
10	MR. STAMETS: What page is that on?
11	MR. SPERLING: Five.
12	A. Page five.
13	MR. STAMETS: Thank you.
14	A. Okay, Exhibit Three is a table of after
15	frac permeabilities that were calculated from bottom hole
16	pressure buildups run in 1975 and '76.
17	The calculated permeabilities were
18	averaged and it was found that the average was .146 milli-
19	darcies.
20	We want to point out that these were
21	after frac permeabilities and that they are higher than
22	would be expected if a if the well was not stimulated.
23	Q. This represents an average after frac-
24	ture treatment for eleven wells?
25	A. Yes, sir.

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2	Q. Do you have any further comment on Ex-
3	hibit Three?
4	A. We'll attempt to prove later that
5	exact to what degree an increase in permeability is caused
6	by fracturing.
7	Q. All right. Would you refer to Exhibit
8	Four and explain the nature and purpose of that exhibit?
9	A Okay. Exhibit Four identifies a
10	typical analysis used in determining the permeability based
11	on the Horner plot.
12	Q. This exhibit identifies the Jicarilla
13	G No. 1-A Well as the subject of this collection of pressure
14	h that correct?
15	
16	
17	0110
18	he more appropriate,
1	A. Okay.
2	0 MR. STAMETS: It's the well in the
2	1 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.
	24 MR. STAMETS: Go ahead.
	25 A. I'd like to mention also that this type

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1	of calculation is a standard in the industry for determining
2	
3	the accurate in situ permeability.
4	Q. These data were collected over a period
5	of 165 hours?
6	A. Yes.
7	Q. Okay. Is the exhibit which is numbered
8	Four and appears on page six a part of the calculation, or
ý	at least an application of the data that's shown on page
10	six?
11	A Yes, it is. It's a plot of the bottom
11	m plus delta T over delta T.
	you shout the intervening page?
13	yos that's a summary of the calculations
14	
1	involved. This on page six is the actual calcu-
1	6 Q. This on page sin is a the conclusions
1	7 lation which was performed by you arriving at the conclusions
1	8 which are stated in the exhibit?
-	9 A. Yes, As we can see here, the permeability
1	20 was .063 millidarcies, which is less than .1 millidarcy re-
	21 guirement, and this is even after fracing the well.
	22 Q. Would you now refer to what's been
	23 marked as Exhibit Five and explain the purpose of that ex-
	24 hibit?
	25 A. Exhibit Five is another permeability

1	11
2	calculation based on a Horner plot, similar to Exhibit Four,
3	but on the Jicarilla H-2 No. A.
4	Now this well was also fraced and we
5	calculated a permeability of .262 millidarcies.
6	Q Can you locate that well for us on an
7	exhibit?
8	A. This well is located in the southeast
9	quarter of Section 2, T 26 North, Range 3 West.
10	Q The data collected is essentially the
11	same as that with reference to Exhibit Four except that it
12	relates to another well?
13	A. Yes.
14	Q And this is true of the plot which ap-
15	pears as a part of this exhibit, that simply puts in graph
16	form the data collected on the first page of the exhibit?
17	A. Yes.
18	Q Okay. Exhibit Five-A has been identi-
19	fied in the booklet. Would you refer to that and explain
20	the purpose of the data collected there?
21	A. Okay. The table you see, or the figure
22	on the page, is taken out of the SPE Monograph Volume 1,
23	Pressure Buildup and Flow Tests in Wells, page 108, and it
24	correlates permeability that has been calculated after fracing
25	to the permeability that is in a pre frac condition.

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 3 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. 6 The calculated fracture length was 1000 7 feet, which is in this equation identified on the bottom of page 8 as X_g, and X_g is determined to be one-half the length of your drainage radius, or your drainage area, which in thi case is 160 acre square, and this is calculated to be 1320 feet. 12 Now if you divide this X_g by X_g you get a fracture penetration equal to .76. 14 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 intersect it at .28. 19 So if you multiply .28 by the permeabil that was measured, we get that the true permeability before fracturing was .0734 millidarcies. 12 Is this a recognized method of determining pre frac permeability? A It's been recognized by SPE and include 		
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24 A. It's been recognized by SPE and include	22	2. Is this a recognized method of deter-
	23	mining pre frac permeability?
25 in their monograph.	24	A. It's been recognized by SPE and included
	25	in their monograph.

1	13
2	Q. Do you have any other comments about any
3	portion of Exhibit Five or its parts?
4	A. We have a cost breakdown for this parti-
5	cular well.
6	If you'll notice on the perforating and
7	stimulation column, the cost would be
8	Q. This would be the exhibit immediately
9	following Five-A and designated Mobil Oil Corporation, Well
10	Cost Statement?
11	A. Yes. As you can see in the column of
12	perforating and stimulation that the cost for this fracturing
13	was roughly 1/2 the total cost cf drilling the well.
14	0. Does that represent the cost of carrying
15	out the frac plan which appears on the previous page, the
16	page previous to the Well Cost Statement?
17	A. Yes, it does. We fractured with 450,000
18	pounds of sand.
19	MR. STAMETS: Are these actual figures
20	based on 1976?
21	A. Yes, this is 1976 figurer.
22	MR. STAMETS: You would have a substantial
23	increase in essentially everyone of these costs in today's
24	dollar figures.
25	A: That's correct.

1 14 2 Q. Would you classify this fracture treatment as a massive treatment? 3 A. Yes, I would. 5 Q. Would you say that this treatment was typical of the treatment required or at least utilized in 6 connection with the completion of the other wells? 7 8 A. In the early days of fracturing technology was limited. They basically fraced with just water and 9 sand and the amount of sand put away was considerably less, 10 and this is a new method of fracturing. We believe it can 11 increase considerably the amount of gas to be recovered, 12 13 But it is expensive. Q 14 But it is expensive. Δ 15 Would you now refer to what's been Q. marked as Exhibit Six and describe the information contained 16 on that exhibit and its purpose? 17 18 Exhibit Six is a summary of hole core A. 19 permeability analysis. These are usually compiled by a company such as CORE Lab, whatever, to determine permeabilities 20 in a qualitative manner rather than a quantitative manner. 21 22 The method usually is by taking one core per foot of hole core and extracting the core so that all 23 the liquids are out and injecting air into it to determine 24 25 the permeability.

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1 15 2 Now these are noted for being higher than 3 what is actually measured in the formation, mainly due to 4 liquids that are present, your interstitial water saturation 5 and the other fluids that may be in the core, which will re-6 duce the permeability. 7 The table listed in Exhibit Six shows 8 the reduction of permeability due to compaction. If you look 9 at the upper lefthand graph, you'll notice an 80 percent 10 permeability reduction due just to compaction and it can be 11 applied to permeabilities that are taken off of the core 12 analysis. As you can see, this has reduced the in situ per-13 meabilities. 14 However, even these permeabilities are 15 higher for the reason I mentioned beforehand. 16 Another reason for --- like H-7 of .216 --17 You're referring now to Well H-7? 0. 18 Okay, this --19 Is that correct? 20 Yes, Well H-7. The number of samples A. 21 taken was only 28 and this was taken out of one portion of <u>22</u> the total core, and if all the core had been analyzed and 23 averaged, it would have been a lot less. 24 So in essence, this is really not accu-25 rate as determining permeability, but it's showing that it's

1	16
2	loweven though even with, you know, the standard core
3	analysis, and well, it's just kind of qualitative rather than
4	quantitative.
5	Q. The source of the information which is
6	shown in the middle of the page, I presume is Petroleum Re-
7	servoir Engineering by AMYX, is that right?
8	A. AMYX.
9	Q. AMYX, okay. Is that a recognized treatise?
10	A. Yes, this is the reservoir engineering
11	book that's used at Texas A & M and elsewhere.
12	Q. Would you refer to what has been marked
13	as Exhibit Seven and describe the information contained on
14	that exhibit and its purpose?
15	A. Exhibit Seven lists a summary of all
16	the pre frac flow rates that have been compiled for the
17	Jicarilla leases. Most of these were taken in the 1950's.
18	If you were to average these first
19	group, it averages 150 Mcf per day, which is less than the
20	188 Mcf per day requirement for formations found at this
21	depth.
22	Q. Now what requirements are you referring
23	to?
24	A. That's the FERC requirements whereby
25	it states a pre-stimulation production rate to atmosphere of

17 1 formations whose tops are between 5500 feet and 6000 feet 2 may not exceed 188 Mcf per day. 3 Okay. And that reference is to FERC Q. 4 Order Number 99? 5 Yes. 6 A. Would you refer to what's been marked 7 as Exhibit Eight and describe the information contained on 8 that exhibit and the source of the information? 9 Exhibit Eight is a laboratory analysis A. 10 of the field sample taken from Jicarilla "E" No. 1 in 1958. 11 This exhibit identifies the flow rates 12 that were found and also a component analysis of the liquid 13 hydrocarbons. 14 As you can see, the GOR is 151,000. We 15 obtained 3.21 barrels per day of liquids out of a flow rate 16 of 486 Mcf per day, and we believe that this is a condensate 17 and not an oil and also that its production rate is less than 18 5 barrels per day, which satisfies another requirement from 19 FERC Order Number 99, which states that the pre-stimulation 20 oil rate shall not exceed 5 barrels of oil per day. 21 In view of your last comment, would you 22 Q. now refer to what's been marked as Exhibit Nine, which is 23 a plat of average daily oil production, and I'll ask you if 24 that plat shows the area colored in yellow, which is the 25

1	18
2	subject of the application, and would you then explain the
3	additional data contained on the exhibit?
4	A. Okay. This is a plot of old production
5	rates that were averaged throughout the life of the field.
6	We took the cumulative production of liquid hydrocarbons
7	divided into the total gas that was produced to obtain this
8	average, and then it was plotted on contours of equal daily
9	rate.
10	I would like to point out that we be-
11	lieve that this is a condensate, that it is in a gas form in
12	the reservoir, and it becomes liquid through reduction of
13	pressure and temperature at the surface.
14	Q. Now the exhibit identifies, and you have
15	identified it as average daily oil production. For what
16	period or during what interval of time?
17	A. This is calculated from the initial
18	potential through the present day.
19	Q. For all wells?
20	A. For all wells that are listed here, yes.
21	I believe we got them all.
22	Q. Over the total life of the well?
23	A. Yes, sir.
24	Q. And what conclusions do you draw from
25	that information with respect to oil production in light of

1	19			
2	the guidelines contained in Order 99?			
3	A. Well, we have very limited data as to			
4	the initial fluid production rate and the best we could do			
5 -	is come up with a daily average throughout the life of the			
6	field.			
7	But we'd like to mention that this is no			
8	an oil. It's a condensate, as stated before, and that we			
9	satisfy the requirements, both that the average if less than			
10	five barrels per day and the fact that it's not an oil to			
11	begin with.			
12	Q. Does the information contained on Exhibi			
13	Eight indicate the gravity, the API gravity of the fluid?			
14	A. Yes, down on the lower righthand corner			
15	we have API gravity of 57.5 degrees.			
16	Q. Does that reinforce your conclusion			
17	that this is a condensate?			
18	A. Yes, sir.			
19	Q. Would you now refer to what's been			
20	marked as Exhibit Ten and explain the purpose of that exhibit			
21	A. Exhibit Ten is a plot of the initial			
22	pre frac rates that we had previously tabulated, just			
23	showing their locations.			
24	Q. Now does Exhibit underneath each of			
25	the wells show the pre frac flow rate that is shown on the			

1	20
2	previous exhibit?
3	A. Yes.
4	Q. And these rates appear to encompass
5	the north/south and east to west of the majority, or at least
6	a substantial number of the wells within the area which is
7	the subject of the application, right?
8	A. Right.
9	Q. Would you refer to Exhibit Eleven and
10	describe the exhibit and what's shown on it? And what its
11	purpose is?
12	A. Exhibit Eleven is an east/west cross
13	section which shows the formations that make up the MesaVerde
14	Q. Would you identify the line of section,
15	please?
16	A. This is the line designated A-C.
17	Q Well, on the map, for example, Exhibit
18	Ten. It's a little hard to read on the cross section itself.
19	A. Okay, the line extends through cur
20	Jicarilla leases, or lease H, which is the southern half of
21	Section 11 and 12 of T26 North, Range 3 West; also encom-
22	passing Section the southern half of Section 10 and
23	crossing over due west to Section 12 of T 26 North, Range
24	4 West.
25	MR. STAMETS: I believe it's Section

1	21
2	17.
3	A. Pardon?
4 .	MR. STAMETS: I believe that's Section
5	17.
6	A Okay, I was giving the western extension
7	of this line.
8	MR. STAMETS: Oh, I'm sorry. I was
9	looking to the east.
10	Q. Well then the line of section runs
11	begins approximately four or five miles to the west of the
12	area designated on the exhibit and in the application, and
13	extends to the east of that area, is that correct?
14	A. Yes.
15	Q. And what conclusions do you draw from
16	the cross section with respect to information essential to
17	consideration of the application?
18	A. Okay, in the starting in the west
19	we have Southland's Jicarilla 101 No. 8, which potentialed
20	in the Mesaverde for 3.2-million a day.
21	Now if we follow this section line due
22	east, we notice that Consolidated Oil and Gas Jicarilla No.
23	1-10 was a dry hole in 1963. This is in the southwest
24	southwest quarter, I believe, of Section 10, T 26 North,
25	Range 3 West. We believe that this identifies the western

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1	22		
2	limit of the field delineated by dry holes.		
3	And as we move again to the east we have		
4	our Jicarilla H No. 8, potentialed for 4.8-million per day,		
5	and then going to our Cheney Federal No. 2, which potentialed		
6	for 5.2-million a day. And these are all post frac rates.		
7	Q. The Cheney Federal is in Section 8?		
8	A. No, it's in Section 17.		
9	Q. 16?		
10	A. 17, T 26 North, Range 2 West.		
11	Q. Okay.		
12	A. It's the easternmost point of the cross		
13	section.		
14	Q That's in the southeast the southwest		
15	quarter of the southwest quarter of 17.		
16	A. Yes, sir.		
17	Q All right. Do you have anything further		
18	on Exhibit Eleven?		
<u>1</u> 9	A. No, sir.		
20	Q. Would you refer to Exhibit Twelve and		
21	describe the information contained on that exhibit and its		
22	purpose?		
23	A. This map has spotted all the Mesaverde		
24	completions and also Pictured Cliffs completions in the		
25	area. The numbers indicate the present gas production in		

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2	Mcf per day attribute	ed to each well.
3	Q.	Now the figure, we'll say in Section
4	35 in Township 27 Nor	th, Range 3 West, the well designated
5	as the No. 3 Jicarill	a G, is the figure to the left of the
6	well the Pictured Cli	ffs production?
7	A	Yes, sir.
8	Q.	And to the right the Mesaverde production?
9	A.	That's correct.
10	Q	Okay, present production.
11	А.	Yes.
12	Q	Can you describe for us what conclusions
13	you draw from a compa	arison of the current daily production
14	rates with respect to	the north, south, east, or west areas
15	with particular rega	d to future development?
16	Α.	Well, as can be seen, the wells to the
17	east and west flanks	have low daily productions, which cor-
18	respond to their low	cumulative productions that have been
19	obtained from these v	vells.
20	Q	Anything else?
21		Would you now refer to Exhibit Thirteen
22	and explain that exh	ibit?
23	А.	Exhibit Thirteen is a structure map
24	contoured on the top	of the Cliff House formation, I believe,
25	showing the general	trend in the area and the location of

24 1 2 our subject leases in comparison. And this is contoured based upon corre-3 Q. lative points on logs or how did you arrive at the --4 Yes, they're contoured on tops that were 5 A. located in each --- in each well on the electric logs. 6 With a common point that is the top of 7 Q. 8 the Point Lookout as the point of reference? 9 The Cliff House. A. Cliff House? That's a member of the 10 Q. 11 Mesaverde formation? 12 Yes, the uppermost member. A. I want to now call your attention to 13 0. what's been marked as Exhibit B for the purposes of iderti-14 fication of this hearing and ask you to explain that exhibit 15 16 and what it is intended to show. This Exhibit B is a plot of profit in-17 A. dicators that -- a result of P & L analysis that were run 18 using various reserves and typical drilling costs, and it 19 shows the first -- the lower one is the rate of return. 20 You notice that anything under 400-million a day at present 21 prices is totally uneconomical to produce. 22 23 You see a profit investment ratio of zero, which is a break even condition and we do not believe 24 at the current prices that reserves of this magnitude are 25

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25 1 worth drilling for. 2 Are the ultimate reserves shown at the Q. 3 bottom of the graph intended to reflect any reserve calcula-4 tion that you have made with respect to undeveloped acreage 5 or is that assumed reserve figures? A. These are just tentative reserve figures 7 to -- as points on the plot. 8 Okay. And the two plots show the pre-Q. 9 sent gas price being received for production in the field 10 versus: the presently prevailing tight gas price permitted 11 under the FERC regulations, right? 12 Yes. A. 13 Based upon the information which you've Q. 14 compiled in the form of these exhibits, and your testimony, 15 what conclusions have you reached with respect to the quali-16 fication of the area designated in the application as a 17 18 tight gas formation under the prevailing regulations involved? We believe that we have satisfied all 19 A. three of the requirements; the requirement that the in situ 20 permeability be less than .1 of a millidarcy; that the pro-21 22 duction rate for formations of this depth not exceed 188 Mcf per day average; and a pre-stimulated rate -- or condi-23 tion to atmosphere permit the oil production rate not exceed 24 25 5 barrels per day.

26 1 I'd like to point out Exhibit Two once 2 more in relation to Exhibit B. 3 That is cumulative gas exhibit? Q. 4 Yes. Okay, as we stated earlier in Ex-A. 5 6 hibit B, that under the present prices anything under 400-7 million per day total recovery is uneconomical. 8 We can see from the cumulative production map that the contour 500 Mcf and on to the zero production 9 10 rate, we see an area that is basically the undeveloped area 11 that we wish to develop, and the average, you might say it 12 would be 250 Mcf in that whole area. 13 So based on the current prices we cannot 14 develop this acreage any further until we would receive some 15 price incentive. Are you designating generally the area 16 Q. 17 to the northeast of the exhibit? Yes, Sections 13, 24, and a few locations 18 A. in 25 and 36, in T 27 North, Range 3 West. 19 20 Q. Okay. 21 Well, I take it, then, that in your opinion the granting of the application, that the result 22 23 price application would result in the recovery of otherwise 24 economically unrecoverable reserves? 25 Yes, sir. A.

27 1 2 Based upon that do you feel that the Q. 3 granting of the application would be in the best interest of 4 conservation? 5 Yes, sir. A. 6 Do you have anything further with respect 0. 7 to any of the exhibits or any other comments? 8 I don't believe so. A. 9 MR. SPERLING: We'd like to offer Ex-10 hibits A, One through Thirteen, and Exhibit B at this time, 11 Mr. Examiner. 12 MR. STAMETS: These exhibits will be 13 admitted. 14 MR. SPERLING: That's all we have. 15 16 CROSS EXAMINATION 17 BY MR. STAMETS: 18 Mr. Hoffmaster, you've indicated, I Q. 19 believe, that you feel that the -- this isolated reservoir 20 is defined on the west side by dry holes, is that correct? 21 A. Yes, sir. And we believe somewhat to 2Ž the east side, also, and to the north. There has been a dry 23 hole in Section 36, Township 28 North, Range 3 West. Also 24 in Section 32, T 28 North, Range 2 West; in Section 20 of 25 T 27 North, Range 2 West; and we've had a number of unecono-

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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 delin-

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?

eate an eastern pinchout, too.

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

29 1 2 not include that acreage? 3 Oh, I see, on the west side? A. 0. Yeah, correct. Well, we had -- we did not have the 6. production or the data that was available to us on this, and 7 our acreage ends at -- just to the east of here on Section 8 35, 2, 11, going south, and we were just ----Q Was there reason to believe that the Q. 10 evidence would be any different concerning that acreage, than 11 the acreage within the yellow outline? 12 No. A. 13 Now, referring to the final exhibit, 0. 14 the economic exhibit, what is the cost data based on in there? 15 Is that based on recent drilling activity, your estimate of 16 what well cost would be? 17 This is based on 1982 drilling cost A. 18 and also prices that we estimate will be in effect then. We 19 used this basically because we believe that before -- that 20 the year would be out before we, all the parties involved 21 would decide on this, you know, course of action concerning 22 this, and we believe that really it's just a slight escala-23 tion and that even present prices will still reflect the 24 same profit indicators. 25 And you indicate that the two-year Q.

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1302payout would be appropriate for a well. Anything beyond two3years you think would be a risky venture?4A. Well, we basically look at our profit5investment ratio and rate of return rather than two-years6payout.7Under current prices you could see that8even at 600-million that the rate of return is only about917 percent or so, which is significantly low.10And furthermore our profit investment11ratio only yields approximately 40 cents, I believe, if the12scale is right, on the dollar.13Q14A. Yes.15Q16Well, I see. I was looking at the16the situation with the tight17A18Q19A20Q20Q21Okay. All right. I'd like to take a22Iook at Exhibit Three, please.23You have a number of wells there. It24inside the boundary of the area that you're proposing here.25is there any reason that you selected this group of wells	r			
 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. 7 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. 10 And furthermore our profit investment ratio only yields approximately 40 cents, I believe, if the scale is right, on the dollar. 13 Q. Talking about 600 M or 600-million? 14 A. Yes. 15 Q. Well, I see. I was looking at the the situation with the tight 16 A. I was looking at current prices. 18 Q. Okay. All right. I'd like to take a look at Exhibit Three, please. 22 You have a number of wells there. It 13 looks like maybe a dozen and there are more wells than that inside the boundary of the area that you're proposing here. 	1	30		
 A. Well, we basically look at our profit investment ratio and rate of return rather than two-years payout. 7 Under current prices you could see that even at 600-million that the rate of return is only about 9 17 percent or so, which is significantly low. 10 And furthermore our profit investment ratio only yields approximately 40 cents, I believe, if the scale is right, on the dollar. 13 Q. Talking about 600 M or 600-million? 14 A. Yes. 15 Q. Well, I see. I was looking at the the situation with the tight 17 A. I was looking at current prices. 18 Q. You were looking at current prices. 19 A. Yes. 20 Q. Okay. All right. I'd like to take a 10 looks like maybe a dozen and there are more wells than that inside the boundary of the area that you're proposing here. 	2	payout would be appropriate for a well. Anything beyond two		
 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 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. 	3	years you think would be a risky venture?		
 6 payout. 7 Under current prices you could see that 8 even at 600-million that the rate of return is only about 9 17 percent or so, which is significantly low. 10 And furthermore our profit investment 11 ratio only yields approximately 40 cents, I believe, if the 12 scale is right, on the dollar. 13 Q Talking about 600 M or 600-million? 14 A Yes. 15 Q Well, I see. I was looking at the 16 the situation with the tight 17 A I was looking at current prices. 18 Q You were looking at current prices. 19 A. Yes. 20 Q Okay. All right. I'd like to take a 21 looks like maybe a dozen and there are more wells than that 23 inside the boundary of the area that you're proposing here. 	4	A. Well, we basically look at our profit		
7 Under current prices you could see that 8 even at 600-million that the rate of return is only about 9 17 percent or so, which is significantly low. 10 And furthermore our profit investment 11 ratio only yields approximately 40 cents, I believe, if the 12 scale is right, on the dollar. 13 Q Talking about 600 M or 600-million? 14 A Yes. 15 Q Well, I see. I was looking at the 16 the situation with the tight 17 A I was looking at current prices. 18 Q You were looking at current prices. 19 A Yes. 20 Q Okay. All right. I'd like to take a 10 ok at Exhibit Three, please. I 21 You have a number of wells there. It 22 You have a number of wells than that 23 looks like maybe a dozen and there are more wells than that 24 inside the boundary of the area that you're proposing here.	5	investment ratio and rate of return rather than two-years		
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 9 17 percent or so, which is significantly low. 10 And furthermore our profit investment 11 ratio only yields approximately 40 cents, I believe, if the scale is right, on the dollar. 12 13 Q Talking about 600 M or 600-million? 14 A. Yes. Q Well, I see. I was looking at the 16 the situation with the tight 17 A. Yes. Q You were looking at current prices. 18 Q Okay. All right. I'd like to take a 10 look at Exhibit Three, please. 20 Q Okay. All right. I'd like to take a Iooks like maybe a dozen and there are more wells than that inside the boundary of the area that you're proposing here. 	7	Under current prices you could see that		
10 And furthermore our profit investment 11 ratio only yields approximately 40 cents, I believe, if the 12 scale is right, on the dollar. 13 Q. 14 A. 15 Q. 16 the situation with the tight 16 the situation with the tight 16 the situation with the tight 17 A. I was looking at current prices. 18 Q. You were looking at current prices. 19 A. Yes. 20 Q. Okay. All right. I'd like to take a 10 Look at Exhibit Three, please. You have a number of wells there. It 23 looks like maybe a dozen and there are more wells than that 24 inside the boundary of the area that you're proposing here.	8	even at 600-million that the rate of return is only about		
 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 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. 	- 9	17 percent or so, which is significantly low.		
 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 I. A. I was looking at current prices. Q. You were looking at current prices. 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. 	10	And furthermore our profit investment		
13 Q Talking about 600 M or 600-million? 14 A. Yes. 15 Q. Well, I see. I was looking at the 16 the situation with the tight 17 A. I was looking at current prices. 18 Q. You were looking at current prices. 19 A. Yes. 20 Q. Okay. All right. I'd like to take a 10 ok at Exhibit Three, please. You have a number of wells there. It 23 looks like maybe a dozen and there are more wells than that 24 inside the boundary of the area that you're proposing here.	11	ratio only yields approximately 40 cents, I believe, if the		
14A.Yes.15Q.Well, I see. I was looking at the16the situation with the tight17A.18Q.Q.You were looking at current prices.19A.20Q.Q.Okay. All right. I'd like to take a21look at Exhibit Three, please.22You have a number of wells there. It23looks like maybe a dozen and there are more wells than that24inside the boundary of the area that you're proposing here.	12	scale is right, on the dollar.		
 15 Q Well, I see. I was looking at the 16 the situation with the tight 17 A. I was looking at current prices. 18 Q. You were looking at current prices. 19 A. Yes. 20 Q. Okay. All right. I'd like to take a 21 look at Exhibit Three, please. 22 You have a number of wells there. It 23 looks like maybe a dozen and there are more wells than that 24 inside the boundary of the area that you're proposing here. 	13	Q Talking about 600 M or 600-million?		
 16 the situation with the tight 17 A. I was looking at current prices. 18 Q. You were looking at current prices. 19 A. Yes. 20 Q. Okay. All right. I'd like to take a 21 look at Exhibit Three, please. 22 You have a number of wells there. It 23 looks like maybe a dozen and there are more wells than that 24 inside the boundary of the area that you're proposing here. 	14	A. Yes.		
 17 A. I was looking at current prices. 18 Q. You were looking at current prices. 19 A. Yes. 20 Q. Okay. All right. I'd like to take a 21 look at Exhibit Three, please. 22 You have a number of wells there. It 23 looks like maybe a dozen and there are more wells than that 24 inside the boundary of the area that you're proposing here. 	15	Q. Well, I see. I was looking at the		
 18 Q. You were looking at current prices. 19 A. Yes. 20 Q. Okay. All right. I'd like to take a 21 look at Exhibit Three, please. 22 You have a number of wells there. It 23 looks like maybe a dozen and there are more wells than that 24 inside the boundary of the area that you're proposing here. 	16	the situation with the tight		
 19 A. Yes. 20 Q. Okay. All right. I'd like to take a 21 look at Exhibit Three, please. 22 You have a number of wells there. It 23 looks like maybe a dozen and there are more wells than that 24 inside the boundary of the area that you're proposing here. 	17	A. I was looking at current prices.		
20 Q. Okay. All right. I'd like to take a 21 look at Exhibit Three, please. 22 You have a number of wells there. It 23 looks like maybe a dozen and there are more wells than that 24 inside the boundary of the area that you're proposing here.	18	Q. You were looking at current prices.		
 21 look at Exhibit Three, please. 22 You have a number of wells there. It 23 looks like maybe a dozen and there are more wells than that 24 inside the boundary of the area that you're proposing here. 	19	A. Yes.		
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.	20	Q. Okay. All right. I'd like to take a		
23 looks like maybe a dozen and there are more wells than that 24 inside the boundary of the area that you're proposing here.	21	look at Exhibit Three, please.		
24 inside the boundary of the area that you're proposing here.	22	You have a number of wells there. It		
inside the boundary of the area that you it proposing here.	23	looks like maybe a dozen and there are more wells than that		
25 Is there any reason that you selected this group of wells	24	inside the boundary of the area that you're proposing here.		
	25	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 hadbottom hole pressure buildups.

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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

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	there, that we could designate acreage that's already been
2	
3	infill drilled as a tight sands reservoir?
4	A. Well, we have no further locations to
5	develop. We believe that the entire area should be designated
6	anyway, regardless of the fact that there is no future de-
7	velopment in here, mainly because they were used as data, you
8	know, in the reservoir determination.
9	Q Are there any wells, infill wells, with-
10	in the area that have been uneconomical or will be uneconomic
11	wells?
12	A. Well, we have the Jicarilla H-4A was
13	plugged. I believe that was a dry hole. That was an infill
14	well. This was in Section 1, T 26 North, Range 3 West, in
15	the southeast quarter.
16	As far as others, I cannot locate them.
17	I believe here, this Jicarilla F-2A on the northeast quarter,
18	excuse me, the northwest quarter of Section 27, T 27 North,
19	Range 3 West, is will probably be also uneconomical.
20	Mainly we've developed as far as we
21	could the best locations for infill development and the fact
22	that we have not developed any further is because we believe
23	that we have run out of economic locations based on current
24	prices.
25	Q. What wells have you drilled in the last

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33 1 couple of years in this area? 2 A. I believe we finished our infill work 3 in 1976. We may have drilled one more, and I cannot recall which one it was, subsequent to that time, but the majority 5 of the infill work was completed in 1976. 6 So you had already determined before 7 0. the NGPA came out that there were some locations in here that 8 were not economic at that time. 9 A. That's correct. 10 Are there any non-fractured potentials Q. 11 available in this area? 12 A. Fracturing is required on each well. 13 14 We do it as a standard policy now to -- as soon as we set 15 pipe, to perforate and fracture, because we -- we tried before to -- in the '50s to produce before fracturing and as -16 tabulated here, our rates were below as required for economic 17 recovery. 18 19 MR. STAMETS: Are there other questions 20 of the witness? 21 Would you identify yourself for the record, please? 22 23 MR. BUCKINGHAM: Allen Buckingham, 24 USGS. The Examiner has touched a lot of the USGS questions 25 that we were going to ask, but with me this morning is Sue

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nschler, a petroleum	engineer, and Robert Higgens, a geolo-
	5 / 55000
st, and they have a	some specific questions to ask.
PESTIONS BY MS. UMSC	CHLER:
Q.	My first question is, do you have any
vidence that would d	lefinitely indicate the areas to the east
orth, and south, do	not meet the criteria that you illu-
rated for this hear	ing?
Α.	We have included in our application
bil leases. As to	whether there should be an extension or
ot, we are not objec	cting to extending the field limits.
Q.	You don't have any evidence whether it
ould or would not me	eet the criteria?
A.	No, we don't.
<u>Q</u>	Is it possible for you to obtain any
formation on those	wells located outside of your boundary
or the permeability	and production criteria?
ē.	Generally we have a hard enough time
inding our own data	. As far as offset operators, I'm in-
lined to believe that	at they really have as limited data as
ossible, just, you l	know, other than completion data. I
on't believe they p	robably performed too many buildup tests
r anything else.	
Q.	And there's one there's a couple of
	VESTIONS BY MS. UMSO Q vidence that would d orth, and south, do trated for this hear A obil leases. As to ot, we are not object Q ould or would not me A Q nformation on those or the permeability A inding our own data lined to believe that ossible, just, you h on't believe they put c anything else.

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2	infill locations in Township 27, 3 West. If these infill		
3	locations have probable reserves of greater than 400 MMcf,		
4	would you develop those at current prices?		
. 5	A. Which are the locations with which you		
6	are concerned?		
7	Q. There's one in the southeast quarter of		
8	15, Section 15.		
9	A. Okay, in Township 26		
10	Q. 27, 3.		
11	A. 27, 3? Well, we would on a risk rate		
12	analysis, we would probably assume the recovery in there to		
13	be in the order of, maybe, four to close to 500-million,		
14	and at current prices this would be low economics to the		
15	point of not even considering.		
16	MS. UMSCHLER: That's all my questions.		
17	MR. STAMETS: Are there other questions		
18	of the witness?		
19	MR. HIGGINS: Yes, sir.		
20			
21	QUESTIONS BY MR. HIGGINS:		
22	Q. On your Exhibit One it's a boundary		
23	question. Looking at the main Mesaverde Pool, there is		
24	you have sort of an island on your map and on the eastern		
25	edge of the pool under consideration there are three or four		

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	2	dry holes. But further east of that another operator has
	3	developed Mesaverde wells.
	4	Could this not be a similar case where
	5	we have select spots where there is no production but the
	6	actual true boundary of this reservoir may well extend east-
· .	7	ward or northward, southward, of the current boundary you
	8	have?
	9	A. We are going strictly on dry holes that
	10	are around here as our limiting factor here to delineate this
	11	structure.
	12	Anything in between these dry holes is
	13	open for conjecture.
	14	Q. That's my point, that it's not con-
	15	clusive in all of these areas. There's a limited number of
	16	dry holes to delineate the boundaries established here.
	17	A. Right.
e ke	18	MR, HIGGINS: No more questions.
	19	
•	20	RECROSS EXAMINATION
	21	BY MR. STAMETS:
	22	Q. I presume Mobil would have no objection
	23	if we decided to take in a little more acreage than what
	24	you have proposed.
	25	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.

Okay.

MR. STAMETS: Any other questions of the

witness? Mr. Padilla?

Q.

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1 CROSS EXAMINATION 2 BY MR. PADILLA: 3 Mr. Hoffmaster, I have just a couple of 0. 4 questions. 5 For instance, what is the average pro-6 ductive life of these Mesaverde wells in the subject area? 7 They can produce -- well, so far they've A. 8 produced for twenty-five years and we expect, well, maybe 9 ten more years or fifteen, or whatever. You know, you can't 10 say. It would have to be on a per well basis. 11 Are some of these wells designated as Q. 12 stripper wells now, do you know? 13 I'm not familiar if there are any. Α. 14 Okay. Now you mentioned that possibly 0. 15 one well has been drilled in this area in the last couple of 16 17 years. Vaguely I recall. I'm not sure. There A. 18 I know it was not an economical well if may not have been. 19 it was. I just recall in the back of my mind seeing an 20 economic analysis run on it, a well. 21 Now going to Exhibit B, what is the Q. 22 current price you're basing your analysis on? Would that 23 be Section 103 or would it be possibly some '78 gas price, or 24 what is the gas price? 25

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2A.Cn Exhibit B?3Q.Yes.4A.The current price? That's the Sec	tion
	tion
4 A. The current price? That's the Sec	tion
5 103 price escalated.	1
6 Q. The most highest price?	and a second
7 A. Right, that is allowed, yes.	
8 Q. If I understand your testimony, yo	u're
9 actually only seeking tight formation designation for t	he
10 existing infill wells that need to fully develop the ar	ea,
11 and also for the, say, Sections 12, 13, and 24 in the n	orth-
12 west area.	
13 A. We're seeking the entire area desi	gnated
14 in yellow on your base map as as tight gas.	
15 Q. But practically speaking, you'd on	1y
16 be able to collect 107 price for those not fully develo	ped
17 areas?	
18 A. Right, for the undeveloped location	ns
19 only.	
20 MR. PADILLA: That's all I have, M	r.
21 Examiner.	Ň
22 MR. STAMETS: Are there any other	ques-
23 tions of the witness? He may be excused.	
24 Anything further in this case? Mr	
25 Carr?	

1	40
2	MR. CARR: Mr. Stamets, Northwest Pipe-
3	line Corporation opposes the application of Mobil in this
4.	case.
5	Northwest believes that the subject area
6	as evidenced by their Exhibit Number Twelve and other ex-
7	hibits, has been substantially developed under existing prices
8	and therefor should not qualify for tight sand designation.
9	under the provisions of FERC Order Number 99.
10	Northwest further believes that the area
11	can be developed under the existing infill order at the pre-
12	sent prices.
13	Instead of reading a fairly lengthy
14	statement that Northwest Pipeline Company has prepared in
15	opposition to this application, with your permission I'll
15	simply present it to you.
17	I have nothing further.
18	MR. STAMETS: That will be fine, Mr.
19	Carr.
20	Also, I would like to ask Mobil to sub-
21	mit some clarification subsequent to the hearing on any well
22	which may have been drilled in the last two years, well,
23	1978 and on.
24	MR. SPERLING: Right, '78 forward.
25	MR. STAMETS: Including 1978; '78, '79,

	4 5	vells are	'81, and i e economic A. under adv	al or un Okay. MR. S visement	economic TAMETS:	cal. And the			
	4 5 6 7 8 9 10 11 12		A.	Okay. MR. S visement	TAMETS:	And the	n I'm ga	oing t	o take
	5 6 7 8 9 10 11 12	his case	. •	MR. S visement	TAMETS:		n I'm ga	oing t	o take
	6 t 7 8 9 10 11 12	his case	under adv	visement			n I'm ga	oing t	o take
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CERTIFICATE

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SALLY W. BOYD, C.S.R. Rt. 1 Box 193-18 Santa Fc, New Medico \$7501

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(505) 455-7405

I, SALLY W. BOYD, C.S.R., DO HEREPY 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 Mo **7154** heard or me on 1981 Nichard A. Here, Examiner

Oil Conservation Division

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 l250 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, <u>mimeo</u>, at 50-52.

-2-

Respectfully submitted,

NORTHWEST PIPELINE CORPORATION

1

Of Counsel:

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

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	dicarilla G f1	36	278 😪
	Jicarilla G #7A	35	27h 3x
	Jicarilla 6 #6	36	27N 34

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

-3-



OIL CONSERVATION DIVISION SANTA FE

2

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 <u>Fed. Reg</u>. 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.

- 2 -

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 Mo. 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.

(SEAL)

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) <u>Designated tight formations</u>. 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).

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UIL CONSERVATION DIVISION UNITED STATES OF AMERICA SANTA FE FEDERAL ENERGY REGULATORY COMMISSION

18 C.F.R. Part 271

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Public

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UNITED STATES OF AMERICA FEDERAL ENERGY REGULATORY COMMISSION

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- 2 -

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CERTIFICATE

SALLY W. BOYD, C.S.R. Rt. 1 Box 193-13 Sunta Fc, New Mickico 87501 Phone (305) 455-7409 I, SALLY W. BOYD, C.S.R., DO HEREPY 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

Oil Conservation Division

(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 USCS recommendation is adopted.

(SEAL)

Williams Kenneth Α.

I.

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) <u>Designated tight formations</u>. 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.

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(ii) <u>Depth</u>. 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 To 26 -2 7 Sec 8 A11 17 8/2

From

R. L. STAMETS Technical Support Chief

All partial Section lots 1-4 18 2 19 All portiol lots 1-4

OIL CONSERVATION DIVISION SANTA FE

1 STATE OF NEW MEXICO 2 ENERGY AND MINERALS DEPARTMENT 2 OIL CONSERVATION DIVISION 3 STATE LAND OFFICE BLDG. 3 SANTA FE, NEW MEXICO 1 Pebruary 1981 4 EXAMINER HEARING 5	i i
6 IN THE MATTER OF: 7 Application of Nobil Producing Texas) 8 and New Mexice, Inc., for designa-) CASE	
IN THE MATTER OF: 7 Application of Mobil Producing Texas) 8 and New Mexico, Inc., for designa-) CASE	
9 Arriba County, New Mexico.	
10 BEFORE: Richard L. Stamets	
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13 14	
APPEARANCES 15	
 16 17 For the Oil Conservation Ernest L. Padilla, Esq. Division: Legal Counsel to the Division State Land Office Bldg. Santa Fe, New Mexico 87501 19 	
20For the Applicant:James E. Sperling, Esq. MODRALL, SPERLING, ROEHL, HARRIS, & SISK2112212323	
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3	APPEARANCES	
4		
5	For Northwest Pipeline William F. Corporation: CAMPBELL,	Carr, Esq. BYRD, AND BLACK
6	Jefferson	
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12	RAYMOND C. HOFFMASTER	
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EXHIBITS

Mobil Exhibit A, Booklet Mobil Exhibit One, Map Mobil Exhibit Two, Map Mobil Exhibit Three, Table Mobil Exhibit Four, Plot and Data Mobil Exhibit Five, Calculation Mobil Exhibit Six, Summary Mobil Exhibit Seven, Data Mobil Exhibit Eight, Analysis Mobil Exhibit Nine, Plat Mobil Exhibit Ten, Plat Mobil Exhibit Eleven, Cross Section Mobil Exhibit Twelve, Map Mobil Exhibit Thirteen Contour Map Mobil Exhibit B, Economic Plot

1	4
2	MR. STAMETS: Wo'll call next dise Number
3	7154.
. 4	MR. PADILLA: Application of Hobil
5	Producing Texas and New Mexico, Inc., for designation of a
6	tight formation, Rio Arriba County, New Mexico.
7	MR. SPERLING: James E. Sperling, Albu-
8	querque, New Mexico, appearing for the applicant, Mobil.
9	We have one witness.
10	MR. CARR: William F. Carr, with the
11	law firm Campbell, Byrd, & Black, Santa Fe, appearing on
12	behalf of Northwest Pipeline Corporation.
13	We do not intend to call a witness.
14	
15	(Witness sworn.)
16	
17	RAYMOND C. HOFFMASTER
18	being called as a witness and being duly sworn upon his oath,
19	testified as follows, to-wit:
20	
21	DIRECT EXAMINATION
22	BY MR. SPERLING:
23	Mr. Hoffmaster, have you on any prior
24	occasion testified before the Oil Conservation Division so
25	that your qualifications are a matter of record?

1 5 2 **P.**. No, sir. 3 Q. That being the case, would you please 4 give us a brief description of your educational and experience 5 background with respect to your profession? 6 A. I graduated from Toxas A & M with a BS 7 in geological engineering in 1974. 8 I was employed by Mobil immediately out 9 of school. I worked as a field ongineer for 4-1/2 years; was 10 transferred to our company office in Houston as a reservoir 11 engineer, where I spont the last year and a half, with re-12 sponsibility of fields in New Mexico and West Texas. 13 Have you had in addition to your edu Q. 14 cational and experience background any other experience in 15 the oil fields that would enhance your qualifications? 16 A. Yes, I'm a Registered Professional En-17 gineer in the State of Texas. 18 MR. SPERLING: Are the witness' qualifi-19 cations acceptable? 20 MR. STAMITS: They are. 21 Q Mr. Hoffmaster, would you tell us briefly 22 the purpose of the application filed by Mobil in this matter? 23 A. Well, Mobil would like to submit an 24 application to designate the Mesaverde Pool under certain 25 sections as a tight formation. We believe that we can --

1	6
2	that the guidelines astablished by FERC Order Number 99 can
3	be proved to in the Mesaverde formation.
4	O This application relates to the Blanco
5	Mesaverde Pool in northwest New Mexico?
6	A. Yes.
7	Q Would you give us a very brief descrip-
8	tion of the geology encountered in the Mesaverde Pool with
9	which this a portion of which this application is con-
10	cerned?
11	A. Well, the
12	A You're referring now to Exhibit Number
13	Ong?
14	A Yes, I am. Okay, the we believe
15	that this is a separate sand body located to the east of the
16	Blanco Mesaverde main pool. It's delineated by dry holes
17	surrounding this area, and we believe it to be a separate
18	sand body that has producing characteristics that are not
⁶ 19	similar to the Blanco Mesaverde,
20	We believe it to be a near shore bar
21	type deposit, whereby the center part of the sand body is
22	the thickest, the most permeable. As the sand thins out on
23	to the east or to the west, we believe that the permeability
24	decreases.
25	Q It might be well at this time, Mr.

1	7
2	Examiner, to for the record describe the method in which we
3	have identified the exhibits which are to be before the
4	Examiner in this matter.
5	With the application we have submitted
6	a bound booklet which contains essentially all of the ex-
7	hibits which support the application. In addition to that,
8	the same bound booklet has been marked for identification
9	here at this hearing as Exhibit A, with Exhibits numbered
10	respectively within Exhibit A, One through Thirteen.
11	With that explanation, would you now
12	refer to what's been marked for identification as Exhibit
13	Two of A?
14	A. Okay. Exhibit Two is a cumulative pro-
15	duction map. We have plotted cumulative production of wells
16	that wore completed in the mid to late '50s.
17	As you can see in Section 36, Township
18	27, Range 3 West, that is a sweet spot whereby we have had
19	the highest cumulative production. As you trend in either
20	direction, the cumulative productions decrease and as you
21	approach the wells that were dry holes surrounding this
22	field, that the production stops.
23	Q. Now the colored area, or the cutlined
24	area, represents the approximately 13,000 acre area which is
25	designated in the application as the area which Nobil seeks

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to have desid	mated so th	abt form	ation ar	7 A A	v
LO MUVE GESK	Yor	-			
R R			Nould w	ou now refe	Maashad
		-	· ·.		
has been mark		,	and exp.	lain the pu	rpose or
that exhibit					
λ.	Oka	y, Exhib	it Three	N A 99	
Ø	Thi	s is in	the bound	i volume?	
Α.	Yes	•			
	MR	STAMETS	: What y	page is tha	t on?
J.M.	MR.	SPERLIN	G: Five	•	
λ.	Pag	e five.			
	MR.	STAMETS	: Thank	you.	-
A	Oka	y, Exhib	it Three	is a table	of after
frac permeab:	ilities that	: were ca	lculated	from botto	m h ole
pressure bui	ldups run in	1975 an	a '76.		
	-	(abilities	wore
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darcies.			no uvotu	30 HUG 7 1-10	ê € î î das daje odie odie.
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			r	t that thes	
after frac p	ermeabilitio	es and th	at they a	are higher	than
would be exp	octed if a	- if the	well was	s not stimu	lated.
0	Thi	s repres	ents an a	average aft	er frac-
ture treatme	nt for eleve	en wells?	c		
λ.	Yea	, sir.			

1	9
2	Q Do you have any further corment on Ex-
3	hibit Three?
4	A We'll attempt to prove later that
5	exact to what degree an increase in permeability is caused
6	by fracturing.
7	All right. Would you refer to Exhibit
8	Four and explain the nature and purpose of that exhibit?
9	A Okay. Exhibit Four identifies a
10	typical analysis used in determining the permeability based
11	on the Horner plot.
12	Q This exhibit identifies the Jicarilla
13	G No. 1-A Well as the subject of this collection of pressure
14	and production data, is that correct?
15	A Correct.
16	6 Can you locate that well on Exhibit
17	One for us, or any of the other exhibits that you've already
18	referred to? Perhaps Two would be more appropriate.
.19	A. Okay.
20	MR. STAMETS: It's the well in the
21	southeast quarter of Section 35 of 27 North, 3 Nest?
22	A Okay, yes, it's in the southeast quarter
23	of Section 35, T 27 North, Range 3 West.
24	MR. STAMETS: Go ahead.
25	A I'd like to mention also that this type

1	10
2	of calculation is a standard in the industry for determining
3	the accurate in situ permeability.
4	Q. These data were collected over a period
5	of 165 hours?
6	λ Yes.
7	Q. Okay. Is the exhibit which is numbered
8	Four and appears on page six a part of the culculation, or
9	at least an application of the data that's shown on page
10	six?
11	A. Yes, it is. It's a plot of the bottom
12	hole pressure versus T plus delta T over delta T.
13	Q How about the intervening page?
14	A. Yes, that's a summary of the calculations
15	involved.
16	2. This on page six is the actual calcu-
17	lation which was performed by you arriving at the conclusions
18	which are stated in the exhibit?
10	Yes. As we can see here, the permeability
20	was .063 millidarcies, which is less than .1 millidarcy re-
21	quirement, and this is even after fracing the well.
22	Q. Would you now refer to what's been
23	marked as Exhibit Five and explain the purpose of that ex-
24	hibit?
25	A. Exhibit Five is another permeability

11 1 calculation based on a Norner plot, similar to Exhibit Four, 2 but on the Jicarilla H-2 No. A. 3 Now this well was also fraced and we calculated a permeability of .262 millidarcies. 5 Q Can you locate that well for us on an 6 exhibit? 7 8 Α. This well is located in the southeast quarter of Section 2, T 26 North, Range 3 West. 9 10 Ő. The data collected is essentially the same as that with reference to Exhibit Four except that it 11 12 relates to another well? 13 Yes. 14 And this is true of the plot which ap-0 15 pears as a part of this exhibit, that simply puts in graph 16 form the data collected on the first page of the exhibit? 17 Yes. A. 18 Okay. Exhibit Five-A has been identi-Q fied in the booklet. Would you refer to that and explain 19 20 the purpose of the data collected there? 21 Okay. The table you see, or the figure A. 22 on the page, is taken out of the SPE Monograph Volume 1, 23 Pressure Buildup and Flow Tests in Wells, page 108, and it 24 correlates permeability that has been calculated after fracing 25 to the permeability that is in a pro-frac condition.
12
If you'll notice on subsequent pages on
Exhibit Five-A, that we involve our calculations of deter-
mining 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 detormined 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, by X, you get
a fracture penetration equal to .76.
Now if you follow the axis here at .76,
bring it up to this curvo 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 permeabili
that was measured, we get that the true permeability before
fracturing was .0734 millidarcies.
Q Is this a recognized method of deter-
mining pro frac permeability?
A. It's been recognized by SPE and included

1	13
2	0. Do you have any other commonts about any
3	portion of Exhibit Five or its parts?
4	A. We have a cost breakdown for this parti-
5	cular well.
6	If you'll notice on the perforating and
7	stimulation column, the cost would be
8	Q. This would be the exhibit immediately
9	following Five-A and designated Mobil Oil Corporation, Well
10	Cost Statement?
11	A Yes. As you can see in the column of
12	perforating and stimulation that the cost for this fracturing
13	was roughly 1/2 the total cost of drilling the well.
14	Q. Does that represent the cost of carrying
15	out the frac plan which appears on the previous page, the
16	page previous to the Well Cost Statement?
17	A. Xes, it does. We fractured with 450,000
18	pounds of sand.
19	MR. STAMETS: Are these actual figures
20	based on 1976?
21	A Yes, this is 1976 figures.
22	MR. STARTS: You would have a substantial
23	increase in essentially everyone of these costs in today's
24	dollar figures.
25	A. That's correct.

1	14
2	0. Nould you classify this fracture treat
3	ment as a massive treatment?
4	A Yes, I would.
5	Q Would you say that this treatment was
6	typical of the treatment required or at least utilized in
7	connection with the completion of the other wells?
8	A In the early days of fracturing techno-
9	logy was limited. They basically fraced with just water and
10	sand and the amount of sand put away was considerably loss
_ 11	and this is a new method of fracturing. We believe it can
12	increase considerably the amount of gas to be recovered.
13	Q But it is expensive.
14	A But it is expensive.
15	A Hould you now refer to what's been
16	marked as Exhibit Six and describe the information contained
17	on that exhibit and its purpose?
18	A. Exhibit Six is a summary of hole core
19	permeability analysis. These are usually compiled by a com-
20	pany such as CORE Lab, whatever, to determine permeabilities
21	in a qualitative manner rather than a quantitative manner.
22	The method usually is by taking one core
23	per foot of hole core and extracting the core so that all
24	the liquids are out and injecting air into it to determine
25	the permeability.

1	15
2	Now these are noted for being higher than
3	what is actually measured in the formation, mainly due to
4	liquids that are present, your interstitial water saturation
5	and the other fluids that may be in the core, which will re-
6	duce the permeability.
7	The table listed in Exhibit Six shows
8	the reduction of permeability due to compaction. If you look
9	at the upper lefthand graph, you'll notice an 80 percent
10	permeability reduction due just to compaction and it can be
11	applied to permeabilities that are taken off of the core
12	analysis. As you can see, this has reduced the in situ per-
13	meabilities.
14	However, even these permeabilities are
15	higher for the reason I mentioned beforehand.
16	Another reason for - like H-7 of .216
17	Q You're referring now to Well H-7?
18	A Okay, this
19	Q. Is that correct?
20	A. Yes, Well H-7. The number of samples
21	taken was only 28 and this was taken out of one portion of
22	the total core, and if all the core had been analyzed and
23	averaged, it would have been a lot less.
24	So in essence, this is really not accu-
25	rate as determining permeability, but it's showing that it's

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	16
1.	loweven though even with, you know. the standard core
	analysis, and well, it's just kind of qualitative rather than
	guantitative.
	Q. The source of the information which is
	shown in the middle of the page, I presume is Petroleum Re-
	servoir Engineering by AMYX, is that right?
	A. AMYX.
	AMYX, okay. Is that a recognized treating
1	A Yos, this is the reservoir engineering
	book that's used at Texas A & M and elsewhere.
2	0. Nould 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

1	17
2	formations whose tops are between 5500 feet and 6000 feet
3	may not exceed 188 Mof par day.
4	0. Okay. And that reference is to FERC
5	Order Number 997
6	A. Yos.
7	Q Would you refer to what's been marked
8	as Exhibit Eight and describe the information contained on
9	that exhibit and the source of the information?
10	A Exhibit Eight is a laboratory analysis
11	of the field sample taken from Jicarilla "E" No. 1 in 1958.
12	This exhibit identifies the flow rates
13	that were found and also a component analysis of the liquid
14	hydrocarbons.
15	As you can see, the GOR is 151,000. We
16	obtained 3.21 barrels per day of liquids out of a flow rate
17	of 486 Mcf per day, and we believe that this is a condensate
18	and not an oil and also that its production rate is less than
19	5 barrels per day, which satisfies another requirement from
20	FERC Order Number 99, which states that the pre-stimulation
21	oil rate shall not exceed 5 barrels of oil per day.
22	Q In view of your last comment, would you
23	now refer to what's been marked as Exhibit Nine, which is
24	a plat of average daily oil production, and I'll ask you if
25	that plat shows the area colored in yellow, which is the

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1	18
2	subject of the application, and would you then explain the
3	additional data contained on the exhibit?
4	A Okay. This is a plot of old production
5	rates that were averaged throughout the life of the field.
6	We took the cumulative production of liquid hydrocarbons
7	divided into the total gas that was produced to obtain this
8	average, and then it was plotted on contours of equal daily
9	rate.
10	I would like to point out that we be-
11	lieve that this is a condensate, that it is in a gas form in
12	the reservoir, and it becomes liquid through reduction of
13	pressure and temperature at the surface.
14	Q Now the exhibit identifies, and you have
15	identified it as average daily oil production. For what
16	period or during what interval of time?
17	A. This is calculated from the initial
18	potential through the present day.
19	Ω For all wells?
20	A For all wells that are listed here, yes.
21	I believe we got them all.
22	Q Over the total life of the well?
23	λ Yes, sir.
24	And what conclusions do you draw from
25	that information with respect to oil production in light of

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19 1 the guidelines contained in Order 99? 2 A. Well, we have very limited data as to 3 the initial fluid production rate and the best we could do 4 is come up with a daily average throughout the life of the 5 field. 6 But we'd like to mention that this is not 7 an oil. It's a condensate, as stated before, and that we 8 satisfy the requirements, both that the average if less than 9 five barrels per day and the fact that it's not an oil to 10 begin with. 11 Does the information contained on Exhibit 12 Q Eight indicate the gravity, the API gravity of the fluid? 13 Yes, down on the lower righthand corner A. 14 15 we have API gravity of 57.5 degrees. Does that reinforce your conclusion 16 Q. 17 that this is a condensate? 18 A. Yes, sir. 19 Would you now refer to what's been Q 20 marked as Exhibit Ten and explain the purpose of that exhibit? 21 λ. Exhibit Ton is a plot of the initial 22 pre frac rates that we had previously tabulated, just 23 showing their locations. 24 Now does Exhibit - underneath each of Q. 25 the wells show the ore frac flow rate that is shown on the

1	30
2	previous exhibit?
3	A. Yes.
4	C. And these rates appear to encompass
5	the north/south and east to west of the majority, or at least
6	a substantial number of the wells within the area which is
7	the subject of the application, right?
8	A Right.
9	Q. Would you refer to Exhibit Eleven and
10	describe the exhibit and what's shown on it? And what its
11	purpose is?
12	A. Exhibit Eleven is an east/west cross
13	section which shows the formations that make up the MesaVerde.
14	Q Would you identify the line of section,
15	please?
16	A. This is the line designated A-C.
17	Q Well, on the map, for example, Exhibit
18	Ten. It's a little hard to read on the cross section itself.
19	A. Okay, the line extends through our
20	Jicarilla leases, or lease H, which is the southern half of
21	Section 11 and 12 of T26 North, Range 3 West; also encom-
22	passing Section the southern half of Section 10 and
23	crossing over due west to Section 12 of T 26 North, Range
24	4 West.
25	MR. STAMETS: I believe it's Section

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1	21
2	17.
3	A. Pardon?
4	MR. STAMETS: I believe that's Section
5	17.
6	A. Okay, I was giving the western extension
7	of this line.
8	MR. STAMETS: Oh, I'm sorry. I was
9	looking to the east.
10	Q Well then the line of section runs
11	begins approximately four or five miles to the west of the
12	area designated on the exhibit and in the application, and
13	extends to the east of that area, is that correct?
14	λ. Yes.
15	And what conclusions do you draw from
16	the cross section with respect to information essential to
17	consideration of the application?
18	A Okay, in the starting in the west
19	we have Southland's Jicarilla 101 No. 3, which potentialed
20	in the Mesaverde for 3.2-million a day.
21	Now if we follow this section line due
22	east, we notice that Consolidated Oil and Gas Jicarilla No.
23	1-10 was a dry hole in 1963. This is in the southwest
24	southwest quarter, I believe, of Section 10, T 26 North,
25	Range 3 West. We believe that this identifies the wostern

1	22
2	limit of the field delineated by dry holes.
3	And as we move again to the east we have
4	our Jicarilla II No. 8, potentialed for 4.8-million per day,
5	and then going to our Cheney Federal No. 2, which potentialed
6	for 5.2-million a day. And these are all post frac rates.
7	η The Cheney Federal is in Section 8?
8	A No, it's in Section 17.
9	Q 16?
10	A 17, T 26 North, Range 2 West.
11	Q Okay.
12	A It's the easternmost point of the cross
13	section.
14	Q That's in the southeast the southwest
15	quarter of the southwest quarter of 17.
16	A. Yes, sir.
17	Q All right. Do you have anything further
18	on Exhibit Eleven?
19	A. No, sir.
20	Q Would you refer to Exhibit Twelve and
21	describe the information contained on that exhibit and its
22	purpose?
23	A This map has spotted all the Mesaverde
24	completions and also pictured Cliffs completions in the
25	area. The numbers indicate the present gas production in

1	23
2	Mof per day attributed to each well.
3	A Now the figure, we'll say in Section
4	35 in Township 27 North, Range 3 West, the well designated
5	as the No. 3 Jicarilla G, is the figure to the left of the
6	well the Pictured Cliffs production?
7	λ. Yes, sir.
8	Q And to the right the Mesaverde production?
9	A That's correct.
10	Q Okay, present production.
11	A. Yes.
12	Can you describe for us what conclusions
13	you draw from a comparison of the current daily production
14	rates with respect to the north, south, east, or west areas
15	with particular regard to future development?
16	A. Well, as can be seen, the wells to the
17	cast and west flanks have low daily productions, which cor-
18	respond to their low cumulative productions that have been
19	obtained from these walls.
20	() Anything else?
21	Would you now refer to Exhibit Thirteen
22	and explain that exhibit?
23	A. Exhibit Thirteen is a structure map
24	contoured on the top of the Cliff House formation, I believe,
25	showing the general trend in the area and the location of

1	24
2	our subject leases in comparison.
3	0 And this is contoured based upon corre-
4	lative points on logs or how did you arrive at the
5	A Yes, they're contoured on tops that were
6	located in each in each well on the electric logs.
7	Q With a common point that is the top of
8 /	the Point Lookout as the point of reference?
9	A The Cliff House.
10	Q. Cliff House? That's a member of the
11	Mesaverde formation?
12	A Yes, the uppermost member.
13	Ω I want to now call your attention to
14	what's been marked as Exhibit B for the purposes of identi-
15	figation of this hearing and ask you to explain that exhibit
16	and what it is intended to show.
17	A. This Exhibit B is a plot of profit in-
18	dicators that a result of P & L analysis that were run
19	using various reserves and typical drilling costs, and it
20	shows the first the lower one is the rate of return.
21	You notice that anything under 400-million a day at present
22	prices is totally uneconomical to produce.
23	You see a profit investment ratio of
24	zero, which is a break even condition and we do not believe
25	at the current prices that reserves of this magnitude are

1	25
2	worth drilling for.
3	Q Are the ultimate reserves shown at the
4	bottom of the graph intended to reflect any reserve calcula-
5	tion that you have made with respect to undeveloped acreage
6	or is that assumed reserve figures?
7	A. These are just tentative reserve figures
8	to as points on the plot.
9	? Okay. And the two plots show the pre-
10	sent gas price being received for production in the field
11	versus the presently prevailing tight gas price permitted
12	under the FERC regulations, right?
13	A Yes.
14	A Based upon the information which you've
15	compiled in the form of these exhibits, and your testimony,
16	what conclusions have you reached with respect to the quali-
17	fication of the area designated in the application as a
18	tight gas formation under the prevailing regulations involved?
19	A. We believe that we have satisfied all
20	three of the requirements; the requirement that the in situ
21	permeability be less than .1 of a millidarcy; that the pro-
22	duction rate for formations of this depth not exceed 188
23	Mcf per day average; and a pre-stimulated rate or condi-
24	tion to atmosphere permit the oil production rate not exceed
25	5 barrels per day.

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1 2	I'd like to point out Exhibit Two once
3	more in relation to Exhibit B.
4	A That is cumulative gas exhibit?
5	Yes. Okay, as we stated earlier in Ex-
6	hibit B, that under the present prices anything under 400-
7	million per day total recovery is uneconomical.
8	We can see from the cumulative production
9	map that the contour 500 Mcf and on to the zero production
9 10	rate, we see an area that is basically the undeveloped area
11	that we wish to develop, and the average, you might say it
11	would be 250 Mcf in that whole area.
12	So based on the current prices we cannot
13	develop this acreage any further until we would receive some
	price incentive.
15	the transformating generally the area
16	
17	to the northeast of the exhibit?
18	A. Yes, Sections 13, 24, and a few locations
19	in 25 and 36, in # 27 North, Range 3 West.
20	o Okay.
21	Well, I take it, then, that in your
22	opinion the granting of the application, that the result
23	in the recovery of otherwise
24	and a monoming?
25	

1	27
2	g. Based upon that do you feel that the
3 :	granting of the application would be in the best interest of
4	conservation?
	λ. Yes, sir.
6	n Do you have anything further with respect
7	to any of the exhibits or any other comments?
8	A. I don't believe so.
9.	MR. SPERLING: We'd like to offer Ex-
10	hibits A, One through Thirteen, and Exhibit B at this time,
11	Mr. Examiner.
12	MR. STAMETO: These exhibits will be
13	admitted.
14	MR. SPERLING: That's all we have.
15	
16	CROSS EXAMINATION
17	BY MR. STAMETS:
18	ρ Mr. Hoffmaster, you've indicated, I
19	believe, that you feel that the this isolated reservoir
20	is defined on the west side by dry holes, is that correct?
21	A Yes, sir. And we believe somewhat to
22	the east side, also, and to the north. There has been a dry
23	hole in Section 36, Township 28 North, Range 3 West. Also
24	in Section 32, T 28 North, Range 2 West; in Section 20 of
25	T 27 North, Range 2 West; and we've had a number of unecono-

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\sim	2	mical wells that we have plugged subsequently in our Jicarill
	3	H & D leases, which would be Section excuse me, the sec-
- -	4	tion 12, it would be the northeast quarter, our Jicarilla
	5	H-3 only produced 30-million; the Jicarilla D on Section 13
	6	has produced 22-million, and have been plugged.
	7	So we believe that we can fairly delin-
• • • • •	8	eate an eastern pinchout, too.
	9	Q. What about down at the southwest end?
	10	It looks like there's a possibility there that the pool
	11	might be continuous with the main body of the reservoir in
1	12	Section 15, 26 North, 3 West?
0	13	A. There's a dry hole, not a dry hole but
	14	it only produced 6-million, in the Northwest Jicarilla No.
	15	11, I believe, in the northeast guarter of Section 15, which
	16	you mentioned.
	17	O Okay. Now there is some acreage in
	18	this isolated reservoir which is outside your yellow line.
	19	Why did you leave that acreage out?
	20	A. This is a new development that we be-
1 1 1	21	lieve is isolated from this main pool that we're discussing.
3	22	Q Well, I perhaps didn't explain myself.
	23	There's quite a bit of acreage which is between the zero
	24	contour line on Exhibit Two and the 500 contour line which
18 - A.	25	is not included inside your yellow outline, and why did you

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1	29
2	not include that acreago?
3	A Oh, I see, on the west side?
4	Q. Yeah, correct.
5	A Wall, we had move did not have the
6	production or the data that was available to us on this, and
7	our acreage ends at just to the east of here on Section
8	35, 2, 11, going south, and we were just
9	Q. Was there reason to believe that the
10	evidence would be any different concerning that acreage, than
11	the acreage within the yellow outline?
12	λ. Νο.
. 13	Q Now, referring to the final exhibit,
14	the economic exhibit, what is the cost data based on in there?
15	Is that based on recent drilling activity, your estimate of
16	what well cost would be?
17	A This is based on 1982 drilling cost
18	and also prices that we estimate will be in effect then. We
19	used this basically because we believe that before that
20	the year would be out before we, all the parties involved
21	would decide on this, you know, course of action concerning
22	this, and we believe that really it's just a slight escala
23	tion and that even present prices will still reflect the
24	same profit indicators.
25	Q And you indicate that the two-year

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1	30
2	payout would be appropriate for a woll. Anything beyond two
3	years you think would be a risky venture?
. 4	A. Well, we basically look at our profit
5	investment ratio and rate of return rather than two-years
6	payout.
7	Under current prices you could see that
8	even at 600-million that the rate of return is only about
9	17 percent or so, which is significantly low.
10	And furthermore our profit investment
11	ratio only yields approximately 40 cents, I believe, if the
12	scale is right, on the dollar.
13	Q Talking about 600 M or 600-million?
14	A. Yes.
15	Q Well, I see. I was looking at the
16	the situation with the tight
17	A. I was looking at current prices.
18	Q You were looking at current prices.
19	A. Yes.
20	Q. Okay. All right. I'd like to take a
21	look at Exhibit Three, please.
22	You have a number of wells there. It
23	looks like maybe a dozen and there are more wells than that
24	inside the boundary of the area that you're proposing here.
25	Is there any reason that you selected this group of wells

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

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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 infillowells, if they were used as data points, would not be representative and would really be meaningless.

A 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

33.

1	32
2	there, that we could designate acreage that's already been
3	infill drilled as a tight sands reservoir?
4	A Nell, we have no further locations to
5	develop. We believe that the entire area should be designated
6	anyway, regardless of the fact that there is no future de-
7	velopment in here, mainly because they were used as data, you
8	know, in the reservoir determination.
9	Q Are there any wells, infill wells, with-
10	in the area that have been uneconomical or will be uneconomic
11	wells?
12	A. Well, we have the Jicarilla H-4A was
13	plugged. I believe that was a dry hole. That was an infill
14	well. This was in Section 1, T 26 North, Range 3 West, in
15	the southeast quarter.
16	As far as others, I cannot locate them.
17	I believe here, this Jicarilla F-2A on the northeast quarter,
18	excuse me, the northwest guarter of Section 27, T 27 North,
19	Range 3 West, is will probably be also uneconomical.
20	Mainly we've developed as far as we
21	could the best locations for infill development and the fact
22	that we have not developed any further is because we believe
23	that we have run out of economic locations based on current
24	prices.
25	9 What wells have you drilled in the last

33 1 2 couple of years in this area? ٨. I believe we finished our infill work 3 in 1976. We may have drilled one more, and I cannot recall 4 which one it was, subsequent to that time, but the majority 5 of the infill work was completed in 1976. 6 So you had already determined before 7 0 the NGPA came out that there were some locations in here that 8 were not economic at that time. 9 That's correct. 10 A. Are there any non-fractured potentials 11 0 available in this area? 12 Fracturing is required on each well. 13 λ. We do it as a standard policy now to --- as soon as we set 14 pipe, to perforate and fracture, because we --- we tried be-15 fore to -- in the '50s to produce before fracturing and as 16 tabulated here, our rates were below as required for economic 17 18 recovery. 19 MR. STAMETS: Are there other questions 20 of the witness? 21 Would you identify yourself for the 22 record, please? 23 MR. BUCKINGHAM: Allen Buckingham, 2¢ USG8. The Examiner has touched a lot of the USGS questions 25 that we were going to ask, but with me this morning is Sue

1	34
2	Umschler, a petroleum engineer, and Robert Higgens, a geolo-
3	gist, and they have some specific questions to ask.
4	
5	QUESTIONS BY MG. UMSCHLER:
6	My first question is, do you have any
7	evidence that would definitely indicate the areas to the east
8	north, and south, do not meet the criteria that you illu-
9	strated for this hearing?
10	A We have included in our application
11	Mobil leases. As to whether there should be an extension or
12	not, we are not objecting to extending the field limits.
13	1 You don't have any evidence whether it
14	would or would not meet the criteria?
15	A. No, we don't.
16	B Is it possible for you to obtain any
17	information on those wells located outside of your boundary
18	for the permeability and production criteria?
19	A. Generally we have a hard enough time
20	finding our own data. As far as offset operators, I'm in-
21	clined to believe that they really have as limited data as
22	possible, just, you know, other than completion data. I
23	don't believe they probably performed too many buildup tests
24	or anything else.
25	Q And there's one there's a couple of

1	35
2	infill locations in Township 27, 3 Vest. If these infill
3	locations have probable reserves of greater than 400 MMcf,
4	would you develop those at current prices?
5	A. Which are the locations with which you
6	are concerned?
7	A There's one in the southeast quarter of
8	15, Section 15.
9	A. Okay, in Township 26
10	Q. 27, 3.
11	A. 27, 37 Well, we would on a risk rate
12	analysis, we would probably assume the recovery in there to
13	be in the order of, maybe, four to close to 500-million,
14	and at current prices this would be low economics to the
15	point of not even considering.
16	MS. UMSCHLER: That's all my questions.
17	MP. STAMETS: Are there other questions
18	of the witness?
19	MR. HIGGINS: Yes, sir.
20	
21	QUESTIONS BY MR. HIGGINS:
22	Q On your Exhibit One it's a boundary
23	question. Looking at the main Mesaverde Pool, there is -
24	you have sort of an island on your map and on the eastern
25	edge of the pool under consideration there are three or four

1	36
2	dry holes. But further east of that another operator has
3	developed Mesaverda wells.
4	Could this not be a similar case where
5	we have select spots where there is no production but the
6	actual true boundary of this reservoir may well extend east
· 7_	' ward or northward, southward, of the current boundary you
8	have?
9	A. We are going strictly on dry holes that
10	are around here as our limiting factor here to delineate this
11	structure.
12	Anything in between these dry holes is
13	open for conjecture.
14	Ω That's my point, that it's not con-
15	clusive in all of these areas. There's a limited number of
16	dry holes to delineate the boundaries established here.
17	A. Right.
18	MR. HIGGINS: No more questions.
19	
20 · 21	RECROSS EXAMINATION
21	BY MR. STAMETS:
23	<u>n</u> I presume Mobil would have no objection
23 24	if we decided to take in a little more acreage than what
24	you have proposed.
23	Λ. No.

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0 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.

Okay.

Q.

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

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38 1 2 CROSS EXAMINATION 3 BY MR. PADILLA: 4 Mr. Hoffmaster, I have just a couple of Q. 5 questions. 6 For instance, what is the average pro-7 ductive life of these Mesaverde wells in the subject area? 8 They can produce -- well, so far they've 1 9 produced for twenty-five years and we expect, well, maybe 10 ten more years or fifteen, or whatever. You know, you can't 11 say. It would have to be on a per well basis. 12 Are some of these wells designated as Q. 13 stripper wells now, do you know? 14 I'm not familiar if there are any. A. 15 Okay. Now you mentioned that possibly Q. 16 one well has been drilled in this area in the last couple of 17 years. 18 Vaguely I recall. I'm not sure. There А. 19 may not have been. I know it was not an economical well if 20 it was. I just recall in the back of my mind seeing an 21 economic analysis run on it, a well. 22 Now going to Exhibit B, what is the 0 23 current price you're basing your analysis on? Would that 24 be Section 103 or would it be possibly some '78 gas price, or 25 what is the gas price?

	1		39
	2	۸.	On Exhibit B?
	3	Ġ.	Yes.
	4	A.	The current price? That's the Section
	5	103 price escalated.	
~	6	он. О	The most highest price?
-2	7	В.	Right, that is allowed, yes.
	8	Q.	If I understand your testimony, you're
	9	actually only seekin	g tight formation designation for the
	10	existing infill well	s that need to fully develop the area,
	11	and also for the, sa	y, Sections 12, 13, and 24 in the north-
	12	west area.	
	13	λ	We're seeking the entire area designated
	14	in yellow on your ba	se map as as tight gas.
	15	Q	But practically speaking, you'd only
	16	be able to collect 1	07 price for those not ful , developed
	17	areas?	
	18	λ.	Right, for the undeveloped locations
	19	only.	
	20		MR. PADILIA: That's all I have, Mr.
	21	Examiner.	
	22		MR. STAMETS: Are there any other ques-
	23	tions of the witness	? He may be excused.
	24		Anything further in this case? Mr.
	25	Carr?	

	1	40
	2	MR. CARR: Mr. Stamets, Northwest Pipe-
	3	line Corporation opposes the application of Mebil in this
	4	CABO.
	5	Northwest believes that the subject area
	6	as evidenced by their Exhibit Number Twelve and other ex-
	7	hibits, has been substantially developed under existing prices
2	8	and therefor should not qualify for tight sand designation.
	9	under the provisions of FERC Order Number 99.
	10	Northwest further believes that the area
	11	can be developed under the existing infill order at the pre-
	12	sent prices.
	13	Instead of reading a fairly lengthy
	14	statement that Northwest Pipeline Company has prepared in
	15	opposition to this application, with your permission I'll
	16	simply present it to you.
•	17	I have nothing further.
	18	NR. STAMETS: That will be fine, Mr.
	19	Carr.
Ŧ	20	Also, I would like to ask Mobil to sub-
	21	mit some clarification subsequent to the hearing on any well
	22	which may have been drilled in the last two years, woll,
	23	1978 and on.
	24	MR. SPERLING: Right, '78 forward.
n	25	MR. STAMETS: Including 1978; '78, 79,

'80 and '81, and if there are any indications that those wells are economical or uneconomical. λ. Okay. MR. STAMETS: And then I'm going to take this case under advisement. (Hearing concluded.)

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ATE RESERV

APPLICATION FOR TIGHT GAS FORMATION DESIGNATION MOBIL PRODUCING TEXAS & NEW MEXICO OPERATED LEASES RIO ARRIBA COUNTY

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Case 2154

NEW MEXICO

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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:

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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.

- 1 -

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 Yerde, 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.

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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.

- 3 -
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 cil. 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 waterbearing 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. 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.

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

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Lease and Well No.	kh* (md ft)	<u>h (ft)</u>	<u>k (md)</u>
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. $k = \frac{179.1 \text{ md ft}}{1222 \text{ ft}} = 0.146 \text{ md} = \frac{1.60 \text{ md}}{11 \text{ samples}}$

k = permeability

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 h = contributing formation interval

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

CHRONOLOGICAL PRESSURE AND PRODUCTION DATA

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$\begin{array}{r} \Delta t \\ 1045 \\ 523 \\ 349 \\ 262 \\ 131.5 \\ 88 \\ 66.2 \\ 53.2 \\ 44.5 \\ 38.3 \\ 33.6 \\ 27.1 \\ 22.8 \\ 19.6 \\ 17.3 \\ 15.5 \\ 14.0 \\ 17.9 \\ 11.9 \\ 10.3 \\ 9.2 \\ 8.3 \\ 7.5 \\ 6.9 \\ 6.4 \\ 5.8 \\ 5.4 \\ 5.0 \end{array}$		490 530 541 550 561 594 612 630 644 655 664 673 689 705 719 732 744 755 764 773 792 812 828 844 860 871 889 905
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$ \begin{array}{r} 15.5 \\ 14.0 \\ 17.9 \\ 11.9 \\ 10.3 \\ 9.2 \\ 8.3 \\ 7.5 \\ 6.9 \\ 6.4 \\ 5.8 \\ 5.4 \\ 5.0 \\ \end{array} $	- ·	744 755 764 773 792 812 828 844 860 871 889 905
14.0 17.9 11.9 10.3 9.2 8.3 7.5 6.9 6.4 5.8 5.4 5.0	- · ·	764 773 792 812 828 844 860 871 889 905
$ \begin{array}{r} 11.9 \\ 10.3 \\ 9.2 \\ 8.3 \\ 7.5 \\ 6.9 \\ 6.4 \\ 5.8 \\ 5.4 \\ 5.0 \\ \end{array} $		773 792 812 828 844 860 871 889 905
6.9 6.4 5.8 5.4 5.0		792 812 • 828 844 860 871 889 905
6.9 6.4 5.8 5.4 5.0		812 • 828 844 860 871 889 905
6.9 6.4 5.8 5.4 5.0		 828 844 860 871 889 905
6.9 6.4 5.8 5.4 5.0		844 860 871 889 905
6.9 6.4 5.8 5.4 5.0		860 871 889 905
5.8 5.4 5.0		871 889 905
5.8 5.4 5.0		889 905
5.4 5.0		905
5.0		
		921
4.6		935
4.3		948
4.1		960
3.9		971
3.7		985
3.6		996
3.4		1007
3.3		1016
		1026 1035
3 0 2		1033
2.9		1055
		1069
2.6		1080
2.59		1085
2.58		1087
- 6 -		
ter an ann an		
	3.9 3.7 3.6 3.4 3.3 3.2 3.1 3.0 2.9 2.7 2.6 2.59 2.59 2.58	3.9 3.7 3.6 3.4 3.3 3.2 3.1 3.0 2.9 2.7 2.6 2.59 2.58

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

Production Rate prior to shut-in (Q) = 1000 MCF/DTime of production prior to shut-in (t) = 261 hours Net feet of contributing formation (h) = 146 feet Formation porosity $(\emptyset) = 14\%$ Formation water saturation (Sw) = 34%Bottom hole flowing pressure (Pwf) = 490 psia Gas specific gravity = .688Formation temperature = $142^{\circ}F = 602^{\circ}R$ Find: Permeability (k) = millidarcies From plot of BHP vs. $\frac{t + \Delta t}{t}$: slope of straight line (m) = 710 psi/ cycle $\frac{1380 + 490}{2}$ Average pressure = $\frac{P* + Pwf}{2}$ = 935 psia @ 935 psia and 142°F : gas deviation factor $(\mathbf{B}) = .8957$ gas viscosity (μ) = 0.01372 centipoise gas formation volume factor (Bg) = .02829 Bt cu ft/SCF p_ = (.02829)(.8957)(602) cu ft/_{SCF} 935 = .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 5.61 cu ft bbls/_{MCF} $kh = \frac{162.6 \text{ x rate x viscosity x formation volume factor}}{\text{slope of straight line of buildup plot}}$ $kh = \frac{162.6 \times Q \times B}{m} = \frac{162.6 \times 1000 \times 0.01372 \times 2.91}{710} = 9.14 \text{ md ft}$ = <u>9.14 md - ft</u> = .063 md

146 feet



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

CHRONOLOGICAL PRESSURE AND PRODUCTION DATA

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

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

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$Q = 1700 \text{ MCF PD}$ $Sw = 34\%$ $t = 342 \text{ hrs}$ $Pwf = 680 \text{ psia}$ $h = 122 \text{ ft}$ $Gas \text{ gravity} = .688$ $\phi = 14\%$ $T = 142^{\circ}F = 602^{\circ}R$
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
<pre>@ 1105 psia and 142°F : = 0.8814</pre>
$kh = \frac{162.6 \times Q \times \mu \times Bg}{m} = \frac{162.6 \times 1700 \times 0.01410 \times 2.469}{300}$
$= 32 \text{ md-ft}$ $k = \frac{32 \text{ md-ft}}{122 \text{ ft}} = 0.262 \text{ md}$



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EXHIBIT 5A

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



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

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 Kb(true) = $.28 \times Kb$ apparent = $.28 \times 32 \text{ md ft} = 8.96 \text{ md ft}$

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

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EXHIBIT 5A

NYDNAULIC PRACTIVEIN: TRPATIENT SENERULE JICARILIA "II", MPIE NO. 2-A BIANCO MESA VERDE FIFIA RIG ARRIAR COMPLY, NEW MERICO

Yermetton () Lower Nese Yerde (5754*-5(7)*-166*04-42 hetes)	Bate (bb)s/sla) 30 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	Pluid Type It ICL	and Type 5,000 gale.Proped 8,000 gale.Versegel 7,500 gale.Versegel 7,500 gale.Versegel 22,500 gale.Versegel		Conc (#/1000 gala) 3.0 0.0	Type () Pone W2-E1	Cone #/1000 gals) 0		Conc /1000 gels)	Тура	Cone (\$/1000 A418)	Huah Slas	Cone (#/gol)	Quantity (Lbs)
(5754°-5523°-166°04-42 hotes) Ht441a Hosa Yorda		-	10,000 gals.Versegel 7,500 gals.Versegel 7,500 gals.Versegel 7,500 gals.Versegel 7,500 gals.Versegel	Pad Nona " "	0.0		0							
(3234°-3572)°-166°04-42 hotes) Hiddio Huga Yorda		-	10,000 gals.Versegel 7,500 gals.Versegel 7,500 gals.Versegel 7,500 gals.Versegel 7,500 gals.Versegel	Pad Nona " "	0.0		Q	14.4.						
Hiddio Hopa Yorda	u u u 50	-	7,500 gale.Verangel 7,500 gale.Verangel 7,500 gale.Verangel		ů.				30	Swr f	1,0	Hone	0.0	
Middla Masa Yorda	30 30 30	-	7,500 gals.Versegel 7,500 gals.Versegel	•			40	- ·	-	-	n in	Hone	0.0	ē
Hiddio Hopa Yorda			7,500 gels.Versagel	•		•	-		-		-	20-60	1.9	7,500
	- %	-			-	۳.	•		•	•	•	-	2.4	15,000
	50 11	•	22,500 gale.Vereagel		, *					-		•	3.0	22,300
	•			•	~	4	•	•	•	•	•	•	4.0	90,000
	•			DROP L	8 RCM95									
	•	1% RCL	5,000 gals, Prepad	71-20	3.0	Hone	•	Ad-Aq	30	Sur f	2,0	jione	0.0	•
	•	-	10,000 gals, Versegel	ted Hone	9,0	WC-II	40	- ·				Hent	0.0	
		•	7,500 gals.Versagel	•	-		-	•			-	20-40	1.0	1,500
	-	-	7,500 gals.Versagel	•	•		-	-			-		2.0	15,000
	•	•	7,500 gals.Versagel	-	-				-		•	•	3.0	22,300
	•	•	22,500 gals.Versagel	•	•	=	•	7	-	٩	-	-	4.0	90,600
(5504'-5680'-176'04-31 helee)														
	30	13 RCL	3,300 gala, Propad	78-20	3.0	Hone 1	0	M-Aq	30	het	2.0	Pene	0.0	•
			6,300 gale, Vernagal		0,0	WC-11	40		-		•	Hene	0.0	•
	_ .		5,000 gale.Versegel	:	-	-	-	:	:	:	-	20-40	t.0	5,000
	-	2	5,000 gals.Versegel	-		-	-		-	-	-		2.0	10,000
			5,000 gels.Versagel		•		-	-			-		3.0	15,000
	-	-	15,000 galsiVersagel	-	-	-	-	•	•	-		-	4,0	60,000
				DROP 4	RENRS									
	30	11, 101,	3,500 gate. Presel	PR-20	3.0	Home	0	M-14	30	bet :	2,0	Pione .	0.0	•
	•	-	6,500 gole.Versagel	Fed None	0,0	WC-11	40	-				Hone	0.0	•
	•	•	3,000 gale.Versegel		•	-	-		•	*	•	20-40	1.0	5,000
	2	•	5,000 gals.Vareegel	•	•	-	-	-	-		•	•	2.0	10,000
	•	•	5,000 gels, Versegel	-	-	-			•	•	-		3.9	15,000
	•	•	15,000 gals.Verengel	-	-	•	•	-	-	•	•	•	4,0	69,000
7				DROP 4	RONBS									
	50	11 RCL	3,500 gale. Press	PR-20	3,0	None	0	M-M	30	Swel	2.0	Hone	0,0	•
			6,500 gels.Versegel	Pad Hone	0.0	NC-11	40		-	•	-	Hene	0.0	0
		•	5,000 gale.Versagel		•	-	-	-	-	-	•	20-60	1.0	5,006
			5,000 gals. Voresgel	_		*		•	•		•	-	2.0	10,000
			5,000 gals.Verengel			:	-	-	:	:	-	-	3.0	15,000
		-	15,000 gale.Verengel	-	-	•	*	-	•	•	•	-	4.0	60,000
Upper Mass Verde													• •	
(3394"-5480"-86"0A-27 holes)	50	IL PCL	10,000 gels, Prepad	PR-20	3.0	None	•	M-M	20	Suct	2.0	None	0.0	
	-		20,000 gals.Versagel	Zad Hone	0.0	YC-11	40	-	-	-		None	0.0	
	-	-	15,000 gels, Versagel	-			-			-		20-40	1.0	15,000
			15,000 gala.Verangel 15,000 gala.Verangel	-	-	-	-			-			2.0	30,000
	-										· •			
			45,000 gala, Versagel		-		-			-	4 4		3.0 4.0	45,000

AD-Aq = Adomits Aqua Surf = Newco Suds

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JE9mith/je 6/30/75

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			EXHIBIT 5A			FDACA	5-10-7	76	٩ :
~	¢` •		FRACPLAN	11		e pris av		\mathcal{I}	S
•		UND TYPE	- VERSAGEL	FRACTUR	ING PRD	CE22 .	• •	J.	
	MORIL-DII CD.+	UCAPPAL I	MESA VERDE FO	PHATION					Ś
<u>.</u>	1 % KCL+ 30 B	S. ADBMITE	ADUA. 2 GALS	PEN-5			•	44	/ · · ·
	INJECTION RATE ASSUMED FRACTUR NET FORMATION T ELASTIC MORELUS FORMATION FERME FORMATION FOROS RHTP - PSI RESERVOIR PRESS RESERVOIR FLUID	e Height - Hickness - Psi Ability - 1 Jty Affe - Psi	FT			50.0 100.0 40.0 0.30 0.10 0.0 3500. 1000. 0.02	[+ 07	C. S. B. S.	
- - -	CW - FLUID 1055 SPURT 1055 - GA TYPE DE SEL GEL CONCENTRATI N-PRIME V-PRIME(SLOT) - WELL SPACINA - DEAINAGE PADIUS WELLEDRE PADIUS DAMAGE PATID TYPE & CONC NO	LBF-SEC++ ACFES - FT - FT		ን - ቀሚ	SANII	0.00 0. WG-11 4(02) 0.45 0.10 350. 2090. 0.40 1.0 5.60	1 họ h(l) h	- 	
] / · · · · · ·	DESIGN PPDD ND INOPEASE (T) (M-S	้ พัฒนาการ	PAD PROPPED VGL FRAC LN 000 FT		VIS CPS	грас Илтн In	079 157 5X	P 2HD SX	
	1 3.7 7.5	e 60.0	15.6 765.	100.0	536.	0.614	2221.	ų .	1
	2 4.0 7.3	? 70.0	18.6 857.	100.0	560.	0,639	2549.	0.	
Y4 = 1000'	3 4.2 8.9 	86.0	23.7 1000'	100.0 <i>100.0</i> 100.0	582. 39 7 601.	0.661 <i>0.674</i> 0.682	3129.	0. <i>0</i> . 0.	
	5 4.7 10.1	100.0	28.2 1117.	106.0	619.	0.700	3591.	ů.	
	6 5.0 10.1	110.0	31.5 1198.	100.0	636.	0.717	3926.	Q.	1. AND 1.
-	7 5.3 10.1	120.0	34.8 1278.	100.0	6 52.	0.734	4258.	0.	
	8 5.6 11.0	0 130.0	38.2 1356.	100.0	667.	n, 749	4589.	o.	
	9 6.0 11.0	n 14n.a	41.7 1433.	100.0	681.	0.763	4917.	0.	an leady of
= 1000'	10 6.4 11.2	\$ 150.0	45.1 1508.	100.0	694.	0.777	5244.	Û.	
: 150 1c - 50 BPM	CREATED	HED	PELATIV (T)	(M-S)	HFZ		-EFF		
CCC Gol - Prepad. ccc Gol - Prepad. ccc Gol - Korgen I t 1 20/201 Sound 5000 Gol - Korseye 5000 Gol - Korseye 1 5 20/201 Sond 5000 Gol - Korseyel	944. 944. 1033. 1117. 1198. 1279. 1356. 1433. 1565.	0. 0. 0. 0. 0. 0. 0. 0. 0.	240.25 244.78 248.92 252.50 255.86 258.97 261.86 264.55	415503, 425140, 433155, 443320, 443321, 443321, 453274, 453280, 453380, 453380, 453380, 453380, 453380, 453380, 453380, 453380, 453380,	1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0	0 0.000 0 0.000 0 0.000 0 0.000 0 0.000 0 0.000 0 0.000 0 0.000	085 084 083 082 081 081 089 087 087	W 2.8	• • • • • • • • • • • • • • • • • • •

MOBIL OIL CORPORATION WELL COST STATEMENT

STATE NEW MEXICO	COUNTY RIU A	or parish KIBA		FIELD BLANCO	(MESA	VERDE)			100. 11
REGION A	356						7562		VELL NO. 2-1
DATE COMMENCED	DATE COMPLETED		STATUS GAS	APE NO. 5241	PREPARED	ACCOUNTING C	ENTER	J_	
· · · · · · · · · · · · · · · · · · ·				L	·				
						COSTS	VHHOLE DOL	LARS/	
						ACTU	L	ESTIM	ATED
RILLING CO									
FUOTAGE						57,102			
DAY KORK		-				9,578			
	ILLING COS					19,352			
	DRILLING	COSTS					66,032		
ELL EXPENS	ES AND RUADS	÷.				3,296			
	AND TESTIN	G				7,679			•
FUEL						97	15		
HATER			•			9,239			
	CHEMICALS					36+668			
	NU CEMENTI	NG SERV	ICES			20,181			
TRANSPUR						3+603			
	ING AND ST	IMULATI	ÛN			162+672			
EQUIPHEN	T RENTAL					1,297			
MISCELLA						6,690			
	WELL EXPE	NSES				• • **	251,842	37	1,000
TOTAL	INTANGIEL	E COSTS					337,874	37	1,000
ELL EQUIPH	ENT								
CASING						34+655			
OTHER EQ	UIPMENT					6,976-			
TOTAL	TANGIBLE	COSTS					27,679		
TOTAL	COSTS						365+553	37	1,600
APPRO	XIMATE COS	T 10 MO	691				365+553		

EXHIBIT 6 PERMEABILITY BASED ON CORE ANALYSIS BLANCO MESA VERDE FIELD

		No. of	Summation of	Average k	Reduced k due to compaction
Ļ	Lease and Well No.	Samples	All k Values	Average n	
ł	Jicarilla H-7 *	28	6.04 md	0.216 md	.17 md
4		130	4.10 md	0.032 md	.026 md
J	Jicarilla G-1	100		• • • • • • • •	.14 md
,	Jicarilla G-5	56	9.95 md	0.18 md	

only one out of three intervals was cored



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

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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 = <u>1955 MCFPD</u> Total = 150 MCFPD 13 wells

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

* See discussion for explanation

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- 10 -

Container No. Ack2	•		E PORT	-	oleum Compan	•	Form X
Coular Presuue. T() pais. 6.70	Container No. LOL	2	Analysis No	12089	Lease Name.		TTCII JYO
LOC - SO - F(LA) Operator MAGEOLIA FAICUATION Constraints	Container Pressure_	570 pala	_@_70		District		
Borns Sampled. Segmentor Liquid. Sad Mean Partie Description Disol (3.20) Sold (7.20) Sold (7.20) <thsold (7.20)<="" th=""> <thsold (7.20)<="" th=""></thsold></thsold>	-	80#	90	•F. (Lab.)	Operator		
State and Stream Sampled 3.01 Dila/day (stock) Weil Depth 5000' Perf 2300 5001 6711. Sample Requested by R. D. Myarm Sabnitid by Los E. Robinson Analysed by 54 587 6 4 Villbanks - FUELD TESTS AND OPERATING DATA: Tempersterve: Bottombde Tempersterve: Bottombde Tempersterve: Bottombde Forting Cating 1039 Flowing Willback Tempersterve: Bottombde Tempersterve: Bottombde Flowing Cating 200 Heater Index Tempersterve: Bottombde To Stock Flowing Cating 201 Primary Sep. Cat. 70 Primary Sep. Cat. 70 Forder Catank 20 Mater Eam 70 Stock Tank Atm. Stock Tank Stock Tank Frimary Sep. Westr. Jointh/day (ast) Sep. Cat/Stock Westr. Stock Tank Westr. Stock Tank Westr. JOIN Stock Tank Westr. Stock Tank Westr. Fried Tests: Cat. 59, 21 Batt/ 642, 9102 Orticl Cat/Stock Westr. Stock Tank Westr. Stock Tank Westr. JOIN Stock Tank Westr. Stock Tank Westr. Stock Tank Westr. JOIN Stock Tank Westr. Stock Tank Westr. Stock Tank Westr. <	Date Sampled			•••	Field		
Volume of Stream Sampled 3.21 bbla/day [stock] Well Depth 3200* rer.22000 solut 0/1*. Sample Supported by R. D. MYSTE Submitted by Lee X. Robinson Analysed by Setter 4 Willbanks- 6-11-50 Pressore: Sciencholds Tesperstars: Sciencholds 6-11-50 Pressore: Sciencholds Tesperstars: Sciencholds 70 Pressore: Sciencholds Tesperstars: Sciencholds Tesperstars: Sciencholds Pressore: Sciencholds Tesperstars: Sciencholds Tesperstars: Sciencholds Priving Casing 270 Primary Sep. Ga. 200 Tesperstar: Sciencholds Priving Casing 270 Primary Sep. Ga. 200 Tesperstar: To Stock Task Atta Boolds Strep Mate To Primary Sep. Ga. 200 Casing Mode Sen To Sciencholds Primary Sep. Ga. 300 Str2 /D Stock Task Metr. 10 Mb/day [strep Sep. Gas/Steck Wetr Sep. Gas/Steck Wetr Primary Sep. Ga. 301 Mb/day [strep Sep. Gas/Steck Wetr Sep. Gas/Steck Wetr Sep. Gas/Steck Wetr Primary Sep. Ga. 312 Mbl/day Slick Attorn back Gold Science Sciencholds Primary Sep. Ga. 312 Mbl/day Slick Gold Science Sciencholds <td>Stream Sampled</td> <td>Benerator</td> <td>Liquid</td> <td></td> <td>Sand</td> <td>مبيها المراجب المجرية فيشاكر أكاستها</td> <td></td>	Stream Sampled	Benerator	Liquid		Sand	مبيها المراجب المجرية فيشاكر أكاستها	
 Bangha Baquested by R. B. MYSKE Submitted by Lee E. Robinson Andred Pletors & Villbanks- Field TESTS AND OPERATING DATA: Pressrer: Bottenhola Submitted by Tey Electron Statemarks Flowing Yolloga (1998) Flowing Tubing 1039 Flowing Tubing 270 Flowing Yolloga (1998) Flowing Yolloga (1998) Flowing Yolloga (1998) Flowing Separator. 200 Back Tank Ata. Bood Tank Not. Bood Tank Not. Bood Tank Mater. Bood Tank Mater. Bood Tank Mater. Bood Tank Water. Cont. Bood Tank Water. Cont. Cont. Cont. State Tank Water. Cont. Con	Volume of Stream	Sampled 3.2	1 bbls/day	(stock)	Well Depth_	5900 Pert 5	380-5880 Shots 6/11.
Shutis Cashy 1032 Battin Tablor 1032 Flowing Tubing 270 Flowing Tubing 270 Primary Separator 270 Primary Separator 270 Primary Separator 270 Primary Separator 270 Block Task Atas Colos Sizes: Tabing SOCS Primary Sep, Col. Casing Primary Sep, Water 10 Mb/day (Gat) Primary Sep, Water 10 Mb/day (Gat) Stock Task Sep, Gas/Stock Water Btock Task Coll Stock Task Coll Stock Task Coll Stock Task Sep, Gas/Stock Water Btock Task Sep, Gas/Stock Water Sep, Gas/Stock Water Stock Task Sep, Gas/Stock Water Sep, Gas/Stock Water Stock Task S	FIELD TESTS AN	D OPERATIN		Submitted by		,	
Bottin Tubing 1039 Entring Walking Boots Flowing Tubing 270 Heate Cottin Boots Flowing Tubing 270 Heate Cottin Boots Flowing Tubing 270 Frinary Sep. Gas 70 Primary Separator 270 Primary Sep. Gas 70 Scondary Separator 270 Mess Em. 710 Boots Bitot Tubing BOOS Mess Em. 710 Boots Bitot Tubing BOOS Casing Boots Batter DODE Primary Sep. Water BOOS Casing Boots Batter DODE Primary Sep. Water BOOS Casing Sep. Gas/Sep. Water BOOS Batter DODE Primary Sep. Water BOOS Sep. Gas/Sep. Water BOOS DODE DODE Primary Sep. Water BOOS Boot Tubing Boot Tubing Casing DODE DODE Primary Sep. Oll Sep. Gas/Stoch Wiss DODE DODE DODE DODE Primary Sep. Casing <td< td=""><td></td><td></td><td></td><td></td><td>- Temperature</td><td></td><td>70 est</td></td<>					- Temperature		70 est
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Bits Septerson Atta: Bits Sect Task Atta: Bits Start Atta: Bits Start Attasphere. 73 Colos Size: Tubing BCDB Castor BCDB Hater Son BCDB Production Rate: Primary Sep. One. MCD (Astronomy September 2000) Batics: Sep. Gas/Sep. Water. HSL (ASTRONOM) Primary Sep. Water. Dill Sep. Gas/Sep. OR. Dill. BCDB Primary Sep. Water. Dill Sep. Gas/Sep. OR. BCDB Dill. Dill. Stock Tank OIL 3.21 hbl/day Sep. Gas/Sep. OR. BCDRONOM Sep. Gas/Sep. OR. BCDRONOM Stock Tank Water Dill Orerall Gas/Liquid Orerall Gas/Liquid Dill. Potential Rates: Cas. OIL OR. OIL OIL Castor Disposition Production: Gas. Batics Castor OIL Castor OIL Castor OIL Castor Dill. Sep. Gas/Sep. OIL Dill. Sep. Gas/Sep. OIL Dill. Dill. Dill. Dill. Dill. Dill. Dill. Dill.	Prima	ry Separator	والمتحدث والمتحد والم		- '	Primary Sep. Oil	
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BOOM Caring BOOM Heater DODE Predaction Eats: Primary Sep. Ges. MCG MET/D. Ration: Sep. Ges./Stack Oll. Str. Ges./Stack Veiser. Bioof Tank Oll. 3.21 hbl/day Sep. Ges./Stack Weiser. Oll. WENDOWD Stock Tank Water. BOOM Overall Ges/Laptid. Oll. Oll. Dirposition Production: Ges. PRO	Stock	Tank	Atm.		- ' '	Stock Tank	
Cooks Sizes: Tubing BODE Casing BODE Ratis: Sep. Gas. MSG MCZ/D Ratis: Sep. Gas/Steck OI 151.4 MCT/Db1. SET. Primary Sep. OI Sep. Gas/Steck OI 151.4 MCT/Db1. Sep. Gas/Steck OI 151.4 MCT/Db1. Primary Sep. OI Sep. Gas/Steck OI 151.4 MCT/Db1. Sep. Gas/Steck OI 151.4 MCT/Db1. Biost Trank OI 3.21 hb1/day Sep. Gas/Steck OI Winter Stock Trank Water DODB OI Coll OI Sep. Gas/Lepide Disposition Production: Gas. FB.0. FW Stort OI Gas Gravity Gas Stort Sep. Gas/Stort Disposition Production: Gas. Dispositi					•	Atmospheric	75
Production Rate: Primary Sep. Gas. MSG MCT/D. Ratios: Sep. Gas/Sep. Watur. 48.6 MCT/Dbl. sett. Primary Sep. Water 10 bbl/day Sep. Gas/Stock Water. Biock Tank Ol. 3.21 bbl/day Stock Tank Ol. 3.21 bbl/day Stock Tank Water. DODB Other Tank Water. Other Tank Tank Tank Diposition Production: Gas. FALO MARKS Ochoor CPM HLS. Carlot Diff Water. Gas Messurement: Method Orifice Mater. Diposition Production: Mol % Vol % GPM Pressure Ease. Disposition Production: Mol % Vol % GPM Pressure Ease. Component Mol % Vol % GPM Proses. 550	Choke Sizes: Tubi	ngR				Heater	
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Bitch Teak OIL 3.21 hbl/day Sep. Ces/Sep. OIL WalkDOWD Stock Tank Water NODB Overall Ges/Liquid Overall Ges/Liquid Potential Rates: Gas Gil OIL OIL OIL Disposition Production: Gas Pala. IV pipeline OIL OIL OIL Disposition Production: Gas Pala. IV pipeline OIL OIL OIL 0.32 GPM Air % Gas Gravity @ 0.40 CPM His Gr./100 Di Water Disposition Production: Gas 0.40 Orifice Mether Pressure Base Dia.655 Gas Messurement: Method Orifice Mether Pressure Base Dia.655 Sample Method Ges 418placement; Liquid Outage B0%.537 EMARKS Content Vapor ENGLER: IBPOO*F. 70% 351 Component Mol % Vol % GPM Pressure Base 10%.126 90%. Component Mol % Vol % GPM Pressure Base 10%.126 90%. 577 <td< td=""><td>1</td><td>Primary Sep. (</td><td>01</td><td></td><td> Sep. (</td><td>Ges/Stock Oil15</td><td>1.4 MCP/bbl</td></td<>	1	Primary Sep. (01		Sep. (Ges/Stock Oil15	1.4 MCP/bbl
Bitch Tenk Oll 3.21 hbl/day Sep. Ces/Sep. Oll Whlmowing Stock Tank Water NODA Overall Ges/Liquid. Overall Ges/Liquid. Potential Rate: Gas. Oll Oll Oll Disposition Production: Gas. Ref. M. Pipeling Oll tank thruck. Pield Tests: Charceal 80-32 GPM Air % Gas Gravity Oll 0.32 GPM Co. % Oll Gravity Oll Co. Ges Messurement: Mater Pressure Base. DA.65 Gas Messurement: Method Orifice Methor Pressure Base. DA.65 Sample Method Ges 41splacement. Idquid Outage REMARKS: Component Mol % Vol % GPM Press. Sw.112 80%.537 LABORATORY REPORT: Content Vapor ENGLER: BP_90. 'F. 70% 351 Component Mol % Vol % GPM Press. Sw.112 80%.537 Rydrogen Sw.176 EP Sol %.226 Res.9.5 Str.12 <t< td=""><td>1</td><td>Primary Sep.</td><td>Water 10 bb</td><td>1/day (est)</td><td> Sep. (</td><td>Gas/Stock Water</td><td></td></t<>	1	Primary Sep.	Water 10 bb	1/day (est)	Sep. (Gas/Stock Water	
Stock Tank Water DODE Overall Gas/Liquid Potential Rates: Gas				bb1/day	•		wakaowa
Oil Oil tank thuck Disposition Production: Gas_PRO. EV B191102 Oil tank thuck Field Tests: Charceal 80-32 GPM Air		Stock Tank W	ater non		Overa	I Gas/Liquid	
Oil Oil tank thuck Disposition Production: Gas_PRG. EV glp31102 Oil tank thuck Field Tests: Charcoal 30.32 GPM CO. % Gas Gravity 0.32 GPM CO. % Oil Gravity 0 0.40 GPM CO. % Oil Gravity 0 0.40 Gen Mesurement: Method Gen & 41801accmant, Liquid Ontage 1h.65 Sample Method Gas & 41801accmant, Liquid Ontage 1h.65 55 Component Mol % Vol % GPM Press. 5% 112 80% 537 LABORATOBY REPORT: Content Yapor ENGLER: BP 90% 555 Carbon Dioxide				ilot			
Disposition Production: Gas PRO. HV pipeline Oil tank thuck Field Tests: Charceal 20.52 GPM Air							•
Field Tests: Charcoal 20.32 GPM Air % Gas Gravity 0.42 GPM CO. % Oil Gravity @ 0.40 Gravity @ Oil Gravity @ Gas Measurement: Method Orifico Motor Pressure Base 14.65 Sample Method Gas displacement, Liquid Ontage REMARKS: Idquid Ontage S% 12 Component Mol % Vol % GPM Pressure Base Judget District Idquid Ontage S% 12 80% Remark S: S% 12 80% 537 Garbon Distride	-		Pao. W pi	peline		•	tank truck
0.32 GPM CO. % Oil Gravity @ Gas Measurement: Method Orifice Motor Pressure Base 14.65 Sample Method Ges 41splacement. Liquid Outage REMARKS: Idquid Outage 80% 532 LABORATORY REPORT: Content Vapor ENGLER: 189 90% 76% 351 Component Mol % Vol % GPM Press 5% 112 80% 537 Hydrogen Sulfde	-						
0-60GPM Gr./100 pH Water 14.65 Gas Messurement: Method Ges & 18placement, Liquid Ontage Sample Method Ges & 18placement, Liquid Ontage REMARKS:							
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REMARKS: Content Vapor ENGLER: IBP90*F. 70%_351 Component Mol % Vol % GPM Press. 5%_112		0-60		GPM CO GPM H.S	Gr./1	-% Oil Gravity 00 pH Water	
LABORATORY REPORT: Content Vapor ENGLER: IBP_90_*F. 70%_351_ Component Mol % Vol % GPM Press. 5%_112		0-60		GPM CO GPM H.S leter	Gr./1 Pr	-% Oil Gravity 00 pH Water essure Base	
Component Mol % Vol % GPM Press. 5%_12_ 80%_577 Hydrogen Sulfde	Sample Method_	0-60		GPM CO GPM H.S leter	Gr./1 Pr	-% Oil Gravity 00 pH Water essure Base	
Component Mol % Vol % GPM Press. 5%_12_ 80%_577 Hydrogen Sulfde	Sample Method_	0-60		GPM CO GPM H.S leter	Gr./1 Pr	-% Oil Gravity 00 pH Water essure Base	
Component Mol % Vol % GPM Press. 5%_12_ 80%_537_ Hydrogen Sulide	Sample Method_	0-60		GPM CO GPM H.S leter	Gr./1 Pr	-% Oil Gravity 00 pH Water essure Base	
Hydrogen Sulfide	Sample Method	0-60 :: Method		GPM CO GPM H.S &ter Account,	Gr./1	% Oil Gravity 00 pH Water essure Base quid Ontage	14.65
Carbon Dioxide	Sample Method	0-60 : Method PORT:	Ges <u><u>éisp</u>1</u>	GPM CO GPM H.S &cement, Content	Gr./1 Pr 14 Vapor F	-% Oil Gravity 00 pH Water essure Base quid Ontage ENGLER: IBP	14.65
Nitrogen	Sample Method REMARKS: LABORATORY RE Component	0-60 : Method PORT:	Ges <u><u>éisp</u>1</u>	GPM CO GPM H.S &cement, Content	Gr./1 Pr 14 Vapor F	% Oil Gravity	14.65
Air 40% 198 Rec. 86.5 Methane 11.19 4.84 50% 226 Res. 9.5 Ethane 7.41 4.82 60% 267 Loss 4.0 Propens 10.09 7.09 Residue Data: *API Gravity @ 60°F i-Butane 3.98 3.32 Mol. Wt 123.913 Reid Vapor Pressure B-Butane 6.92 6.47 CF/Gal 19.115 Seidue Data: *API Gravity @ 60°F i-Pentane 6.92 6.47 Gal/Mol 19.880 26/70 Equiv B-Pentane 6.50 6.01 *API 57.5 Burrell: Air Heranes (f) 45.02 60.28 Calc VP 2.14 TOTAL 200.00 100.00 Conganion Samples Conganion Samples TOTAL 200.00 100.00 State 216 State 216	Sample Method REMARKS: LABORATORY RE Component Hydrogen Sulfide	0-60 : Method PORT:	Ges <u><u>éisp</u>1</u>	GPM CO GPM H.S &cement, Content	Gr./1 Pr 14 Vapor F	-% Oil Gravity 00 pH Water essure Base quid Outage ENGLER: IBP 5%12 	14.65
Methane 11.19 4.84 50% 226 Res. 9.5 Ethane 7.41 4.82 60% 267 Loss 4.0 Propane 10.09 7.09 Residue Data: "API Gravity @ 60"F i-Butane 3.28 3.32 Mol. Wt 123.913 Reid Vapor Pressure n-Butane 6.92 6.47 CF/Gal 19.115 Gal/Mol 19.880 26/70 Equiv n-Pentane 6.50 6.01 *API 57.5 Burrell: Air Heranes 6.50 6.01 *API 57.5 Burrell: Air TOTAL 100.00 100.00 Companion Samples TOTAL 100.00 100.00 100.00 100.00 REMARKS: Tot I. F. Robinson (2) State file 10	Sample Method	0-60 : Method PORT:	Ges <u><u>éisp</u>1</u>	GPM CO GPM H.S oter Accement, Content	Gr./1 Pr 14 Vapor F	-% Oil Gravity 00 pH Water essure Base quid Outage ENGLER: IBPQ 5%12 10%126 20%150	14.65
Ethane 7.41 4.82 60% 267 Loss 4.0 Propane 10.09 7.09 Residue Data: 'API Gravity @ 60'F. I-Butane 3.96 3.32 Mol Wt 123.913 Reid Vapor Pressure B-Butane 6.90 7.17 CF/Gal 19.115 Reid Vapor Pressure B-Butane 6.92 6.47 CF/Gal 19.115 Reid Vapor Pressure B-Pentane 6.92 6.47 Gal/Mol 29.860 26/70 Equiv. B-Pentane 6.50 6.01 'API 57.55 Burrell: Air Herzanes 6.50 6.01 'API 57.55 Burrell: Air TOTAL 200.00 200.00 Constant Constant TOTAL 200.00 200.00 Constant Constant Sect RIM AL CTT INS RSC BCB WS file Constant Constant	Sample Method_ REMARKS: LABORATORY RE Component Hydrogen Sulfide Carbon Dioxide Nitrogen	0-60 : Method PORT:	Ges <u><u>éisp</u>1</u>	GPM CO GPM H.S oter Accement, Content	Gr./1 Pr 14 Vapor F	-% Oil Gravity 00 pH Water essure Base quid Outage ENGLER: IBPQ 5%12 10%26 20%15 80%17	14.65
Propane 10.09 7.09	Sample Method REMARKS: LABORATORY RE Component Hydrogen Sulfide Carbon Dioxide Nitrogen Air	0-60	Ges £ispl Vol. %	GPM CO GPM H.S oter Accement, Content	Gr./1 Pr 14 Vapor F	-% Oil Gravity 00 pH Water essure Base quid Outage ENGLER: IBPQ 5%112 10%126 20%156 80%195	14.65
Propane 10.09 7.09 Besidue Data: *API Gravity @ 60°F i-Butane 3.98 3.32 Mol. Wt. 123.913 Reid Vapor Pressure n-Butane 6.90 7.17 CF/Gal. 19.115 Reid Vapor Pressure i-Pentane 6.92 6.47 CF/Gal. 19.115 Burrell: Air p-Pentane 6.50 6.01 *API. 57.5 Burrell: Air Herzanes 6.50 6.01 *API. 57.5 Burrell: Air	Sample Method REMARES: LABORATORY RE Component Hydrogen Sulfide Carbon Dioxide Nitrogen Air Methane	0-60 : Method PORT: Mol %	Ges \$18p1	GPM CO GPM H.S oter Accement, Content	Gr./1 Pr 14 Vapor F	-% Oil Gravity 00 pH Water essure Base quid Outage ENGLER: IBP 5%12 10%22 80%22 50%22	14.65
i-Butane 3.98 9.32 Mol. Wt 123.913 Reid Vapor Pressure n-Butane 6.90 7.17 CF/Gal 19.115 i-Pentane 6.92 6.47 Gal/Mol 19.880 26/70 Equiv. n-Pentane 6.50 6.01 API 57.5 Burrell: Air Hezznes (†) 42.02 60.28 Cale VP 2.14 CO TOTAL 200.00 100.00 Companion Samples Tot J. F. Robinson (2) Sci RTM AL CTE INS RSC PCB MS file	Sample Method REMARES: LABORATORY RE Component Hydrogen Sulfide Carbon Dioxide Nitrogen Air Methane	0-60 : Method PORT: Mol % 	Ges &ispl Vol. % 4.84 4.84	GPM CO GPM H.S oter Accement, Content	Gr./1 Pr 14 Vapor F	-% Oil Gravity 00 pH Water essure Base quid Outage ENGLER: IBP 5%12 10%22 80%22 50%22 60%22 50%22	14.65
B-Butane B.90 7.17 CF/Gal 19.115 i-Pentane 6.92 6.47 Gal/Mol 19.880 26/70 Equiv. B-Pentane 6.50 6.01 API 57.5 Burrell: Air Hezznes (*) 45.02 60.28 Cole VP 2.14 Cole TOTAL 200.00 200.00 Companion Samples Cole VP 2.14 Cole TOTAL 200.00 200.00 Companion Samples Cole VP 2.14 Cole TOTAL 200.00 200.00 Companion Samples Cole VP 2.14 Cole REMARKS: Tot I. Y. Robinson (2) Sci RIM AL CIF INS RSC BCB MS £11e Cole VP 2.14 Cole VP 2.14	Sample Method REMARES: LABORATORY RE Component Hydrogen Sulfde Carbon Dioxide Nitrogen Air Methane Ethane	0-60 : Method PORT: Mol % _	Ges &ispl Vol. % 4.84 4.84	GPM CO GPM H.S oter Accement, Content	Gr./1	-% Oil Gravity 00 pH Water essure Base quid Ontage ENGLER: IBP 5%112 5%122 10%125 80%172 40%192 50%226 60%261	14.65
i-Pentane 6.92 6.47 Gal/Moi 19.830 26/70 Equiv. s-Pentane 6.50 6.01 'API 57.5 Burrell: Air Hezznes (†) 45.02 £0.28 Caic VP 2.14 Cos TOTAL 200.00 200.00 Companion Samples REMARKS:	Sample Method_ REMARKS: LABORATORY RE Component Hydrogen Sulfde Carbon Dioxide Nitrogen Air Methane Ethane Propane	0-60 : Method PORT: Mol % _	Ges (18) Vol % _	GPM CO GPM H.S oter Accement, Content	Gr./1	-% Oil Gravity 00 pH Water essure Base quid Ontage ENGLER: IBP 5%12 5%12 20%15 80%17 40%19 50%22 60%25 Besidue Data:	14.65
B-Pentane 6.50 6.01 *API 57.5 Burrell: Air Hezanes (†) 45.02 60.28 Calc VP 2.14 CO TOTAL 200.00 100.00 Companion Samples TOTAL 200.00 100.00 Companion Samples Soi J. F. Robinson (2) *Sci RIM AL CIF INS RSC BCB MS file	Sample Method	0-60 : Method PORT: Mol % 11.19 7.41 10.09 3.98	Ges (18) Vol % 4.84 4.82 7.09 3.32	GPM CO GPM H.S oter Accement, Content	Gr./1	-% Oil Gravity construction of the second sec	14.65
Heranes (†) 45.01 60.28 Calc VP 2.14 TOTAL 200.00 200.00 Companion Samples TOTAL 200.00 200.00 BEMARKS:	Sample Method_ REMARKS: LABORATORY RE Component Hydrogen Sulfide Carbon Dioxide Nitrogen Air Methane Ethane Propane i-Butane n-Butane	0-60	Ges (18) Vol % 	GPM CO GPM H.S oter Accement, Content	Gr./1	-% Oil Gravity 00 pH Water essure Base quid Ontage ENGLER: IBP 5%12 5%12 10%126 20%156 80%176 40%195 60%266 Residue Data: Mol. Wt123.913 CF/Gal19.115	14.65
TOTAL 100.00 100.00 Companion Samples BEMARKS:	Sample Method_ REMARKS: LABORATORY RE Component Hydrogen Sulfide Carbon Dioxide Nitrogen Air Methane Ethane Propane i-Butane n-Butane j-Pentane	0-60	Ges (18) Vol % 	GPM CO GPM H.S oter Accement, Content	Gr./1	% Oil Gravity	14.65
TOTAL 200.00 200.00	Sample Method REMARKS: LABORATORY RE Component Hydrogen Sulfide Carbon Dioxide Nitrogen Air Methane Ethane Fropane i-Butane n-Butane p-Pentane D-Pentane	0-60	Ges (18) Vol % Vol % 	GPM CO GPM H.S &cement, Content	Gr./1	% Oil Gravity	14.65
BEMARKS:	Sample Method REMARKS: LABORATORY RE Component Hydrogen Sulfide Carbon Dioxide Nitrogen Air Methane Ethane Fropane i-Butane n-Butane p-Pentane D-Pentane	0-60	Ges (18) Vol % Vol % 	GPM CO GPM H.S &cement, Content	Gr./1 Pr IA Vapor Press.	-% Oil Gravity con pH Water essure Base quid Ontage essure Base quid Ontage essure Base quid Ontage 5%_112 5%_112 5%_112 5%_122 50%_126 80%_176 40%_196 50%_226 60%_265 Residue Data: Mol Wt_123.913 CF/Gal_19.115 Gal/Mol_19.880 ^API57.5 Calc VP2.14	14.65
Sci RIM AL CIE INS REC BCB WS file	Sample Method_ REMARKS: LABORATORY RE Component Hydrogen Sulfide Carbon Dioxide Nitrogen Air Methane Ethane Propane i-Butane B-Butane B-Pentane B-Pentane Hexanes (†)	0-60	Ges (18) Vol. % Vol. % 4.84 4.82 7.09 3.32 7.17 6.47 6.01 6.01 6.01	GPM CO GPM H.S &cement, Content	Gr./1 Pr IA Vapor Press.	-% Oil Gravity con pH Water essure Base quid Ontage essure Base quid Ontage essure Base quid Ontage 5%_112 5%_112 5%_112 5%_122 50%_126 80%_176 40%_196 50%_226 60%_265 Residue Data: Mol Wt_123.913 CF/Gal_19.115 Gal/Mol_19.880 ^API57.5 Calc VP2.14	14.65
Sci RIM AL CIZ IRS REC BCB WS file	Sample Method_ REMARKS: LABORATORY RE Component Hydrogen Sulfide Carbon Dioxide Nitrogen Air Methane Ethane Propane i-Butane B-Butane B-Pentane Hexanes (†)	0-60	Ges (18) Vol. % Vol. % 4.84 4.82 7.09 3.32 7.17 6.47 6.01 6.01 6.01	GPM CO GPM H.S &cement, Content	Gr./1 Pr IA Vapor Press.	-% Oil Gravity con pH Water essure Base quid Ontage essure Base quid Ontage essure Base quid Ontage 5%_112 5%_112 5%_112 5%_122 50%_126 80%_176 40%_196 50%_226 60%_265 Residue Data: Mol Wt_123.913 CF/Gal_19.115 Gal/Mol_19.880 ^API57.5 Calc VP2.14	14.65
SCI RIM AL CTE INS REC BCB WS 2110	Sample Method_ REMARKS: LABORATORY RE Component Hydrogen Sulfide Carbon Dioxide Nitrogen Air Methane Ethane Propane i-Butane B-Butane B-Pentane Hexanes (†)	0-60	Ges (18) Vol. % Vol. % 4.84 4.82 7.09 3.32 7.17 6.47 6.01 6.01 6.01	GPM CO GPM H.S &cter Accement, Content GPM	Gr./1 Pr IA Vapor Press.	-% Oil Gravity con pH Water essure Base quid Ontage essure Base quid Ontage essure Base quid Ontage 5%_112 5%_112 5%_112 5%_122 50%_126 80%_176 40%_196 50%_226 60%_265 Besidue Data: Mol Wt_123.913 CF/Gal_19.115 Gal/Mol_19.880 ^API57.5 Calc VP2.14	14.65
	Sample Method_ REMARKS: LABORATORY RE Component Hydrogen Sulfide Carbon Dioxide Nitrogen Air Methane Ethane Propane i-Butane B-Butane B-Pentane Hexanes (†) TOTAL REMARKS:	0-60 : Method PORT: Mol % 11.19 .7.\$1 10.09 3.98 8.90 6.92 6.50 \$5,01 \$200.00	Ges (18) Vol % Vol % 4.84 4.82 7.09 9.32 7.17 6.47 6.01 50,28 200,00	GPM CO GPM H.S &cter Accement, Content GPM	Gr./1 Pr IA Vapor Press.	-% Oil Gravity complexity cassure Base guid Ontage ENGLER: IBP 5%12 50%22 60%22 60%26 Besidue Data: Mol. Wt123.913 CF/Gal19.115 Gal/Mol19.830 ^API57.5 Calc VP2.14 Companion Samples	14.65
	Sample Method_ REMARKS: LABORATORY RE Component Hydrogen Sulfide Carbon Dioxide Nitrogen Air Methane Ethane Propane i-Butane B-Butane B-Pentane Hexanes (†) TOTAL REMARKS:	0-60 : Method PORT: Mol % 11.19 .7.\$1 10.09 3.98 8.90 6.92 6.50 \$5,01 \$200.00	Ges (18) Vol % Vol % 4.84 4.82 7.09 9.32 7.17 6.47 6.01 50,28 200,00	GPM CO GPM H.S &cter Accement, Content GPM	Gr./1 Pr IA Vapor Press.	-% Oil Gravity complexity cassure Base guid Ontage ENGLER: IBP 5%12 50%22 60%22 60%26 Besidue Data: Mol. Wt123.913 CF/Gal19.115 Gal/Mol19.830 ^API57.5 Calc VP2.14 Companion Samples	14.65
Alexander Barter Barter Bart Materia Contra Klonka	Sample Method REMARKS: LABORATORY RE Component Hydrogen Sulfide Carbon Dioxide Nitrogen Air Methane Ethane Propane i-Butane n-Butane n-Butane D-Pentane Hexanes (†) TOTAL REMARKS: To 1	0-60 : Method PORT: Mol % 11.19 .7.41 10.09 3.96 8.90 6.92 6.50 45.01 200.00 J. F. Rol	Ges (18) Vol. % Vol. % 4.84 4.82 7.09 3.32 7.17 6.47 6.01 50.28 100.00 binson (2)	GPM CO _GPM H.S accoment, Content GPM	Gr./1 Pr IA Vapor Press.	-% Oil Gravity complexity call ontage call ontage companion Samples % Oil Gravity essure Base source and the second source and the second so	14.65
	Sample Method_ REMARKS: LABORATORY RE Component Hydrogen Sulfide Carbon Dioxide Nitrogen Air Methane Ethane Propane i-Butane n-Butane B-Pentane Hexanes (†) TOTAL REMARKS: To 1 801	0-60	Ges (18) Vol. % Vol. % 4.84 4.82 7.09 3.32 7.17 6.47 6.01 50.28 100.00 binson (2)	GPM CO _GPM H.S accoment, Content GPM	Gr./1 Pr IA Vapor Press.	-% Oil Gravity complexity call ontage call ontage companion Samples % Oil Gravity essure Base source and the second source and the second so	14.65

11 -

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

CELV 2: 1981

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

J. A. Minin

Regulatory Engineering Supervisor

HFWeaver/lcc

Attachments

cc: Mr. Jim Sperling

NEW MEXICO DEPARTMENT OF ENERGY & MINERALS

JAN 20 1981

OIL CORSTANCE OF STANSION SANTA FE

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. 7/54

APPLICATION

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: A11 Section 12: A].1 Section 13: A11 Section 14: A]] Section 15: S/2 Section 22: A11 Section 23: A11 Section 24: A11 Section 25: A11

A1]

A11

A11

A11

Section 26:

Section 27:

Section 35:

Section 36:

Township 26 North, Range 3 West, N.M.P.M.

Section	1:	A11
Section	2:	A11
Section	11:	A11
Section	12:	A11
Section	13:	A11
Section	14:	A11
Section	23:	A11
Section	24:	A11

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.

- 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.

- 2 -

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.

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

By:

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 James E. Sperling

James E. Sperling



STATE OF NEW MEXICO ENERGY AND MINERALS DEPARTMENT OIL CONSERVATION DIVISION

BRUCE KING GOVERNOR LARRY KEHDE SECRETARY

February 24, 1981

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

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

core 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. CONS RVATION DIVISION SANTA FE

February 19, 1981

NINE GREENWAY PLAZA-SUITE 2700 HOUSTON, TEXAS 77046

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,

r.a. mon

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." $\underline{1}/$

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, <u>mimeo</u>, at 50-52.

-2-

Respectfully submitted,

NORTHWEST PIPELINE CORPORATION

Of Counsel:

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

-3-

EXHIBIT 1

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27N 3W 27N 3W

27N 3W

27N 3N 27N 3N 27N 3N

27N 34 27N 34

27N 3H 27N 3H

27N 34

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36

Well Name

Cheney Federal 1>	8
Cheney Federal #3	17
Cheney Federal #2A	17
Cheney Federal #2	17
Featherstone Federal #1*	19
Jicarilla E #4	11
Jicarilla E #5	34
Jicarilla E #24	14
Jicarilla E #2	° 34
Jicarilla E #3	15
Jicarilla F #1	22
Jicarilla F #3A	22
Jicarilla F #IA	22
licarilla F #4	23
Jicarilla F #54	23
Jicarilla F #5	23
Jicarilla F #AA	23
Jicarilla F #7	24
Jicerilla G #2	25
Jicarilla G #5A	25
Jicarilla G #5	25
Jicarilla 6 18	26
Jicarilla 6 #4A	56
Jicarilla G #4	25
Jicarilla G #8A	26
Jicariila F #6	27
dicarilla F #2A	27
dicarilla F 12	27
Jicarilla F \$6A	27
Jicarilla G #1	35
Jicarilla G #3A	35
Stearilla 6 43	35
Jicarilla G flA	35
dicarilla G #7	36

Jicarilla G #7A Jicarilla G #6

This well is included in the light Sands formation if it is in lots

-3-

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

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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." $\underline{1}/$

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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.

-2-

Respectfully submitted,

-3-

NORTHWEST PIPELINE CORPORATION

Of Counsel:

Donald C. Shepler Northwest Pipeline Corporation 315 East Second South Salt Lake City, Utah 84111 Exhibit 1

Hell Naraz	Sec Twp Rge Qtr
Cheney Fedural 13	8 26N 2H M
Cheney Federal #3	17 26N 2W B
Cheney Federal #2A	17 26N 2W D (infill)
Cheney Federal #2	17 26N 2W H
Featherstone Federal #1*	19 26N 2W A
Jicarilla E #4	77 - 27N 38 - M
Jicarilla E #5	14 27N 34 A
Jicarílla E #24	14 27N 3N D (infill)
Jicarilla E #2	14 27H 34 L
Ĵicarilla E #3	15 27N 3W M
Jicarilla F #1	22 27N 3W B
Jicarilla F #3A	22 27N134 H (infill)
Jicarilla F #1A	22 27N 3N P (infill)
Jicarilla F #4	23 27H 3H A
Jicarilla F 15A	23 27N 3A C (infili)
Jicarilla F #5	23 27N 34 M
Jicarilla F #4A	23 27N 3¥ P (infill)
Bicarilla F #7	24 27N 3N M
Jicarilla G #2	25 27N 34 A
Jicarilla G 15A	25 27N 3N D (infill)
Jicarilla G #5	25 27N 34 M
Jicarilla 6 #8	26 27N 34 A
Jicarilla G #4A	26 27h 3월 Ð (infill)
Jicarilla G 44	25 27H 3H H
Jicarilla G ≇8A	26 27# 3# P (infill)
Jicarilla F £6	27 27N 3H A
dicarilla F #2A	27 27N 3₩ D (infill)
dicarilla F #2	27 27N 3N H
Jicarilla F \$6A	27 27% 3% P (infill)
Jicarilla G #1	35 27H 34 A
Sicarilla G #3A	35 27N 3H D (infill)
Sicarilla 6 43	35 27N 34 H
Jicerilla G fla	35 27H 34 P (infill)
Jizarilla G #7	36 27N 34 A
Jicarilla G #7A	35 27N 3M D (infill)
Jicarilla 6 #6	36 27N 34 M

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

-3-

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

JAN 20 1981 OIL CONSTRUCTION DIVISION SANTA FE

Case No. 7154

APPLICATION

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:

 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: A11 Section 12: A11 Section 13: A11 Section 14: All Section 15: S/2 Section 22: A11 Section 23: A11 Section 24: A11 Section 25: A11 Section 26: A11 Section 27: A11 Section 35: A11 Section 36: All

Township 26 North, Range 3 West, N.M.P.M.

Section	1:	A117
Section	2:	A11
Section	11:	A11]
Section	12:	A11
Section	13:	A11
Section	14:	A11)
Section	23:	A11)
Section	24:	A11
		_

Township 26 North, Range 2 West, N.M.P.M.

Section	7:	-Lot 4
		NE/4, S/2
Section	17:	A11
Section	18:	All
Section	19:	Lots 1, 2, 3

Containing 13,920 acres, more or less.

- 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.

~ 2 -

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,

MODRALE, SPERLING, ROEHL, HARRIS & SISK, P.A. By: 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.

AM James E.

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 tert 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 Ccunty, 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, Texnship 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.

Page 2 of 3 Examiner Hearing - Wednesday - February 11, 1981

Docket No. 5-81

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 NW44 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.

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- 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.
- <u>CASE 7153</u>: 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 less, 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 Fast, 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 No. 6-81

DOCKET: COMMISSION HEARING - WEDNESDAY - FEBRUARY 18, 1981

OIL CONSERVATION CONMISSION - 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 Pennsyl-vanian 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 JANES E. SPERLING JOSEPH Q. ROEHL GEORGE T. HARRIS, JR. JANIEL 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

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MODRALL, SPERLING, ROEHL, HARR A PROFESSIONAL ASSOCIATION

> PUBLIC SERVICE BUILDING P. O. BOX 2166 ALBUQUERQUE, NEW MEXICO 87103 505-243-451

JOHN F. SIMMS J. R. HODRALL (1902-1977) AUGUSTUS T. SEYMOUR (1907-1965)

JUD A. FRY PAUL M. FISH MARK B. THOMPSON EII GEORGE J. HOPKINS JEFFREY W. LOUBET 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

Case No. 7154 - Docket No. 5-81 Re:

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.

Mery truly yours, ames E. Sperlin

/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:

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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)

JANES E. SPERLING JOSEPH E. ROEHL GEORGE T. HARRIS, JR DANIEL A. SISK LELAND S. SEDBERRY, JR. ALLEN C. DEWEY, JR. FRANK H. ALLEN, JR. JAMES A. PARKER KENNETH L. HARRIGAN PETER J. ADANG 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

505-243-451

JOHN F. SIMMS J. R. MODRALL (1902-1977) (1885-1954) AUGUSTUS T. SEYMOUR (1907-1965)

January 19, 1981

JUDY A. FRY PAUL M. FISH MARK B. THOMPSON III GEORGE J. HOPKINS JEFFREY W. LOUBET RUTH M. SCHIFANI THOMAS L. JOHNSON LYIN H. SLADE ZACHARY L. MCCORMICK CLIFFORD K. ATKINSON DOUGLAS A. BAKER DEBORAH J. HERZBERG LARRY P. AUSHERMAN CHARLES E. STUCKEY DOUGLAS R. VADNAIS

JAN 20 1981

OIL CONSTRUCTION DIVISION

SANTA FE

Cuse 7154

Mr. Joe D. Ramey Secretary-Director Department of Energy & Minerals Oil Conservation Division P. O. Box 2088

Application of Mobil Producing Texas Re: and New Mexico, Inc. for Designation of Tight Formation, Rio Arriba County, New Mexico

Dear Mr. Ramey:

Santa Fe, New Mexico 87501

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 1MM James E. Sperling

JES/iev Enclosures

cc: J. A. Morris, w/o encl. (except Application)

ROUGH_______dr/

STATE OF NEW MEXICO ENERGY AND MINERALS DEPARTMENT OII, 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, 19⁸¹, at Santa Fe, New Mexico, before Examiner Richard L. Stame

NOW, on this <u>day of April</u>, 19<u>81</u>, 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: -2-Case No. 7154 Order No. R-

> TOWNSHIP 26 NORTH, RANGE 2 WEST, NMPM Section 7: Lot 4 Section 8: NE/4 and S/2 Section 17: Lot 4 Section 17: Lot 4 Section 17: Lot 4 Section 17: Lot 4 TOWNSHIP 26 NORTH, RANGE 3 WEST, NMPM Sections 1 and 2: All Sections 11 through 14: All Sections 23 and 24: All Sections 24

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: R/l Section 7: Lots 1, 2, and 3 Section 19: Lot 4 Section 20: W/2

> TOWNSHIP 26 NORTH, RANGE 3 WEST, NMPM Section 3: 422 E/2 Section 10: 5: 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 <u>5563</u> 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 <u>5484</u> feet to <u>6018</u> feet on the Industrian Elsetric log of the Mobil Jicavilla 'H' Wall No TA located in Unit Dog Section 1, Volonahip 26 North, Range 3 West, NMPM, run on July 15, 1976.

(9) That the Mesaverde formation underlying the abovedescribed 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

-3-

permeability, gas productivity, or crude oil productivity not in excess of the following parameters:

- (a) average <u>in situ</u> 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 crudeoil 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:

-4-

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

TOWNSHIP 26 NORTH, RANGE 3 WEST, NMPM

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Section 3:		
Section 10:	100 2/2	
Section 12:	E/2	
Sections 13	and 14: All	
Section 15:		
Sections 23	and 24: All	
and a second		
TOWNSHIP 27	NORTH, RANGE 3	WES

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 24: All Section 25: E/2 Section 28: E/2 Section 34: ATT 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

OIL CONSERVATION DIVISION SANTA FE

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. Manie

HFWeaver:1md Enclosures

J. A. Morris Regulatory Engineering Supervisor

FEDERAL ENERGY REGULATORY COMMISSIO

WASHINGTON 20426

NOV 1 8 1981

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

OIL CURSERVATION DIVISION SANTA FE

EPLY REFER TOC

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

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 <u>economically</u> 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. Joe D. Ramey

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, Director Division of NGPA Compliance

Attachment

15 FERC 161,277

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) (Coloredo - 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. EX79-76 (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 desigmated 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 <u>1</u>/ 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 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.

DC-C-37

Docket No. RM79-76

an area of not more than 160 acres, the Commission found that the incentive price was not necessary to encourage development in these fields. <u>See</u>, NGPA section 107(b). In sum, substantial development prior to the issuance of infill drilling orders <u>and</u> 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.

- 2 -

On April 29, 1981, Nountain Petroleum Corporation, along with J-W Operating Company and H. G. Westerman (hereinafter "Nountain"), filed an application for rehearing of Order No. 137 on the ground that the Naverly, Beecher Island and Mildred Fields were erroneously excluded from the Niobrara Formation's designation as a tight formation by the Commission. Although Hountain did not file comments to the Commission's Notice of Proposed Rulemsking in this docket issued on September 23, 1981, Hountain 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 J Sand case and the instant one, the portions of the formations that were excluded were

Docket No. RH79-76

those portions that were substantially developed at the time the infill drilling orders were issued. Subsequent development is no. onsidered 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 infili 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.

- 3 -

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)(1)(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, Hountain 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 wakes a contrary statement. Kountain asserts that when it initially received its 640-acre unit spacing from Colorado,

Docket No. RH79-76

ail 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, gcs-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.

- 4 -

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 Docket No. RM79-76

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area can be further developed without the tight formation incentive price. 2/Mountain rests its case on arguments, not economic facts.

- 5 -

In order for Mountain to obtain reconsideration of the excluded Waverly, Beecher Island and Hildred 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 <u>3</u>/ 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 economics], 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 gis in question, even if the section 107 price was not. Docket No. RM79-76

The Commission orders:

Based upon the foregoing discussion, the application for reheating filed by Mountain in this docket is denied.

- 6

By the Commission.

(SEAL)

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)

i

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 2008 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 he'Thterior

GEOLOGICAL SURVEY South Central Region P. O. Box 26124 Albuquerque, New Mexico 87125

OIL CONSERVATION DIVISION SANTA FE

JUL 0 2 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: E_2^{1} Sections 10, 11,12,13, 14 and 15: All Section 22: E_2^{1} Sections 23, 24, 25 and 26: All Sections 35 and 36: All

Exhibit C

TOWNSHIP 27 NORIH, 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: E₃ Sections 9, 10, 11, 12, 13, 14, 15 and 16: All Section 17: E₃ Section 20: E₃ 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: NW4 Section 8: S¹/₂ Section 9: NE¹/₄ Section 10: NW¹/₄ Section 10: NW¹/₄ Section 16: NE¹/₄ Section 17: NE¹/₄, W¹/₂ Section 19: N¹/₂ Section 20: W¹/₂ Section 30: N¹/₂ TOWNSHIP 26 NORTH, RANGE 3 WEST, NMPM Section 1: N¹/₂, SW¹/₄

Section 1: N₂, SW₄ Section 2: All Sections 3 and 10: NE¹/₄ Section 11: All Section 12: N¹/₂, SW¹/₄ Sections 13 and 14: NE¹/₄, SW¹/₄ Section 23: NE¹/₄ Section 24: NE¹/₄, SW¹/₄

TOWNSHIP 27 NORTH, RANGE 2 WEST, NMPM

Section 17: SEA Section 20: SEA Section 21: SWA Section 28: Wa Section 29: Ea TOWNSHIP 27 NORTH, RANGE 3 WEST, NMPM Section 9: E_2^* Section 10: All Section 11: W_2^* Sections 14 and 15: N_2^* , SW_3^* Section 16: NE $_4^*$ Section 21: E_2^* Sections 22 and 23: All Section 24: SW_3^* Section 25: N_2^* , SW_3^* Section 26 and 27: All Section 28: NE $_4^*$ Section 34: NE $_4^*$ Section 35: All Section 36: N_2^* , SW_3^*

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: SE4 Section 19: S¹/₂

TOWNSHIP 26 NORTH, RANGE 3 WEST, NMPM Section 12: SE4 Section 13: SE4, NW4 Section 14: SE4, NW4 Section 24: NW4

TOWNSHIP 27 NORTH, RANGE 3 WEST, NMPM Section 15: SE4

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: SW4 Section 9: SE4 Section 10: SW4 Section 16: SE4 Section 30: S4

TOWNSHIP 26 NORTH, RANGE 3 WEST, NMPM Section 1: SE4 Section 3: SE4 Section 10: SE4 Section 23: SE4 Section 24: SE4 3

TOWNSHIP 27 NORTH, RANGE 2 WEST, NMPM Section 17: NE 4 Section 20: NE4 Section 21: NW4 Section 28: E4 Section 29: W4

TOWNSHIP 27 NORTH, RANGE 3 WEST, NMPM Section 11: E¹/₂ Section 14: SE¹/₄ Section 16: SE¹/₄ Section 24: NW¹/₄ Section 25: SE¹/₄ Section 28: SE¹/₄ Section 34: SE¹/₄ Section 36: SE¹/₄

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,

Sene of Daniel Gene F. Daniel

Deputy Conservation Manager, Oil and Gas



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United States Department of the Interior

GEOLOGICAL SURVEY South Central Region P. O. Box 26124 Albuquerque, New Mexico 87125

OIL CONSERVATION DIVISION SANTA FE

JUL 0 2 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: E_2^{+} Sections 10, 11,12,13, 14 and 15: All Section 22: E_2^{+} 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

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TOWNSHIP 27 NORTH, RANGE 3 WEST, NMPM Section 8: E₂ Sections 9, 10, 11, 12, 13, 14, 15 and 16: All Section 17: E₂ Section 20: E₂ 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: NW4 Section 8: St Section 9: NEt Section 10: NW4 Section 16: NEt Section 16: NEt Section 17: NEt, W2 Section 19: N2 Section 20: W2 Section 30: N2

> TOWNSHIP 26 NORTH, RANGE 3 WEST, NMPM Section 1: N¹/₂, SW¹/₄ Section 2: All Sections 3 and 10: NE¹/₄ Section 11: All Section 12: N¹/₂, SW¹/₄ Sections 13 and 14: NE¹/₄, SW¹/₄ Section 23: NE¹/₄ Section 24: NE¹/₄, SW¹/₄

> TOWNSHIP 27 NORTH, RANGE 2 WEST, NMPM Section 17: SE4 Section 20: SE4 Section 21: SW4 Section 28: W2 Section 29: E2

TOWNSHIP 27 NORTH, RANGE 3 WEST, NMPM Section 9: E_2^* Section 10: All Section 11: W_2^* Sections 14 and 15: N_2^* , SW_4^* Section 16: NE $_4^*$ Section 21: E_2^* Sections 22 and 23: All Section 24: SW_4^* Section 25: N_2^* , SW_4^* Sections 26 and 27: All Section 28: NE $_4^*$ Section 34: NE $_4^*$ Section 35: All Section 36: N_2^* , SW_4^*

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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: SE4 Section 19: St

TOWNSHIP 26 NORTH, RANGE 3 WEST, NMPM Section 12: SE4 Section 13: SE4, NW4 Section 14: SE4, NW4 Section 24: NW4

TOWNSHIP 27 NORTH, RANGE 3 WEST, NMPM Section 15: SE4

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: SW4 Section 9: SE4 Section 10: SW4 Section 16: SE4 Section 30: S4

TOWNSHIP 26 NORTH, RANGE 3 WEST, NMPM

Section 1: SE⁴ Section 3: SE⁴ Section 10: SE⁴ Section 23: SE⁴ Section 24: SE⁴ 3

TOWNSHIP 27 NORTH, RANGE 2 WEST, NMPM Section 17: NE & Section 20: NE& Section 21: NW& Section 28: E Section 29: W¹/₂

TOWNSHIP 27 NORTH, RANGE 3 WEST, NMPM Section 11: E2 Section 14: SE2 Section 16: SE3 Section 24: NW2 Section 25: SE3 Section 28: SE3 Section 34: SE3 Section 36: SE3

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

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, RID 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 <u>4th</u> 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

-2-Case No. 7154 Order No. R-6678

> 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 -3-Case No. 7154 Order No. R-6678

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 abovedescribed 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.

-4-Case No. 7154 Order No. R-6678

(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

SEAL

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

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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: Section 24: E/2 A11 Section 25: E/2 Section 28: E/2 Section 34: E/2 Section 36: S/2

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STATE OF NEW MEXICO ENERGY AND MINERALS DEPARTMENT OIL CONSERVATION DIVISION

BRUCE KING GOVERNOR LARRY KEHOE SECRETARY

May 6, 1981

POST OFFICE 80% 01 STATE LAND OFFICE 1 SANTA FE, NEW MERCIO 41 (505) 827-2434

Re: CASE NO.

Mr. James Sperling Modrall, Sperling, Roehl, Harris & Sisk Attorneys at Law Post Office Box 2168 Albuquerque, New Mexico 87103 ORDER NO. <u>R-6678</u>

Applicant:

Mobil Producing Texas and New Mexico, Inc.

7154

Dear Sir:

Enclosed herewith are two copies of the above-referenced Division order recently entered in the subject case.

Pours very truly JOE D. RAMEY Director

JDR/fd

Copy of order also sent to:

Hobbs OCD	x
Artesia OCD	x
Aztec OCD	×

Other William F. Carr

NEW MEXICO DEPARTMENT OF ENERGY & MINERALS OIL CONSERVATION DIVISION JAN 20 1981

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OIL COME AMAIN & MAISION SANTA FE

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

APPLICATION

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:

 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: A11 Section 12: A11 Section 13: A11 Section 14: A11 Section 15: S/2 Section 22: A11 Section 23: A11 Section 24: A11 Section 25: A11 Section 26: A11 Section 27: A11 Section 35: A11 Section 36: A11

Township 26 North, Range 3 West, N.M.P.M.

Section	1:	A11
Section	2:	A11
Section	11:	A11
Sect: on	12:	A11
Section	13:	A11
Section	14:	A11
Section	23:	A11
Section	24:	A11

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.

- 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.

- 2 -

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.

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

By:

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

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EXHIBIT 1 Blanco Mesa Verde Completions Map folder EXHIBIT 2 -Cumulative Mesa Verde Gas Production Map folder EXHIBIT 3 Summary of Post Frac Permeabilities 5 Pressure Buildup Analysis Jicarilla 'G' #1-A EXHIBIT 4 6 EXHIBIT 5 Pressure Buildup Analysis 7 Jicarilla 'H' #2-A EXHIBIT 5A Calculation of Pre Frac 8 Permeability Summary of Mesa Verde Whole Core EXHIBIT 6 9 Permeabilities Summary of Mesa Verde Initial Natural Flow rates EXHIBIT 7 10 EXHIBIT 8 Fluid Analysis - Jicarilla 'H' #1 11 EXHIBIT 9 Average Condensate Production Map folder EXHIBIT 10 Initial Natural Flow Rates Map folder EXHIBIT 11 Mesa Verde Cross Section Map folder **EXHIBIT 12** Mesa Verde Completion Map and Current Production Map folder EXHIBIT 13 Mesa Verde Structure Map Map folder

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.
<u>History</u>:

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.

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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 The other well was cored in only well averaged 0.032 md. 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.

- 3 -

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 <u>not</u> in a fluid state in the reservoir, but becomes so at surface conditions.

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 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 waterbearing 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 chall 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.	<u>kh* (md ft)</u>	<u>h (ft)</u>	<u>k (md)</u>
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
	$\frac{9.1 \text{ md } \text{ft}}{22 \text{ ft}} = 0.$	1 10 ma – <u></u>	<u>0 md</u> samples

k = permeability

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h = contributing formation interval

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

CHRONOLOGICAL PRESSURE AND PRODUCTION DATA

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at (hrs)		$\frac{t + \Delta t}{\Delta t}$	BHP
Flowing			490
.25		1045	530
.50		523	541
.75		349	550
1		262	
1			561
2		131.5	594
3		88	612
4		66.2	630
5		53.2	644
5 6 7 8		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	5 S	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
6 6		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

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

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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 (\emptyset) = 14% Formation water saturation (Sw) = 34%Bottom hole flowing pressure (Pwf) = 490 psia Gas specific gravity = .688Formation temperature = $142^{\circ}F$ = $602^{\circ}R$ 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 (\mathbf{B}) = .8957 gas viscosity $(\mu) = 0.01372$ centipoise gas formation volume factor (Bg) = .02829 \underline{Bt} cu ft/_{SCF} = (.02829)(.8957)(602) cu ft/_{SCF} 935 = .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} $kh = \frac{162.6 \text{ x rate x viscosity x formation volume factor}}{\text{slope of straight line of buildup plot}}$ $kh = \frac{162.6 \times Q \times Q}{m} = \frac{162.6 \times 1000 \times 0.01372 \times 2.91}{710} = 9.14 \text{ md ft}$ 9.14 md - ft = .063 md146 feet

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

CHRONOLOGICAL PRESSURE AND PRODUCTION DATA

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∆ t (hrs)		$\frac{t + \Delta t}{\Delta t}$	B	HP
Flowing .25 .5 .75 1.0 1.5 2 3 4 6 8 10 12 16 20 24 28 32 36 40 44 48 54 60 70 80 90 100 100 110 120 130 140 150 160		$\begin{array}{c} 680\\ 1369\\ 685\\ 457\\ 343\\ 229\\ 172\\ 115\\ 86.5\\ 58\\ 44\\ 35\\ 30\\ 22\\ 18\\ 15.2\\ 13.2\\ 11.7\\ 10.5\\ 9.6\\ 8.8\\ 8.1\\ 7.3\\ 6.7\\ 5.9\\ 5.3\\ 4.8\\ 4.4\\ 4.1\\ 3.8\\ 3.6\\ 3.4\\ 3.3\\ 3.1\end{array}$	8) 8) 8) 8) 9) 9) 9)	60 80 01 32 57 78 94 10 23 37 46 55 69 83 98 12 26 37 48 58 64 71 78
165		3.07	13	
		- 7 -		
	•		т., <u>,</u>	. in 1997 - 1997
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EXHIBIT 5

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

	Q t h		17 34 12 14	700 N 42 hi 22 ft 4%	ACF S	PD		÷	Gas	gra	Pwf vity	= ,6	30 psi		PR
from BH	P vs	5.	<u>t +</u>	$\frac{\Delta t}{t}$:	ដា	#	300	psi	/cyc	le	~			
Average	Pre	essi	ure	(P)	=	<u></u> P *	+ 2	<u>Pwf</u>	= <u>15</u>	<u>30 +</u> 2	<u>680</u>	=	1105	psia	
@ 1105	psi	ia	and	1420	PF:			ع = بير = Bg =	0.0	1410	cp. eser	voir	bbl/M	CF	
kh	=	16	2.6 r	x Q n	хд	X	Bg	=	<u>16</u>	2.6	<u>x 17</u>	00 x	0.014	10 x	2.469
				md-1					;						
	k	=	<u>32</u> 122	md-1 ft	[t	=	0.2	62 md							
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EXHIBIT 5A

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





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 $Kh(true) = .28 \times Kh$ apparent = .28 x 32 md ft = 8.96 md ft

 $K = \frac{8.96 \text{ md ft}}{122^{1}} = .0734 \text{ md}$

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EXHIBIT 5A

HYDRAULIC PRACTINEING TARATHENT SCHEDULE Jicarilia "H" Wrij, NG, 2-A Blando Mesa Vrade Firto Rio Arriba County, New Merico

								Fluid						
	Treeting	3404	Treating Fluid Volume		Reducing Agt	Cellin		Ager			ing Agent		Sond Date	
	Rate	Fluid	end	Type	Conc	Type	Cone	Type	Cone	type	Cone	Hunh	Cone	Quantity
Formation	(bbts/als)	Туре	Туре		(#/1000 gals)	لم	#/1000 gale)		(#/1000 gala)		(#/1000 gals)	\$1.10	(f/gel)_	(Lbg)
Lover Mess Yerde														
(5754'-5920'-166'OA-42 heles)	50	11 KCL	5,000 gals, Prepad	FR-20	3.0	None	0	M·M	30	- fve f	1.0	None	0,0	0
			10,000 gals. Versegel	Pad None	0.0	90-11	40	- **	**	*		None	0.0	0
	•	•	7,500 gals.Versagel	••	•	-			h	•	M	20-40	1.0	7,500
	M		7,500 gals, Versagel	н			-		-	-	-	•	1.0	15,000
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		•	22,500 gale.Versegel		•	•	-		-	*	•	•	4,0	90,000
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	~ 70		10,000 gals, Versagel		0,0	VC-11	40		~			lione	0,0	ŏ
-	-	-		Les bound	0,0							20-40	1.0	7,500
	-	-	7,500 gals.Versegel									20-40	2.0	15,000
		-	7,500 gals.Versegal										3,0	22,500
	-	-	7,500 Bals.Versagel	-					<u> </u>				4.0	- 90,000
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~	· ••		5,000 guls.Versagel			- -		-	-	-	-	20-40	1.0	5,900
	*		5,000 gals.Versagel			-	-		-		-	-	2.0	10,000
	-		5,000 gats.Versagel				-	-			-		3.0	15,000
			15,000 gals.Versegel		-	-	•	-	-		•	-	4.0	60,000
				DROP 4	RCNBS									
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		•	5,500 gals, Varsagel	Fad None	0.0	NC-11	60	•	ં સ			None	0.0	0
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	*	•	5,000 gels, Versagel	•		ы		•			•	M	3,0	15,000
	4	-	15,000 gals, Versagel		-	-	-	-	-		-	•	4,0	\$0,000
				DROP 4	RCNBS									
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			5,000 gals.Versagel					•				*	2.0	10,000
			5,000 gals, Versagel							-			3,0	15,000
	•		15,000 gals, Versagel				· •	-	-		•	1 m	4,0	60,000
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	- 1 - N	-	15,000 gals, Versegel				-			-	*	20-40		15,000
		-	15,000 gals, Verwagel		•	•	-				•	-	2.0	30,000
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	-		45,000 gale.Versagel		•	н	-			м	•	•	4.0	180,000

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AD-Aq = Adomite Aqua Surf = Houco Suda

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· ·	CH - FLUID 1098 SPURT 1088 - GAL		SOPT (MIN)			0.001 0.	0n	
	TYPE DE GEL GEL CONCENTRATIO	н				HG-11 4(m/M		
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	WELL SPACING - A DPAINAGE PADIUS	CPES		•		350.		
	WELLINDEF PADIUS				41 *	0.400		
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7	1 8.7 7.3	60.0 15			535.	0.614 2		Q.
	2 4.0 7.3	70.0 18		•	560.	n.639 2		o.
X4 = 1000'	3 4.2 8.9 ≻ ≮3 8.9	90.0 21 86.0 23	.7 1000	100.0	582. 594	0.661 2 0.674 3	129.	0. 0.
	4 4,4 8,9	90.0 24		100.0	601.	0.682 3		0.
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		L	<u> </u>	<u> </u>					annan a' Listaine annanana
		-				COST	S ZWHOLE DOLL	.ARS/	
						ACTU	L.	ESTI	MATED
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ERILLING CO FOOTAGE						57,102			
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	ING AND ST	IMULAT	10N			162,872			
	IT RENTAL					1,297			
HISCELLA						6 • 6 9 0		-	
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TOTAL	. INTANGIBL	LE COST	\$				337,874	3	71,000
WELL EQUIPH	IENT		,						
CASING	11 1 T 25 54 C 44 T					34,655			
OTHER EC	UTANENT					6,976-			
TOTAL	TANGIBLE	COSTS					27+679		
TOTAL	COSTS						365,553	3	71,400
APPR	XIMATE COS	ST TO M	081L				365+553		

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EXHIBIT 6 PERMEABILITY BASED ON CORE ANALYSIS BLANCO MESA VERDE FIELD

	-			Reduced k
Lease and Well No.	No. of <u>Samples</u>	Summation of All k Values	<u>Average k</u>	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

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ا نىپ only one out of three intervals was cored



Fro. 2-46. Changes in permeability with overburden pressure. (a) <u>Curve A-Colorado: 3.96 millidarcys</u>; B-Southern California coast, 40.9; C-San Jonquin 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.^m)

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

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

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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 = <u>1955 MCFPD</u> Total = 150 MCFPD 13 wells

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

* See discussion for explanation

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· · · Lobo · ·	Same 25 19	NRC)	Tana Mana	Jicarilla "I"	Well No. 1 M
Container No. 4042 An	alysis No. 12		District	Les	State Nev Mexico
Container Pressure 570 paia	e 10 90	*F. (Field)	Operator	Magnolis Petro	Leum Co.
	e)	•F. (Lab.)			decounty Rio Arriba
Date Sampled 5-20-58	1	·····	Field	Mosayerde	Depth 5386-5880
Stream Sampled Separator L	No. Jacob	tast	Sand	5900' Part	380-5880 Shote 6/2t
Volume of Stream Sampled 3.21	PPIB/067 1		Well Depth		•
Sample Requested by R. D. Mya	50 Su	bmitted byL	ee E. Robin	Analyzed by	eters & Willbanks- 6-11-58
FIELD TESTS AND OPERATING	DATA:		B	н. Полаго 10-10-	<u>ө-ш-х,</u>
Pressures: Bottombole			1 emperature	: Bottomhole	70 est.
Shutin Casing	1039		-	Flowing Wellhead	Bone
Shutin Tubing	- 570		-	Heater Inlet	bone
Flowing Tabing			-	Heater Outlet	70
Flowing Casing	• 570			Primary Sep. Gas.	70
Primary Separator	· 2/0		-	Primary Sep. Oil	70
Secondary Separator			- ·	Meter Run	
Stock Tank	·Ata.	· · · · ·		Stock Tank	and the second
· · · · · · · · · · · · · · · · · · ·				Atmospheric	75
Choke Sizes: Tubing		Casing 200	بالمدعود بمتدا فكتند وكالوات والأعبر بهره	Hester	
Production Rate: Primary Sep. Ga		/₽	Ratios: Sep. G		3.6 MCF/Dbl. est.
Primary Sep. Oil.					1.4 MCF/bbl
Primary Sep. We	ater 10 bbl/	day (est)	-	as/Stock Water	
Stock Tank Oil	<u> </u>	bl/day	_ Sep. G	us/Sep. Oll	an chown
Stock Tank Wate			Overal	Gas/Liquid	
Potential Rates: Gas_5,731 M	cf/day pil	<u>ot</u>	_Allowable Rate	e: Gas	
Qil			-	Oil	
Disposition Production: GasP	a. IV pipe	line		0i1	tank timek
Field Tests: Charcoal 80-32		GPM Air		6 Gas Gravity	
0-82				6 Oil Gravity	
0-60		PM H.S	Gr./10	•	· · ·
	rifice Net		Pre	-	14.65
	as displac			uid Outage	
Sample Method			Laq	and Oatage	
REMARXS:				<u> </u>	
		······			
REMARXS:		Content		NGLER: IBP_9	0°F. 70%_351_
REMARKS:	Vol. %	Content GPM		NGLER: IBP_9 54 11	
REMARXS: LABORATORY REPORT: Component Mol. %	Vol. %		Vapor El	5% 11	2 80% 537
REMARKS: LABORATORY REPORT: Component Mol. % Hydrogen Sulfide	Vol. %		Vapor El	5% 11 10% 12	2 80%_ <u>537_</u> 6 90%
REMARXS: LABORATORY REPORT: Component Mol. % Hydrogen Sulfide Carbon Dioxide	Vol. %		Vapor El	5% 11 10% 12 20% 15	2 80% <u>537</u> 6 90% 90% 95% 95%
REMARXS: LABORATORY REPORT: Component Mol. % Hydrogen Sulfde Carbon Dioxide Nitrogen	Vol. %		Vapor El	5% 11 10% 12 20% 15 80% 17	2
REMARXS: LABORATORY REPORT: Component Mol. % Hydrogen Sulfide Carbon Dioxide Nitrogen Air			Vapor El	5%_11 10%_12 20%_15 80%_17 40%_19	2 80% 537 6 90% 0 95% 6 EP 674 3 Rec 86.5
REMARXS: LABORATORY REPORT: Component Mol. % Hydrogen Sulfide Carbon Dioxide Nitrogen Air Methane 11.19			Vapor El	5%_11 10%_12 20%_15 80%_17 40%_19 50%_22	2 80% 537 6 90% 0 95% 6 EP 6 EP 6 Rec. 8 80%
REMARXS: LABORATORY REPORT: Component Mol. % Hydrogen Sulfide Carbon Dioxide Nitrogen Air Methane Ethane 7.41	<u> </u>		Vapor El	5%_11 10%_12 20%_15 20%_15 20%_17 40%_19 50%_22 60%_26	2 80% 537 6 90% 0 95% 6 EP 67b 3 Rec. 66.5 6 Res. 9.5 7 Loss 4.0
REMARXS: LABORATORY REPORT: Component Mol. % Hydrogen Sulfide Carbon Dioxide Nitrogen Air Methane 11.19 Ethane 7.41 Propane 10.09	<u>k.84</u> <u>k.82</u> 7.09		Vapor El Press.	5%_11 10%_12 20%_15 20%_17 40%_19 50%_22 60%_26	2 80% 537 6 90% 0 95% 6 EP 67b 8 Rec. 86.5 6 Res. 9.5 7 Loss 4.0 (*API Gravity @ 60°F
REMARXS: LABORATORY REPORT: Component Mol. % Hydrogen Sulfide Carbon Dioxide Nitrogen Air Methane Ethane T.119 Ethane T.119 Ethane T.119 Ethane T.119 Ethane T.119 Ethane T.119 Sthane T.119 Ethane T.119 Sthane T.119 Sthane T.119 Sthane T.119 Sthane T.119 Sthane T.119 Sthane T.119 Sthane T.119 Sthane T.119 Sthane T.119 Sthane T.119 Sthane T.119 Sthane T.119 Sthane T.119 Sthane T.119 Sthane T.119 Sthane T.119 Sthane T.119 Sthane Sthane T.119 Sthane Sthane T.119 Sthane T.119 Sthane T.119 Sthane T.119 Sthane T.119 Sthane T.119 Sthane T.119 Sthane T.119 Sthane T.119 Sthane T.119 Sthane T.119 Sthane T.119 Sthane T.119 Sthane T.119 Sthane T.119 Sthane T.119 Sthane T.119 Sthane T.119 Sthane	<u>k.84</u> <u>k.82</u> <u>7.09</u> <u>3.32</u>		Vapor El Press.	5%_11 10%_12 20%_15 20%_17 40%_19 50%_22 60%_26	2 80% 537 6 90% 0 95% 6 EP 67b 8 Rec. 86.5 6 Res. 9.5 7 Loss 4.0 (*API Gravity @ 60°F
REMARXS: LABORATORY REPORT: Component Mol. % Hydrogen Sulfide Carbon Dioxide Nitrogen Air Methane Ethane Propane 10.09	<u>k.84</u> <u>k.82</u> 7.09		Vapor El Press.	5% 11 10% 12 20% 15 20% 17 40% 19 50% 22 60% 26 sidue Data: Mol. Wt_123.913	2 80% 537 6 90% 0 95% 6 EP 67b 3 Rec. 86.5 6 Res. 9.5 7 Loss 4.6 7 API Gravity @ 60°F 8 Reid Vapor Pressura
REMARKS: LABORATORY REPORT: Component Mol. % Hydrogen Sulfide Carbon Dioxide Nitrogen Air Methane Fropane i-Butane B-Butane B-Sutane B-Sutane B-Sutane	<u>k.84</u> <u>k.82</u> <u>7.09</u> <u>3.32</u>		Vapor El Press.	5% 11 10% 12 20% 15 20% 17 40% 19 50% 22 60% 26 sidue Data: Mol. Wt_123.913 CF/Gal_19.115	2 80% 537 6 90% 0 95% 6 EP 67b 3 Rec. 86.5 6 Res. 9.5 7 Loss 4.0 7 API Gravity @ 60°F Reid Vapor Pressura
REMARKS: LABORATORY REPORT: Component Mol. % Hydrogen Sulfide Carbon Dioxide Nitrogen Air Methane 11.19 Ethane 7.41 Propane i-Butane 8.90 i-Pentane 6.92	4.8 4.8 4.8 7.09 3.32 7.17 6.4 7		Vapor El Press.	5% 11 10% 12 20% 15 80% 17 40% 19 50% 22 60% 26 midue Data: Mol. Wt 123.913 CF/Gal 19.115 Gal/Mol 19.880	2 80% 537 6 90% 90% 90% 90% 90% 6 95% 6 EP 67h 8 Rec. 66.5 6 Res. 9.5 7 Loss 4.6 7 Loss 4.6 6 Reid Vapor Pressure 26/70 Equiv 26/70 Equiv
REMARKS: LABORATORY REPORT: Component Mol. % Hydrogen Sulfide Carbon Dioxide Nitrogen Air Methane 11.19 Ethane 7.41 Propane 10.09 i-Butane B-Butane B-Sutane B-Pentane B-Pentane C.50	4.84 4.82 7.09 3.32 7.17 6.47 6.01		Vapor El Press.	5% 11 10% 12 20% 15 20% 15 80% 17 40% 19 50% 22 60% 26 esidue Data: Mol. Wt_123.913 CF/Gal_19.115 Gal/Mol_19.880 *API_57.5	2 80% 537 6 90% 0 95% 6 85% 6 86% 8 86% 8 86% 8 86% 8 86% 9 86% 6 86% 7 1083 6 9.5 7 1083 8 9.5 7 1083 8 9.5 9.5 9.5 7 1083 9.5 9.5 7 1083 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.6 9.5 9.6 9.5 9.6 9.5 9.6 9.5 9.6 9.5 9.6 9.5 9.6 9.5 9.6 9.5
REMARKS: LABORATORY REPORT: Component Mol. % Hydrogen Sulfide Carbon Dioxide Nitrogen Air Methane 11.19 Ethane 7.41 Propane i-Butane 8.90 i-Pentane 6.92	4.8 4.8 4.8 7.09 3.32 7.17 6.4 7		Vapor El Press.	5% 11 10% 12 20% 15 20% 15 20% 17 40% 19 50% 22 60% 26 csidue Data: Mol. Wt. 123.913 CF/Gal 19.115 Gal/Mol 19.880 *API 57.5 Calc. VP 2.14	2 80% 537 6 90% 0 95% 6 85% 6 86% 8 86% 8 86% 8 86% 8 86% 9 86% 6 86% 7 1083 6 9.5 7 1083 8 9.5 7 1083 8 9.5 9.5 9.5 7 1083 9.5 9.5 7 1083 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.6 9.5 9.6 9.5 9.6 9.5 9.6 9.5 9.6 9.5 9.6 9.5 9.6 9.5 9.6 9.5
REMARXS: LABORATORY REPORT: Component Mol. % Hydrogen Sulfide Carbon Dioxide Nitrogen Air Methane 11.19 Ethane 7.41 Propane 10.09 i-Butane 3.98 n-Pentane 6.50 Heranes (†)	4.84 4.82 7.09 3.32 7.17 6.47 6.01 60.28		Vapor El Press.	5% 11 10% 12 20% 15 20% 15 80% 17 40% 19 50% 22 60% 26 esidue Data: Mol. Wt_123.913 CF/Gal_19.115 Gal/Mol_19.880 *API_57.5	2 80% 537 6 90% 0 95% 6 85% 6 86% 8 86% 8 86% 8 86% 8 86% 9 86% 6 86% 7 1083 6 9.5 7 1083 8 9.5 7 1083 8 9.5 9.5 9.5 7 1083 9.5 9.5 7 1083 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.6 9.5 9.6 9.5 9.6 9.5 9.6 9.5 9.6 9.5 9.6 9.5 9.6 9.5 9.6 9.5
REMARXS: LABORATORY REPORT: Component Mol. % Hydrogen Sulfide Carbon Dioxide Nitrogen Air Methane 11.19 Ethane 7.41 Propane 10.09 i-Butane 3.98 n-Butane 6.92 n-Pentane 6.50 Heranes (†) 45.01 TOTAL	4.84 4.82 7.09 3.32 7.17 6.47 6.01		Vapor El Press.	5% 11 10% 12 20% 15 20% 15 20% 17 40% 19 50% 22 60% 26 csidue Data: Mol. Wt. 123.913 CF/Gal 19.115 Gal/Mol 19.880 *API 57.5 Calc. VP 2.14	2 80% 537 6 90% 0 95% 6 85% 6 86% 8 86% 8 86% 8 86% 8 86% 9 86% 6 86% 7 1083 6 9.5 7 1083 8 9.5 7 1083 8 9.5 9.5 9.5 7 1083 9.5 9.5 7 1083 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.6 9.5 9.6 9.5 9.6 9.5 9.6 9.5 9.6 9.5 9.6 9.5 9.6 9.5 9.6 9.5
REMARXS: LABORATORY REPORT: Component Mol. % Hydrogen Sulfide Carbon Dioxide Nitrogen Air Methane 11.19 Ethane 7.41 Propane 10.09 i-Butane 3.98 n-Pentane 6.50 Heranes (†)	4.84 4.82 7.09 3.32 7.17 6.47 6.01 60.28		Vapor El Press.	5% 11 10% 12 20% 15 20% 15 20% 17 40% 19 50% 22 60% 26 csidue Data: Mol. Wt. 123.913 CF/Gal 19.115 Gal/Mol 19.880 *API 57.5 Calc. VP 2.14	2 80% 537 6 90% 0 95% 6 85% 6 86% 8 86% 8 86% 8 86% 8 86% 9 86% 6 86% 7 1083 6 9.5 7 1083 8 9.5 7 1083 8 9.5 9.5 9.5 7 1083 9.5 9.5 7 1083 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.6 9.5 9.6 9.5 9.6 9.5 9.6 9.5 9.6 9.5 9.6 9.5 9.6 9.5 9.6 9.5
REMARXS: LABORATORY REPORT: Component Mol. % Hydrogen Sulfide Carbon Dioxide Nitrogen Air Methane 11.19 Ethane 7.41 Propane 10.09 i-Butane 3.98 n-Butane 6.92 n-Pentane 6.50 Heranes (†) 45.01 TOTAL	<u>4.84</u> <u>4.82</u> <u>7.09</u> <u>3.32</u> <u>7.17</u> <u>6.47</u> <u>6.01</u> <u>60.28</u> <u>100.00</u>		Vapor El Press.	5% 11 10% 12 20% 15 20% 15 20% 15 20% 15 20% 17 40% 19 50% 22 60% 26 esidue Data: Mol. Wt 123.913 CF/Gal 19.115 Gal/Mol 19.680 *API 57.5 Calc. VP 2.14 companion Samples	2 80% 537 6 90% 0 95% 6 85% 6 86% 8 86% 8 86% 8 86% 8 86% 9 86% 6 86% 7 1083 6 9.5 7 1083 8 9.5 7 1083 8 9.5 9.5 9.5 7 1083 9.5 9.5 7 1083 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.6 9.5 9.6 9.5 9.6 9.5 9.6 9.5 9.6 9.5 9.6 9.5 9.6 9.5 9.6 9.5
REMARXS: LABORATORY REPORT: Component Mol. % Hydrogen Sulfide Carbon Dioxide Nitrogen Air Methane 11.19 Ethane 7.41 Propane 10.09 i-Butane 3.98 n-Butane 6.92 n-Pentane 6.50 Heranes (†) TOTAL 100.00 REMARKS:	<u>4.84</u> <u>4.82</u> <u>7.09</u> <u>3.32</u> <u>7.17</u> <u>6.47</u> <u>6.01</u> <u>60.28</u> <u>100.00</u>		Vapor El Press.	5% 11 10% 12 20% 15 20% 15 20% 17 40% 19 50% 22 60% 26 csidue Data: Mol. Wt. 123.913 CF/Gal 19.115 Gal/Mol 19.880 *API 57.5 Calc. VP 2.14	2 80% 537 6 90% 0 95% 6 85% 6 86% 8 86% 8 86% 8 86% 8 86% 9 86% 6 86% 7 1083 6 9.5 7 1083 8 9.5 7 1083 8 9.5 9.5 9.5 7 1083 9.5 9.5 7 1083 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.6 9.5 9.6 9.5 9.6 9.5 9.6 9.5 9.6 9.5 9.6 9.5 9.6 9.5 9.6 9.5
REMARKS: LABORATORY REPORT: Component Mol. % Hydrogen Sulide Carbon Dioxide Nitrogen Air Methane 11.19 Ethane 7.41 Propane 10.09 i-Butane 3.98 B-Butane 5.90 i-Pentane 6.92 B-Pentane 5.90 Heranes (†) TOTAL 10.00 REMARKS: Tot L. F. Robin	<u>4.84</u> <u>4.82</u> <u>7.09</u> <u>3.32</u> <u>7.17</u> <u>6.47</u> <u>6.01</u> <u>60.28</u> <u>100.00</u>	GPM	Vapor El Press.	5% 11 10% 12 20% 15 20% 15 20% 15 20% 15 20% 17 40% 19 50% 22 60% 26 esidue Data: Mol. Wt 123.913 CF/Gal 19.115 Gal/Mol 19.680 *API 57.5 Calc. VP 2.14 companion Samples	2 80% 537 6 90% 0 95% 6 EP 67b 3 Rec. 66.5 6 Res. 9.5 7 Loss 4.0 7 API Gravity @ 60°F Reid Vapor Pressure 26/70 Equiv Rurrell: Air CO2
REMARKS: LABORATORY REPORT: Component Mol. % Hydrogen Sulide Carbon Dioxide Nitrogen Air Methane 11.19 Ethane 7.41 Propane 10.09 i-Butane 3.98 B-Butane 5.90 i-Pentane 6.92 B-Pentane 5.90 Heranes (†) TOTAL 10.00 REMARKS: Tot L. F. Robin	<u>4.84</u> <u>4.82</u> <u>7.09</u> <u>3.32</u> <u>7.17</u> <u>6.47</u> <u>6.01</u> <u>60.28</u> <u>100.00</u>	GPM	Vapor El Press.	5% 11 10% 12 20% 15 20% 15 80% 17 40% 19 50% 22 60% 26 esidue Data: Mol. Wt_123.913 CF/Gal_19.115 Gal/Mol_19.880 *API_57.55 Calc. VP_2.1A pmpanion Samples	2 80% 537 6 90% 0 95% 6 EP 67b 3 Rec. 66.5 6 Res. 9.5 7 Loss 4.0 7 API Gravity @ 60°F Reid Vapor Pressure 26/70 Equiv Rurrell: Air CO2
REMARKS: LABORATORY REPORT: Component Mol. % Hydrogen Sulide Carbon Dioxide Nitrogen Air Methane 11.19 Ethane 7.41 Propane 10.09 i-Butane 3.98 B-Butane B-Butane B-Pentane 6.92 R-Pentane Carbon Dioxide 11.19 TOTAL 10.09 i-Butane 10.00 Berauce (†) 10.00 EBUARKS: TOTAL 200.00 REMARKS: TOTAL CTE	<u>4.84</u> <u>4.82</u> <u>7.09</u> <u>3.32</u> <u>7.17</u> <u>6.47</u> <u>6.01</u> <u>60.28</u> <u>100.00</u>	GPM	Vapor El Press.	5% 11 10% 12 20% 15 20% 17 40% 19 50% 22 60% 26 esidue Data: Mol. Wt 123.913 CF/Gal 19.115 Gal/Mol 19.680 • API 57.5 Calc. VP 2.1A pompanion Samples	2 80% 537 6 90% 0 95% 6 EP 67b 3 Rec. 66.5 6 Res. 9.5 7 Loss 4.0 7 API Gravity @ 60°F Reid Vapor Pressure 26/70 Equiv Rurrell: Air CO2