CASE 7087: BLACKWOOD & NICHOLS COMPANY, LTD. FOR DESIGNATION OF A TIGHT FORMATION, SAN JUAN AND RIO ARRIBA COUNTIES,

Case No.

7087

Application

Transcripts

Small Exhibits

ETC

Husky

Husky Oil Company

600 South Cherry Street
Denver, Colorado 80222
(303) 370-1300

April 9, 1981

1087

Federal Energy Regulatory Commission
Office of General Counsel
825 North Capitol Street, N.E.
Washington, D.C. 20426
Attn; Leslie Lawner

Dear Sirs:

RE: Docket No. RM79-76 (New Mexico-4)
NOTICE OF PROPOSED RULEMAKING
BY DIRECTOR OPPR

Husky Oil Company ("Husky") is active in oil and gas exploration, development and production. Husky currently has gas production in the State of New Mexico, including San Juan and Rio Arriba counties.

Husky wishes to support the recommendation of the State of New Mexico Oil Conservation Division that the Fruitland Formation be designated as a tight formation under the Commission's final regulation, 18 CFR 271.703. Husky believes that such a designation will offer the needed economic stimulus for further natural gas exploration in this area. Husky further believes that the technology required to protect the environment is currently available.

Thank you for the opportunity to comment.

Sincerely,

Gretchen J. Scrivner
Manager, Natural Gas Supply

GJS:ss

cc: New Mexico Oil Conservation Division

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. 7087
Order No. R-6594

APPLICATION OF BLACKWOOD &
NICHOLS CO., LTD. FOR DESIG-
NATION OF A TIGHT FORMATION,
SAN JUAN AND RIO ARRIBA COUNTIES,
NEW MEXICO.

ORDER OF THE DIVISION

BY THE DIVISION:

This cause came on for hearing at 9 a.m. on November 12, 1980, at Santa Fe, New Mexico, before Examiner Richard L. Stamets.

NOW, on this 23rd day of February, 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, Blackwood & Nichols Co., Ltd., 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 Fruitland formation underlying the following lands situated in San Juan and Rio Arriba Counties, approximately 18 miles east of the city of Aztec, New Mexico, hereinafter referred to as the Fruitland formation, be designated as a tight formation in said Federal Energy Regulatory Commission's regulations:

TOWNSHIP 30 NORTH, RANGE 7 WEST, NMPM
Sections 2 through 10: All
Section 16: W/2
Sections 17 through 21: All
Section 29: N/2

TOWNSHIP 30 NORTH, RANGE 8 WEST, NMPM
Section 1: All
Sections 12 and 13: All
Section 24: All

TOWNSHIP 31 NORTH, RANGE 6 WEST, NMPM
Section 6: Lots 8, 9, 10 and 11 and S/2
Section 7: All
Sections 18 through 20: All
Section 30: All

TOWNSHIP 31 NORTH, RANGE 7 WEST, NMPM
Section 1: Lots 5, 6, 7 and 8 and S/2
Section 9: S/2
Section 10: S/2
Sections 11 through 16: All
Sections 19 through 36: All

TOWNSHIP 31 NORTH, RANGE 8 WEST, NMPM
Section 25: All
Section 36: All

(3) That the Fruitland formation underlies all of the above-described lands; that the formation consists of primarily coal seams, shales and tight sandstone stringers; that the top of such formation is found at an average depth of 2800 feet below the surface of the area set out in Finding No. (2) above; and that the thickness of such formation varies with an average thickness of 300 feet within said area.

(4) That the type section for the Fruitland formation for the proposed tight formation designation is found at a depth of from approximately 2926 feet to 3224 feet on the Laserlog dated July 30, 1978, from the Northeast Blanco Unit Well No. 17-A located in Unit D of Section 9, Township 30 North, Range 7 West, Rio Arriba County, New Mexico.

(5) That the following described wells produce natural gas in commercial quantities from the Fruitland formation within the proposed area:

Northeast Blanco Unit Well #202	NE/4, Section 11, T-31-N, R-7-W, San Juan County, New Mexico

Northeast Blanco Unit Well #204	SW/4, Section 1, T-31-N, R-7-W, San Juan County, New Mexico

(6) That the Fruitland formation underlying the above described lands has been penetrated by in excess of one hundred wells, none of which, with the above-named exceptions, produced natural gas in commercial quantities from the Fruitland formation.

(7) That the evidence presented in this case demonstrated that no well formerly or currently completed in the Fruitland formation within the proposed area may reasonably be presumed to have exhibited permeability, gas productivity, or crude oil productivity 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.

(8) That based on analysis of available data from existing wells within the proposed area and utilizing generally and customarily accepted petroleum engineering techniques and measurements:

(a) The estimated average in situ gas permeability throughout the pay section of the Fruitland formation is expected to be 0.1 millidarcy or less; and

(b) The stabilized production rate, against atmospheric pressure, of wells completed for production in the Fruitland formation, without stimulation, is not expected to exceed production levels determined by reference to well depth, as found in the table set out in 18 C.F.R. §271.703(c)(2)(B) of the regulations; and

(c) No well drilled into the formation is expected to produce, without stimulation, more than five barrels of crude oil per day.

(9) That within the proposed area there is the Ojo Alamo aquifer, found at depths of approximately 2000 feet or approximately 800 feet above the Fruitland formation.

(10) That existing State of New Mexico and Federal Regulations relating to casing and cementing of wells will assure that development of the Fruitland formation will not adversely affect said aquifers.

(11) That the Fruitland formation, or any portion thereof, as described herein, is not currently being developed by infill drilling as defined in 18 C.F.R. §271.703(b)(6) of the regulations.

(12) That the Fruitland formation within the proposed area 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 Fruitland formation underlying the following described lands in San Juan and Rio Arriba Counties, New Mexico, be designated as a tight formation:

TOWNSHIP 30 NORTH, RANGE 7 WEST, NMPM
Sections 2 through 10: All
Section 16: W/2
Sections 17 through 21: All
Section 29: N/2

TOWNSHIP 30 NORTH, RANGE 8 WEST, NMPM
Section 1: All
Sections 12 and 13: All
Section 24: All

TOWNSHIP 31 NORTH, RANGE 6 WEST, NMPM
Section 6: Lots 8, 9, 10 and 11 and S/2
Section 7: All
Sections 18 through 20: All
Section 30: All

TOWNSHIP 31 NORTH, RANGE 7 WEST, NMPM
Section 1: Lots 5, 6, 7 and 8 and S/2
Section 9: S/2
Section 10: S/2
Sections 11 through 16: All
Sections 19 through 36: All

TOWNSHIP 31 NORTH, RANGE 8 WEST, NMPM
Section 25: All
Section 36: All

(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.

STATE OF NEW MEXICO
OIL CONSERVATION DIVISION

JOE D. RAMEY
Director

S E A L

fd/

BLACKWOOD & NICHOLS CO., LTD.
2013 FIRST NATIONAL CENTER WEST
OKLAHOMA CITY, OKLAHOMA 73102

405 235-8505

BEFORE THE [illegible] STATE OIL CONSERVATION DIVISION
Applicants EXHIBIT NO. A
CASE NO. 7087
Submitted by Blackwood
Hearing Date 12/10/80

FRUITLAND FORMATION

GEOGRAPHICAL AND GEOLOGICAL DESCRIPTION OF THE FORMATION

Geographical

The Fruitland is one of several tight sandstone formations of the San Juan Basin, New Mexico. The San Juan Basin is approximately 80 miles long from the SE to NW and 40 miles wide from SW to NE. The approximate center of the gas production in the San Juan Basin is 25 miles SE of Aztec, New Mexico.

Natural gas has been produced for many years from this basin. The most prolific reservoirs are within the Mesaverde group. The Fruitland formation has not been produced over much of the San Juan Basin because of low permeability, and the high costs of producing the gas.

Blackwood & Nichols Co., Ltd. operates the Northeast Blanco Unit, a 33,500 acre area located on the northeast flank of the San Juan Basin. The Northeast Blanco Unit is located in Townships 30 & 31N and Range 6 & 7W also Sections 25 & 36, T31N-R8W and Sections 1, 12, 13 & 24, T30N - R8W. A Map of the Northeast Blanco Unit is provided.

Geological

The Fruitland formation is upper Cretaceous age and consists primarily of coal and shale with some sandstone stringers. These stringers when located in the basal portion of the Fruitland are sometimes intertounged with the Pictured Cliffs formation below.

A general geologic section of the San Juan Basin is included with this application.

In the Northeast Blanco Unit area the Fruitland formation dips gently to the southwest. It contains coals, shale and tight sandstones. The Fruitland formation in this area contains fluids at above normal pressures. The initial pressures encountered in the Fruitland are approximately 1500-1600 psig @ 3000 feet while the original pressures in the Mesaverde in this area were only 1400-1500 psig at 6000 feet.

The Fruitland formation has been drilled through and logged in over 100 wells from 1950 through 1978 in the Northeast Blanco Unit area. The general characteristics observed when drilling, logging and drill stem testing were those of a very tight reservoir. The data collected indicated that gas was present in certain sandstone stringers and coal seams within the Fruitland formation. The permeabilities were indicated to be so low, however, that only one of the more than 100 wells in the Northeast Blanco Unit attempted a completion in the Fruitland formation prior to 1979. The extremely low permeability indicated and the low price allowed for gas made any completion attempt infeasible because there was no chance that it would be profitable.

The one well completed in the Fruitland formation in the Northeast Blanco Unit prior to 1979 was the Howell 3-B. This well which was located in the SW/4 of section 3, T30N, R7W, Rio Arriba County, New Mexico produced approximately 59,000 Mcf from the Fruitland reservoir and was abandoned in the early 1950's. No other attempt to produce gas from the Fruitland formation were made in the Northeast Blanco Unit area until 1979.

One well west of the Northeast Blanco Unit was drilled and completed by Phillips Petroleum Company in the early 1950's. This well is located in the NE/4 of section 17, T31N, R7W. The well produced approximately 30-40 Mcfpd on initial completion and was declared non commercial. This well has continued , however, to produce low volumes of gas for more than 20 years. This indicates that gas is present and could be developed and produced from the Fruitland formation in this area if a high enough price were established to make these expensive low volume wells profitable.

Blackwood & Nichols Co., Ltd. operates the Northeast Blanco Unit. We have taken all necessary precautions to insure that all fresh water zones are protected and not adversely affected by our operations. Our procedures have been in accord with all State and Federal rules and regulations.

A part of the pertinent Federal regulations are attached. They are the pages 1 through 5 of supplement to U.S.G.S. NTL - 6.
Pages C-6, C-7 & C-8 of New Mexico Oil Conservation Division of the Energy and Minerals Department are also attached.

We believe that compliance with these rules and regulations adequately protects and will not adversely affect or impair any fresh water aquifers that are being used or expected to be used in the foreseeable future for domestic or agricultural water supplies.

Geological and Engineering Data

The Fruitland formation of the northeast flank of the San Juan Basin is composed primarily of coal seams, shales and tight sandstone stringers. This information has been determined from hundreds of logs run on wells drilled for the last 30 years. Electric logs, Gammaray Neution logs, Sonic logs, Formation density logs, Sidewall Neution logs and many other types have been analysed and interpreted over the years to show the coal seams, shales and tight sandstones. These logs have also indicated that natural gas and water (almost fresh enough to drink) is present within the void space of the Fruitland formation.

Pressure information has been obtained in several different ways. A drill stem test was taken on Northeast Blanco Unit well # 33-12 on October 24, 1955. The Fruitland formation was tested from a depth of 3055 feet to 3205 feet. This drill stem test has been analysed and computations have been made that show the permeability to be 0.067 MD/ft/cp on the average. The highest recorded shut in pressure was 1629 psig. A copy of the computerized data analysis is attached. A copy of the log on the Northeast Blanco Unit well # 33-12 is also included as a part of this application.

While drilling over 100 deeper wells in the Northeast Blanco Unit area additional pressure information was obtained. It is necessary to raise the mud weight 11.5 - 12.5 lbs per gallon in order to control the pressure in the Fruitland formation. The pressure which is found in the Fruitland formation is abnormally high for the depth drilled. This abnormally high pressure may also be an indication of low porosity and permeability. A reduction in the original void space of the Fruitland formation may have occured to cause a reduction in the original permeability. Another interpretation could be that this formation was once at a deeper level below the surface and that normal pressures at that deeper level are still trapped even though the Fruitland formation is now found at shallower depths. The permeability required to trap the abnormally high pressure in the Fruitland formation would have to be extremely low.

Flow rates of wells in the area which have recently been produced from the Fruitland formation also prove low permeability. Information about each new shallow gas well in the area of the Northeast Blanco Unit and the adjacent wells is given below along with calculations of stabilized production, production improvement by stimulation etc.

Stabilized production vs depth guidelines.

Blackwood & Nichols Co., Ltd. has drilled five test holes in 1979. These five holes have resulted so far in two Fruitland producers, two Fruitland Pictured Cliffs commingled wells, and one well which has been unsuccessfully attempted in the Pictured Cliffs and the Fruitland formation. This unsuccessful hole has been re-completed in the Fruitland and is now testing gas and water at non commercial rates.

A listing of the five Northeast Blanco Unit wells, with completion information, production information etc. follows. The pipeline production figures are shown. Calculations to approximate "stabilized production rate against atmospheric pressure" have been included.

Two wells the Northeast Blanco Unit well # 202 and # 204 produce commingled from the Fruitland and Pictured Cliffs reservoirs. In order to allocate production by zone 50% of the gas sales have been assigned to each zone.

All the Northeast Blanco Unit wells were stimulated prior to production. The calculated productivity improvements ratio is 10-11. The Western Company has furnished a "Fracture stimulation Recommendation" for the Northeast Blanco Unit well # 203. A copy of this recommended procedure which shows fluids, rates, pressures, proppants, costs etc. is enclosed. In order to approximate stabilized production rates without stimulation computations have been made. A theoretical stabilized production rate to the atmosphere has been calculated in the following manner. The pressure differential between shut in pressure and pipeline pressure has been ascertained for each producing well. This pressure differential is then used with pipeline pressure and actual production to calculate the theoretical stabilized production rate to the atmosphere. The following formula has been used

$$\frac{\Delta p}{\text{Shut in pres.}} = \frac{\text{Production (to the pipeline)}}{\text{Production (to the atmosphere)}}$$

Where Δp = Shut in pressure psig - pipeline pressure psig

Then in order to estimate the"non stimulated" stabilized production rate, the calculated production to the atmosphere has been divided by 10, for wells stimulated in a manner simular to that recommended for the Northeast Blanco Unit well # 203. This factor of 10 is the smaller of the productivity increases calculated by the Western Comapny as being created by the stimulation which has already occured in several wells. A productivity increase of 4 times has been assumed for other stimulation treatments (performed on Palmer Oil & Gas Company wells).

Northeast Blanco Unit well # 201
SW/4 Section 9, T31N-R7W
San Juan County, New Mexico

This well was spudded on June 30, 1979 and completed on July 24, 1979. The Fruitland & Pictured Cliffs zones were perforated and fractured. The well was not capable of commercial production. A small gas flow with large volumes of water resulted. The # 201 well was reworked in the summer of 1980. The previous perforations were shut off. A copy of the Form C-103 showing details of the rework is enclosed. The Fruitland zone was perforated and stimulated from 3482-3494 feet. The initial testing on this well to date still does not indicate acommercial producer. During the initial 8 day test in August, 1980 the well produced 72 Mcf of gas, an average of 9 Mcfpd. When adjusted for "production into the atmosphere" the producing ratio is less than 15 Mcfpd. The 201 is now producing natural gas and water.

Northeast Blanco Unit well # 202
NE/4 Section 11, T31N-R7W
San Juan County, New Mexico
(Fruitland-Pictured Cliffs commingled)

	Mcf	Days	Mcf/pd	Mcfpd/zone
June, 1980	17,584	32	550	275
July, 1980	12,606	24	526	263

Each zone has produced an average of 270 Mcfpd for the last two months into the pipeline. The "production against atmosphere pressure" is estimated to be 395 Mcfpd.

$$\frac{922 - 292}{922} = \frac{270}{\text{Production (atmosphere)}}$$

The well was previously stimulated and productive capacity theoretically increased 10 fold. The pre stimulation "stabilized production rate to the atmosphere" is calculated to be 40 Mcfpd from the Fruitland reservoir. A copy of the completion report is enclosed.

Northeast Blanco Unit well # 203
NW/4 Section 11, T31N-R7W
San Juan County, New Mexico

This well was originally perforated and completed in both the Fruitland and Pictured Cliffs reservoirs in August of 1979. When the well was turned into the pipeline to begin sales it produced so much water that it died. The well would not produce and had to be re-completed during July, 1980. A copy of the re-completion report is enclosed. The well is currently producing gas and water. The volume of water is so great that the well cannot flow continuosly. The 203 is now flowing intermittently from the Fruitland reservoir only from perforations at 3368-3392.

The first sales from this well occurred in August, 1980. The well produced 1193 Mcf in twelve days. The average production was 99 Mcfpd. When adjusted to "non-stimulated" production a 10 Mcfpd rate is obtained. This ratio when adjusted for "production to the atmosphere" rather than into a pipeline does not exceed 15 Mcfpd.

Northeast Blanco Unit well # 204
SW/4 Section 1, T31N-R7W
San Juan County, New Mexico
(Fruitland - Pictured Cliffs commingled)

	Mcf	Days	Mcfpd	Mcfpd/zone
June, 1980	8187	32	252	126
July, 1980	7313	32	229	115

Using 120 Mcfpd/zone as the average production into the pipeline, we calculate that the production to the atmosphere would be 162 Mcfpd.

$$\frac{942 - 246}{942} = \frac{120}{\text{Production (atmosphere)}}$$

This well was stimulated prior to production. If we reduce the 162 Mcfpd/zone by a factor of five based on the theoretical productivity increase obtained by stimulation we estimate 34 Mcfpd. The Fruitland zone is calculated to have 34 Mcfpd "stabilized production rate against atmospheric pressure" in this well. A copy of the completion report is enclosed.

Northeast Blanco Unit well # 205
SE/4 Section 10, T31N-R7W
San Juan County, New Mexico

This well was spudded on July 22, 1979 and originally completed August 7, 1979 as a Pictured Cliffs Producer. When the well was turned into the pipeline it produced too much water and died. It was necessary to re-complete the well in July of 1980. The Pictured Cliffs zone was abandoned and the Fruitland perforated and stimulated on July 18, 1980. The well has recently been put on production. A copy of the re-completion report is enclosed.

This well first produced in August, 1980. The gas sales for a 22 day period were 3334 Mcf, or an average of 152 Mcfpd. When this production is adjusted to "non stimulated" production (a factor of 10) a 15 Mcfpd rate is obtained. The calculation to increase the pipeline production for "stabilized production to the atmosphere" results in approximately 20 Mcfpd.

Tenneco Oil Company now operates three wells adjacent to the north boundary of the Northeast Blanco Unit which produce from the Fruitland reservoir. These wells were originally drilled and completed by Palmer Oil and Gas Company and were purchased by Tenneco Oil Company. The wells and their more recent production are listed below.

Tenneco Yager # 3
Sw/4 Section 3, T31N-R7W
San Juan County, New Mexico

	Prod. Mcf.	Days	Mcfpd
June, 1980	2500	24	104
July, 1980	3716	32	116

The Fruitland zone averaged 110 Mcfpd to the pipeline when adjusted for "production to the atmosphere", that would be approximately 140 Mcfpd

$$\frac{1467 - 311}{1467} = \frac{110}{\text{Production (atmosphere)}}$$

This zone was previously stimulated with a treatment which should have increased productivity four times. One fourth of the 140 Mcfpd = 35 Mcfpd. A copy of the completion report is enclosed.

Tenneco Yager # 4
Ne/4 Section 10, T31N-R7W
San Juan County, New Mexico

	Prod. Mcf	Days	Mcfpd
May, 1980	447	31	14
June, 1980	275	23	12

The Fruitland zone averaged only 13 Mcfpd for the period May 1 - June 30, 1980. When this figure is adjusted to show "production to the atmosphere" it becomes 16 Mcfpd. A copy of the completion report is enclosed.

$$\frac{1427 - 268}{1427} = \frac{13}{\text{Production (atmosphere)}}$$

Tenneco Federal # 3
NW/4 Section 10, T31N - R7W
San Juan County, New Mexico

	Prod. Mcf	Days	Mcfpd
June, 1980	286	24	12
July, 1980	319	31	10

The Fruitland has averaged only 11 Mcfpd sales into the pipeline recently. No recent shut in pressure is available from which to compute the "productivity to the atmosphere". If we estimate a 40% increase in productivity to the atmosphere the rate would be 15 Mcfpd. A Copy of the completion report is enclosed.

Summary and Conclusions

For over 30 years the Fruitland formation has been penetrated and logged and occasionally drill stem tested and produced on the northeast flank of the San Juan Basin, New Mexico.

Only one well had produced gas prior to 1979 from the Fruitland formation within the area of the Northeast Blanco Unit. The Howell 3-B well was drilled in March of 1952 - completed at a total depth of 3025 feet in the Fruitland. The well produced a total of approximately 59,000 Mcf and was abandoned.

Since that time over 100 wells have been drilled in the Northeast Blanco Unit. The Fruitland zone was logged and evaluated in each well and was not considered to be commercially productive. All wells drilled from 1953 to 1978 were completed in the Mesaverde or Dakota reservoirs.

One Fruitland well was drilled and completed in 1952 to the west of the Northeast Blanco Unit by Phillips Petroleum Company. The well produced very low volumes of gas (approximately 30 Mcfpd) and was declared to be non commercial. This well is located in the NE NE of Section 17, T31N-R7W, San Juan County, New Mexico. This well has continued to produce for over 25 years and was one of the main reasons that additional shallow wells were drilled in 1978 by Palmer Oil and Gas to the north of the Northeast Blanco Unit.

The results of the Palmer Oil and Gas wells which were completed in the Fruitland were shown earlier in this report. Three of the six shallow wells drilled by Palmer Oil and Gas are now producing from the Fruitland formation. A Fruitland completion was attempted in the State # 2 well but was unsuccessful because of too much water.

Blackwood & Nichols Co., Ltd. attempted five shallow wells along the northern boundary of the Northeast Blanco Unit in 1979. Two of these wells, the # 202 and # 204 were completed as commercial wells in the Fruitland and Pictured Cliffs reservoirs initially. The other three wells were not completed successfully and produced to much water. In 1980 these three wells were re-worked and re-completed in the Fruitland formation only. The difficulties in log interpretation, and completion techniques including cementing, perforating, and stimulating for production raised the cost of these 3 wells significantly above the estimated costs.

All five of the Blackwood & Nichols Co., Ltd. wells are now producing from the Fruitland formation. One well, the # 201, is currently non commercial and the # 203 well is borderline.

The difficulty in analizing logs and the need to re-complete 3 of the 5 Blackwood & Nichols Co., Ltd. wells should also be considered.

In conclusion, it is well established that natural gas occurs in the Fruitland formation in this area. It is also well known that the Fruitland formation is extremely "tight". The Fruitland formation has been by-passed while drilling and completing in the deeper Mesaverde reservoir and Dakota reservoir because of "non commercial" economics. The designation of the Fruitland as a "tight" reservoir will enable gas to be produced which would otherwise be left in the ground as "non commercial".

The calculated non stimulated stabilized "flow rate to the atmosphere"

NEBU well #		Fruitland Form. Mcfpd
201		15
202		40
203		15
204		34
205		20
Palmer Oil & Gas (Tenneco)		
Yager # 3		35
Federal # 3		15
	7 well total	174
	1 well average	25 Mcfpd per well

All available data collected to this time support the designation of the Fruitland formation in the Northeast Blanco Unit area as a "tight" reservoir. The in situ permeability as measured and calculated from the drill stem test of the Fruitland in the Northeast Blanco Unit well 33-12 was only 0.067 md/ft. The average calculated - non stimulated stabilized production to the atmosphere of the seven producing Fruitland wells in the Northeast Blanco Unit area and just outside the north boundary is 25 Mcf per well per day. The high cost of drilling eleven wells to find seven Fruitland producers and the necessity of expensive stimulation procedures to enhance production should also be noted.

GENERAL GEOLOGIC SECTION

ERA	PERIOD	EPOCH	SAN JUAN BASIN
CENOZOIC	TERTIARY	EOCENE	WASATCH-SAN JOSE
		PALEOCENE	ANIMAS - NACIMIENTO
MESOZOIC	CRETACEOUS	UPPER	McDERMOTT CGL.
			KIRTLAND SH.
			FARMINGTON SS.
			FRUITLAND FM.
			PICTURED CLIFFS SS.
			LEWIS SH.
			MESA-VERDE GROUP: CLIFF HOUSE SS. / MENEFEE SH. / POINT LOOKOUT SS.
			MANCOS SHALE: L. HOSTA SS. / GALLUP SS. / SANASTEE MEM / GREENHORN LS. / GRANEROS SH.
			DAKOTA SS.
		LOWER	BURRO CANYON FM.
	JURASSIC	UPPER	MORRISON FM.
			SAN RAFAEL GROUP: SUMMERVILLE FM. / TODILTO LS. / ENTRADA SS.
		MIDDLE	CARMEL FM.
		LOWER	GLEN CANYON GROUP: NAVAJO SS. / KAYENTA FM. / WINGATE SS.
	TRIASSIC	UPPER	CHINLE SH.
			SHINARUMP CGL.
		MIDDLE	MOENKOPI SH.
		LOWER	
PALEOZOIC	PERMIAN	OCHOA-GUADALUPE	
		LEONARD	DeCHELLY SS.
		WOLFCAMP	ORGAN ROCK SH. / CEDAR MESA SS. / CUTLER ARKOSE / HALGAITO SH.
	PENNSYLVANIAN	VIRGIL	
		MISSOURI	UPPER HERMOSA LS.
		DES MOINES	? / LOWER HERMOSA LS.
		ATOKA	MOLAS SH.
		MORROW	
	MISS	CHESTER-MERAMEC	
		OSAGE	LEADVILLE LS.
		KINDER HOOK	
	DEVONIAN	UPPER	OURAY LS. / ELBERT FM. / ANETH DOL.
		MIDDLE	
		LOWER	
	SILURIAN		
	ORDOVICIAN		
	CAMBRIAN	UPPER	IGNACIO QTZTE
		MIDDLE	
		LOWER	
PRECAMBRIAN			PRECAMBRIAN IGNEOUS AND METAMORPHICS

BEFORE EXAMINER STAMETS
OIL CONSERVATION DIVISION
Applicant EXHIBIT NO. 2
CASE NO. 1087
Submitted by Markwood
Hearing Date 12/10/80

FRUITLAND FORMATION

MEANING AND PURPOSE OF EXHIBITS

Exhibit 1. Required map showing wells producing from the Fruitland Formation and the exact area of this application.

Exhibit 2. Geologic Section shows relationship of the Fruitland Formation with other formations in the area.

Exhibit 3. Federal Regulations - these are the pertinent parts of the regulations protecting fresh water from pollution.

Exhibit 4. State Regulations - these are the applicable regulations showing how fresh water must be protected by use of steel casing, cement etc.

Exhibit 5. Drill Stem Test Analysis uses pressures and rates obtained by D.S.T. to calculate "in situ permeability".

Exhibit 6. Radioactivity Log 33-12 well was used to estimate the reservoir thickness and in the permeability caculation.

Exhibit 7. Fracture Stimulation Recommendation NEBU well No. 203 shows the procedure and cost to increase (stimulate) productivity in this well.

Exhibit 8. Recompletion Report NEBU well No. 201 shows producing interval (last perforations) and fracture stimulation treatment used on this well.

Exhibit 9. Completion Report NEBU well No. 202 shows producing interval (perforations) and Fracture stimulation treatment used on this well.

Exhibit 10. Completion Report NEBU well No. 203 shows how this well was re-worked to shut off water coming from the lower perforations.

Exhibit 11. Completion Report NEBU well No. 204 shows producing interval (perforations) and Fracture stimulation treatment used on this well.

Exhibit 12. Request for allowable NEBU well No. 204 shows wells initial shut in tubing and casing pressure - these initial high pressures require very long shut in time to ever be approuched again.

Exhibit 13. Completion Report NEBU well No. 205 shows producing interval and Fracture stimulation procedure used in this well.

Exhibit 14. Completion Report Yager No. 3 shows producing interval (perforations) and Fracture stimulation procedure used in this well.

Exhibit 15. Completion Report Yager No. 4 shows producing interval (perforations) and Fracture stimulation procedure used in this well.

Exhibit 16. Completion Report Federal No. 3 shows producing interval (perforations) and Fracture stimulation procedure used in this well.

Exhibit 17. Cross Section A-A'

Exhibit 18. Cross Section B-B'

Exhibit 19. Cross Section C-C'

Exhibit 20. Supplemental Gas Volume Estimates for October 1980

United States Department of the In[illegible]
GEOLOGICAL SURVEY
FARMINGTON DISTRICT
DURANGO DISTRICT

BEFORE EXAMINER STAMETS
OIL CONSERVATION DIVISION
~~Applicant~~ EXHIBIT NO. 3
CASE NO. 7087
Submitted by Blackwood
Hearing Date 12/10/80

Supplement To USGS Data

Above Data Required on Well Sign

GENERAL REQUIREMENTS
FOR
OIL AND GAS OPERATIONS ON FEDERAL AND INDIAN LEASES

These requirements apply generally to all oil and gas operations on Federal and Indian leases. They apply specifically to the above-described well. Special requirements that apply and are effective for this well, if any, are check-marked in Section 15 of these General Requirements.

1. GENERAL

A. Full compliance with applicable laws and regulations, with the approved Permit to Drill, and with the approved Surface Use and Operations Plan is required. Lessees and/or operators are fully accountable for the actions of their contractors and subcontractors.

B. Each well shall have a well sign in legible condition from spud date to final abandonment. The sign should show the operator's name, lease name or unit name, well number, location of the well, and the lease serial number.

C. A complete copy of the approved Application for Permit to Drill and the accompanying Surface Use and Operations Plan, along with any conditions of approval, shall be available to authorized personnel at the drillsite whenever active construction or drilling operations are under way.

D. A drilling operations progress report is to be submitted daily from spud date until the well is completed and the Well Completion Report (Form 9-330) is filed. The report should be on paper not less than 5 X 8 inches in size, and each page should identify the well by operator's name, well name and number, and by well location.

E. Immediate notice is required of all blowouts, fires, spills, and accidents involving life-threatening injuries or loss of life. (See NTL-3A.)

F. No construction activities, such as roads, well sites, tank battery sites, pits, or other work involving surface disturbance of previously non-disturbed land will be commenced until a Surface Use and Operations Plan is submitted and approval obtained.

G. If, during operations, any archeological or historical sites, or any object of antiquity subject to the Antiquities Act of June 8, 1906, are discovered, all operations which would affect such sites are to be suspended and the discovery reported promptly to the appropriate office of the Geological Survey.

H. Prior approval of the District Engineer is required for variance from the approved drilling program and before commencing plugging operations, plugback work, casing repair work, corrective cementing operations, or suspending drilling operations indefinitely. Emergency approval may be obtained orally, but such approval does not waive the written report requirements.

I. Blowout prevention equipment is to be installed, tested, and in working order before drilling below the surface casing, and shall be maintained ready for use until drilling operations are completed.

J. All shows of fresh water and minerals will be reported and protected.

K. Well area and lease premises will be maintained in a workmanlike manner with due regard to safety, conservation, and appearance. All waste associated with the drilling operations will be contained and will be buried in place (in a separate trash pit) or removed and deposited in an approved sanitary landfill. All garbage (metal containers will be crushed) and debris left on site will be buried at least two feet deep. All trash and debris will be buried or removed from the site within one month after removal of the drilling rig and/or completion rig, and the wellsite will be kept clean and in an aesthetically satisfactory condition for the life of the well.

L. Unless drilling operations are commenced within one year, approval of an Application for Permit to Drill will expire. A written request for extension may be granted if timely submitted.

2. CONSTRUCTION ACTIVITIES (Refer to Surface Operating Standards for Oil and Gas Exploration and Development--Second Edition)

A. Prior to commencing construction of road, pad, or other associated developments, operator will provide the dirt contractor with a copy of the Surface Use Plan, the conditions of approval, and a copy of Sections 2 and 3 of these General Requirements.

B. No gravel or other related minerals from new or existing pits on Federal land will be used in construction of roads, well sites, etc., without prior approval from the surface management agency.

C. Vegetative materials removed during construction must be disposed of in such manner that it does not detract from the aesthetics of the area and does not accelerate erosion. Vegetation removed during clearing operations should be placed in drainages, washes, gullies, etc., and "walked down" by crawler-type tractor. If there are no drainages in the immediate area, the vegetation should be "walked down" in place. All trash resulting from construction activities will not be piled or left in rows, but will be left so it does not detract from the natural appearance of the area. Any available topsoil encountered during construction should be stockpiled for use in restoring the pit area after the pits are covered. A drainage ditch must be constructed above the cut slope of the pad.

D. Unless otherwise approved, all access roads should be limited to 20 feet in width, excluding turnouts.

(1) Water bars will be constructed on the access road to the well location and conform to surface management agency specifications. The maximum slope distance between water bars will be:

% Slope	Slope Distance
Less than 1%.	.400 feet
1% - 5%	.300 feet
5% - 15%.	.200 feet
15% - 25%	.100 feet
Greater than 25%.	50 feet

When the access road is graded, water bars will be left in the road or replaced immediately upon completion of grading.

E. Each existing fence to be crossed by the permittee will be braced and tied off before cutting so as to prevent slacking of the wire. The opening will be protected as necessary during construction to prevent the escape of livestock and upon completion of construction, the fence will be repaired back to the original standard of the existing fence. A cattleguard will be installed

fn any fence where a road is to be regularly traveled. A twelve-foot gate will be installed adjacent to the cattleguard when necessary.

NOTE: Sections 2-C and 2-D above apply primarily to Federal surface. If the land is privately owned, these requirements may be varied to comply with the operator-landowner agreement.

3. DRILLING PITS

A. Mud pits will be constructed so as not to leak, break, or allow discharge of liquids. Pits are not to be located in natural drainage. Any plastic material used to line pits must be removed to below-ground level before pits are covered.

B. All unguarded pits containing liquids will be fenced.

C. Liquids in pits will be allowed to evaporate, or be properly disposed of otherwise, before pits are recontoured. Under no circumstances will pits be cut and drained.

4. CASING AND CEMENTING REQUIREMENTS

A. Surface casing is to be set at sufficient depth to protect fresh water zones and provide well control; and cement circulated to the surface.

B. Intermediate and production casing strings are to be set and cemented as necessary to effectively isolate and seal off all water, oil, gas, or coal-bearing strata encountered in the well down to the casing point.

C. Prior to drilling the plug after cementing, all casing strings shall be pressure tested. Test pressure shall not be less than 600 psi for surface casing, and a minimum of 1,500 psi or 0.2 psi/ft., whichever is greater, for other casing strings. If the pressure declines more than 10 percent in 30 minutes, or if there is other indication of a leak, the casing shall be recemented, repaired, or an additional casing string run, and the casing shall be tested again in the same manner.

D. After cementing but before commencing any tests, the casing string shall stand cemented until the cement has reached a compressive strength of at least 500 psi at the shoe, except that in no case shall tests be initiated until cement has been in place at least 8 hours. WOC time will be recorded in the driller's log.

5. BLOWOUT PREVENTION

A. Blowout preventers and related well control equipment shall be installed, tested, and used in such manner necessary to prevent blowouts. All wells must be equipped with at least one blowout preventer while drilling below surface casing.

B. While drill pipe is in use, ram-type blowout preventers shall be actuated to test proper functioning once each trip, but in no event less than once each day. The annular-type blowout preventer shall be actuated on the drill pipe at least once each week.

C. Blowout preventers are to have proper rams for the operations being performed. Casing rams are required when running casing.

D. Blowout preventers are to have handwheels installed.

E. A choke line and a kill line are to be properly installed. The kill line is not to be used as a fill-up line.

F. The accumulator system shall have a pressure capacity to provide for repeated operation of hydraulic preventers.

G. Drill string safety valve(s) to fit all pipe in the drill string are to be maintained on the rig floor while drilling operations are in progress.

H. Blowout prevention drills are to be conducted as necessary to assure that equipment is operational and that each crew is properly trained to carry out emergency duties. All BOP tests and drills are to be recorded in the driller's log.

I. The maximum pressure to be allowed on blowout preventers during well control operations is to be posted for each casing string.

J. The characteristics, use, and testing of drilling mud and the conduct of related drilling procedures shall be such as are necessary for well control. Quantities of mud materials sufficient to insure well control shall be maintained, readily accessible for use at all times.

K. From the time drilling operations are initiated and until drilling operations are completed, a member of the drilling crew or the toolpusher shall maintain rig floor surveillance at all times, unless the well is secured with blowout preventers or cement plugs.

6. REPORTS

A. The following reports shall be filed with the District Engineer within 15 days after the work is completed:

(1) Five copies of Sundry Report, Form 9-331, giving complete information concerning:

(a) Setting of each string of casing. Show size, grade and weight of casing set, size hole, depth set, amount and type of cement used, whether cement circulated, top of cement behind casing if determined, depth of cementing tools if used, casing test method and results, and date work was done. Show spud date on first report submitted.

(b) Intervals tested, perforated, acidized, or fractured, and results obtained. Show date work was done.

(2) Five copies of Well Completion Report, Form 9-330. Show formation tops, drill stem test information, completion data, and production tests. Show all oil and gas zones and important water sands under Item 37. Data on water sands should include rate of water inflow and elevation to which water rose in hole.

(3) Two copies of all electrical and radioactivity logs run.

7. DRILLER'S LOG

A. The following shall be entered in the daily driller's log:

(1) Blowout preventer pressure tests, including test pressures and results.

(2) Blowout preventer tests for proper functioning.

(3) Blowout prevention drills conducted.

(4) Casing run, including size, grade, weight and depth set.

(5) How pipe was cemented, including amount of cement, type, whether cement circulated, location of cementing tools, etc.

(6) Waiting on cement time for each casing string.

(7) Casing pressure tests after cementing, including test pressure and results.

8. DRILLSTEM TESTS

A. Estimated amounts of oil and gas recovered and/or produced during drillstem tests are to be shown in the driller's log and reported in accordance with NTL-4.

9. GAS FLARING

A. Approval is granted to flare gas while drilling and completion testing.

B. When gas is used for drilling, the blooey line will be located where no damage to vegetation will occur. If this is not possible, an earthen baffle will be constructed to keep the heat and residue within the operating area.

C. Failure to request permission to vent gas after 60 days following the date the well is completed will result in compensation due the United States being the full value of the gas so wasted. (See NTL-4.)

10. WATER DISPOSAL

A. An application for approval of the disposal method for water production from all new wells must be filed with the District Engineer pursuant to Section VII of NTL-28. Failure to timely file such application will be considered an incident of non-compliance and will be grounds for issuing a shut-in order until the application is submitted.

11. SAFETY

A. All rig heating stoves are to be of the explosion-proof type.

B. Drilling rig engines should have water-cooled exhausts.

C. Rig safety lines are to be installed.

D. Hard hats must be utilized.

12. SUBSEQUENT OR CHANGE OF PLANS

A. Any additional construction, re-construction, or alterations of facilities, including roads, gathering lines, batteries, etc., which will result in the disturbance of new ground, will require the filing of a suitable plan and prior approval by the Survey after clearance with the surface management agency.

13. REMOVAL OF DRILLING RIG

A. Unless a well has been properly cased and cemented, or properly plugged, the drilling rig must not be moved from the drillsite without prior approval from the Survey.

14. ABANDONMENT

A. If the well is dry and is to be plugged, approval of the proposed plugging program may be obtained orally; however, oral approval must be confirmed in writing by immediately filing a Notice of Intention to Abandon on Form 9-331 in quintuplicate with the District Engineer. The report should show the total depth reached, the reason for plugging, and the proposed intervals, by depths, where cement plugs are to be placed, type of plugging mud, etc.

B. Upon completion of approved plugging, erect a regulation well marker which should not be less than 4 inches in diameter and extend at least 4 feet above general ground level. Heap up the dirt around the base of the marker about 12 inches to take care of any settling of the cellar. The top of the marker must be closed or capped. The following minimum information shall be permanently placed on the marker with a plate, cap, or welded bead:

(1) Operator
(2) Well number and name
(3) Section, Township and Range
(4) Footage location

If approval is obtained to omit the dry hole marker, casings should be cut off four feet below ground level.

C. Within 15 days after plugging the well, a Subsequent Report of Abandonment is to be filed on Form 9-331 in quintuplicate, showing the manner in which the well was plugged, including depths where casing was cut and pulled, intervals (by depths) where cement plugs were placed, and the date plugging was completed. When all surface restoration work is completed, advise the District Office so that a field inspection of the wellsite can be made.

D. If, upon abandonment of wells on Federal surface, the retention of the well pad and/or access road is not considered necessary for the management and multiple use of the natural resources, they will be ripped a minimum of 12" in depth. After ripping, water bars will be installed as stated in 2-D-(1). All ripped surfaces are to be protected from vehicular travel by construction of a dead-end ditch and earthen barricade at the entrance to these ripped areas. (Reseeding of the affected areas may be required.)

E. Surface restoration after abandonment of wells on non-Federal surface normally will be in accordance with the operator-landowner agreement; however, minimum Federal restoration requirements on private surface-Federal minerals will be required.

15. SPECIAL STIPULATIONS

The following special requirements apply and are effective when checked:

☐ A. _____ surface casing should be set at _____ feet and cement circulated to the surface.

☐ B. Ram-type blowout preventers and related control equipment shall be pressure tested with water to the rated working pressure of the stack assembly (except that the annular-type preventer may be tested to 70 percent of rated working pressure) (a) when installed; (b) before drilling possible abnormally-pressured zones; and (c) following repairs that require disconnecting o pressure seal in the assembly.

☐ C. Minimum required fill of cement behind the _____ casing is to _____.

☑ D. All above-ground permanent structures and equipment will be painted a non-glare color that simulates the natural color of the site, as follows:

- ☐ Brown, Federal Standard 595a-30318
- ☑ Green, Federal Standard 595a-34127
- ☐ Gray, Federal Standard 595a-36357
- ☐ Sand, Federal Standard 5952-30277

☐ E. A kelly cock will be installed and maintained in operable condition.

☐ F. The District Office is to be notified in sufficient time for a representative to witness cementing of the _____ casing.

☐ G. A Communitization Agreement covering the acreage dedicated to the well must be filed for approval with the U. S. Geological Survey, P. O. Box 26124, Albuquerque, New Mexico 87125. The effective date of the agreement must be prior to any sales.

[ ] H. Compacted areas will be plowed or ripped before reseeding. Reseeding of the disturbed lands is required upon completion of drilling and completion activities and abandonment of the well. All seeding will be done between July 1 and September 15. Seeding will be done with a disc-type drill with two boxes for various seed sizes. The drill rows will be eight to ten inches apart. The seed will be planted not less than one-half inch deep or more than one inch deep. The seeder will be followed with a drag, packer, or roller to insure uniform coverage of the seed, and adequate compaction. Drilling of the seed will be done on the contour where possible, not up and down the slope. Where slopes are too steep for contour drilling, a "cyclone" hand-seeder or similar broadcast seeder will be used. Seed will then be covered to the depth described above by whatever means is practical.

If, in the opinion of the surface management agency, the seeding is unsuccessful, the lessee/operator may be required to make subsequent seedings until revegetation is successful.

Species to be planted in pounds pure-live-seed per acre:

☑ Seed Mix No. 1
Crested Wheatgrass (Agropyron desertorum)----------2½
Smooth Brome (Bromus inermis)----------2½
Fourwing Saltbush (Dewinged) (Atriplex canescens)---------- ½
Nomad Alfalfa (Medicago sitiva)----------1

☐ Seed Mix No. 2
Crested Wheatgrass (Agropyron desertorum)----------3½
Fourwing Saltbush (Dewinged) (Atriplex canescens)----------1
Sand Dropseed (Sporobolus cryptandrus)----------3/4
Alkali Sacaton (Sporobolus airoides)----------3/4

☐ Seed Mix No. 3
Fourwing Saltbush (Dewinged) (Atriplex canescens)----------1
Sand Dropseed (Sporobolus cryptandrus)----------1½
Alkali Sacaton (Sporobolus airoides)----------1½
Shad Scale (Atriplex confertifolia)----------3/4

☐ Seed Mix No. 4--NIPP
Indian Ricegrass----------1
Sand Dropseed----------1
Galletta----------2

☐ Seed Mix No. 5--NIPP
Alkali Sacaton----------1
Sand Dropseed----------1
Galletta----------2

☐

Seed Mix No. 6--BIA		Minimum % PLS accept.
Alkali Sacaton	1	76%
Sand Dropseed	1	76%
Galletta	2	55%

PLS (Pure Live Seed) = Germination X Purity

After drilling is completed, the pad will be seeded with the recommended seed mix. Seed will be drilled to a depth of not less than ¼ inch and not more than 3/4 inch, followed by a drag or packer. Compacted areas will be plowed (disced) to a depth of 4-6 inches before seeding. Areas too steep to be drilled will be broadcast seeded with a "cyclone" hand-held seeder or similar device, using 150% of the recommended drilled rate of seed per acre. The cut slope will be dressed up and seeded according to the above stipulation.

☐ I. No well and/or production equipment within the irrigable fields of the Navajo Indian Irrigation Project will exceed two feet above the natural ground surface elevation, and will be adequately barricaded for safety.

☐ J. Any production piping systems shall be installed with at least four feet of cover.

☐ K. In addition to the well-control equipment stipulated in Section 5, either an annular blowout preventer or a rotating head must be used while drilling below surface casing to. _____.

☑ L. Other:

See special stips

DIRECTORY OF FEDERAL PERSONNEL
OIL AND GAS OPERATIONS IN FARMINGTON AND DURANGO DISTRICTS

Surface Use and Rehabilitation

Bureau of Land Management
P. O. Box 568, or
900 La Plata Highway
Farmington, New Mexico 87401

Office hours: 7:45 a.m. to 4:30 p.m.

Office phones: (505) 325-3581, 325-3582, and 325-2922

Names of people involved with Oil and Gas Operations:

Bob Calkins, Area Manager
Bob Moore, Lands & Minerals Supervisor
Russ Pigors, Inspector
Bob Harler, Inspector
Steve Friedman, Inspector

Drilling and Producing Operations

U. S. Geological Survey--Oil and Gas Operations
P. O. Box 959, or
3535 East 30th Street
Farmington, New Mexico 87401

Office hours: 8:00 a.m. to 4:30 p.m.

Office phones: (505) 325-4572 or 325-4573

Home Phones

Jim Sims, District Supervisor.....
Errol Becher, Petroleum Engineer.....325-3886
Mildred Kuchera, Petroleum Engineer.....325-3448
Bill Spence, Petroleum Engineer.....327-2193
Ray Swanson, Petroleum Engineering Technician.....325-3183
Ken Baker, Petroleum Engineering Technician.....327-2170
Fred Edwards, Petroleum Engineering Technician.....325-7885
Andrew Stump, Environmental Scientist.....327-0507
George Carlson, Environmental Scientist.....325-0757

U. S. Geological Survey--Oil and Gas Operations
Federal Building
701 Camino del Rio
Durango, Colorado 81301

Office hours: 8:00 a.m. to 4:30 p.m.

Office phone: (303) 247-5144

Home Phones

Carl Barrick, Petroleum Engineer.....259-0628
Terry Galloway, Petroleum Engineering Technician.....247-3646
Randall Walker, Petroleum Engineering Technician.....247-0487
John Keller, Environmental Scientist.....247-5308
Donald Englishman, Environmental Scientist.....563-4314

Each well drilled on any communitized tract shall be [illegible] in the [illegible] of the combined units with a tolerance of 150 feet for topographical [illegible], but [illegible] shall not be located closer than 330 feet to the outer boundaries of the [illegible] or [illegible].

RULE 105. PIT FOR CLAY, SHALE, AND DRILL CUTTING

In order to assure a supply of proper material for mud-laden fluid to confine oil, gas, or water to their native strata during the drilling of any well, operators shall provide before drilling is commenced an adequate pit for the accumulation of drill cuttings.

RULE 106. SEALING OFF STRATA

(a) During the drilling of any oil or natural gas well, all oil, gas, and water strata above the producing horizon shall be sealed or separated in order to prevent their contents from passing into other strata.

(b) All fresh waters and waters of present or probable value for domestic, commercial, or stock purposes shall be confined to their respective strata and shall be adequately protected by methods approved by the Division. Special precautions by methods satisfactory to the Division shall be taken in drilling and abandoning wells to guard against any loss of artesian water from the strata in which it occurs, and the contamination of artesian water by objectionable water, oil, or gas.

(c) All water shall be shut off and excluded from the various oil and gas bearing strata which are penetrated. Water shut-offs shall ordinarily be made by cementing casing.

RULE 107. CASING AND TUBING REQUIREMENTS

(a) Any well drilled for oil or natural gas shall be equipped with such surface and intermediate casing strings and cement as may be necessary to effectively seal off and isolate all water-, oil-, and gas-bearing strata and other strata encountered in the well down to the casing point. In addition thereto, any well completed for the production of oil or natural gas shall be equipped with a string of properly cemented production casing at sufficient depth to ensure protection of all oil- and gas-bearing strata encountered in the well, including the one(s) to be produced.

Sufficient cement shall be used on surface casing to fill the annular space behind the casing to the top of the hole, provided however, that authorized field personnel of the Division may, at their discretion, allow exceptions to the foregoing requirement when known conditions in a given area render compliance impracticable.

All cementing shall be by pump and plug method unless some other method is expressly authorized by the Division.

All cementing shall be with conventional-type hard-setting cements to which such additives (lighteners, densifiers, extenders, accelerators, retarders, etc.) have been added to suit conditions in the well.

Authorized field personnel of the Division may, when conditions warrant, allow exceptions to the above paragraph and permit the use of oil-base casing packing material in lieu of hard-setting cements on intermediate and production casing strings; provided however, that when such materials are used on the intermediate casing string, conventional-type hard-setting cements shall be placed throughout all oil- and gas-bearing zones and throughout at least the lowermost 300 feet of the intermediate casing string. When such materials are used on the production casing string, coventional-type hard-setting cements shall be placed throughout all oil- and gas-bearing zones and shall extend upward a minimum of 500 feet above the uppermost perforation or, in the case of an open-hole completion, 500 feet above the production casing shoe.

All casing strings shall be tested and proved satisfactory as provided in paragraph (c) below.

(b) After cementing, but before commencing tests required in paragraph (c) below, all casing strings shall stand cemented in accordance with Option 1 or 2 below. Regardless of which option is taken, the casing shall remain stationary and under pressure for at least eight hours after the cement has been placed. Casing shall be "underpressure" if some acceptable means of holding pressure is used or if one or more float valves are employed to hold the cement in place.

OPTION 1

Allow all casing strings to stand cemented a minimum of eighteen (18) hours prior to commencing tests. Operators using this option shall report on Form C-103 the actual time the cement was in place before initiating tests.

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OIL CONSERVATION DIVISION
Applicants EXHIBIT NO. 4
CASE NO. 7087
Submitted by Blackwood
Hearing Date 12/10/80

(May be used in the counties of San Juan, Rio Arriba, McKinley, Sandoval, Lea, Eddy, Chaves, and Roosevelt only.) Allow all casing strings to stand cemented until the cement has reached a compressive strength of at least 500 pounds per square inch in the "zone of interest" before conducting tests, provided however, that no tests shall be commenced until the cement has been in place for at least eight (8) hours.

The "zone of interest" for surface and intermediate casing strings shall be the bottom 20 percent of the casing string, but shall be no more than 1000 feet nor less than 300 feet of the bottom part of the casing unless the casing is set at less than 300 feet. The "zone of interest" for production casing strings shall include the interval or intervals where immediate completion is contemplated.

To determine that a minimum compressive strength of 500 pounds per square inch has been attained, operators shall use the typical performance data for the particular cement mix used in the well, at the minimum temperature indicated for the zone of interest by Figure 107-A, Temperature Gradient Curves. Typical performance data used shall be that data furnished by the cement manufacturer or by a competent materials testing agency, as determined in accordance with the latest edition of API Code RP 10 B "Recommended Practice for Testing Oil-Well Cements."

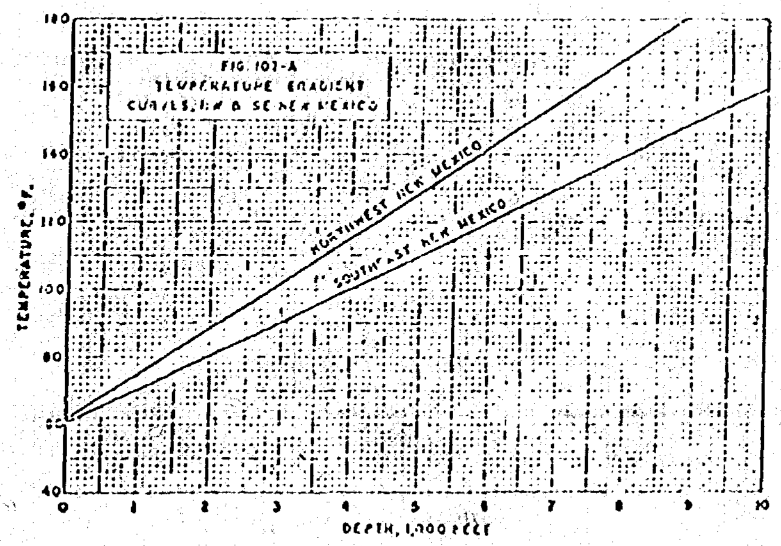


Figure 107-A

Operators using the compressive strength criterion (Option 2) shall report the following information on Form C-103:

(1) Volume of cement slurry (cu. ft.) and brand name of cement and additives, percent additives used, and sequence of placement if more than one type cement slurry is used.

(2) Approximate temperature of cement slurry when mixed.

(3) Estimated minimum formation temperature in zone of interest.

(4) Estimate of cement strength at time of casing test.

(5) Actual time cement in place prior to starting test.

(c) All casing strings except conductor pipe shall be tested after cementing and before commencing any other operations on the well. Form C-103 shall be filed for each casing string reporting the grade and weight of pipe used. In the case of combination strings utilizing pipe of varied grades or weights, the footage of each grade and weight used shall be reported. The results of the casing test, including actual pressure held on pipe and the pressure drop observed shall also be reported on the same Form C-103.

(1) Casing strings in wells drilled with rotary tools shall be pressure tested. Minimum casing test pressure shall be approximately one-third of the manufacturer's rated internal yield pressure except that the test pressure shall not be less than 600 pounds per square inch and need not be greater than 1500 pounds per square inch. In cases where combination strings are involved, the above test pressures shall apply to the lowest pressure rated casing used. Test pressures shall be applied for a period of 30 minutes. If a drop of more than 10 percent of the test pressure should occur, the casing shall be considered defective and corrective measures shall be applied.

(2) [illegible] wells drilled with cable tools [illegible] in subparagraph (c) (1) above, or by bailing the well dry [illegible] of at least one (1) hour before commencing any further operations on the well.

(d) Requirements for tubing of wells are as follows:

(1) All flowing oil wells equipped with casing larger in size than 2 7/8-inch OD shall be tubed.

(2) All gas wells equipped with casing larger in size than 2 7/8-inch OD shall be tubed.

(3) Tubing shall be set as near the bottom as practical and tubing perforations shall not be more than 250 feet above the top of the pay.

(4) The Division Director may, upon proper application, grant administrative exceptions to the provisions of sub-paragraphs (2) and (3) above, without notice and hearing, provided waste will not be caused thereby.

(e) The Division's District Supervisors or their representatives shall have authority to approve tubingless completions without the necessity of administrative approval or notice and hearing when the following conditions exist:

(1) The well is to be completed with a total depth of 5,000 feet or less,

(2) The well is not a wildcat (it is not more than one mile from an existing well producing from the same common source of supply to which it is projected).

(3) No known corrosive or pressure problems exist which might make the tubingless method of completion undesirable,

(4) The well will not be a dual completion,

(5) The tubing used as a substitute for casing will be either 2 3/8-inch OD or 2 7/8-inch OD.

RULE 108. DEFECTIVE CASING OR CEMENTING

In any well that appears to have a defective casing program or faultily cemented or corroded casing which will permit or may create underground waste, the operator shall proceed with diligence to use the appropriate method and means to eliminate such hazard of underground waste. If such hazard of waste cannot be eliminated, the well shall be properly plugged and abandoned.

RULE 109. BLOWOUT PREVENTION (See Rule 114 (b) also)

(a) Blowout preventers shall be installed and maintained in good working order on all drilling rigs operating in areas of known high pressures at or above the projected depth of the well and in all areas where pressures which will be encountered are unknown, and on all workover rigs working on wells in which high pressures are known to exist.

(b) Blowout preventers shall be installed and maintained in good working order on all drilling rigs and workover rigs operating within the corporate limits of any city, town, or village, or within 1320 feet of a habitation, school, or church, wherever located.

(c) All operators, when filing Form C-101, Application for Permit to Drill, Deepen, or Plug Back, or Form C-103, Sundry Notices, for any operation requiring blowout prevention equipment in accordance with Sections (A) and (b) above, shall submit a proposed blowout prevention program for the well. The program is submitted may be modified by the District Supervisor if, in his judgment, such modification is necessary.

RULE 110. PULLING OUTSIDE STRINGS OF CASING

In pulling outside strings of casing from any oil or gas well, the space outside the casing left in the hole shall be kept and left full of mud-laden fluid or cement of adequate specific gravity to seal off all fresh and salt water strata and any strata bearing oil or gas not producing.

RULE 111. DEVIATION TESTS AND DIRECTIONAL DRILLING

(a) Any well which is drilled or deepened with rotary tools shall be tested at reasonably frequent intervals to determine the deviation from the vertical. Such tests shall be made at least once each 500 feet or at the first bit change succeeding 500 feet. A tabulation of all deviation tests run, sworn to and notarized, shall be filed with Form C-104, Request for Allowable and Authorization to Transport Oil and Natural Gas. When the deviation averages more than five degrees in any 500-foot interval, the Division Director may require that a directional survey be run to establish the location of the producing interval(s).

JOHNSTON

Schlumberger

computerized data analysis

COMPANY BLACKWOOD & NICHOLS WELL NORTH EAST BLANCO #33-12 TEST NO. 1 COUNTY SAN JUAN STATE NEW MEXICO

BEFORE EXAMINER STAMETS
OIL CONSERVATION DIVISION
Applicant's EXHIBIT NO. 5
CASE NO. 7087
Submitted by Blackwood
Hearing Date 7/31/80

F.R. # 00095 C

JOHNSTON
Schlumberger

COMPUTERIZED DATA ANALYSIS

MAY 20, 1980

GENTLEMEN:

THE ENCLOSED TEST APPEARS TO BE A GOOD MECHANICAL DRILL STEM TEST DURING WHICH THE TOOLS DID FUNCTION PROPERLY. THE FORMATION PRODUCED ENOUGH RESERVOIR FLUID FOR PROPER IDENTIFICATION. RESERVOIR PRESSURE DRAWDOWN WAS SUFFICIENT AND AN ADEQUATE SHUT-IN BUILD-UP DID OCCUR FOR RELIABLE QUANTITATIVE ANALYSIS. RESERVOIR PARAMETERS WERE CALCULATED BY THE HORNER METHOD.

1. FLOW RATE: A FLOW RATE OF 35 MCF/DAY OF GAS WAS NOTED DURING THIS TEST.

2. RESERVOIR PRESSURE: EXTRAPOLATION OF THE SHUT-IN PRESSURE BUILD-UP INDICATES A MAXIMUM RESERVOIR PRESSURE OF 1677 P.S.I.G. AT RECORDER DEPTH.

3. PERMEABILITY: THE CALCULATED TRANSMISSIBILITY FACTOR OF 106.45 MD.-FT./CP. INDICATES AN AVERAGE EFFECTIVE PERMEABILITY TO GAS OF 0.067 MD. FOR THE REPORTED 20 FOOT NET INTERVAL. THE CALCULATIONS WERE BASED ON A SLOPE OF 139 P.S.I./LOG CYCLE OBTAINED FROM THE SHUT-IN BUILD-UP PLOT. IT WAS ASSUMED FOR THESE CALCULATIONS: (A) GAS GRAVITY 0.70, (B) VISCOSITY .0125 CP., (C) AND GAS DEVIATION FACTOR .855. THESE FIGURES WERE OBTAINED FROM THE AVAILABLE TECHNICAL LITERATURE.

4. WELLBORE DAMAGE: THE CALCULATED DAMAGE RATIO OF 5.5% INDICATES THAT WELLBORE DAMAGE IS PRESENT AT THE TIME AND CONDITIONS OF THIS TEST. THE PRESSURE DROP DUE TO DAMAGE IS ESTIMATED TO BE 1211 P.S.I.

5. RADIUS OF INVESTIGATION: THE CALCULATED RADIUS OF INVESTIGATION OF THIS TEST IS 5.0 FEET BASED ON AN ASSUMED POROSITY OF 10%, COMPRESSIBILITY OF 1.26×10^{-3}, AND OTHER ASSUMPTIONS MADE IN NUMBER 3 ABOVE.

6. GENERAL COMMENTS: THE FORMATION EXHIBITS THE CHARACTERISTICS OF RELATIVELY LOW PERMEABILITY EFFECTIVE TO THE RESERVOIR FLUID AND INDICATES THE PRESENCE OF WELLBORE DAMAGE.

Dennis Myren

DENNIS MYREN
RESERVOIR EVALUATION
DEPARTMENT

BLACKWOOD & NICHOLS
NORTH EAST BLANCO #33-12; SAN JUAN COUNTY, NEW MEXICO
TEST #1; 3055' TO 3205'

FIELD REPORT # 00095 C

Gas Reservoir Engineering Data

JOHNSTON

Instrument No. L-436 Field Report No. 00095 C

Damage Ratio	DR	5.57		Effective Transmissibility TO GAS	$\frac{Kh}{\mu}$	106.45	Md-ft. / Cp.
Maximum Reservoir Pressure	P_o	1677	P.S.I.G.	Flow Rate ESTIMATED	Q_g	35	MCF 'day
Slope of Shut-in Curve	M_g	139	PSI/log cycle	Flow Rate	Q	-	
Potentiometric Surface (Datum Plane, Sea Level)	PS	-	ft.	Pressure Gradient		0.523	PSI/ft.
Radius of Investigation		5.0	ft.	K (Effective to GAS)		0.067	Md.

SLOPE M_G = 1677 - 1538 = 139

Assumptions made for Calculations for Gas Recoveries

1. Q_g is taken as steady state flow and unless stated otherwise at standard conditions 14.7 P.S.I. and 60°F.
2. P_f is final formation flowing pressure at steady state flow.
3. Formation flow is taken as single phase flow. If liquid (condensate) is produced at surface, condensation is assumed to have occurred in drill pipe.
4. Radial flow is assumed.
5. Unless given, gas specific gravity is assumed to be 0.7 (air 1.0) and having pseudo critical temperature at 385° Rankin and pseudo critical pressure of 666 P.S.I.A.
6. Other standard radial flow, steady state assumptions.

Empirical Equations:

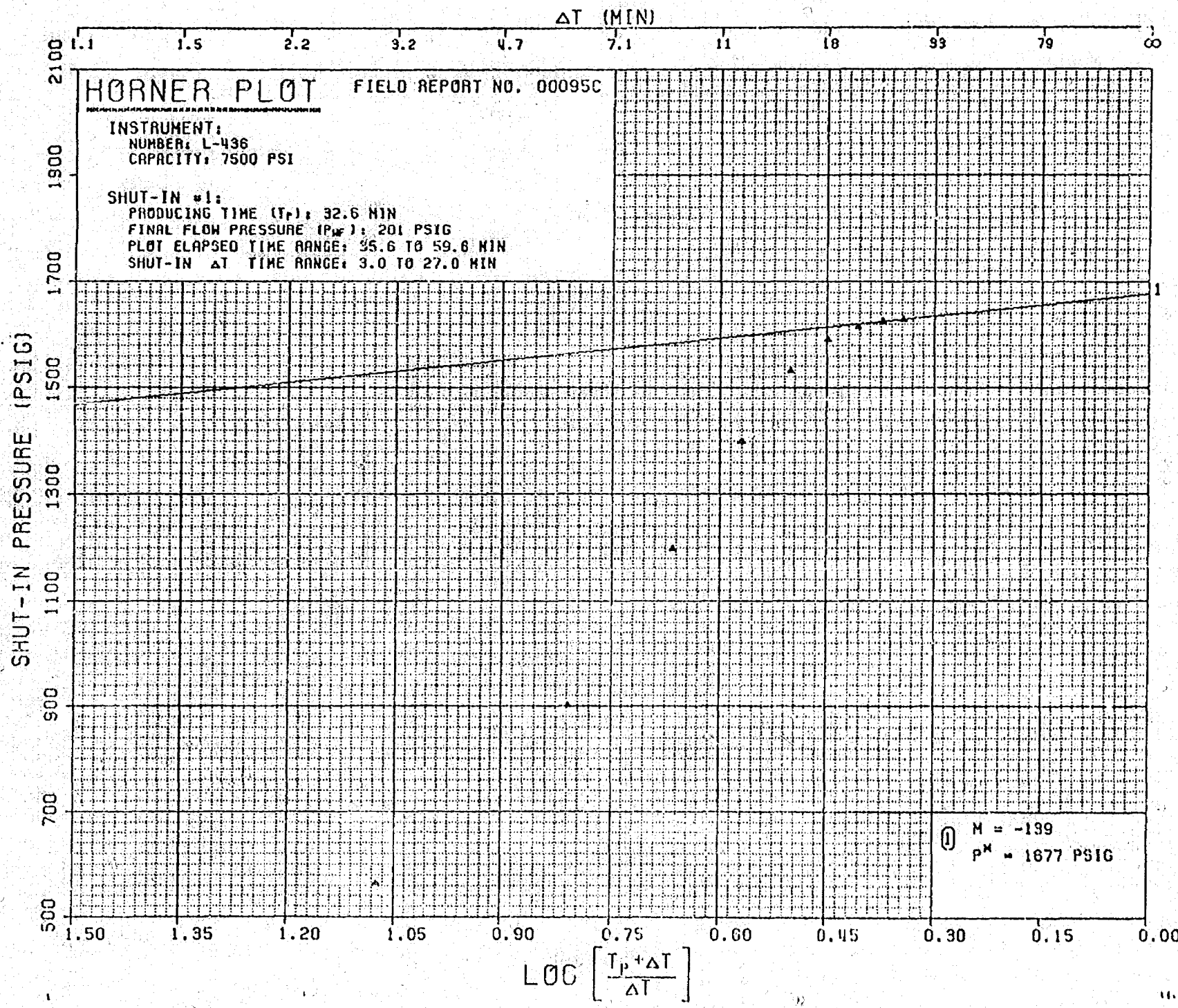
1. $EDR = \frac{P_o^2 - P_f^2}{M_g(\log T + 2.65)}$ where $M_g = \frac{P_1^2 - P_{10}^2}{\text{Log Cycle}}$

2. Transmissibility $\frac{Kh}{\mu Z} = \frac{1637^{\circ} T_f Q_g}{M_g}$

3. P.S. = $\left[P_o \times 2.309 \text{ ft./PSI}\right]$ - $\left[\text{Recorder depth to sea level.}\right]$

4. Radius of Investigation, $r_{i'} = \sqrt{\frac{Kt}{40\phi(1 - S_w)\mu c}}$ where t = time in days

In making any interpretation, our employees will give Customer the benefit of their best judgment as to the correct interpretation. Nevertheless, since all interpretations are opinions based on inferences from electrical, mechanical or other measurements, we cannot, and do not, guarantee the accuracy or correctness or any interpretations, and we shall not be liable or responsible, except in the case of gross or willful negligence on our part, for any loss, costs, damages or expenses incurred or sustained by Customer resulting from any interpretation made by any of our agents or employees.


ΔT (MIN)
1.1
1.5
2.2
3.2
4.7
7.1
11
18
33
79
∞
HORNER PLOT
FIELD REPORT NO. 00095C
INSTRUMENT:
NUMBER: L-436
CAPACITY: 7500 PSI
SHUT-IN #1:
PRODUCING TIME (T_p): 32.6 MIN
FINAL FLOW PRESSURE (P_{wf}): 201 PSIG
PLOT ELAPSED TIME RANGE: 35.6 TO 59.6 MIN
SHUT-IN ΔT TIME RANGE: 3.0 TO 27.0 MIN
SHUT-IN PRESSURE (PSIG)
2100
1900
1700
1500
1300
1100
900
700
500
1
M = -139
P^* = 1677 PSIG
1.50
1.35
1.20
1.05
0.90
0.75
0.60
0.45
0.30
0.15
0.00
LOG $\left[\frac{T_p+\Delta T}{\Delta T}\right]$

FIELD REPORT NO. 00095C

INSTRUMENT:

NUMBER: L-436

CAPACITY: 7500 PSI

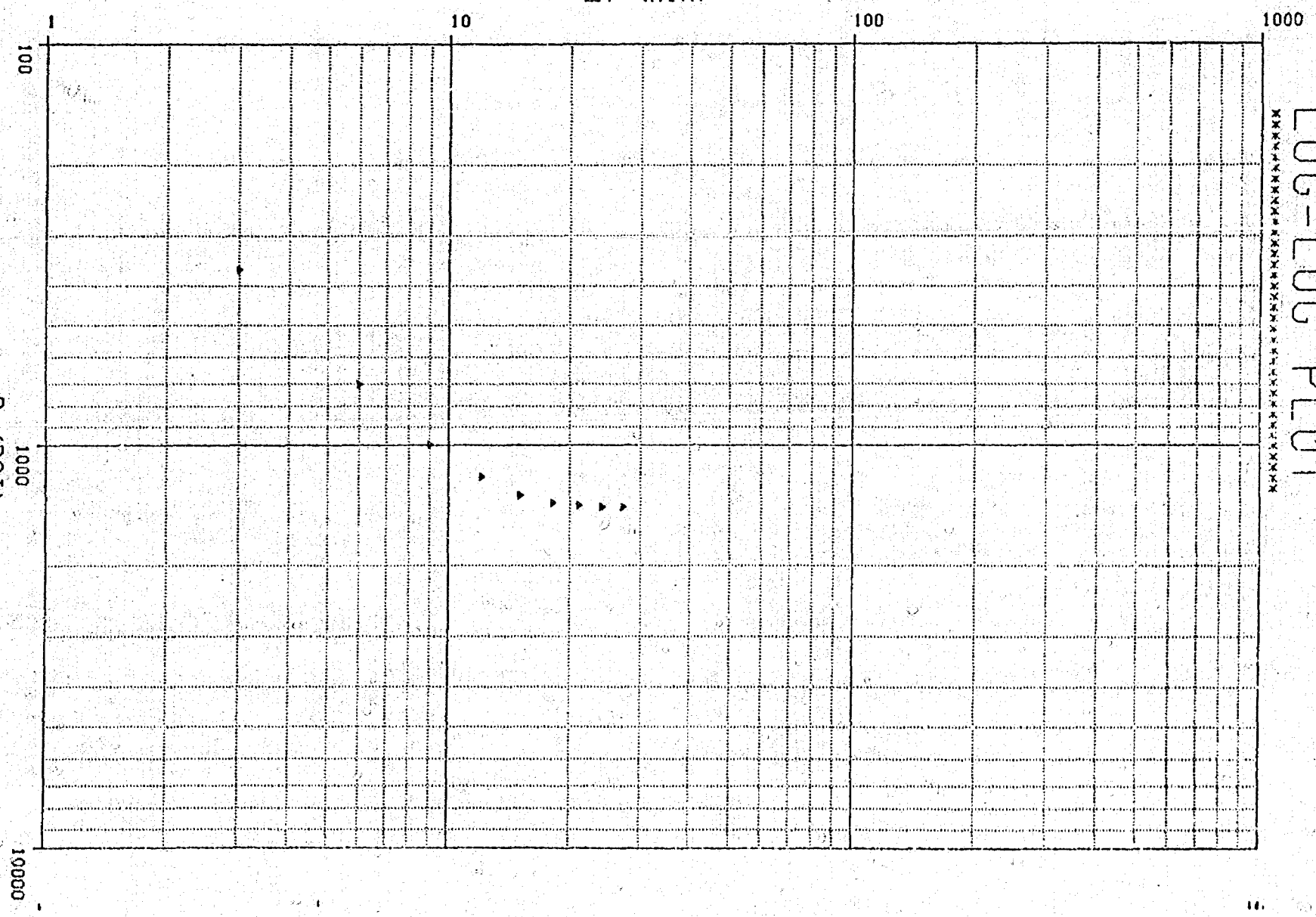
SHUT-IN #1:

FINAL FLOW PRESSURE (P_{WF}): 201 PSIG

PLOT ELAPSED TIME RANGE: 35.6 TO 59.6 MIN

SHUT-IN ΔT TIME RANGE: 3.0 TO 27.0 MIN

LOG-LOG PLOT



WELL IDENTIFICATION

COMPANY:	BLACKWOOD & NICHOLS 2Ø13 FIRST NATIONAL CENTER WEST OKLAHOMA CITY, OKLAHOMA 73102	CUSTOMER:	SAME
WELL:	NORTH EAST BLANCO #33-12	LOCATION:	-
TEST INTERVAL:	3Ø55' TO 32Ø5'	FIELD:	BLANCO
TEST NO:	1	TEST DATE:	1Ø-24-55
COUNTY:	SAN JUAN	STATE:	NEW MEXICO
TECHNICIAN:	MORRIS BOWEN	TEST APPROVED BY:	MR. W.J. LINTON

EQUIPMENT AND HOLE DATA

TEST TYPE:	DUAL PACKERS			DRILL PIPE LENGTH:	-	FT.
				DRILL PIPE I.D.:	-	IN.
ELEVATION:	-		FT.	DRILL COLLAR LENGTH:	-	FT.
TOTAL DEPTH:	32Ø5		FT.	DRILL COLLAR I.D.:	-	IN.
MAIN HOLE/CASING SIZE:	9 7/8		IN.	PACKER DEPTHS:	3Ø5Ø & 3Ø55	FT.
RAT HOLE/LINER SIZE:	-		IN.		&	FT.
FORMATION TESTED:	-				&	FT.
NET PROD. INTERVAL:	-		FT.	DEPTHS REF. TO:	-	
POROSITY:	-		%			

TEST TOOL CHAMBER DATA

SAMPLER PRESSURE:	-	PSIG
RECOVERED OIL GRAVITY:	API @	DEG. F.
RECOVERY GOR:		FT3/BBL.

SAMPLE CHAMBER CONTENTS

FLUID	VOLUME	RESIST. (OHM-M)	MEAS. TEMP. (DEG F.)	CHLOR. (PPM)
GAS:	- FT.3			
OIL:	- CC			
WATER:	CC			
MUD:	CC			
FILTRATE:				
TOTAL LIQUID:	- CC			

MUD DATA

TYPE:	MUD
WEIGHT:	11.4 LB/GAL.
VISCOSITY:	63 SEC.
WATER LOSS:	- CC

FLUID	RESIST (OHM-M)	TEMP (DEG F)	CHLOR (PPM)
MUD:	-	-	
FILTRATE:	-	-	

REMARKS

NO. OF REPORTS REQUESTED: 5

FIELD REPORT NO. ØØØ95C

SURFACE INFORMATION

DESCRIPTION(RATE OF FLOW)		TIME	PRESSURE PSIG	SURFACE CHOKE
STRONG BLOW OF AIR TO SURFACE IMMEDIATELY. TO SURFACE IN 1Ø MINUTES.	GAS	-	Ø	1"

CUSHION TYPE: -	- FT	- PSIG	3/4 IN. BOTTOM CHOKE

RECOVERY INFORMATION

RECOVERY	FEET	BARRELS	%OIL	%WATER	%OTHERS	API GRAV.	DEG.	RESIST	DEG.	CHL PPM
-	-	-	-	-	-	-	-	-	-	-

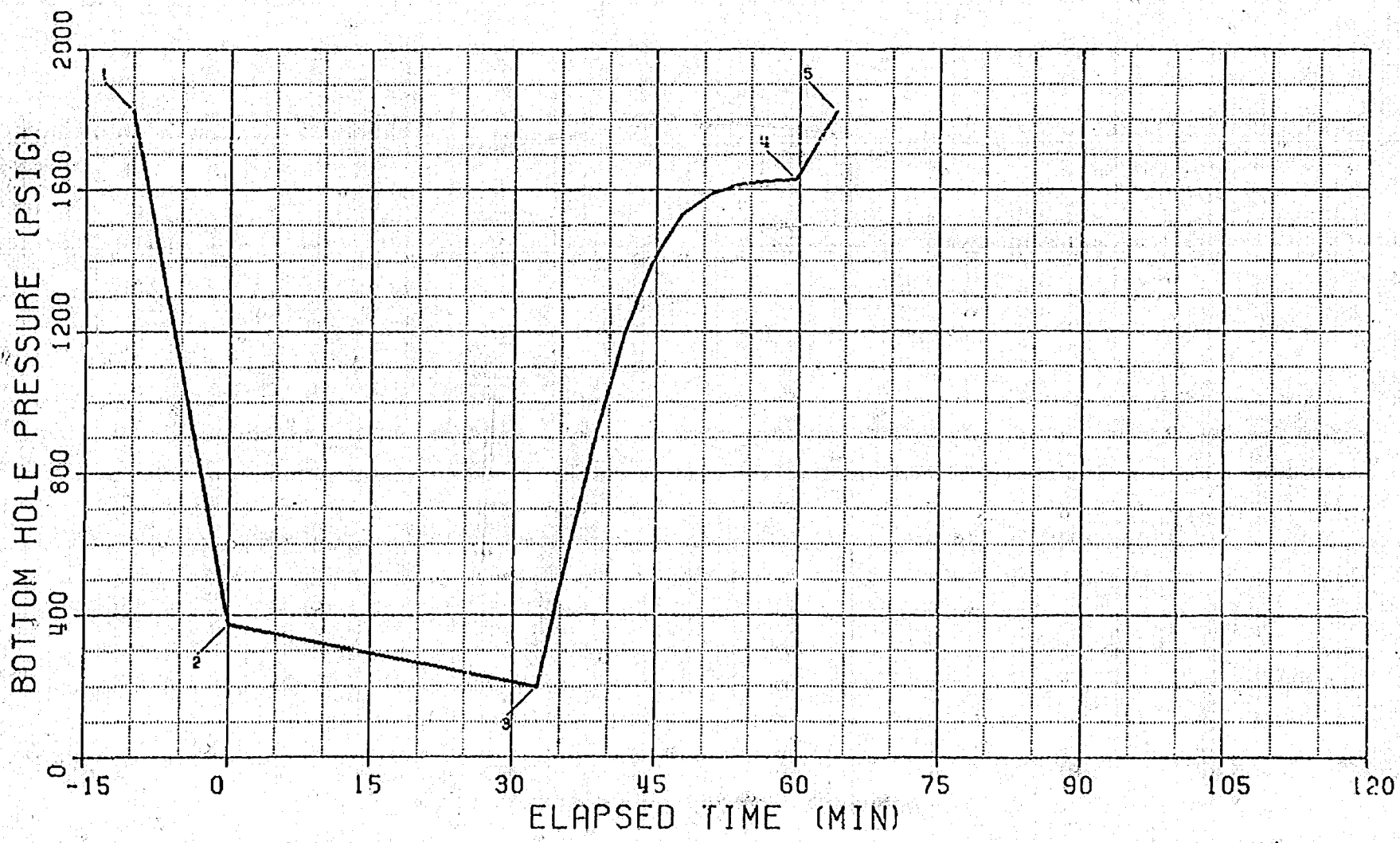
PRESSURE LOG

FIELD REPORT NO. 00095C

INSTRUMENT:

NUMBER: L 436

CAPACITY: 7500 PSI



BOTTOM HOLE PRESSURE AND TIME DATA

INSTRUMENT NO.: L-436 CAPACITY (PSI): 75ØØ
PORT OPENING:— BOTTOM HOLE TEMP (F): 11Ø

EXPLANATION	LABELED POINT	PRESSURE (PSIG)	ELAPSED TIME (MIN)
HYDROSTATIC MUD	1	1825	
START FLOW	2	375	Ø.Ø
END FLOW & START SHUT-IN	3	2Ø1	32.6
END SHUT-IN	4	1629	59.6
HYDROSTATIC MUD	5	1825	

* SUMMARY OF FLOW PERIODS *

FLOW PERIOD	ELAPSED TIME AT START (MIN)	ELAPSED TIME AT END (MIN)	DURATION OF FLOW (MIN)	PRESSURE AT START (PSIG)	PRESSURE AT END (PSIG)
1	Ø.Ø	32.6	32.6	375	2Ø1

* SUMMARY OF SHUT-IN PERIODS *

SHUT-IN PERIOD	ELAPSED TIME AT START (MIN)	ELAPSED TIME AT END (MIN)	DURATION OF SHUT-IN (MIN)	PRESSURE AT START (PSIG)	PRESSURE AT END (PSIG)	FINAL FLOW PRESSURE (PSIG)	PRODUCING TIME (MIN)
1	32.6	59.6	27.Ø	2Ø1	1629	2Ø1	32.6

FIELD REPORT NO. ØØØ95C
INSTRUMENT NO. L-436

FIELD REPORT NO. ØØØ95C
INSTRUMENT NO. L-436

TEST PHASE : FLOW PERIOD # 1

ELAPSED TIME (MIN)	DELTA TIME (MIN)	FLOWING PRESSURE (PSIG)
Ø.Ø	Ø.Ø	375
32.6	32.6	2Ø1

TEST PHASE : SHUT-IN PERIOD # 1

1. FINAL FLOW PRESSURE ["P_{WF}"] = 2Ø1 PSIG
2. PRODUCING TIME ["T_P"] = 32.6 MIN

ELAPSED TIME (MIN)	DELTA TIME ["DT"] (MIN)	SHUT-IN PRESSURE ["P_{WS}"] (PSIG)	LOG [(T +DT)/DT] P	DELTA PRESSURE [P_{WS} - P_{WF}]
32.6	Ø.Ø	2Ø1		Ø
35.6	3.Ø	565	1.Ø74	364
38.6	6.Ø	9Ø2	Ø.8Ø8	7Ø1
41.6	9.Ø	1198	Ø.665	997
44.6	12.Ø	14ØØ	Ø.57Ø	1199
47.6	15.Ø	1532	Ø.5Ø2	1331
5Ø.6	18.Ø	1591	Ø.449	139Ø
53.6	21.Ø	1614	Ø.4Ø7	1413
56.6	24.Ø	1625	Ø.373	1424
59.6	27.Ø	1629	Ø.344	1428

Supplemental Gas Volume estimates for

October Gas Sales 1980

Northeast Blanco Unit Well No.	Gas Sales	Fruitland	Days	15,025 Mcfpd	14,73 Mcfpd
201	1054	1054	32	33	34
202*	9573	4787	32	150	153
203	588	588	30	20	21
204*	7119	3560	32	111	113
205	1714	1714	32	54	55

*The Fruitland and Pictured Cliffs formations are being produced commingled in these 2 (two) wells (202 & 204). The production has been assigned equally to each formation.

Northeast Blanco Unit Well No. 201
October production 34 Mcfpd.
The estimated stabilized production to the atmosphere = 1500/ (1500-300) x 34 = 43Mcfpd. The 43 Mcfpd is after stimulation. The flow improvement should be at least 4 times because of stimulation. Therefore the "non stimulated stabilized production rate to the atmosphere" is estimated to be 11 Mcfpd.

Northeast Blanco Unit Well No. 202
October Production rate (Fruitland) 153 Mcfpd.
The estimated stabilized production rate (stimulated) to the atmosphere is calculated to be 1478/ (1478-310) x 153 = 194Mcfpd. The stimulation procedure theoretically improved the producing capacity by a factor grater than 4. Therefore the "non stimulated stabilized production rate to the atmosphere" is estimated to be 48 Mcfpd for October, 1980 from the Fruitland formation.

Northeast Blanco Unit Well No. 203
October production averaged 21 Mcfpd.
The estimated stabilized production rate to the atmosphere is 1475/ (1475-310) x 21 = 27Mcfpd. The stimulation procedure used on this well has been calculated to show that the production should have been increased 10 fold. Therefore the estimated "non stimulated stabilized production rate to the atmosphere" is calculated to be 3 Mcfpd.

Northeast Blanco Unit Well No. 204
October production averaged 113 Mcfpd from the Fruitland.
The estimated stabilized production rate to the atmosphere is 1420/ (1420-310) x 113 = 145Mcfpd. The well was stimulated prior to production in a manner to increase the productivity at least 4 times. Therefore the estimated "non stimulated stabilized production rate to the atmosphere" is 36Mcfpd.

Northeast Blanco Unit Well No. 205
October production averaged 55 Mcfpd.
The estimated stabilized production rate to the atmosphere is estimated to be 1475/ (1475-310) x 55 = 70Mcfpd. This well was stimulated in a manner which should have increased productivity at least 4 times. Therefore the "non stimulated stabilized production rate to the atmosphere" is 18Mcfpd.

In October the 5 Northeast Blanco Unit wells averaged 75 Mcfpd per well actual gas sales from the Fruitland formation. All of these wells have been stimulated by fracturing.

The estimated average per well stabilized production(prior to stimulation and adjusted to zero line pressure) is 23 Mcfpd .

This average of 23 Mcfpd per well is down from the 25 Mcfpd per well calculated for the wells in this area from July production.

1120

BEFORE EXAMINER STAMETS
OIL CONSERVATION DIVISION
Applicants EXHIBIT NO. 20
CASE NO. 7087
Submitted by Blackwood
Hearing Date 12/10/80

Western Petroleum Services

BEFORE EXAMINER STAMETS
OIL CONSERVATION DIVISION
Applicants EXHIBIT NO. 7
CASE NO. 7287
Submitted by Blackwood
Hearing Date 18/10/80

FRACTURE STIMULATION RECOMMENDATION

FOR

BLACKWOOD & NICHOLS CO., LTD

NEBU NO. 203

PICTURED CLIFFS AND FRUITLAND FORMATIONS

BLANCO PICTURED CLIFFS FIELD

SAN JUAN COUNTY, NEW MEXICO

Sec.11, T31N, R7W

Prepared for:
Mr. Loos
Blackwood & Nichols Co., LTD
Farmington, New Mexico

Prepared by:
Randy LaFollette
The Western Company
Denver, Colorado

August 12, 1980

Service Point:
Farmington, New Mexico
505-327-6222

DISCUSSION:

The customer requested fracture stimulation designs for the Pictured Cliffs and Fruitland zones in the #203 well. Mini Max III-30 gel is recommended with a 2% condensate phase for fluid loss control. Mini Max III is a titanate cross-linked hydroxy-propyl guar gum gel featuring very low leak-off, perfect proppant support and neutral pH.

Figure I shows the anticipated rate-pressure relationship for treatment via 4½" casing. At the recommended rate of 30 BPM, a surface pressure of 2,600 psi is expected. Treatment with 100,000 gallons of Mini Max III-30/2% HC and 190,000# 10/20 mesh sand is recommended to yield a propped length of 972 feet. Average sand concentration in the fracture is .73#/ft^2 (see Exhibit II). Figure II shows the McGuire and Sikora productivity increase chart. With the reservoir and fracture parameters given, a theoretical 10 fold production increase is calculated.

The expected rate-pressure graph for the Fruitland is presented in Figure III. At the recommended 17 BPM rate, a surface treating pressure of 2,700 psi is expected. Treatment with 40,000 gallons of Mini Max III-30/2% HC and 76,000# 10/20 mesh sand is recommended to yield a propped length of 1,200 feet. Average sand concentration in the fracture is .75#/ft^2 (see Exhibit II). Figure IV shows the McGuire-Sikora graph. After scaling, an 11 fold productivity increase is calculated.

WELL DATA:

Formation:	Pictured Cliffs
Average Depth To Zone:	3,500 ft.
Zone Height:	133 ft.
Casing Size:	4½"
Perforated Interval:	3456, 3478, 3492, 3518, 3534, 3554, 2 jspf, .34" diameter
Bottom Hole Temperature:	120° F
Fracture Gradient:	.65 psi/ft
Bottom Hole Fracture Pressure:	2,275 psi
Bottom Hole Pressure:	1,375 psi
Overburden:	900 psi
Hydrostatic Head:	1,515 psi with fresh water
ISDP (fresh water):	760 psi
Porosity:	10%
Permeability:	.06 md
Well Spacing:	160 acres

WELL DATA:

Formation:	Pictured Cliffs
Average Depth To Zone:	3,500 ft.
Zone Height:	133 ft.
Casing Size:	4½"
Perforated Interval:	3456, 3478, 3492, 3518, 3534, 3554, 2 jspf, .34" diameter
Bottom Hole Temperature:	120° F
Fracture Gradient:	.65 psi/ft
Bottom Hole Fracture Pressure:	2,275 psi
Bottom Hole Pressure:	1,375 psi
Overburden:	900 psi
Hydrostatic Head:	1,515 psi with fresh water
ISDP (fresh water):	760 psi
Porosity:	10%
Permeability:	.06 md
Well Spacing:	160 acres

TREATMENT PROCEDURE:

It is recommended that the Pictured Cliffs zone be fracture stimulated via 4½" casing with 100,000 gallons of Mini Max III-30/2% HC gel containing 190,000# 10/20 mesh sand. Average anticipated injection rate and surface treating pressure are 30 BPM and 2,600 psi, respectively. Stage fluid and sand as follows:

1. Pump 20,000 gallons of Mini Max III-30/2% HC as a pad to initiate the fracture and establish sufficient fracture width to accept sand. (Add 1#/1000 B-5.)

2. Pump 20,000 gallons of Mini Max III-30/2% HC with 1 ppg 10/20 mesh sand. (Add 1#/1000 B-5.)

3. Pump 20,000 gallons of Mini Max III-30/2% HC with 2 ppg 10/20 mesh sand. (Add 2#/1000 B-5.)

4. Pump 20,000 gallons of Mini Max III-30/2% HC with 3 ppg 10/20 mesh sand. (Add 2#/1000 B-5.)

5. Pump 20,000 gallons of Mini Max III-30/2% HC with 3½ ppg 10/20 mesh sand. (Add 2#/1000 B-5.)

6. Cut sand, start flush with 500 gallons of Mini Max III-30 gel.

7. Continue to flush to top perforation with 1,815 gallons of fresh water.

8. Shut in for at least 6 hours to allow gel to break and fracture to heal and recover treating fluid load.

NOTE: All gel to contain 2% condensate, 1 gal/1000 Aquaflow, 1 gal/1000 Adocide.

TREATMENT PROCEDURE:

Treating Conductor	4½" casing
Injection Rate	30 BPM
Expected Surface Treating Pressure	2,600 psi
Total Pumpable Volume of Mini Max III-40 Gel Phase	100,000 gallons
Total Pumpable Volume of Condensate	2,000 gallons
Total Pumpable Volume of Fresh Water Flush & Reserve	5,000 gallons
Total 10/20 Mesh Sand Required	190,000#

Auxiliary Materials:

161# B-5 gel breaker

105 gallons Adocide bactericide

105 gallons Aquaflow surfactant

COST ESTIMATE:

100,500 gallons of Mini Max III-30/2% HC @ .24/gal	$24,120.00
161# B 5 @ 2.15/lb	346.15
105 gallons Adocide @ 29.40/gal	3,087.00
105 gallons Aquaflow @ 25.85/gal	2,714.25
Chemical Delivery Charge @ .68/T mi x 3.5 T x 75 mi	178.50
190,000# 10/20 Sand @ 5.25/cwt	9,975.00
Sand Pumping Charge @ .70/cwt	1,330.00
Proppant Delivery Charge @ .68/T mi x 95 T x 75 mi	4,845.00
30 BPM Master Mixer @ 760.00	760.00
1,912 HHP @ 3.15/HHP	6,022.80
Mileage Charge @ 1.90/unit mi x 6 units x 75 mi	855.00
Sandmaster @ 875.00	875.00
Ratiometer @ 134.00	134.00
TOTAL	$55,242.70

Subject to terms and conditions in the published price schedule of The Western Company of North America.

WELL DATA:

Formation:	Fruitland
Average Depth To Zone:	3,380 ft.
Zone Height:	42 ft.
Casing Size:	4½" - 10.5#
Perforated Interval:	3368, 3374, 3384, 3392, 2 jspf, .34" diameter
Bottom Hole Temperature:	120° F
Fracture Gradient:	.9 psi/ft
Bottom Hole Fracture Pressure:	3,050 psi
Bottom Hole Pressure:	1,375 psi
Overburden:	1,675 psi
Hydrostatic Head:	1,450 psi with fresh water
ISDP (fresh water):	1,600 psi
Porosity:	10%
Permeability:	.06 md
Well Spacing:	160 acres

TREATMENT PROCEDURE:

It is recommended that the Fruitland zone be fracture stimulated via 4½" casing with 40,000 gallons of Mini Max III-30/2% HC gel and 76,000# 10/20 mesh sand. Average anticipated injection rate and surface treating pressure are 17 BPM and 2,700 psi, respectively. Stage fluid and proppant as follows:

1. Pump 8,000 gallons of Mini Max III-30/2% HC as a pad to initiate the fracture and establish sufficient fracture width to accept sand. (Add 1#/1000 B-5.)
2. Pump 8,000 gallons of Mini Max III-30/2% HC with 1 ppg 10/20 mesh sand. (Add 1#/1000 B-5.)
3. Pump 8,000 gallons of Mini Max III-30/2% HC with 2 ppg 10/20 mesh sand. (Add 2#/1000 B-5.)
4. Pump 8,000 gallons of Mini Max III-30/2% HC with 3 ppg 10/20 mesh sand. (Add 2#/1000 B-5.)
5. Pump 8,000 gallons of Mini Max III-30/2% HC with 3½ ppg 10/20 mesh sand. (Add 2#/1000 B-5.)
6. Cut sand, start flush with 500 gallons of Mini Max III-30 gel.
7. Continue to flush to top perforation with 1,750 gallons of fresh water.
8. Shut in for at least 6 hours to allow gel to break and fracture to heal and recover treating fluid load.

NOTE: All gel to contain 2% condensate, 1 gal/1000 Aquaflow, 1 gal/1000 Adocide.

TREATMENT REQUIREMENTS:

Treating Conductor	4½" casing
Injection Rate	17 BPM
Expected Surface Treating Pressure	2,700 psi
Total Pumpable Volume of Mini Max III-30 Gel Phase	40,000 gallons
Total Pumpable Volume of Condensate	800 gallons
Total Pumpable Volume of Fresh Water Flush & Reserve	5,000 gallons
Total 10/20 Mesh Sand Required	76,000#

Auxiliary Materials:

42 gallons Aquaflow surfactant

42 gallons Adocide bactericide

65# B-5 gel breaker

COST ESTIMATE:

40,000 gallons of Mini Max III-30/2% HC @ .24/gal	$ 9,600.00
65# B-5 @ 2.15/lb	139.75
42 gallons Adocide @ 29.40/gal	1,234.80
42 gallons Aquaflow @ 25.85/gal	1,085.70
Chemical Delivery Charge @ .68/T mi x 1.5 T x 75 mi	76.50
76,000# 10/20 Sand @ 5.25/cwt	3,990.00
Sand Pumping Charge @ .70/cwt	532.00
Proppant Delivery Charge @ .68/T mi x 38 T x 75 mi	1,938.00
17 BPM Master Mixer @ 730.00	730.00
1,125 HHP @ 3.15/HHP	3,543.75
Mileage Charge @ 1.90/unit mi x 6 units x 75 mi	855.00
Ratiometer @ 134.00	134.00
TOTAL	$23,859.50

Subject to terms and conditions in the published price schedule of The Western Company of North America.

F.C.

FIGURE I

COMPANY Blackwood & Nichols

WELL #203

DEPTH 3,500'

TREATING STRING 4½"

PERFORATIONS 12-.74" holes

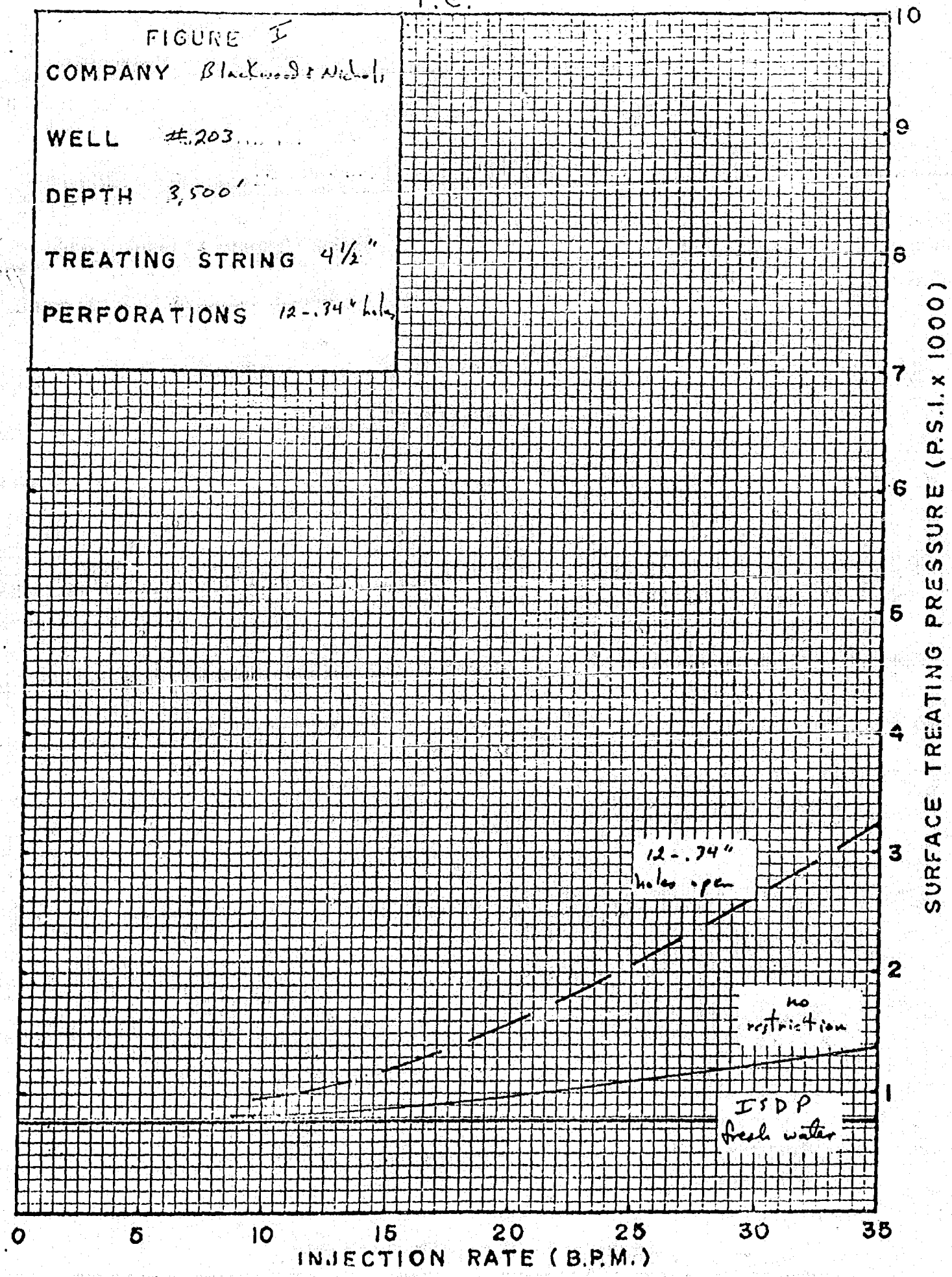
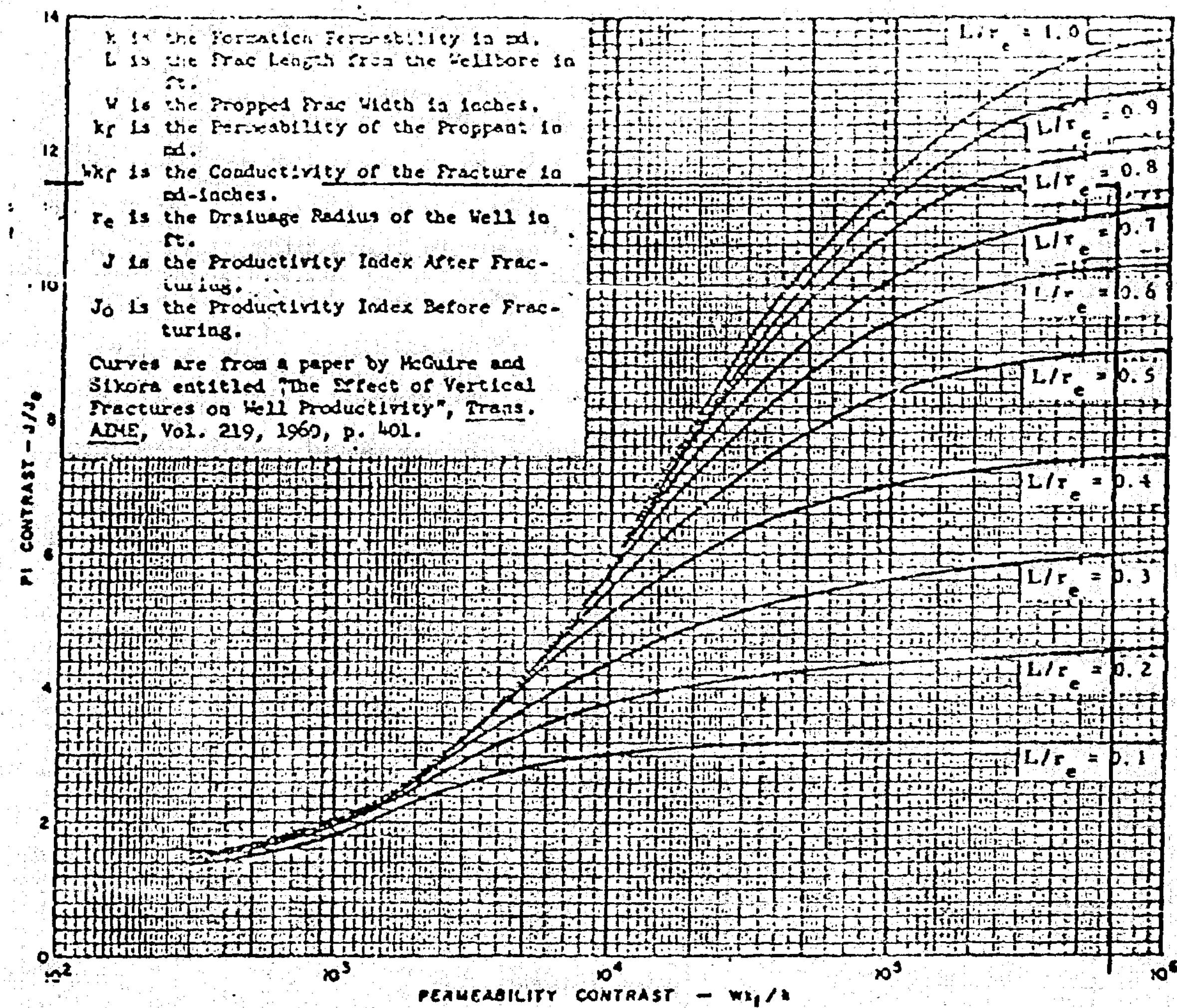


FIGURE II



INCREASES IN PRODUCTION FROM VERTICAL FRACTURES

J/J_0 = 10 after scaling

Note: This graph is based on a well spacing (A) of 40 acres and a wellbore radius (r_w) of 3 inches. It can be converted to other well spacing and wellbore radii by use of the following scaling factors:

Well Spacing	Drainage Radii	Scaling Factors for Abscissa (Wk_f/k)	Scaling Factors for Ordinate (J/J_o)
For spacing shown and 3-inch wellbore radius.			
10 Acres	330 ft	2.00	1.11
20 Acres	467 ft	1.42	1.05
40 Acres	660 ft	1.00	1.00
80 Acres	933 ft	0.71	0.95
160 Acres	1320 ft	0.50	0.91
320 Acres	1867 ft	0.35	0.87
640 Acres	2640 ft	0.25	0.84
For other spacing (A) and wellbore radii (r_w).			
A	$104\sqrt{A}$	$\sqrt{40/A}$	$\frac{3.095}{\log(.472)(r_e/r_w)}$

FIGURE III

COMPANY Blackwood & Nichols

WELL #203

DEPTH 3,380'

TREATING STRING 4 1/2"

PERFORATIONS 8-.34" holes

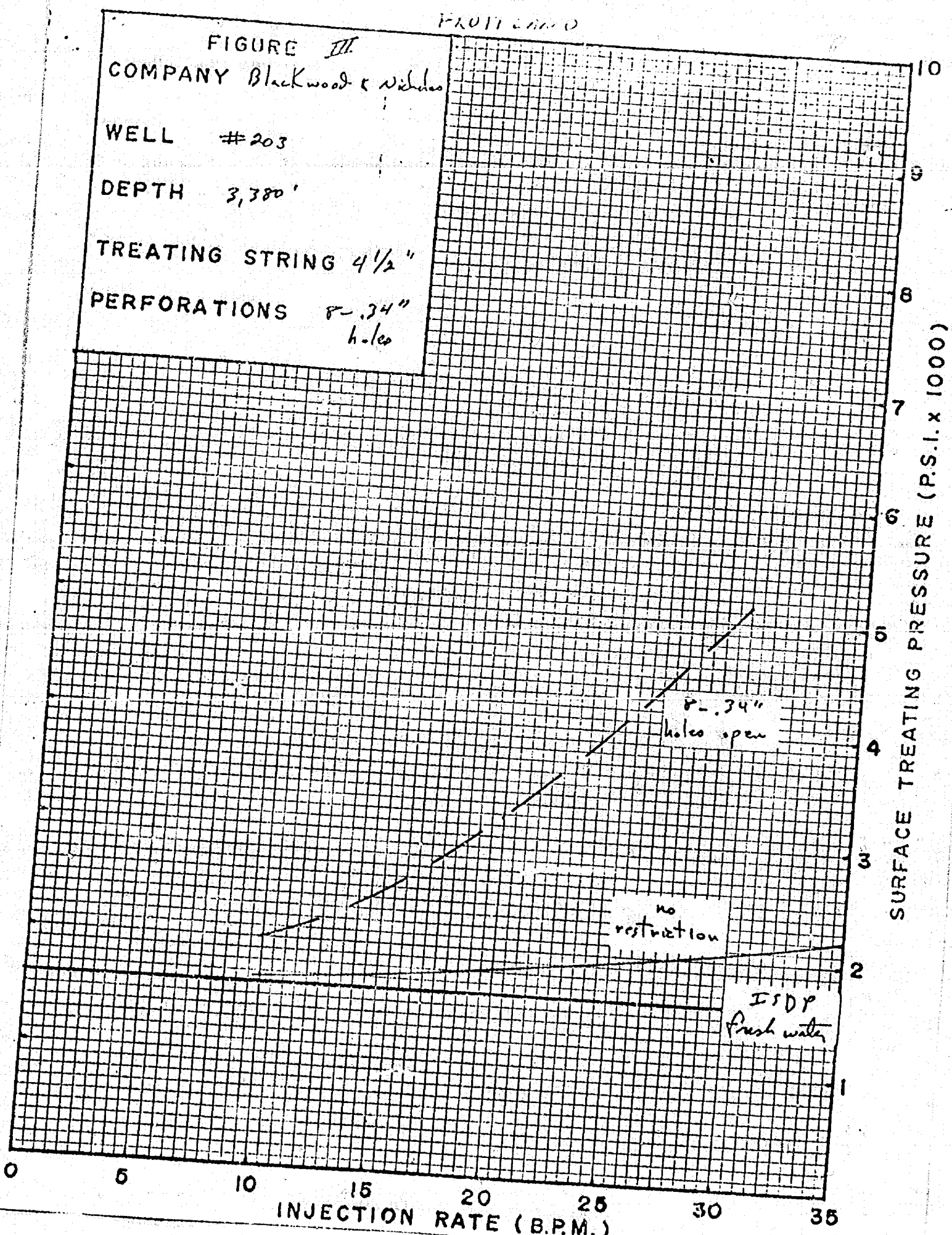
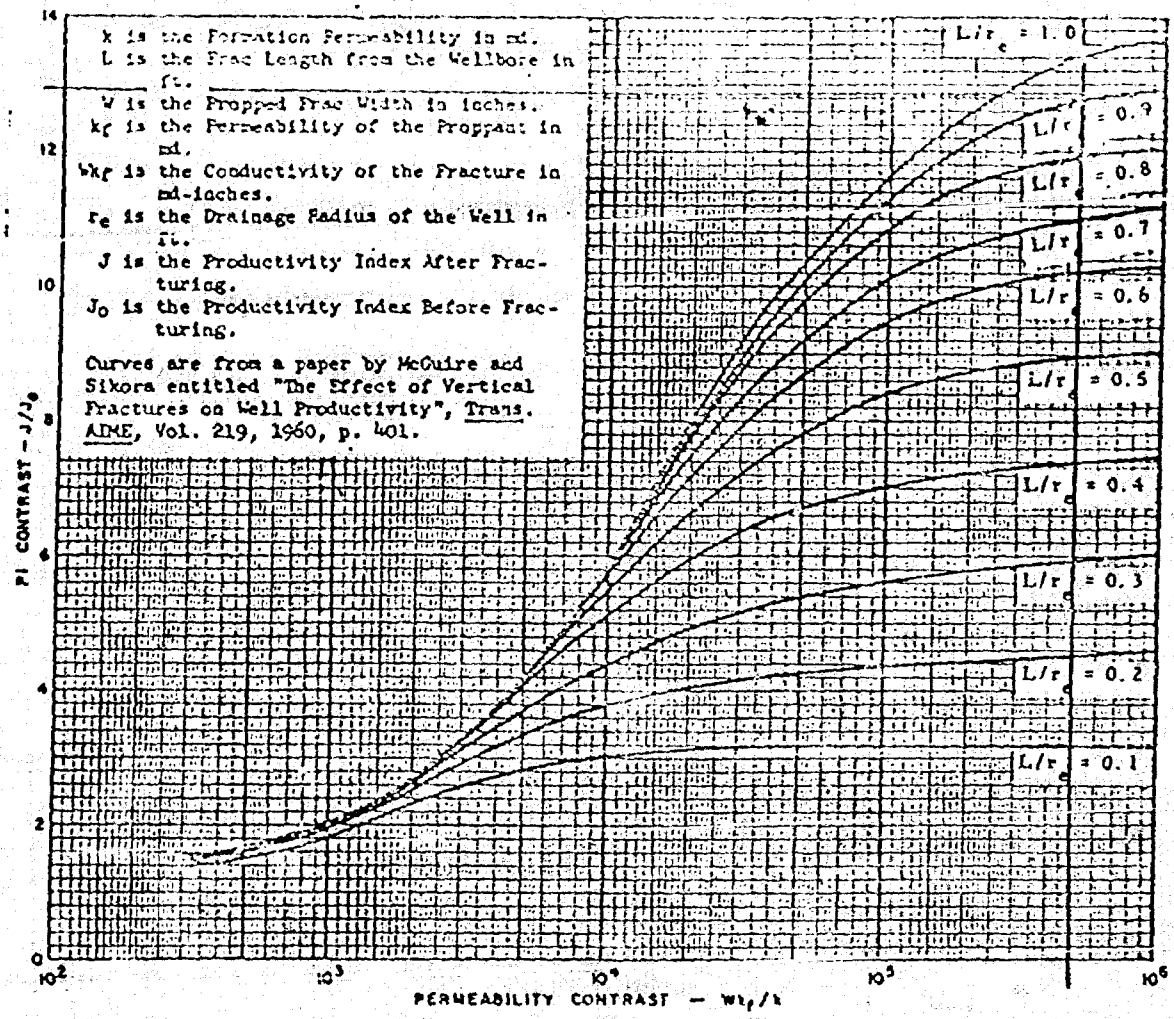


FIGURE II



INCREASES IN PRODUCTION FROM VERTICAL FRACTURES

J/J_o = 11 after scaling

Note: This graph is based on a well spacing (A) of 40 acres and a wellbore radius (r_w) of 3 inches. It can be converted to other well spacing and wellbore radii by use of the following scaling factors:

Well Spacing	Drainage Radii	Scaling Factors for Abscissa (Wk_f/k)	Scaling Factors for Ordinate (J/J_o)
For spacing shown and 3-inch wellbore radius.			
10 Acres	330 ft	2.00	1.11
20 Acres	467 ft	1.42	1.05
40 Acres	660 ft	1.00	1.00
80 Acres	933 ft	0.71	0.95
160 Acres	1320 ft	0.50	0.91
320 Acres	1867 ft	0.35	0.87
640 Acres	2640 ft	0.25	0.84
For other spacing (A) and wellbore radii (r_w).			
A	$104\sqrt{A}$	$\sqrt{10/A}$	$\frac{3.005}{\log(.472)(r_e/r_w)}$

EXHIBIT I

THE WESTERN COMPANY

PROPPANT PROFILE STUDY

PERFECT SUPPORT FLUIDS

FLUID STUDIED - MINI MAX III 30/2%HC
TOTAL VOLUME - 108616 GAL
FLUID PENETRATION - 1121 FT

PERM. TO STIMULATION FLUID - .060
PERM. TO RESERVOIR FLUID - .060
LEAK-OFF FLUID VISCOSITY - 1.00
RESERVOIR FLUID VISCOSITY - .01
RESERVOIR FLUID COMP. - 4.00E-04
STIMULATION FLUID C-III - 0.00080
FRACTURE HEIGHT - 133
COMBINED C - 0.00060

FRAC. PRESSURE - 2275
RESERVOIR PRESSURE - 1375
N PRIME - .690
K PRIME - 0.013000
YOUNGS MODULUS - 5.00E+06
WIDTH - .396
INJECTION RATE - 30.0

FLUID VOLUME (GAL)	SURFACE PROPPANT CONC (LB/GAL)	LOCATION IN FRACTURE (FT)	FRACTURE PROPPANT CONC (LB/FT^2)	CUMULATIVE PROPPANT (LB)
			.000	0
20000	.00	972 TO 1121	.425	20000
20000	1.00	795 TO 972	.705	60000
20000	2.00	582 TO 795	.862	120000
20000	3.00	320 TO 582	.821	190000
20000	3.50	0 TO 320		

USED 4.63 UNITS

EXHIBIT II

THE WESTERN COMPANY

PROPPANT PROFILE STUDY

PERFECT SUPPORT FLUIDS

FLUID STUDIED - MINI MAX III 30/2% HC
TOTAL VOLUME - 43446 GAL
FLUID PENETRATION - 1377 FT

PERM. TO STIMULATION FLUID - .060
PERM. TO RESERVOIR FLUID - .060
LEAK-OFF FLUID VISCOSITY - 1.00
RESERVOIR FLUID VISCOSITY - .01
RESERVOIR FLUID COMP. - 4.40E-04
STIMULATION FLUID C-III - 0.00080
FRACTURE HEIGHT - 42
COMBINED C - 0.00083

FRAC. PRESSURE - 3050
RESERVOIR PRESSURE - 1375
N PRIME - .655
K PRIME - 0.024000
YOUNGS MODULUS - 5.00E+06
WIDTH - .383
INJECTION RATE - 17.0

FLUID VOLUME (GAL)	SURFACE PROPPANT CONC (LB/GAL)	LOCATION IN FRACTURE (FT)	FRACTURE PROPPANT CONC (LB/FT^2)	CUMLATIVE PROPPANT (LB)
				0
8000	.00	1203 TO 1377	.000	8000
8000	1.00	994 TO 1203	.455	24000
8000	2.00	736 TO 994	.739	48000
8000	3.00	411 TO 736	.880	76000
8000	3.50	0 TO 411	.810	

4.76 UNITS

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NEW MEXICO OIL CONSERVATION COMMISSION

Form C-103
Supersedes Old
C-102 and C-103
Effective 1-1-65

SUNDRY NOTICES AND REPORTS ON WELLS

(DO NOT USE THIS FORM FOR PROPOSALS TO DRILL OR TO DEEPEN OR PLUG BACK TO A DIFFERENT RESERVOIR. USE "APPLICATION FOR PERMIT —" (FORM C-101) FOR SUCH PROPOSALS.)

1. OIL WELL ☐ GAS WELL ☒ OTHER.

2. Name of Operator
Blackwood & Nichols Co., Ltd.

3. Address of Operator
P. O. Box 1237, Durango, Co. 81301

4. Location of Well
UNIT LETTER M, 990 FEET FROM THE South LINE AND 1030 FEET FROM THE West LINE, SECTION 9 TOWNSHIP 31N RANGE 7W NMPM.

15. Elevation (Show whether DF, RT, GR, etc.)
6652' GL

5a. Indicate Type of Lease
State ☐ Fee ☒

5. State Oil & Gas Lease No.

7. Unit Agreement Name
Northeast Blanco Unit Agrmt. #1, Sec. 929

8. Farm or Lease Name
Northeast Blanco Unit

9. Well No.
201

10. Field and Pool, or Wildcat
So. Los Pinos Fruitland-PC

12. County
San Juan

16. Check Appropriate Box To Indicate Nature of Notice, Report or Other Data

NOTICE OF INTENTION TO:

PERFORM REMEDIAL WORK ☐
TEMPORARILY ABANDON ☐
PULL OR ALTER CASING ☐
PLUG AND ABANDON ☐
CHANGE PLANS ☐
OTHER ☐

SUBSEQUENT REPORT OF:

REMEDIAL WORK ☐
COMMENCE DRILLING OPNS. ☐
CASING TEST AND CEMENT JOB ☐
ALTERING CASING ☐
PLUG AND ABANDONMENT ☐
OTHER Water encroachment ☒

17. Describe Proposed or Completed Operations (Clearly state all pertinent details, and give pertinent dates, including estimated date of starting any proposed work) SEE RULE 1103.

7-21-80 3697' PBTD. Pulled 2 3/8" tubing. Ran Gamma Ray and Neutron Logs. Set drillable bridge plug at 3549'. Tested perforation at 3560' - 3588', no decrease in water. Set cement retainer at 3536'. Shut off water and gas. Set drillable cement retainer at 3373'. Squeeze cemented perforations 3441' - 3449', with 50 sacks neat cement, squeezed off at 2500 PSI.

7-22-80 3697' PBTD. Drilled retainer at 3373' and cement to 3459'.

7-23-80 3697' PBTD. Perforated 4 1/2" csg. 3482' - 3494' with 11 holes. Versagel fractured with 30,350 gals. water and 30,000 lbs. 10-20 sand. Maximum pressure 2450 PSI, average treating pressure 2300 PSI, average injection rate 17.5 bbls/min.

7-25-80 3697' PBTD. Reran 111 jts. 2 3/8" 4.7# J-55 EUE tubing; set at 3473'.

18. I hereby certify that the information above is true and complete to the best of my knowledge and belief.

SIGNED LeLaasse DeLasso Loos TITLE District Manager DATE 7-28-80

APPROVED BY _____ TITLE _____ DATE _____

CONDITIONS OF APPROVAL, IF ANY:

Form 9-331
Dec. 1973

Form Approved
Budget Bureau No. 42-R1424

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUNDRY NOTICES AND REPORTS ON WELLS

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

1. oil well ☐ gas well ☒ other

2. NAME OF OPERATOR
Blackwood & Nichols Co., Ltd.

3. ADDRESS OF OPERATOR
P.O. Box 1237, Durango, Co. 81301

4. LOCATION OF WELL (REPORT LOCATION CLEARLY. See space 17 below.)
AT SURFACE: 1070' F/NL - 1760' F/EL
AT TOP PROD. INTERVAL: Same
AT TOTAL DEPTH: Same

5. LEASE
NM 03358

6. IF INDIAN, ALLOTTEE OR TRIBE NAME

7. UNIT AGREEMENT NAME
Northeast Blanco Unit #1, Sec. 929

8. FARM OR LEASE NAME
Northeast Blanco Unit

9. WELL NO.
202

10. FIELD OR WILDCAT NAME
South Los Pinos PC

11. SEC., T., R., M., OR BLK. AND SURVEY OR AREA
8-11-31N-7W

12. COUNTY OR PARISH
San Juan

13. STATE
New Mexico

14. API NO.

15. ELEVATIONS (SHOW DF, KDB, AND WD)
6440' GL

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

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

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

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

8-15-79 Perforated two holes per foot per interval; 3272', 3282', 3292', 3306', 3318', 3402', 3412', 3420', 3428', 3440', 3446', 3452', 3474'; twenty-six holes. Mini-Max II fractured with 48,000 gals of gelled water, 80,000 lbs 10-20 sand, 500 gallons 10% acetic acid. Ten HCL ball sealers. Maximum treating pressure 3000 PSI; Average treating pressure 1300 PSI; Average injection rate 26 bbls/min.

Subsurface Safety Valve: Manu. and Type ______ Set @ ______ Ft.

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

SIGNED [signature] DeLasso Loos TITLE District Manager DATE 8-21-79

(This space for Federal or State office use)

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

*See Instructions on Reverse Side

Form 9-331
Dec. 1973

Form Approved.
Budget Bureau No. 42-R1424

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUNDRY NOTICES AND REPORTS ON WELLS

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

1. oil well ☐ gas well ☒ other

2. NAME OF OPERATOR
Blackwood & Nichols Co., Ltd.

3. ADDRESS OF OPERATOR
P.O. Box 1237, Durango, Colo. 81301

4. LOCATION OF WELL (REPORT LOCATION CLEARLY. See space 17 below.)
AT SURFACE: 990' F/NL - 1490' F/EL
AT TOP PROD. INTERVAL: Same
AT TOTAL DEPTH: Same

5. LEASE
NM 03358

6. IF INDIAN, ALLOTTEE OR TRIBE NAME

7. UNIT AGREEMENT NAME
NEBU Agrmt. No. 1, Sec. 929

8. FARM OR LEASE NAME
Northeast Blanco Unit

9. WELL NO.
203

10. FIELD OR WILDCAT NAME
South Los Pinos-Fruitland - PC

11. SEC., T., R., M., OR BLK. AND SURVEY OR AREA
C-11-31N-7W

12. COUNTY OR PARISH
San Juan

13. STATE
New Mexico

14. API NO.
30-045-23485

15. ELEVATIONS (SHOW DF, KDB, AND WD)
6546' GL

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

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

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

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

7-13-80 3630' PBTD. Pulled 2 3/8" tubing, Ran Gamma Ray and Neutron Logs. Set Retrievamatic Packer at 3496'. Well made water thru tubing.

7-15-80 3630' PBTD. Reset packer at 3459'. Well making water thru tubing and between tubing and 4 1/2" csg. Reset packer at 3393'. Well making water thru tubing. Dry gas between tubing and 4 1/2" csg. Set cement retainer at 3409'.

7-16-80 3630' PBTD. Set Retrievamatic at 3405', pressured up to 2000 PSI, held OK.

7-17-80 3630' PBTD. Reran 108 jts. 2 3/8" 4.7# J-55 EUE tubing; 3356' landed at 3366'.

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

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

SIGNED LeRasso Loos TITLE District Manager DATE 7-28-80

(This space for Federal or State office use)

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

*See Instructions on Reverse Side

410

BLACKWOOD & NICHOLS CO., LTD.
P. O. BOX 1237
DURANGO, COLORADO 81301
(303) 247-0728

Drilling Report - Pictured Cliffs

Northeast Blanco Unit Well No. 204 LOCATION: 830' F/SL - 990' F/WL
Sec. 1-T31N-R7W
San Juan County, New Mexico
Elevation: 6546' GL

8-8-79 Moved Four Corners Drilling Company's rig on location and rigging up.

8-9-79 350', sand. Nippled up, tested 9 5/8" casing to 800 PSI for thirty minutes; held O.K. Spudded 12¼" hole at 10:30 A.M., 8-8-79. Ran 5 jts 9 5/8" 36.00# H-40 casing; 204' set at 217'. Cemented with 150 sacks class B cement with 1/4# flocele per sack and 2% $CaCl_2$. Plug down 4:00 P.M., 8-8-79; cement circulated. 1/4° at 217'.

8-10-79 1930' sand. 3/4° @ 721', 1° @ 1242', 2° @ 1682'.

8-11-79 2572', sand. 1½° at 2307'.

8-12-79 3128', sand. Mud wt. 10.6#, vis. 43.

8-13-79 3600', shale. Mud wt. 10.6#, vis. 40. 1° at 3128', 1° at 3600'. Laying down 3½" drill pipe.

8-14-79 3680' TD, shale. Mud wt. 10.6# Vis. 48. Ran 113 jts 4½" 10.50# K-55 casing; 3675' set at 3686'. Float collar at 3635'; cemented with 265 sacks Howco Lite cement with 1/4# flocele per sack, followed with 222 sacks 50-50 Pozmix with 2% gel and 1/4# flocele per sack. Plug down 2:15 PM, 8-13-79. Rig released.

8-18-79 3680' TD; 3640' PBTD. Moved Drake Well Services rig on location and rigged up. Picked up 2 3/8" tubing with 3 7/8" bit. Cleaned out to 3640'. Tested 4½" casing to 3400 PSI for thirty minutes, held OK. Spotted 500 gals 10% acetic acid. Ran Gamma Ray Correlation and Cement Bond logs. Perforated two holes per foot per interval; 3404', 3412', 3420', 3428', 3442', 3498', 3518', 3530', 3538', 3548' 3574' 3598' - twenty-four holes. Preparing to fracture.

8-19-79 3680' TD; 3640' PBTD. Mini-Max II fractured with 48,048 gallons gelled water, 75,000 lbs 10-20 sand. Maximum treating pressure 2000 PSI; Average treating pressure 1600 PSI; Average Injection rate 28 bbls/min. Dropped ten HCl ball sealers. Final shut-in pressure 650 PSI. Well now cleaning up.

8-20-79 3640' PBTD. Going in hole with tubing, cleaning out.

8-21-79 3640' PBTD. Cleaning out, preparing to land 2 3/8" tubing.

8-22-79 3640' PBTD. Cleaned out to 3640'. Ran 119 jts 2 3/8" 4.7# J-55 EUE tubing; 3569' landed at 3580'. Seating nipple at 3550'. Released rig 2:00 PM, 8-21-79.

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NEW MEXICO OIL CONSERVATION COMMISSION
REQUEST FOR ALLOWABLE
AND
AUTHORIZATION TO TRANSPORT OIL AND NATURAL GAS

Form C-104
Supersedes Old C-104 and C-1
Effective 1-1-65

I. Operator

Address: Blackwood & Nichols Co., Ltd.
P.O. Box 1237, Durango, Colorado 81301

Reason(s) for filing (Check proper box)

New Well [X]
Recompletion [ ]
Change in Ownership [ ]

Change in Transporter of:
Oil [ ]
Casinghead Gas [ ]
Dry Gas [ ]
Condensate [ ]

Other (Please explain)

If change of ownership give name and address of previous owner

II. DESCRIPTION OF WELL AND LEASE

Lease Name	Well No.	Pool Name, Including Formation	Kind of Lease	Lease No.
Northeast Blanco Unit	204	South Los Pinos PC	State, Federal or Fee: Fee	

Location
Unit Letter M ; 830 Feet From The South Line and 990 Feet From The West
Line of Section 1 Township 31N Range 7W , NMPM, San Juan County

III. DESIGNATION OF TRANSPORTER OF OIL AND NATURAL GAS

Name of Authorized Transporter of Oil [XX] or Condensate [ ]: Inland Corporation
Address (Give address to which approved copy of this form is to be sent): P.O. Box 1528 Farmington, New Mexico 8740

Name of Authorized Transporter of Casinghead Gas [ ] or Dry Gas [XX]: El Paso Natural Gas Company
Address (Give address to which approved copy of this form is to be sent): P.O. Box 990 Farmington, New Mexico 8740

If well produces oil or liquids, give location of tanks.	Unit	Sec.	Twp.	Rge.

Is gas actually connected? No When

If this production is commingled with that from any other lease or pool, give commingling order number:

IV. COMPLETION DATA

Designate Type of Completion – (X)	Oil Well	Gas Well	New Well	Workover	Deepen	Plug Back	Same Res'v.	Diff. Res'v.
		X	X					

Date Spudded	Date Compl. Ready to Prod.	Total Depth	P.B.T.D.
8-8-79	8-21-79	3680'	3640'

Elevations (DF, RKB, RT, GR, etc.)	Name of Producing Formation	Top Oil/Gas Pay	Tubing Depth
6546' GL	Fruitland - P.C.	3404'	3580'

Perforations	Depth Casing Shoe
3404' - 3598' Twenty-four holes	3686'

TUBING, CASING, AND CEMENTING RECORD

HOLE SIZE	CASING & TUBING SIZE	DEPTH SET	SACKS CEMENT
12 1/4"	9 5/8"	0131	150

Form 9-331
Dec. 1973

Form Approved.
Budget Bureau No. 42-R1424

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUNDRY NOTICES AND REPORTS ON WELLS

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

1. oil well ☐ gas well ☒ other

2. NAME OF OPERATOR
Blackwood & Nichols Co., Ltd.

3. ADDRESS OF OPERATOR
P. O. Box 1237, Durango, Co. 81301

4. LOCATION OF WELL (REPORT LOCATION CLEARLY. See space 17 below.)
AT SURFACE: 1180' F/SL - 925' F/EL
AT TOP PROD. INTERVAL: Same
AT TOTAL DEPTH: Same

5. LEASE
NM 03358

6. IF INDIAN, ALLOTTEE OR TRIBE NAME

7. UNIT AGREEMENT NAME
NEBU Agrmt. No. 1, Sec. 929

8. FARM OR LEASE NAME
Northeast Blanco Unit

9. WELL NO.
205

10. FIELD OR WILDCAT NAME
South Los Pinos Fruitland - PC

11. SEC., T., R., M., OR BLK. AND SURVEY OR AREA
P-10-31N-7W

12. COUNTY OR PARISH
San Juan

13. STATE
New Mexico

14. API NO.
30-045-23601

15. ELEVATIONS (SHOW DF, KDB, AND WD)
6560' GL

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

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

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

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

7-18-80 3620' PBTD. Pulled 2 3/8" tubing, ran Gamma Ray and Neutron Logs. Set cement retainer at 3430'. Tested 4 1/2" csg. to 3000 PSI for 10 minutes, held OK. Perforated 3350' - 3362' with 11 holes. Versagel fractured with 300 gals. 15% HCL acid and 28,640 gals. water, 30,000 lbs. 10-20 sand. Maximum pressure 2700 PSI, average teating pressure 2200 PSI, average injection rate 15 bbls/min.

7-20-80 3620' PBTD. Reran 107 jts. 2 3/8" 4.7# J-55 EUE tubing; set at 3339'.

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

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

SIGNED Deloasso Loos TITLE District Manager DATE 7-28-80

(This space for Federal or State office use)

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

*See Instructions on Reverse Side

#17

BEFORE EXAMINER STAMETS
OIL CONSERVATION DIVISION
Applicant's EXHIBIT NO. 13
CASE NO. 7087
Submitted by Blackwood
Hearing Date 12/10/80

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OPERATOR	1	1

Form C-105
Revised 1-1-65

NEW MEXICO OIL CONSERVATION COMMISSION
WELL COMPLETION OR RECOMPLETION REPORT AND LOG

5a. Indicate Type of Lease: State ☐ Fee ☒

5. State Oil & Gas Lease No.

7. Unit Agreement Name

8. Farm or Lease Name: Yager

9. Well No.: 3

10. Field and Pool, or Wildcat: Undesignated PC & So. Los Pinos Fruitland Extension

12. County: San Juan

TYPE OF WELL: OIL WELL ☐ GAS WELL ☒ DRY ☐ OTHER

TYPE OF COMPLETION: NEW WELL ☒ WORK OVER ☐ DEEPEN ☐ PLUG BACK ☐ DIFF. RESVR. ☐ OTHER

Name of Operator: Palmer Oil & Gas Company

Address of Operator: P. O. Box 2564, Billings, Montana, 59103

Location of Well: UNIT LETTER N LOCATED 800 FEET FROM THE South LINE AND 1850 FEET FROM THE West LINE OF SEC. 3 TWP. 31N RGE. 7W NMPM

Date Spudded	16. Date T.D. Reached	17. Date Compl. (Ready to Prod.)	18. Elevations (DF, RKB, RT, GR, etc.)	19. Elev. Cashinghead
8/2/77	8/11/77	10/29/77	6597 KB	

Total Depth	21. Plug Back T.D.	22. If Multiple Compl., How Many	23. Intervals Drilled By	Rotary Tools	Cable Tools
3669	3647	two	→	0-TD	

Producing Interval(s), of this completion — Top, Bottom, Name

ictured Cliffs - 3361-3391
uitland: 3155-65, 3182-3209, 3219-27, 3233-39, 3245-51, 3258-63, 3267-71, 3275-95

25. Was Directional Survey Made: No

Type Electric and Other Logs Run: chlumberger - No open hole logs run - ran CBL-GR & TDT thru casing

27. Was Well Cored: No

CASING RECORD (Report all strings set in well)

CASING SIZE	WEIGHT LB./FT.	DEPTH SET	HOLE SIZE	CEMENTING RECORD	AMOUNT PULLED
9 5/8"	36#	237'	13 3/4"	250 sacks	
7 "	20#	3652'	8 3/4"	700 sacks	

LINER RECORD

SIZE	TOP	BOTTOM	SACKS CEMENT	SCREEN
None				

30. TUBING RECORD

SIZE	DEPTH SET	PACKER SET
2 3/8"	3413	3318' Model "D"
1½"	3232	none

Perforation Record (Interval, size and number)

3361-3391
3155-65
3182-3209
3219-27
3233-39
3245-51
3258-63
3275-95
3267-71
(1 shot/foot)

32. ACID, SHOT, FRACTURE, CEMENT SQUEEZE, ETC.

DEPTH INTERVAL	AMOUNT AND KIND MATERIAL USED
3361-3391	1000 gals. 15% MR-1
3361-3391	52,700 gals gelled wtr; 45,000# 10-;

PRODUCTION

Date First Production	Production Method (Flowing, gas lift, pumping — Size and type pump)	Well Status (Prod. or Shut-in)
SI	Flowing	SI

Date of Test	Hours Tested	Choke Size	Prod'n. For Test Period →	Oil — Bbl.	Gas — MCF	Water — Bbl.	Gas — Oil Ratio

Flow Tubing Press.	Casing Pressure	Calculated 24-Hour Rate →	Oil — Bbl.	Gas — MCF	Water — Bbl.	Oil Gravity — API (Corr.)
- SITP 1293 - SITP 1421	PC - SICP 1478					

Disposition of Gas (Sold, used for fuel, vented, etc.): Will be sold

Test Witnessed By

List of Attachments

RECEIVED
DEC 27 1977
OIL CON. COM.
DIST. 3

I hereby certify that the information shown on both sides of this form is true and complete to the best of my knowledge and belief.

SIGNED Robert D Ballantyne TITLE Drilling Supt. DATE 12/2/77

#14

BEFORE EXAMINER STAMETS
OIL CONSERVATION DIVISION
Applicant EXHIBIT NO. 14
CASE NO. 7087
Submitted by Blackwood
Hearing Date 12/10/80

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Form C-105
Revised 1-1-65

NEW MEXICO OIL CONSERVATION COMMISSION
WELL COMPLETION OR RECOMPLETION REPORT AND LOG

5a. Indicate Type of Lease: State [ ] Fee [X]

5. State Oil & Gas Lease No.

1a. TYPE OF WELL: OIL WELL [ ] GAS WELL [X] DRY [ ] OTHER

b. TYPE OF COMPLETION: NEW WELL [X] WORK OVER [ ] DEEPEN [ ] PLUG BACK [ ] DIFF. RESVR. [ ] OTHER

7. Unit Agreement Name

8. Farm or Lease Name: Yager

2. Name of Operator: Palmer Oil & Gas Company

9. Well No.: No. 4

3. Address of Operator: P. O. Box 2564, Billings, Montana 59103

10. Field and Pool, or Wildcat: Undesignated PC & S. Los Pinos Fruit. Ext.

4. Location of Well: UNIT LETTER E LOCATED 1450 FEET FROM THE N LINE AND 835 FEET FROM THE E LINE OF SEC. 10 TWP. 31N RGE. 7W NMPM

12. County: San Juan

15. Date Spudded	16. Date T.D. Reached	17. Date Compl. (Ready to Prod.)	18. Elevations (DF, RKB, RT, GR, etc.)	19. Elev. Cashinghead
12/16/78	1/15/78	3/21/78	6601 GL, 6612 KB	

20. Total Depth	21. Plug Back T.D.	22. If Multiple Compl., How Many	23. Intervals Drilled By	Rotary Tools	Cable Tools
3603'	3599'	two	→	0-TD	

24. Producing Interval(s), of this completion — Top, Bottom, Name
3197-3276 - Fruitland
3350-3517 - Pictured Cliffs

25. Was Directional Survey Made: no

26. Type Electric and Other Logs Run: Schlumberger - FDC/CNL-GR

27. Was Well Cored: no

28. CASING RECORD (Report all strings set in well)

CASING SIZE	WEIG. LB./FT.	DEPTH SET	HOLE SIZE	CEMENTING RECORD	AMOUNT PULLED
8-5/8"	24#	220'	12-1/4"	250 sx	
5-1/2"	14#	3602'	7-7/8"	200 sx	

29. LINER RECORD

SIZE	TOP	BOTTOM	SACKS CEMENT	SCREEN

30. TUBING RECORD

SIZE	DEPTH SET	PACKER SET
2-3/8"	3310'	3310'
1"	3157'	

31. Perforation Record (Interval, size and number)
L.Pictured Cliffs: 3495, 3500, 3503, 3515, 3517
U.Pictured Cliffs: 3350', 3352, 3355, 3365, 3367, 3382.
Fruitland: 3197-3204, 3208-26, 3232-48, 3262-76 (1 shot/foot)

32. ACID, SHOT, FRACTURE, CEMENT SQUEEZE, ETC.

DEPTH INTERVAL	AMOUNT AND KIND MATERIAL USED
3517-3382'	500 gal. 15% HCL; foam frac
	w/2102 bbls 70% foam & 120,000# 10/20
	sd, 1,826 MMCF Nitrogen
3197-3276	Natural

33. PRODUCTION

Date First Production	Production Method (Flowing, gas lift, pumping — Size and type pump)	Well Status (Prod. or Shut-in)
shut in	flowing	shut in

Date of Test	Hours Tested	Choke Size	Prod'n. For Test Period →	Oil — Bbl.	Gas — MCF	Water — Bbl.	Gas—Oil Ratio
FR- 3/21/78 PC- 3/14/78	3 hrs						

Flow Tubing Press.	Casing Pressure	Calculated 24-Hour Rate →	Oil — Bbl.	Gas — MCF	Water — Bbl.	Oil Gravity — API (Corr.)
FR-SITP 1425 PC-SITP 1475	FR-SICP 1427					

34. Disposition of Gas (Sold, used for fuel, vented, etc.): to be sold

Test Witnessed By: Joe Elledge

35. List of Attachments

36. I hereby certify that the information shown on both sides of this form is true and complete to the best of my knowledge and belief.

SIGNED James G. Routson TITLE Petroleum Engineer DATE 3/28/78

#1

BEFORE EXAMINER STAMETS
OIL CONSERVATION DIVISION
Applicant EXHIBIT NO. 15
CASE NO. 7087
Submitted by Blackwood
Hearing Date 12/10/80

Form 9-330
(Rev. 5-63)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUBMIT IN DUPLICA. (See other instructions on reverse side)

Form approved.
Budget Bureau No. 42-R355.5.

WELL COMPLETION OR RECOMPLETION REPORT AND LOG*

1a. TYPE OF WELL: OIL WELL ☐ GAS WELL ☒ DRY ☐ Other

b. TYPE OF COMPLETION: NEW WELL ☒ WORK OVER ☐ DEEP-EN ☐ PLUG BACK ☐ DIFF. RESVR. ☐ Other

2. NAME OF OPERATOR: Palmer Oil & Gas Company

3. ADDRESS OF OPERATOR: P. O. Box 2564, Billings, Montana 59103

4. LOCATION OF WELL (Report location clearly and in accordance with any State requirements)*
At surface 1850' FNL, 1640' FEL
At top prod. interval reported below same
At total depth same

5. LEASE DESIGNATION AND SERIAL NO.: NM-28749
6. IF INDIAN, ALLOTTEE OR TRIBE NAME:
7. UNIT AGREEMENT NAME:
8. FARM OR LEASE NAME: Federal
9. WELL NO.: No. 3
10. FIELD AND POOL, OR WILDCAT: Undesignated PC and S. Los Pinos Fruitland Ext
11. SEC., T., R., M., OR BLOCK AND SURVEY OR AREA: SW¼NE¼ Sec. 10-31N-7W
12. COUNTY OR PARISH: San Juan
13. STATE: New Mexico

14. PERMIT NO.: DATE ISSUED:

15. DATE SPUDDED	16. DATE T.D. REACHED	17. DATE COMPL. (Ready to prod.)	18. ELEVATIONS (DF, RKB, RT, GR, ETC.)*	19. ELEV. CASINGHEAD
3/27/78	4/4/78	5/13/78	6539 GL, 3550 KB	

20. TOTAL DEPTH, MD & TVD	21. PLUG, BACK T.D., MD & TVD	22. IF MULTIPLE COMPL., HOW MANY*	23. INTERVALS DRILLED BY	ROTARY TOOLS	CABLE TOOLS
3630'	3585'	two	→	0-TD	

24. PRODUCING INTERVAL(S), OF THIS COMPLETION—TOP, BOTTOM, NAME (MD AND TVD)*
3325-3522 - Pictured Cliffs
3106-3264 - Fruitland

25. WAS DIRECTIONAL SURVEY MADE: no

26. TYPE ELECTRIC AND OTHER LOGS RUN: no open hole logs were run

27. WAS WELL CORED: no

28. CASING RECORD (Report all strings set in well)

CASING SIZE	WEIGHT, LB./FT.	DEPTH SET (MD)	HOLE SIZE	CEMENTING RECORD	AMOUNT PULLED
8-5/8"	24#	252' KB	12-1/4"	225 sx	
5-1/2"	14#	3630'	7-7/8"	350 sx	

29. LINER RECORD

SIZE	TOP (MD)	BOTTOM (MD)	SACKS CEMENT*	SCREEN (MD)

30. TUBING RECORD

SIZE	DEPTH SET (MD)	PACKER SET (MD)
2-3/8"	3300'	
1"	3209'	

31. PERFORATION RECORD (Interval, size and number)
PC - 3325, 3326, 3328, 3332, 3344, 3351, 3483, 3486, 3516, 3522 (1 shot each)
Fr - 3106-20, 3130-36, 3150-90, 3198-3214, 3228-36, 3252-56, 3260-64 (1 sh/ft)

32. ACID, SHOT, FRACTURE, CEMENT SQUEEZE, ETC.

DEPTH INTERVAL (MD)	AMOUNT AND KIND OF MATERIAL USED
3325-3522	-500 gal 15% HCl. Foam fraced w/120,000 10/20 sd, 1,336,500 scf N_2;
3106-3264	- no treatment

33.* PRODUCTION

DATE FIRST PRODUCTION	PRODUCTION METHOD (Flowing, gas lift, pumping—size and type of pump)	WELL STATUS (Producing or shut-in)
shut in	flowing	shut-in

DATE OF TEST	HOURS TESTED	CHOKE SIZE	PROD'N. FOR TEST PERIOD →	OIL—BBL.	GAS—MCF.	WATER—BBL.	GAS-OIL RATIO
5/13/78	3 hrs	3/4"			FR 78 PC 225		

FLOW. TUBING PRESS.	CASING PRESSURE	CALCULATED 24-HOUR RATE →	OIL—BBL.	GAS—MCF.	WATER—BBL.	OIL GRAVITY-API (CORR.)
PC 138 FR. 38	FCP 599			1806 624		

34. DISPOSITION OF GAS (Sold, used for fuel, vented, etc.): to be sold
TEST WITNESSED BY: Joe Elledge

35. LIST OF ATTACHMENTS

36. I hereby certify that the foregoing and attached information is complete and correct as determined from all available records

SIGNED Robert D. Ballantyne TITLE Production Sup't DATE 5/30/78
Robert D. Ballantyne

*(See Instructions and Spaces for Additional Data on Reverse Side)

#110

BEFORE EXAMINER STAMETS
OIL CONSERVATION DIVISION
Applicant EXHIBIT NO. 16
CASE NO. 7087
Submitted by Blackwood
Hearing Date 12/10/80

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION
STATE LAND OFFICE BLDG.
SANTA FE, NEW MEXICO
12 November 1980

EXAMINER HEARING

IN THE MATTER OF:

Application of Blackwood & Nichols Company, Ltd., for designation of a tight formation, San Juan and Rio Arriba Counties, New Mexico.

CASE 7087

BEFORE: Richard L. Stamets

TRANSCRIPT OF HEARING

A P P E A R A N C E S

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

For the Applicant: William F. Carr, Esq.
CAMPBELL & BLACK P. A.
Jefferson Place
Santa Fe, New Mexico 87501

I N D E X

E X H I B I T S

E X H I B I T S

Applicant Exhibit Fourteen

Applicant Exhibit Fifteen

Applicant Exhibit Sixteen

MR. STAMETS: We'll call next Case 7087.

MR. PADILLA: Application of Blackwood and Nichols Company, Ltd., for designation of a tight formation, San Juan and Rio Arriba Counties, New Mexico.

MR. CARR: Mr. Examiner, I am William F. Carr, with the law firm of Campbell and Black, Santa Fe, New Mexico, appearing on behalf of the applicant, Blackwood and Nichols Company, Limited.

I have one witness, Charles Blackwood, and would request that since Mr. Blackwood testified in the previous case, that the record reflect that he is qualified to testify in this case and is under oath.

MR. STAMETS: The record shall so reflect.

CHARLES F. BLACKWOOD

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

DIRECT EXAMINATION

BY MR. CARR:

Q. Mr. Blackwood, would you briefly state what Blackwood and Nichols Company, Limited, is seeking with this application?

A. We are seeking that the area of the Northeast Blanco Unit be designated a tight reservoir for the Fruitland formation under the category 107 of the NGPA.

Q. Have you prepared certain exhibits for introduction in this case?

A. Yes, I have.

Q. Have each of these exhibits previously been submitted to the USGS and to the Oil Conservation Division with a statement of the meaning and purpose of each exhibit?

A. Yes, they have.

Q. Will you please refer to what has been marked for identification as Applicant's Exhibit Number One and review this for the Examiner?

A. This is a map of the area of the Northeast Blanco Unit and some adjacent areas to the -- surrounding, which shows all wells currently producing from the Fruitland formation. It also shows the location of a well which was drill stem tested and in situ permeability calculations made from the pressures collected from the drill stem test. It also shows the producing Mesaverde wells in the area, but not colored. It also shows the boundary of the Northeast Blanco Unit, which is the precise area of our application.

Q. Will you please refer to what has been marked for identification as Exhibit A and review the informa-

tion contained therein for Mr. Stamets?

A. This is a geographical and geological description of the formation. It was prepared as my testimony and I will just read most of it into the record; summarizing at various places.

Geographical. The Fruitland is one of several tight sandstone formations of the San Juan Basin, New Mexico. San Juan Basin is approximately 80 miles long from the southeast to northwest and 40 miles ide from the southwest to northeast. The approximate center of the gas production in the San Juan Basin is 25 miles southeast of Aztec, New Mexico.

Natural gas has been produced for many years from this basin. The most prolific reservoirs are within the Mesaverde group. The Fruitland formation has not been produced over much of the San Juan Basin because of low permeability and the high cost of producing the gas.

Blackwood and Nichols Co, Ltd,, operates the Northeast Blanco Unit, a 33,500 acre area, located on the northeast flank of the San Juan Basin. The Northeast Blanco Unit is located in Townships 30 and 31 North, Range 6 and 7 West; also Sections 25 and 36 of Township 31 North, 8 West, Sections 1, 12, 13, and 24, Township 30 North, Range 8 West.

A map of the Northeast Blanco Unit is

provided. That's the Exhibit One.

Geological. Fruitland formation is upper Cretaceous age and consists primarily of coal and shale with some sandstone stringers. These stringers when located in the basal portion of the Fruitland are sometimes intertongued with the Pictured Cliffs formation below.

A general geologic section of the San Juan Basin is included with this application. That's our Exhibit Two.

In the Northeast Blanco Unit area the Fruitland formation dips gently to the southwest. I contains coals, shale, and tight sandstones.

The Fruitland formation in this area contains fluids at above normal pressures. The initial pressures encountered in the Fruitland are approximately 1500 to 1600 psig at 3000 feet, while the original pressures in the Mesaverde in this area are only 1400 to 1500 psig at 6000 feet.

The Fruitland formation has been drilled through and logged in over 100 wells from 1950 to 1978 in the Northeast Blanco Unit area. The general characteristics observed when drilling, logging, and drill stem testing, were those of a very tight reservoir. The data collected indicated that gas was present in certain sandstone stringers

within the Fruitland formation.

The permeabilities were indicated to be so low, however, that only one of more than 100 wells in the Northeast Blanco Unit area attempted a completion in the Fruitland formation prior to 1979. The extremely low permeability indicated and the low price allowed for gas made any completion attempt infeasible because there was no chance that it would be profitable.

The one well completed in the Fruitland formation in the Northeast Blanco Unit prior to 1979 was the Howell 3-B. This well was located in the southwest quarter of Section 3, Township 30 North, Range 7 West, Rio Arriba County, New Mexico, and produced approximately 59,000 Mcf from the Fruitland reservoir and was abandoned in the early 1950's. No ther attempt to produce gas from the Fruitland formation was made in the Northeast Blanco Unit area until 1979.

One well west of the Northeast Blanco Unit area was drilled and completed by Phillips Petroleum Company in the early 1950's. This well is located in the northeast quarter of Section 17, Township 31 North, Range 7 West. The well produced approximately 30 to 40 Mcf per day on initial completion, and was declared noncommercial. This well has continued, however, to produce low volumes of gas

for more than twenty years. This indicates that gas is present and could be developed and produced from the Fruitland formation in this area if a high enough price were established to make these expensive low volume wells profitable.

Blackwood and Nichols Co., Ltd., operates the Northeast Blanco Unit. We have taken all necessary precautions to insure that all fresh water zones are protected and not adversely affected by our operations. Our procedures have been in accord with all State and Federal rules and regulations. A part of the pertinent Federal regulations are attached, Exhibit Three. They are pages 1 through 5 of supplement to the USGS NTL-6.

Pages C-6, C-7, and C-8 of the New Mexico Oil Conservation Division of the Energy and Minerals Department are also attached. That's our Exhibit Four.

We believe that compliance with these rules and regulations adequately protects and will not adversely affect or impair any fresh water aquifers that are being used, or expected to be used in the foreseeable future, for domestic or agricultural water supplies.

Geologic and Engineering Data. The Fruitland formation of the northeast flank of the San Juan Basin is composed primarily of coal seams, shales, and tight sandstone stringers. This information has been determined by

hundreds of logs run on wells drilled in the last thirty years. Electric logs, gamma ray neutron logs, sonic logs, formation density logs, sidewall neutron logs, and many other types, have been analyzed and interpreted over the years to show the coal seams, shales, and tight sandstones. These logs have indicated that natural gas and water (almost fresh enough to drink) is present within the void space of the Fruitland formation.

Pressure information has been obtained in several different ways. A drill stem test was taken on the Northeast Blanco Unit Well No. 33-12 on October 24th, 1955. The Fruitland formation was tested from a depth of 3055 feet to 3205 feet. This drill stem test has been analyzed and computations have been made to show the permeability to be 0.067 millidarcy per foot centipoise on the average. The highest recorded shut-in pressure was 1629 psig.

A copy of the computerized data analysis is attached, Exhibit Number Five.

A copy of the log on the Northeast Blanco Unit Well No. 33-12 is also included as a part of this application, Exhibit Number Six.

While drilling over 100 deeper wells in the Northeast Blanco Unit area, additional pressure information was obtained. It is necessary to raise the mud weight to 11.5

to 12.5 pounds per gallon in order to control the pressure in the Fruitland formation. Pressure which is found in the Fruitland formation is abnormally high for the depth drilled. This abnormally high pressure may also be an indication of low porosity and permeability.

A reduction in the original void space of the Fruitland formation may have occurred to cause a reduction in the original permeability.

Another interpretation could be that this formation was once at a deeper level below the surface and that normal pressures at the deeper level are still trapped even though the Fruitland formation is now found at shallower depths.

The permeability required to trap the abnormally high pressures in the Fruitland formation would have to be extremely low.

Flow rates of wells in the area, which have recently been produced from the Fruitland formation, also prove low permeability. Information about each new shallow gas well in the area of the Northeast Blanco Unit and the adjacent wells is given below, along with calculations of stabilized production, production improvement by stimulation, et cetera.

Stabilized production versus depth

guidelines. Blackwood and Nichols Co., Ltd., has drilled five test holes in 1979. These five holes have resulted so far in two Fruitland producers, two Fruitland-Pictured Cliffs commingled wells, and one well which has been unsuccessfully attempted in the Pictured Cliffs and Fruitland. This unsuccessful hole has been recompleted in the Fruitland and is now testing gas and water at noncommercial rates.

A listing of the five Northeast Blanco Unit wells, with completion information, production information, et cetera, follows. The pipeline production figures are shown. Calculations to approximate stabilized production rate against atmospheric pressure have been included.

Two wells, the Northeast Blanco Unit Well 202 and 204 produce commingled from the Fruitland and Pictured Cliffs reservoirs. In order to allocate production by zone, 50 percent of the gas sales have been assigned to each zone.

All the Northeast Blanco Unit wells were stimulated prior to production. The calculated productivity improvements ratio is 10 to 11.

MR. STAMETS: Mr. Blackwood, --

A. Yes.

MR. STAMETS: -- did use essentially the identical process in making these calculations?

A. Yes.

MR. STAMETS: It would seem as though there would be no necessity in covering all of those again, but perhaps we should go to the back and let you --

A. All right,

MR. STAMETS: -- summarize what the results of those were.

A. I would love to.

MR. STAMETS: And --

A. Let me just state --

MR. STAMETS: -- everything that you've included in here, in Exhibit A, is your statement and your testimony.

A. Yes, that's right.

MR. STAMETS: Okay.

A. I'd be more than happy not to read the rest of this into the record, satisfactory.

MR. STAMETS: I think that would be just fine.

A. Okay. Let's just -- why don't we skip over here then to summary and conclusions, if that's all right.

MR. STAMETS: I'm tickled to death.

A. Okay.

For over thirty years the Fruitland formation has been penetrated and logged and occasionally drill stem tested and produced on the northeast flank of the San Juan Basin, New Mexico.

Only one well had produced gas prior to 1979 from the Fruitland formation within the area of the Northeast Blanco Unit. The Howell 3-B Well was drilled in March of 1952; completed at a total depth of 3025 feet in the Fruitland. The well produced a total of approximately 59,000 Mcf and was abandoned.

Since that time over 100 wells have been drilled in the Northeast Blanco Unit. The Fruitland zone was logged and evaluated in each well and is not considered to be commercially productive. All wells drilled from 1953 to 1978 were completed in the Mesaverde or Dakota reservoirs.

One Fruitland well was drilled and completed in 1952 to the west of the Northeast Blanco Unit by Phillips Petroleum Company. The well produced very low volume of gas (approximately 30 Mcf per day) and was declared to be noncommercial. This well is located in the northeast northeast of Section 17, Township 31 North, Range 7 West, San Juan County, New Mexico.

This well has continued to produce for over 25 years and was one of the main reasons that additional

shallow wells were drilled in 1978 by Palmer Oil and Gas to the north of the Northeast Blanco Unit.

The results of the Palmer Oil and Gas wells which were completed in the Fruitland were shown earlier in this report. Three of the six shallow wells drilled by Palmer Oil and Gas are now producing from the Fruitland formation. Fruitland completion was attempted in the State No. 2 Well but was unsuccessful because of too much water.

Blackwood and Nichols Co., Ltd., attempted five shallow wells along the northern boundary of the Northeast Blanco Unit in 1979. Two of these wells, the No. 202 and No. 204, were completed as commercial wells in the Fruitland and Pictured Cliffs reservoirs initially. The other three wells were not completed successfully and produced too much water.

In 1980 these three wells were reworked and recompleted in the Fruitland formation only. The difficulties in log interpretation and completion techniques including cementing, perforating, and stimulation for production, raised the cost of these three wells significantly above the estimated costs.

All five of the Blackwood and Nichols Co., Ltd., wells are now producing from the Fruitland formation. One well, the No. 201, is currently noncommercial and the No. 203 well is borderline.

The difficulty in analyzing the logs and the need to recomplete three of five Blackwood and Nichols Co., Ltd., wells, should also be considered.

In conclusion, it is well established that natural gas occurs in the Fruitland formation in this area. It is also well known that the Fruitland formation is extremely tight. The Fruitland formation has been bypassed while drilling and completing the deeper Mesaverde reservoir and Dakota reservoir because of noncommercial economics.

The designation of the Fruitland as a tight reservoir will enable gas to be produced which would otherwise be left in the ground as noncommercial.

The calculated non-stimulated stabilized flow rate to the atmosphere of several wells is listed.

Northeast Blanco Well Number 201, 15 Mcf per day.

Northeast Blanco Well Number 202, 40 Mcf per day.

Northeast Blanco 203, 15 Mcf per day.

Northeast Blanco Well 204, 34 Mcf per day.

Northeast Blanco Well 205, 20 Mcf per day.

Palmer Oil and Gas or Tenneco No. 3, 35 Mcf per day.

Palmer Oil and Gas or Tenneco Federal No. 3, 15 Mcf per day.

The seven well total is 174 Mcf per day. The per well average is 25 Mcf per day per well.

All available data collected to this time support the designation of the Fruitland formation in the Northeast Blanco Unit as a tight reservoir. The in situ permeability as measured and calculated from the drill stem tests of the Fruitland in the Northeast Blanco Well No. 33-12 was only 0.067 millidarcy per foot. The average calculated non-stimulated stabilized production to the atmosphere of the seven producing Fruitland wells in the Northeast Blanco Unit area, and just outside to the north boundary, is 25 Mcf per well per day.

The high cost of drilling eleven wells to find seven Fruitland producers, and the necessity of expensive stimulation procedures to enhance production should also be noted.

Q. In preparing your testimony, have you used methods, techniques, and tests generally acceptable in the oil and gas industry?

A. Yes.

Q. Will the data available -- available to you and that data presented at this hearing support the con-

clusion that the entire area governed by this application should qualify for the tight sand --

A. I believe so.

Q. -- designation. Does the Fruitland formation underlie all the acreage which you are requesting?

A. Yes.

Q. And in your opinion is the formation generally productive throughout the area?

A. Again, the Fruitland will be productive throughout the area on a spotty basis. Some -- some of the lenses within the Fruitland will not be found to be productive.

Q. And in making your presentation today, what is the average depth from the surface to the top of the Fruitland that you've been using?

A. We've been using a figure of less than 3000 feet; about 2800 feet.

Q. What fluids are being produced from the wells in the Fruitland?

A. Natural gas and fresh water.

Q. Nothing that could be characterized as crude oil?

A. No.

Q. Has this formation been authorized for development under an infill drilling program?

A. No.

Q. In your opinion will granting the application be in the best interests of conservation, prevention of waste, and the protection of correlative rights?

A. Yes.

MR. CARR: At this time, Mr. Examiner, we have made reference in our presentation to six exhibits. There are ten additional exhibits which were not specifically referred to by Mr. Blackwood because they -- they're covered in his Exhibit A, which is a summary of his testimony, and with your permission we would like to at this time without identifying those, there are references made to them in Exhibit A, offer Exhibits A and one through Sixteen.

MR. STAMETS: Those are -- the exhibits we didn't discuss are the ones that support the testimony that we entered based on Exhibit A rather your direct testimony.

MR. CARR: That's correct.

A. Yes, that's correct.

MR. STAMETS: Okay, these exhibits will be admitted.

MR. CARR: We have nothing further on direct.

CROSS EXAMINATION

BY MR. STAMETS:

Q. Mr. Blackwood, looking at Exhibit Number Five, which is the computerized data analysis, it would appear as though Schlumberger used 20 feet of pay in calculating the permeability.

A. Yes, that's right.

Q. And you tested a zone that was about 200 feet, is that correct?

A. Yes, that's true.

Q. So I presume what they used was only the portion which indicated it had any significant permeability.

A. The --

Q. Or porosity.

A. -- reduction from 200 to 20 feet was a result of looking at the log on the well, although the interval tested was much thicker than the actual porous interval.

Q. And this change would serve only to increase the calculated permeability.

A. That's true. Had we left it at 200, we'd have 1/10th of this number.

Q. Again, I think we'll need a cross section of this area, probably to clearly demonstrate that the forma-

tion does exist, and also to identify the tight section.

All of the Fruitland production is on the north side of the unit. Have you attempted any other Fruitland or Pictured Cliffs completions or tests elsewhere in the unit?

A. The only thing that's to the south is this Howell 3-B Well, which was referred to in the testimony. It is in Section 3 down here in the southern part of the unit, Section 3 of Township 30 North, 7 West, in the southwest portion. That well actually was completed and hooked into the pipeline and sold approximately 59,000 Mcf of gas, but that was back in the early '50's.

Q. I presume that well was stimulated in some manner?

A. To be perfectly honest, I don't know. That well was done -- that was not a part of the Northeast Blanco Mesaverde Unit. It was done by another operator prior to our company's operations, and I've been able to find this on only some scout tickets. I believe the data we have to be accurate but I don't think -- I don't know if it was stimulated or not.

Q. Okay, perhaps our well file reflects that.

A. It's the Howell 3-B Well.

Q. Okay.

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

CROSS EXAMINATION

BY MR. CHAVEZ:

Q. The Fruitland formation lots of times is considered to be lenticular in area, rather scattered. Do you see any problem of that occurring perhaps in this -- in this -- where you have the Fruitland wells now, that perhaps that one section of sand, that one lens, would, say, pinch out and perhaps be overlapped by another Fruitland lens?

A. Oh, yes, I think that's definitely the case; that this is definitely made up of many different lenses. Our -- our completion of our five wells to date show that we're producing water free from two of the wells and producing quite a bit of water from the other three wells.

I believe them to be in separate lenses.

Q. Okay, we're looking at more of just a single formation, geologic area, rather than just a single structure, then, is what you really mean.

A. That's right.

Q. On this electrical log of the Northeast Blanco Unit 33-12, would you locate the Fruitland coal for me

on the exhibit?

A. The radioactive -- I would suspect that it's this -- one of the coals is probably down here about 3260 to 75.

The interval that we assume to be the porous interval that was being tested by the drill stem test are the two little stringers from 3170 to 80 and about 3160 to 70.

Q. Okay, they're slightly shaded in there.

A. Yeah, those are the zones that we believe contributed the small gas flow and the pressure from the drill stem test.

Q. You wouldn't identify any coal further up or --

A. Oh, there may very well be others, yes. This -- I would much rather have a different suite of logs to try to find coal from than this. I think that --

Q. The reason I asked is because I wanted to ask if you considered that perhaps some of that gas was produced within that area from the test was included gas from the coals.

A. That is entirely possible. I believe that the coal contains gas and that the coal would contribute some gas over the Fruitland interval.

Q. This computerized analysis of the shut-in pressure shows that there was skin damage ratio of 5.57, which is rather high. What type of estimate would you say for a flow rate if there hadn't been any skin damage? Will you take into consideration the high ratio of skin damage?

A. Well, the flow rate, of course, could be improved by removing the skin damage, probably on a factor of -- of as much as five, but the -- we believe that the permeability that we're measuring, though, is probably -- the calculated number here of permeability cannot be increased by that factor. We're talking about undamaged permeability.

Q. Right, the permeability is achieved after the skin damage.

A. Yes, out past -- out past the skin damage.

Q. But then, therefor, say, just using a ratio of just five, say, not knowing the 5.57, therefor your flow rate would have actually been up as high as 165 Mcf a day.

A. Uh-huh. However, I don't think any rate like that would be stabilized. I think you might get that rate for the first week and two months later you'd be back to a much lower stabilized producing rate.

MR. CHAVEZ: That's all the questions I have.

MR. STAMETS: Any other questionsof the witness? He may be excused.

We will reopen this case as well at the December 10th Examiner Hearing to discuss at least the cross section and whatever questions we might think of between now and then.

If there is nothing further in the hearing, the hearing is adjourned.

(Hearing continued.)

C E R T I F I C A T E

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

Sally W. Boyd C.S.R.

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 7087 heard by me on 11-12, 1980.

Richard L. Stamets, Examiner
Oil Conservation Division

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION
STATE LAND OFFICE BLDG.
SANTA FE, NEW MEXICO
12 November 1980

EXAMINER HEARING

IN THE MATTER OF:

Application of Blackwood & Nichols Company, Ltd., for designation of a tight formation, San Juan and Rio Arriba Counties, New Mexico.

CASE 7087

BEFORE: Richard L. Stamets

TRANSCRIPT OF HEARING

A P P E A R A N C E S

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

For the Applicant: William F. Carr, Esq.
CAMPBELL & BLACK P. A.
Jefferson Place
Santa Fe, New Mexico 87501

I N D E X

E X H I B I T S

E X H I B I T S

Applicant Exhibit Fourteen

Applicant Exhibit Fifteen

Applicant Exhibit Sixteen

MR. STAMETS: We'll call next Case 7087.

MR. PADILLA: Application of Blackwood and Nichols Company, Ltd., for designation of a tight formation, San Juan and Rio Arriba Counties, New Mexico.

MR. CARR: Mr. Examiner, I am William F. Carr, with the law firm of Campbell and Black, Santa Fe, New Mexico, appearing on behalf of the applicant, Blackwood and Nichols Company, Limited.

I have one witness, Charles Blackwood, and would request that since Mr. Blackwood testified in the previous case, that the record reflect that he is qualified to testify in this case and is under oath.

MR. STAMETS: The record shall so reflect.

CHARLES F. BLACKWOOD

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

DIRECT EXAMINATION

BY MR. CARR:

Q. Mr. Blackwood, would you briefly state what Blackwood and Nichols Company, Limited, is seeking with this application?

A. We are seeking that the area of the Northeast Blanco Unit be designated a tight reservoir for the Fruitland formation under the category 107 of the NGPA.

Q. Have you prepared certain exhibits for introduction in this case?

A. Yes, I have.

Q. Have each of these exhibits previously been submitted to the USGS and to the Oil Conservation Division with a statement of the meaning and purpose of each exhibit?

A. Yes, they have.

Q. Will you please refer to what has been marked for identification as Applicant's Exhibit Number One and review this for the Examiner?

A. This is a map of the area of the Northeast Blanco Unit and some adjacent areas to the -- surrounding, which shows all wells currently producing from the Fruitland formation. It also shows the location of a well which was drill stem tested and in situ permeability calculations made from the pressures collected from the drill stem test. It also shows the producing Mesaverde wells in the area, but not colored. It also shows the boundary of the Northeast Blanco Unit, which is the precise area of our application.

Q. Will you please refer to what has been marked for identification as Exhibit A and review the informa-

tion contained therein for Mr. Stamets?

A. This is a geographical and geological description of the formation. It was prepared as my testimony and I will just read most of it into the record; summarizing at various places.

Geographical. The Fruitland is one of several tight sandstone formations of the San Juan Basin, New Mexico. San Juan Basin is approximately 80 miles long from the southeast to northwest and 40 miles wide from the southwest to northeast. The approximate center of the gas production in the San Juan Basin is 25 miles southeast of Aztec, New Mexico.

Natural gas has been produced for many years from this basin. The most prolific reservoirs are within the Mesaverde group. The Fruitland formation has not been produced over much of the San Juan Basin because of low permeability and the high cost of producing the gas.

Blackwood and Nichols Co, Ltd,, operates the Northeast Blanco Unit, a 33,500 acre area, located on the northeast flank of the San Juan Basin. The Northeast Blanco Unit is located in Townships 30 and 31 North, Range 6 and 7 West; also Sections 25 and 36 of Township 31 North, 8 West, Sections 1, 12, 13, and 24, Township 30 North, Range 8 West.

A map of the Northeast Blanco Unit is

provided. That's the Exhibit One.

Geological. Fruitland formation is upper Cretaceous age and consists primarily of coal and shale with some sandstone stringers. These stringers when located in the basal portion of the Fruitland are sometimes intertongued with the Pictured Cliffs formation below.

A general geologic section of the San Juan Basin is included with this application. That's our Exhibit Two.

In the Northeast Blanco Unit area the Fruitland formation dips gently to the southwest. I contains coals, shale, and tight sandstones.

The Fruitland formation in this area contains fluids at above normal pressures. The initial pressures encountered in the Fruitland are approximately 1500 to 1600 psig at 3000 feet, while the original pressures in the Mesaverde in this area are only 1400 to 1500 psig at 6000 feet.

The Fruitland formation has been drilled through and logged in over 100 wells from 1950 to 1978 in the Northeast Blanco Unit area. The general characteristics observed when drilling, logging, and drill stem testing, were those of a very tight reservoir. The data collected indicated that gas was present in certain sandstone stringers

within the Fruitland formation.

The permeabilities were indicated to be so low, however, that only one of more than 100 wells in the Northeast Blanco Unit area attempted a completion in the Fruitland formation prior to 1979. The extremely low permeability indicated and the low price allowed for gas made any completion attempt infeasible because there was no chance that it would be profitable.

The one well completed in the Fruitland formation in the Northeast Blanco Unit prior to 1979 was the Howell 3-B. This well was located in the southwest quarter of Section 3, Township 30 North, Range 7 West, Rio Arriba County, New Mexico, and produced approximately 59,000 Mcf from the Fruitland reservoir and was abandoned in the early 1950's. No ther attempt to produce gas from the Fruitland formation was made in the Northeast Blanco Unit area until 1979.

One well west of the Northeast Blanco Unit area was drilled and completed by Phillips Petroleum Company in the early 1950's. This well is located in the northeast quarter of Section 17, Township 31 North, Range 7 West. The well produced approximately 30 to 40 Mcf per day on initial completion, and was declared noncommercial. This well has continued, however, to produce low volumes of gas

for more than twenty years. This indicates that gas is present and could be developed and produced from the Fruitland formation in this area if a high enough price were established to make these expensive low volume wells profitable.

Blackwood and Nichols Co., Ltd., operates the Northeast Blanco Unit. We have taken all necessary precautions to insure that all fresh water zones are protected and not adversely affected by our operations. Our procedures have been in accord with all State and Federal rules and regulations. A part of the pertinent Federal regulations are attached, Exhibit Three. They are pages 1 through 5 of supplement to the USGS NTL-6.

Pages C-6, C-7, and C-8 of the New Mexico Oil Conservation Division of the Energy and Minerals Department are also attached. That's our Exhibit Four.

We believe that compliance with these rules and regulations adequately protects and will not adversely affect or impair any fresh water aquifers that are being used, or expected to be used in the foreseeable future, for domestic or agricultural water supplies.

Geologic and Engineering Data. The Fruitland formation of the northeast flank of the San Juan Basin is composed primarily of coal seams, shales, and tight sandstone stringers. This information has been determined by

hundreds of logs run on wells drilled in the last thirty years. Electric logs, gamma ray neutron logs, sonic logs, formation density logs, sidewall neutron logs, and many other types, have been analyzed and interpreted over the years to show the coal seams, shales, and tight sandstones. These logs have indicated that natural gas and water (almost fresh enough to drink) is present within the void space of the Fruitland formation.

Pressure information has been obtained in several different ways. A drill stem test was taken on the Northeast Blanco Unit Well No. 33-12 on October 24th, 1955. The Fruitland formation was tested from a depth of 3055 feet to 3205 feet. This drill stem test has been analyzed and computations have been made to show the permeability to be 0.067 millidarcy per foot centipoise on the average. The highest recorded shut-in pressure was 1629 psig.

A copy of the computerized data analysis is attached, Exhibit Number Five.

A copy of the log on the Northeast Blanco Unit Well No. 33-12 is also included as a part of this application, Exhibit Number Six.

While drilling over 100 deeper wells in the Northeast Blanco Unit area, additional pressure information was obtained. It is necessary to raise the mud weight to 11.5

to 12.5 pounds per gallon in order to control the pressure in the Fruitland formation. Pressure which is found in the Fruitland formation is abnormally high for the depth drilled. This abnormally high pressure may also be an indication of low porosity and permeability.

A reduction in the original void space of the Fruitland formation may have occurred to cause a reduction in the original permeability.

Another interpretation could be that this formation was once at a deeper level below the surface and that normal pressures at the deeper level are still trapped even though the Fruitland formation is now found at shallower depths.

The permeability required to trap the abnormally high pressures in the Fruitland formation would have to be extremely low.

Flow rates of wells in the area, which have recently been produced from the Fruitland formation, also prove low permeability. Information about each new shallow gas well in the area of the Northeast Blanco Unit and the adjacent wells is given below, along with calculations of stabilized production, production improvement by stimulation, et cetera.

Stabilized production versus depth

guidelines. Blackwood and Nichols Co., Ltd., has drilled five test holes in 1979. These five holes have resulted so far in two Fruitland producers, two Fruitland-Pictured Cliffs commingled wells, and one well which has been unsuccessfully attempted in the Pictured Cliffs and Fruitland. This unsuccessful hole has been recompleted in the Fruitland and is now testing gas and water at noncommercial rates.

A listing of the five Northeast Blanco Unit wells, with completion information, production information, et cetera, follows. The pipeline production figures are shown. Calculations to approximate stabilized production rate against atmospheric pressure have been included.

Two wells, the Northeast Blanco Unit Well 202 and 204 produce commingled from the Fruitland and Pictured Cliffs reservoirs. In order to allocate production by zone, 50 percent of the gas sales have been assigned to each zone.

All the Northeast Blanco Unit wells were stimulated prior to production. The calculated productivity improvements ratio is 10 to 11.

MR. STAMETS: Mr. Blackwood, --

A. Yes.

MR. STAMETS: -- did use essentially the identical process in making these calculations?

A. Yes.

MR. STAMETS: It would seem as though there would be no necessity in covering all of those again, but perhaps we should go to the back and let you --

A. All right.

MR. STAMETS: -- summarize what the results of those were.

A. I would love to.

MR. STAMETS: And --

A. Let me just state --

MR. STAMETS: -- everything that you've included in here, in Exhibit A, is your statement and your testimony.

A. Yes, that's right.

MR. STAMETS: Okay.

A. I'd be more than happy not to read the rest of this into the record, satisfactory.

MR. STAMETS: I think that would be just fine.

A. Okay. Let's just -- why don't we skip over here then to summary and conclusions, if that's all right.

MR. STAMETS: I'm tickled to death.

A. Okay.

For over thirty years the Fruitland formation has been penetrated and logged and occasionally drill stem tested and produced on the northeast flank of the San Juan Basin, New Mexico.

Only one well had produced gas prior to 1979 from the Fruitland formation within the area of the Northeast Blanco Unit. The Howell 3-B Well was drilled in March of 1952; completed at a total depth of 3025 feet in the Fruitland. The well produced a total of approximately 59,000 Mcf and was abandoned.

Since that time over 100 wells have been drilled in the Northeast Blanco Unit. The Fruitland zone was logged and evaluated in each well and is not considered to be commercially productive. All wells drilled from 1953 to 1978 were completed in the Mesaverde or Dakota reservoirs.

One Fruitland well was drilled and completed in 1952 to the west of the Northeast Blanco Unit by Phillips Petroleum Company. The well produced very low volume of gas (approximately 30 Mcf per day) and was declared to be noncommercial. This well is located in the northeast northeast of Section 17, Township 31 North, Range 7 West, San Juan County, New Mexico.

This well has continued to produce for over 25 years and was one of the main reasons that additional

shallow wells were drilled in 1978 by Palmer Oil and Gas to the north of the Northeast Blanco Unit.

The results of the Palmer Oil and Gas wells which were completed in the Fruitland were shown earlier in this report. Three of the six shallow wells drilled by Palmer Oil and Gas are now producing from the Fruitland formation. Fruitland completion was attempted in the State No. 2 Well but was unsuccessful because of too much water.

Blackwood and Nichols Co., Ltd., attempted five shallow wells along the northern boundary of the Northeast Blanco Unit in 1979. Two of these wells, the No. 202 and No. 204, were completed as commercial wells in the Fruitland and Pictured Cliffs reservoirs initially. The other three wells were not completed successfully and produced too much water.

In 1980 these three wells were reworked and recompleted in the Fruitland formation only. The difficulties in log interpretation and completion techniques including cementing, perforating, and stimulation for production, raised the cost of these three wells significantly above the estimated costs.

All five of the Blackwood and Nichols Co., Ltd., wells are now producing from the Fruitland formation. One well, the No. 201, is currently noncommercial and the No. 203 well is borderline.

The difficulty in analyzing the logs and the need to recomplete three of five Blackwood and Nichols Co., Ltd., wells, should also be considered.

In conclusion, it is well established that natural gas occurs in the Fruitland formation in this area. It is also well known that the Fruitland formation is extremely tight. The Fruitland formation has been bypassed while drilling and completing the deeper Mesaverde reservoir and Dakota reservoir because of noncommercial economics.

The designation of the Fruitland as a tight reservoir will enable gas to be produced which would otherwise be left in the ground as noncommercial.

The calculated non-stimulated stabilized flow rate to the atmosphere of several wells is listed.

Northeast Blanco Well Number 201, 15 Mcf per day.

Northeast Blanco Well Number 202, 40 Mcf per day.

Northeast Blanco 203, 15 Mcf per day.

Northeast Blanco Well 204, 34 Mcf per day.

Northeast Blanco Well 205, 20 Mcf per day.

Palmer Oil and Gas or Tenneco No. 3, 35 Mcf per day.

Palmer Oil and Gas or Tenneco Federal No. 3, 15 Mcf per day.

The seven well total is 174 Mcf per day. The per well average is 25 Mcf per day per well.

All available data collected to this time support the designation of the Fruitland formation in the Northeast Blanco Unit as a tight reservoir. The in situ permeability as measured and calculated from the drill stem tests of the Fruitland in the Northeast Blanco Well No. 33-12 was only 0.067 millidarcy per foot. The average calculated non-stimulated stabilized production to the atmosphere of the seven producing Fruitland wells in the Northeast Blanco Unit area, and just outside to the north boundary, is 25 Mcf per well per day.

The high cost of drilling eleven wells to find seven Fruitland producers, and the necessity of expensive stimulation procedures to enhance production should also be noted.

Q. In preparing your testimony, have you used methods, techniques, and tests generally acceptable in the oil and gas industry?

A. Yes.

Q. Will the data available -- available to you and that data presented at this hearing support the con-

clusion that the entire area governed by this application should qualify for the tight sand --

A. I believe so.

Q. -- designation. Does the Fruitland formation underlie all the acreage which you are requesting?

A. Yes.

Q. And in your opinion is the formation generally productive throughout the area?

A. Again, the Fruitland will be productive throughout the area on a spotty basis. Some -- some of the lenses within the Fruitland will not be found to be productive.

Q. And in making your presentation today, what is the average depth from the surface to the top of the Fruitland that you've been using?

A. We've been using a figure of less than 3000 feet; about 2800 feet.

Q. What fluids are being produced from the wells in the Fruitland?

A. Natural gas and fresh water.

Q. Nothing that could be characterized as crude oil?

A. No.

Q. Has this formation been authorized for development under an infill drilling program?

A. No.

Q. In your opinion will granting the application be in the best interests of conservation, prevention of waste, and the protection of correlative rights?

A. Yes.

MR. CARR: At this time, Mr. Examiner, we have made reference in our presentation to six exhibits. There are ten additional exhibits which were not specifically referred to by Mr. Blackwood because they -- they're covered in his Exhibit A, which is a summary of his testimony, and with your permission we would like to at this time without identifying those, there are references made to them in Exhibit A, offer Exhibits A and one through Sixteen.

MR. STAMETS: Those are -- the exhibits we didn't discuss are the ones that support the testimony that we entered based on Exhibit A rather your direct testimony.

MR. CARR: That's correct.

A. Yes, that's correct.

MR. STAMETS: Okay, these exhibits will be admitted.

MR. CARR: We have nothing further on direct.

CROSS EXAMINATION

BY MR. STAMETS:

Q. Mr. Blackwood, looking at Exhibit Number Five, which is the computerized data analysis, it would appear as though Schlumberger used 20 feet of pay in calculating the permeability.

A. Yes, that's right.

Q. And you tested a zone that was about 200 feet, is that correct?

A. Yes, that's true.

Q. So I presume what they used was only the portion which indicated it had any significant permeability.

A. The --

Q. Or porosity.

A. -- reduction from 200 to 20 feet was a result of looking at the log on the well, although the interval tested was much thicker than the actual porous interval.

Q. And this change would serve only to increase the calculated permeability.

A. That's true. Had we left it at 200, we'd have 1/10th of this number.

Q. Again, I think we'll need a cross section of this area, probably to clearly demonstrate that the forma-

tion does exist, and also to identify the tight section.

All of the Fruitland production is on the north side of the unit. Have you attempted any other Fruitland or Pictured Cliffs completions or tests elsewhere in the unit?

A. The only thing that's to the south is this Howell 3-B Well, which was referred to in the testimony. It is in Section 3 down here in the southern part of the unit, Section 3 of Township 30 North, 7 West, in the southwest portion. That well actually was completed and hooked into the pipeline and sold approximately 59,000 Mcf of gas, but that was back in the early '50's.

Q. I presume that well was stimulated in some manner?

A. To be perfectly honest, I don't know. That well was done -- that was not a part of the Northeast Blanco Mesaverde Unit. It was done by another operator prior to our company's operations, and I've been able to find this on only some scout tickets. I believe the data we have to be accurate but I don't think -- I don't know if it was stimulated or not.

Q. Okay, perhaps our well file reflects that.

A. It's the Howell 3-B Well.

Q. Okay.

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

CROSS EXAMINATION

BY MR. CHAVEZ:

Q. The Fruitland formation lots of times is considered to be lenticular in area, rather scattered. Do you see any problem of that occurring perhaps in this -- in this -- where you have the Fruitland wells now, that perhaps that one section of sand, that one lens, would, say, pinch out and perhaps be overlapped by another Fruitland lens?

A. Oh, yes, I think that's definitely the case; that this is definitely made up of many different lenses. Our -- our completion of our five wells to date show that we're producing water free from two of the wells and producing quite a bit of water from the other three wells.

I believe them to be in separate lenses.

Q. Okay, we're looking at more of just a single formation, geologic area, rather than just a single structure, then, is what you really mean.

A. That's right.

Q. On this electrical log of the Northeast Blanco Unit 33-12, would you locate the Fruitland coal for me

on the exhibit?

A. The radioactive -- I would suspect that it's this -- one of the coals is probably down here about 3260 to 75.

The interval that we assume to be the porous interval that was being tested by the drill stem test are the two little stringers from 3170 to 80 and about 3160 to 70.

Q. Okay, they're slightly shaded in there.

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A. Oh, there may very well be others, yes. This -- I would much rather have a different suite of logs to try to find coal from than this. I think that --

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Q. Right, the permeability is achieved after the skin damage.

A. Yes, out past -- out past the skin damage.

Q. But then, therefor, say, just using a ratio of just five, say, not knowing the 5.57, therefor your flow rate would have actually been up as high as 165 Mcf a day.

A. Uh-huh. However, I don't think any rate like that would be stabilized. I think you might get that rate for the first week and two months later you'd be back to a much lower stabilized producing r te.

MR. CHAVEZ: That's all the questions I have.

MR. STAMETS: Any other questionsof the witness? He may be excused.

We will reopen this case as well at the December 10th Examiner Hearing to discuss at least the cross section and whatever questions we might think of between now and then.

If there is nothing further in the hearing, the hearing is adjourned.

(Hearing continued.)

C E R T I F I C A T E

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

_____

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

_____, Examiner
Oil Conservation Division

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION
STATE LAND OFFICE BLDG.
SANTA FE, NEW MEXICO
10 December 1980

EXAMINER HEARING

IN THE MATTER OF:

Application of Blackwood & Nichols Company, Ltd., for designation of a tight formation, San Juan and Rio Arriba Counties, New Mexico.

CASE 7087

BEFORE: Richard L. Stamets

TRANSCRIPT OF HEARING

A P P E A R A N C E S

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

For the Applicant: William F. Carr, Esq.
CAMPBELL & BLACK P. A.
Jefferson Place
Santa Fe, New Mexico 87501

I N D E X

CHARLES F. BLACKWOOD

E X H I B I T S

MR. STAMETS: We'll call now Case 7087.

MR. PADILLA: Application of Blackwood and Nichols Company, Ltd., for designation of a tight formation, San Juan and Rio Arriba Counties, New Mexico.

MR. CARR: Mr. Examiner, we'd like the record to reflect this is a continuation of the hearing in this case, held on November 12th, 1980.

Also we'd like the record to reflect that Mr. Blackwood was previously qualified as an expert in petroleum engineering, and that he was placed under oath at that time. If you would like to re-swear him in, it might be appropriate at this time.

MR. STAMETS: Since this is a continuation of that case, the record was left open, the record does show that Mr. Blackwood was qualified and sworn. I don't see any need in doing that again.

MR. CARR: At the hearing on November the 12th the Examiner requested that we prepare and present some additional information. To do that we have taken our previously submitted meaning and purpose of exhibits which was not offered as an exhibit but which was included with the exhibits previously offered, that simply was a summary of the exhibits offered at the prior hearing and a brief statement of what they were intended to show.

We have added to that four more exhibits, Exhibits Seventeen through Twenty, and have simply added them to that meaning and purpose of exhibits and have supplied you with additional copies and ask that this now supersede that summary which was presented at the prior hearing.

MR. STAMETS: Okay, that will be fine.

MR. CARR: Mr. Blackwood is going to start testifying from the land plat, or the required map that was offered as Exhibit One in the prior case.

We have revised this and have provided copies to you to substitute. The only change has been that we have placed traces on this map to show the location of the various cross sections from which he will testify.

MR. STAMETS: And that is identified as Revised Exhibit One?

MR. CARR: That is correct.

CHARLES F. BLACKWOOD

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

DIRECT EXAMINATION

BY MR. CARR:

Q Mr. Blackwood, will you now refer to

what has been marked as our revised Exhibit One and state, or restate, what it is designed to show?

A. This map, which is -- was previously called Exhibit One is now one called Revised Exhibit One, and shows in red the producing Pictured Cliffs wells in this area, both within the Northeast Blanco Unit Area and immediately adjacent to the north side of the Northeast Blanco Unit Area.

The map also shows the boundary of the 33,500-acre unit area that we are talking about. It shows the location where we have a drill stem test, which was used and calculated to obtain the permeability for the area, and we have added to it the trace lines of cross section A-A', which is an east/west trending cross section at the northern part of the unit; B-B', which is a cross section going from north to south across the unit; and C-C', which is again a cross section running east and west across the Northeast Blanco Unit.

Q. Will you now refer to Blackwood and Nichols Exhibit -- well, Exhibit Seventeen, which is the A-A' cross section, and explain to Mr. Stamets what it shows?

A. Okay. This is our cross section A'A', which was prepared in order to define for this application what we mean by the Fruitland formation. We have the top of the Fruitland marked on these logs and the base of the Fruit-

land. This cross section is hung on a datum of 3100 feet above sea level.

We have chosen to include in the Fruitland the lowermost coal, the lowermost Fruitland coal, which by virtually all authors and references is generally included in the Fruitland formation.

If you'll let me go on to Section B-B'.

Q That's our Exhibit Number Eighteen.

A I'd like to again say that this cross section B-B' runs from B to the south to B' to the north, and again shows the top of the Fruitland, as we would like to see it used in the area of our Northeast Blanco Unit, and the base of the Fruitland.

Again we have put the base of the Fruitland at the lowermost coal.

There is some difficulty in picking the base of the Fruitland formation and as you're probably well aware, there is inter-tongueing between the lower part of the Fruitland formation and the upper part of the Pictured Cliffs formation.

If you take a look at our cross section B-B', at the south end of the unit you will note that the massive Pictured Cliffs sandstone with the coal at the very top is the only massive sandstone present in this area. A

few minor sandstones and coals, thin in nature and discontinuous, are found at the southern end of our Northeast Blanco Unit, and I think that we would not have any trouble picking this precise point as being totally Fruitland above this point, totally Pictured Cliffs below this point at the southern part of our unit.

However, as we go to the north, we find about ten miles north of our original south boundary of our unit, we find a massive sandstone developing above the extremely massive Pictured Cliffs sandstone, and this sandstone occurs in all of the wells to the northern part of our unit. See, here's our massive Pictured Cliffs sandstone, which is obvious and easy to find in all of the wells, and there's a coal right at the uppermost part of it, which we say is the base of the -- the base of the Fruitland.

However, in this area there is a massive sandstone bed some 40 feet thick.

Q. Mr. Blackwood, when you say this area, you're talking about the --

A. The northern half of our unit.

Q. Fine.

A. The northern half of the Northeast Blanco Unit. A thick sandstone occurs separated from what's generally recognized as the massive Pictured Cliffs sandstone by

shales and coal beds and this sandstone by some authors and by some authorities is included in the Pictured Cliffs. There is quite a nomenclature problem trying to decide what to do with this sandstone.

It is my recommendation, and I have drawn these cross sections to show only the massive Pictured Cliffs sandstone beneath the lowermost Fruitland coal. This -- this should be the boundary marker, I believe, for the Northeast Blanco Unit Area, the reason being we find it impossible to do our underground plumbing in such a manner to call this area, 50 or 60 foot interval beneath this sandstone, Fruitland --

Q. Could you tell us what well you're talking about when you say this ---

A. Okay. Let's take, for example, Well 102-A.

Q. On Exhibit Eighteen.

A. On Exhibit Eighteen, the cross section B-B'.

There exists above the top of the massive Fruitland -- of the massive Pictured Cliffs sandstone, and the lowermost Fruitland coal, an interval approximately 40 feet thick, which is Fruitland formation. Then there also exists a 30-foot thick sandstone, which may be very likely

equivalent to the massive Pictured Cliffs sandstone. Inasmuch as we need to make one mark on this well log, and we need to call a continuous Fruitland, we have chosen to say that the base of the Fruitland is the lowermost Fruitland coal. We think that any other pick will end up being impossible to complete your wells. For example, if we call a 40-foot interval in the middle of the Fruitland Pictured Cliffs, and that interval disappears in the middle of our unit and becomes nothing, we have -- we have a completion problem. We don't know whether to complete this interval as Pictured Cliffs or as Fruitland, and we therefor have chosen the easiest log pick, which also gives you continuous Fruitland formation without a hole in it which could possibly represent a Pictured Cliffs sandstone stringer.

Q. Will you now refer to Exhibit Nineteen, cross section C-C', and review that for Mr. Stamets?

A. Cross section C-C' occurs in the southern -- about the central to southern part of the unit area, and it goes from Well 104-A, which is on the C at the western extremity of the unit, to Well 22-A, which is on the eastern extremity of the unit.

We have again picked the lowermost coal as the base of the Fruitland formation, and this -- this occurred at the top of the massive Pictured Cliffs sandstone.

This -- this is again the best pick because at the western side of this unit -- well, there is no doubt that that would be the proper pick at the western side of the unit. Again, as we go east and slightly north, an additional sandstone occurs above this interval which could confuse the -- the pick, but we believe that it's in the best nature of this definition to have one continuous Fruitland interval and not try to confuse it with having a possible tongue of the Pictured Cliffs sand protruding into the Fruitland interval.

Q. Mr. Blackwood, if for the purposes of this application you were asked to select a type log, which log would it be?

A. Mr. Carr, I think that the best type log would be the 17-A, and the reason is that -- that log is one which appears on two of the cross sections, in other words, the north/south and the east/west cross sections, B-B' and C-C', cross at Well 17-A.

And it is very typical of the Fruitland formation throughout the area.

MR. STAMETS: What's the top and bottom of the Fruitland in that well?

A. In 17-A? Let's see, the base would be at 32 -- about 3224, and the top is about 2926.

MR. STAMETS: Thank you.

A. As you can see, we have approximately a 250-foot thickness throughout the area and generally no - no major problems throughout the entire Fruitland area, but you can see that individual sandstones and individual coal beds are not continuous. In fact, quite the opposite is true. Most of these are -- are known to be from surface studies and from log studies, to be lenses which are not large in areal extent and do not continue, generally, even from one mile to the next.

Q. Mr. Blackwood, will you now refer to what has been marked for identification as our Exhibit Twenty, and identify this and explain what information it contains?

A. Exhibit Twenty is supplement to the gas volume estimates which were made previously in the former hearing.

This is an attempt to update the gas production up to October of 1980. Our company had the gas sales production available from the Fruitland wells that we operate in this unit for October, 1980, and so I have made the calculations to show what the "non-stimulated, stabilized, production rate to the atmosphere" is estimated to be in each of these wells.

I might just run through them briefly.

In Northeast Blanco Well No. 201, the non-stimulated, stabilized production rate to the atmosphere is estimated to be 11 Mcf per day.

Northeast Blanco Unit Well No. 202, the estimated non-stimulated, stabilized production rate to the atmosphere is estimated to be 48 Mcf per day for October of 1980.

Well No. 203, this estimate of non-stimulated, stabilized production rate to the atmosphere is 3 Mcf per day.

Northeast Blanco Unit Well No. 204, the non-stimulated, stabilized production rate to the atmosphere is estimated to be 36 Mcf per day.

And finally, in the Northeast Blanco Unit Well No. 205, the non-stimulated, stabilized production rate to the atmosphere is estimated to be 18 Mcf per day.

The five Northeast Blanco Unit wells average 75 Mcf per day actual gas sales from the Fruitland formation in October. All five of these wells were previously stimulated by fracturing.

So that we find the average per well stabilized production rate prior to stimulation and adjusted to zero line pressure is 23 Mcf per day. This 23 Mcf per

day average per well is down from the 25 Mcf per day average per well calculated for the wells in this area from July production.

Q. Mr. Blackwood, in your opinion does the portion of the Fruitland formation which is the subject of this application qualify for designation as tight formation under Section 107 of the Natural Gas Policy Act?

A. Yes, it does.

Q. In your opinion will granting this application be in the best interest of conservation, the prevention of waste, and the protection of correlative rights?

A. Yes.

Q. Were revised Exhibit One and Exhibits Seventeen through Twenty prepared by you or under your direction and supervision?

A. Yes, they were prepared by me.

MR. CARR: At this time, Mr. Stamets, we would offer into evidence revised Exhibit One and Exhibits Seventeen through Twenty.

MR. STAMETS: These revised exhibits will be admitted.

MR. CARR: I have nothing further of this witness on direct.

CROSS EXAMINATION

BY MR. STAMETS:

Q. Mr. Blackwood, what we have here is a relatively large area with the only development being located along the northernmost fringes. Why at this time is such a small area developed in the Fruitland?

A. Well, one reason, Mr. Stamets, is that we would -- we're still hesitant to develop this area rapidly because we don't know what the economics are. If you'd no the average of 75 Mcf per well per day after stimulation of our five wells, and one of the five wells making only an actual 21 Mcf per day after fracturing, we are hesitant to charge ahead prior to obtaining a higher price in the area.

Q. On the assumption, on my own assumption, that perhaps there would be some reluctance on the part of the Division to approve such a large area without some actual wells being scattered throughout the area, I've drawn a line, I've drawn two lines across this unit, one between Sections 19 and 30 in 7 West, 31 North, east to west across the --

A. Just a minute. Okay.

Q. And then another between Sections 6 and 7, in the township immediately to the south.

A. Now let me see if I understand what

you're saying.

You have -- one of these lines you put between Section 19 and 30.

Q. Right.

A. On the west side of the unit.

Q. Right, and then run it -- run it from west to east.

A. Uh-huh.

Q. Then the same thing three sections to the south.

A. Yes, okay.

Q. All right. My thinking being that conceivably this large unit might be approved on the provision that within a year wells would be completed in each of these blocks which would demonstrate that indeed the permeabilities and the productive capacities which are encountered in the Fruitland bear out what has been demonstrated on the northern side, and upon failure to complete wells in these blocks, or upon failure to complete in these blocks that bore out that information, that they would be eliminated from the tight sands findings.

MR. CARR: Point of clarification. When you said drilling in each of these blocks, what do you mean by each of these blocks?

Q. Okay, let's --

A. You mean --

Q. Let's say, for example, we decide this today, or a decision is made today that all of this unit belongs in. Then within a year the completion of a well in Section 33 of 31 North, 7 West, demonstrating in situ gas permeability of less than 0.1 of a millidarcy and productive capacity lower than that spelled in Federal regs, would demonstrate that that block should be retained.

A. that's this central block that's like --

Q. Yes.

A. -- miles -- north/south dimension, three miles.

Q. Right, but upon failure to complete such a well in here, that central block would be thrown out.

And the same --

A. And the same thing for the southern block.

Q. -- thing for the southern block.

A. I would only say that at this point we don't have any plans to drill that far south within the next year, and that if those were thrown out and not prejudice us at some future point going in, I would not object to that greatly. I think that undoubtedly at some point in the future

a well will be drilled down there and information will be forthcoming, but information is not easy to obtain.

Perhaps we could go off the record for just a moment, I'll tell you --

Q. Okay, let's --

A. -- about something we have done.

Q. Okay, let's go off the record.

(Thereupon discussion was had off the record.)

MR. STAMETS: Let's go back on the record.

Q. We were talking about making blocks out of this thing.

Let me ask one further question, then, Mr. Blackwood. Is it possible that this type of a concept, the block concept, could result in the somewhat speedier development or testing of the Fruitland in those blocks than just simply authorizing the entire unit as a whole?

A. Yes, Mr. Stamets, I think the block concept would provide impetus for us do additional permeability testing within each of the additional blocks in order to

qualify those blocks for the tight reservoir treatment. I think it would, would speed up the development.

Q. Would you mention a period of time under normal business practices, one year?

A. I would prefer two years. We've had a difficult time obtaining the necessary drilling rigs. As a matter of fact, we're still drilling at this date, and barely will finish our 1980 drilling program the last three or four days of the year.

I would recommend that we had a two year period in which to take permeability information on each of these additional blocks.

Q. Okay. Thank you. Based on a phone call that I got from FERC since we had the last hearing, I'd like to ask you a couple of questions concerning the protection provided for any aquifers in the area by the Division's and the U. S. Geological Survey's casing and cementing practices.

In general, what's the average depth of the Fruitland in this area?

A. The average depth to the top of the Fruitland is around 2900 feet and to the base, around 3100 feet.

Q. Okay. Now, in drilling these wells what would your normal casing program be?

A. We normally run 9-5/8ths inch casing for surface casing. Let me look at a -- to about 200 to 250 feet. Then we drill a 7-7/8ths inch hole, or larger, and generally run 7-inch -- well, for Mesaverde wells, which are going to go deeper, we generally run 7-inch casing through the Pictured Cliffs at approximately 3600 feet, and cement back to the surface all the way. We circulate cement clear back to the surface outside our 7-inch casing.

Q. What type of cement, or what volume would you use on the 9 5/8ths? That would be circulated, as well?

A. Yes, that's circulated, as well.

Q. Okay. Now I don't recall this instant if you've discussed fresh water in the original hearing. I presume that you did. Will you referesh my memory on that?

A. Well, fresh water exists in the Fruitland and sometimes in the Pictured Cliffs. The -- we occasionally receive flows of fresh water from the uppermost portion of the Pictured Cliffs or the lowermost part of the Fruitland, so that would be around 3100 feet.

Q. Okay, now obviously having the cement circulated to the surface would protect the shallowest water, that which might lie between 200 feet and 250, and is there any other water below 250 feet until you get to this water

that you're talking about in the Fruitland and Pictured Cliffs?

A. Yes, waters occur in several of the sandstones, particularly the Ojo Alamo sandstone. It carries water in this area.

Q. And that's above the Fruitland?

A. It's above the Fruitland.

Q. How much?

A. How far above the Fruitland?

Q. Yes.

A. Again that varies greatly from area to area, based on the geologic interpretation, but in some areas it's directly above the Fruitland. In other areas it's several hundred feet higher.

Q. Okay. In completing a Fruitland well in this area, what completion techniques would you use?

A. Well, what we have used in the past is to set 4-1/2 inch casing and circulate cement clear back to the surface.

Q. Okay, specifically what I'm talking about is in the treatment of the zone, acidizing, fracturing.

A. We have --

Q. And then obviously, the next question is how are we all assured that we don't frac into and damage the fresh water?

A. Well, the -- we perforate the sandstones which are indicated to be porous and gas productive. We do generally acidize with a small volume of acid, 500 to 1500 gallons of acid, and we do large fracture stimulation jobs of between 50 and 100,000 gallons of water per reservoir, and introduce 50 to 100,000 pounds of sand.

The rates which we use are intended to fracture these to a radius -- excuse me, let me look in my recommendations.

Q. Okay.

A. This radius of propped length, that's propped up after we open a frac, we introduce sand to keep it propped open of 1200 feet in the largest of these frac jobs.

The only statement that I can make about safety to the fresh water zones is that we attempt to perforate as far as possible from the fresh water zones and not to fracture into them because what we're interested in is gas production rather than water production, and it is in our best interest to not fracture into the water zone.

I should also say that the water zones are generally the far from the gas producing zones and it is not likely that these fracture stimulations would fracture into the water zones.

Q. You're speaking of far vertically?

A. Far vertically, yes.

Q. On what order of magnitude?

A. Well, several hundred feet. I don't -- just looking at these cross sections, the Ojo Alamo water zone is higher than any place shown on these cross sections, and I don't -- I don't see any fresh water zones, you know, adjacent to the top of the Fruitland.

Q So what you're saying is where you have these fresh water zones, it's just a rare occurrence, not the predictable sort of thing.

A The fresh water zone that is continuous and is a large aquifer in the area, is generally several hundred feet higher than our Fruitland formation, and presents no problem.

Q Okay.

A A little, small quantities of fresh water occur in the coal beds themselves, but those would not be of sufficient quantities to be useful for agriculture purposes, and actually, would only need to be drained off before the gas from the coals or the coals themselves could be produced.

MR. PADILLA: To your knowledge does anyone use any of this fresh water located close to or in the

coal seams --

A. No, no. The coal seams are occurring at around 3000-foot depths and the Ojo Alamo fresh waters are up around, you know, 2000-foot depths, and even those are not really being used for irrigation or anything like that at this point.

The Ojo Alamo is used, I believe, somewhere in the basin as a source of water to actually waterflood or re-pressure oil and gas reservoirs, but not for agricultural purposes.

Q. The water that you'd be trying to protect would be the Ojo Alamo water, the water above.

A. Yes.

Q. Now you treated these wells to the -- on the north side of the area?

A. Yes.

Q. And did you experience any water inflow problems on those wells?

A. Yes, we did. We believe that the water that we recovered from these wells was from the coal sections in the lowermost part of the Fruitland.

Q. And did it deplete, or is it depleted?

A. It is depleted. It has not totally depleted.

Q. What volumes are we talking about here?

A. Well, we don't -- we get almost no measurable water at the surface, of 1 barrel per day, or something. The water -- the gas bubbles up through the water and comes out as slightly wet gas and then in the separators we separate some of the water out, but it's not -- it's not adequate to flow water. It's just a matter of it impeding the natural gas flow.

Q. If you fraced into any significant water zone, you'd be aware of that immediately and you'd have a well which would not be a producing well in any event.

A. If -- if water were present in such quantities in the Fruitland or Pictured Cliffs, the water would basically become an artesian flow. These zones are over pressured. They contain higher than normal pressures and if we actually encountered a water zone in the Fruitland or Pictured Cliffs wells, I would expect the water either to flow to the surface or the water to fill the pipe almost to the top of the ground level, and we have not encountered anything like that.

Q. What's the nature of the formation above the Fruitland that separates the Fruitland from the Ojo Alamo water?

A. It's a shale.

Q Would that --

A. The Kirtland shale.

Q. Would that tend to heal up any fractures that were induced in that zone?

A. Well, yes, and the fractures would not be anticipated to go that high; to have that vertical extent.

Q Your normal fracturing treatment is intended to go out horizontally and not vertically?

A. Well, of course, it obviously fractures both directions, but it's intended to fracture the formation that you're gas is to be produced from.

Q You've had no indication that they extend upward to any great extent?

A. No, not to any fresh water aquifer.

Q Not going up 1200 feet?

A. No, no.

Q Just to refresh my memory, in the original hearing you went through some rather complicated mathematics, engineering, to demonstrate that these wells which had been treated and were downhole commingled probably were well within the limits set out in our regulations relative to in situ permeability and productivity, and that as to the Fruitland there was one well which had not been treated, which bore out all of those figures, is that correct?

A. No, all of the Fruitland wells were treated. The -- I think what you're referring to, in the one Fruitland well which we have within the area, was the one Fruitland hole which was drill stem tested back in the 1950's.

Q. That's the well shown --

A. That's the well shown in yellow.

Q. -- with the yellow square on Exhibit Number One Revised?

A. Yes.

Q. Okay.

A. That -- that well was drill stem tested prior to any stimulation or fracture.

Q. So that well does lend or give validity to the --

A. The permeability factor.

Q. Right, the arithmetic calculations that show that everything should be within the parameters set out.

MR. STAMETS: Are there any other questions of this witness?

MR. CARR: I have no further questions.

MR. STAMETS: He may be excused. Anything further in this case? The case will be taken under advisement.

C E R T I F I C A T E

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

Sally W. Boyd C.S.R.

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

_____, Examiner
Oil Conservation Division

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.

Blackwood & Nichols Co., Ltd., 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 Fruitland formation in San Juan and Rio Arriba Counties, New Mexico.

After notice and hearing on the application of Blackwood & Nichols Co., Ltd., the Oil Conservation Division hereby recommends that that portion of the Fruitland formation which is described in Exhibit A (being Oil Conservation Division Order No. R-6594) attached hereto and incorporated by reference, be designated a tight formation. 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 United States Geological Survey ratification of this recommendation, respectively.

Respectfully submitted,

ERNEST L. PADILLA
Attorney for the
Oil Conservation Division

VERIFICATION

STATE OF NEW MEXICO)
)ss.
COUNTY OF SANTA FE)

ERNEST L. PADILLA, being first duly sworn, on oath, states that he is an attorney for the Oil Conservation Division of the Energy and Minerals Department of the State of New Mexico; that he has executed the foregoing document with full power and authority to do so; and that the matters and facts set forth therein are true to the best of his information, knowledge and belief.

ERNEST L. PADILLA

Subscribed and sworn to before me, this _____ day of March, 1981.

NOTARY PUBLIC

My Commission Expires:

_____

CERTIFICATE OF SERVICE

I hereby certify that I have this day served a copy of the foregoing Recommendation to Campbell and Black, P.A., Attorneys for Blackwood & Nichols Co., Ltd., in accordance with the requirements of Section 1.17 of the Rules of Practice and Procedure.

Dated this _____ day of March, 1981.

ERNEST L. PADILLA

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION
STATE LAND OFFICE BLDG.
SANTA FE, NEW MEXICO
10 December 1980

EXAMINER HEARING

IN THE MATTER OF:

Application of Blackwood & Nichols Company, Ltd., for designation of a tight formation, San Juan and Rio Arriba Counties, New Mexico.

CASE 7087

BEFORE: Richard L. Stamets

TRANSCRIPT OF HEARING

A P P E A R A N C E S

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

For the Applicant: William F. Carr, Esq.
CAMPBELL & BLACK P. A.
Jefferson Place
Santa Fe, New Mexico 87501

I N D E X

E X H I B I T S

MR. STAMETS: We'll call now Case 7087.

MR. PADILLA: Application of Blackwood and Nichols Company, Ltd., for designation of a tight formation, San Juan and Rio Arriba Counties, New Mexico.

MR. CARR: Mr. Examiner, we'd like the record to reflect this is a continuation of the hearing in this case, held on November 12th, 1980.

Also we'd like the record to reflect that Mr. Blackwood was previously qualified as an expert in petroleum engineering, and that he was placed under oath at that time. If you would like to re-swear him in, it might be appropriate at this time.

MR. STAMETS: Since this is a continuation of that case, the record was left open, the record does show that Mr. Blackwood was qualified and sworn. I don't see any need in doing that again.

MR. CARR: At the hearing on November the 12th the Examiner requested that we prepare and present some additional information. To do that we have taken our previously submitted meaning and purpose of exhibits which was not offered as an exhibit but which was included with the exhibits previously offered, that simply was a summary of the exhibits offered at the prior hearing and a brief statement of what they were intended to show.

We have added to that four more exhibits, Exhibits Seventeen through Twenty, and have simply added them to that meaning and purpose of exhibits and have supplied you with additional copies and ask that this now supersede that summary which was presented at the prior hearing.

MR. STAMETS: Okay, that will be fine.

MR. CARR: Mr. Blackwood is going to start testifying from the land plat, or the required map that was offered as Exhibit One in the prior case.

We have revised this and have provided copies to you to substitute. The only change has been that we have placed traces on this map to show the location of the various cross sections from which he will testify.

MR. STAMETS: And that is identified as Revised Exhibit One?

MR. CARR: That is correct.

CHARLES F. BLACKWOOD

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

DIRECT EXAMINATION

BY MR. CARR:

Q. Mr. Blackwood, will you now refer to

what has been marked as our revised Exhibit One and state, or restate, what it is designed to show?

A. This map, which is -- was previously called Exhibit One is now one called Revised Exhibit One, and shows in red the producing Pictured Cliffs wells in this area, both within the Northeast Blanco Unit Area and immediately adjacent to the north side of the Northeast Blanco Unit Area.

The map also shows the boundary of the 33,500-acre unit area that we are talking about. It shows the location where we have a drill stem test, which was used and calculated to obtain the permeability for the area, and we have added to it the trace lines of cross section A-A', which is an east/west trending cross section at the northern part of the unit; B-B', which is a cross section going from north to south across the unit; and C-C', which is again a cross section running east and west across the Northeast Blanco Unit.

Q. Will you now refer to Blackwood and Nichols Exhibit -- well, Exhibit Seventeen, which is the A-A' cross section, and explain to Mr. Stamets what it shows?

A. Okay. This is our cross section A'A', which was prepared in order to define for this application what we mean by the Fruitland formation. We have the top of the Fruitland marked on these logs and the base of the Fruit-

land. This cross section is hung on a datum of 3100 feet above sea level.

We have chosen to include in the Fruitland the lowermost coal, the lowermost Fruitland coal, which by virtually all authors and references is generally included in the Fruitland formation.

If you'll let me go on to Section B-B'.

Q. That's our Exhibit Number Eighteen.

A. I'd like to again say that this cross section B-B' runs from B to the south to B' to the north, and again shows the top of the Fruitland, as we would like to see it used in the area of our Northeast Blanco Unit, and the base of the Fruitland.

Again we have put the base of the Fruitland at the lowermost coal.

There is some difficulty in picking the base of the Fruitland formation and as you're probably well aware, there is inter-tongueing between the lower part of the Fruitland formation and the upper part of the Pictured Cliffs formation.

If you take a look at our cross section B-B', at the south end of the unit you will note that the massive Pictured Cliffs sandstone with the coal at the very top is the only massive sandstone present in this area. A

few minor sandstones and coals, thin in nature and discontinuous, are found at the southern end of our Northeast Blanco Unit, and I think that we would not have any trouble picking this precise point as being totally Fruitland above this point, totally Pictured Cliffs below this point at the southern part of our unit.

However, as we go to the north, we find about ten miles north of our original south boundary of our unit, we find a massive sandstone developing above the extremely massive Pictured Cliffs sandstone, and this sandstone occurs in all of the wells to the northern part of our unit. See, here's our massive Pictured Cliffs sandstone, which is obvious and easy to find in all of the wells, and there's a coal right at the uppermost part of it, which we say is the base of the -- the base of the Fruitland.

However, in this area there is a massive sandstone bed some 40 feet thick.

Q. Mr. Blackwood, when you say this area, you're talking about the --

A. The northern half of our unit.

Q. Fine.

A. The northern half of the Northeast Blanco Unit. A thick sandstone occurs separated from what's generally recognized as the massive Pictured Cliffs sandstone by

shales and coal beds and this sandstone by some authors and by some authorities is included in the Pictured Cliffs. There is quite a nomenclature problem trying to decide what to do with this sandstone.

It is my recommendation, and I have drawn these cross sections to show only the massive Pictured Cliffs sandstone beneath the lowermost Fruitland coal. This -- this should be the boundary marker, I believe, for the Northeast Blanco Unit Area, the reason being we find it impossible to do our underground plumbing in such a manner to call this area, 50 or 60 foot interval beneath this sandstone, Fruitland --

Q Could you tell us what well you're talking about when you say this --

A Okay. Let's take, for example, Well 102-A.

Q On Exhibit Eighteen.

A On Exhibit Eighteen, the cross section B-B'.

There exists above the top of the massive Fruitland -- of the massive Pictured Cliffs sandstone, and the lowermost Fruitland coal, an interval approximately 40 feet thick, which is Fruitland formation. Then there also exists a 30-foot thick sandstone, which may be very likely

equivalent to the massive Pictured Cliffs sandstone. Inasmuch as we need to make one mark on this well log, and we need to call a continuous Fruitland, we have chosen to say that the base of the Fruitland is the lowermost Fruitland coal. We think that any other pick will end up being impossible to complete your wells. For example, if we call a 40-foot interval in the middle of the Fruitland Pictured Cliffs, and that interval disappears in the middle of our unit and becomes nothing, we have -- we have a completion problem. We don't know whether to complete this interval as Pictured Cliffs or as Fruitland, and we therefor have chosen the easiest log pick, which also gives you continuous Fruitland formation without a hole in it which could possibly represent a Pictured Cliffs sandstone stringer.

Q. Will you now refer to Exhibit Nineteen, cross section C-C', and review that for Mr. Stamets?

A. Cross section C-C' occurs in the southern -- about the central to southern part of the unit area, and it goes from Well 104-A, which is on the C at the western extremity of the unit, to Well 22-A, which is on the eastern extremity of the unit.

We have again picked the lowermost coal as the base of the Fruitland formation, and this -- this occurred at the top of the massive Pictured Cliffs sandstone.

This -- this is again the best pick because at the western side of this unit -- well, there is no doubt that that would be the proper pick at the western side of the unit. Again, as we go east and slightly north, an additional sandstone occurs above this interval which could confuse the -- the pick, but we believe that it's in the best nature of this definition to have one continuous Fruitland interval and not try to confuse it with having a possible tongue of the Pictured Cliffs sand protruding into the Fruitland interval.

Q. Mr. Blackwood, if for the purposes of this application you were asked to select a type log, which log would it be?

A. Mr. Carr, I think that the best type log would be the 17-A, and the reason is that -- that log is one which appears on two of the cross sections, in other words, the north/south and the east/west cross sections, B-B' and C-C', cross at Well 17-A.

And it is very typical of the Fruitland formation throughout the area.

MR. STAMETS: What's the top and bottom of the Fruitland in that well?

A. In 17-A? Let's see, the base would be at 32 -- about 3224, and the top is about 2926.

MR. STAMETS: Thank you.

A. As you can see, we have approximately a 250-foot thickness throughout the area and generally no - no major problems throughout the entire Fruitland area, but you can see that individual sandstones and individual coal beds are not continuous. In fact, quite the opposite is true. Most of these are -- are known to be from surface studies and from log studies, to be lenses which are not large in areal extent and do not continue, generally, even from one mile to the next.

Q. Mr. Blackwood, will you now refer to what has been marked for identification as our Exhibit Twenty, and identify this and explain what information it contains?

A. Exhibit Twenty is supplement to the gas volume estimates which were made previously in the former hearing.

This is an attempt to update the gas production up to October of 1980. Our company had the gas sales production available from the Fruitland wells that we operate in this unit for October, 1980, and so I have made the calculations to show what the "non-stimulated, stabilized, production rate to the atmosphere" is estimated to be in each of these wells.

I might just run through them briefly.

In Northeast Blanco Well No. 201, the non-stimulated, stabilized production rate to the atmosphere is estimated to be 11 Mcf per day.

Northeast Blanco Unit Well No. 202, the estimated non-stimulated, stabilized production rate to the atmosphere is estimated to be 48 Mcf per day for October of 1980.

Well No. 203, this estimate of non-stimulated, stabilized production rate to the atmosphere is 3 Mcf per day.

Northeast Blanco Unit Well No. 204, the non-stimulated, stabilized production rate to the atmosphere is estimated to be 36 Mcf per day.

And finally, in the Northeast Blanco Unit Well No. 205, the non-stimulated, stabilized production rate to the atmosphere is estimated to be 18 Mcf per day.

The five Northeast Blanco Unit wells average 75 Mcf per day actual gas sales from the Fruitland formation in October. All five of these wells were previously stimulated by fracturing.

So that we find the average per well stabilized production rate prior to stimulation and adjusted to zero line pressure is 23 Mcf per day. This 23 Mcf per

day average per well is down from the 25 Mcf per day average per well calculated for the wells in this area from July production.

Q. Mr. Blackwood, in your opinion does the portion of the Fruitland formation which is the subject of this application qualify for designation as tight formation under Section 107 of the Natural Gas Policy Act?

A. Yes, it does.

Q. In your opinion will granting this application be in the best interest of conservation, the prevention of waste, and the protection of correlative rights?

A. Yes.

Q. Were revised Exhibit One and Exhibits Seventeen through Twenty prepared by you or under your direction and supervision?

A. Yes, they were prepared by me.

MR. CARR: At this time, Mr. Stamets, we would offer into evidence revised Exhibit One and Exhibits Seventeen through Twenty.

MR. STAMETS: These revised exhibits will be admitted.

MR. CARR: I have nothing further of this witness on direct.

CROSS EXAMINATION

BY MR. STAMETS:

Q. Mr. Blackwood, what we have here is a relatively large area with the only development being located along the northernmost fringes. Why at this time is such a small area developed in the Fruitland?

A. Well, one reason, Mr. Stamets, is that we would -- we're still hesitant to develop this area rapidly because we don't know what the economics are. If you'd note the average of 75 Mcf per well per day after stimulation of our five wells, and one of the five wells making only an actual 21 Mcf per day after fracturing, we are hesitant to charge ahead prior to obtaining a higher price in the area.

Q. On the assumption, on my own assumption, that perhaps there would be some reluctance on the part of the Division to approve such a large area without some actual wells being scattered throughout the area, I've drawn a line, I've drawn two lines across this unit, one between Sections 19 and 30 in 7 West, 31 North, east to west across the --

A. Just a minute. Okay.

Q. And then another between Sections 6 and 7, in the township immediately to the south.

A. Now let me see if I understand what

you're saying.

You have -- one of these lines you put between Section 19 and 30.

Q. Right.

A. On the west side of the unit.

Q. Right, and then run it -- run it from west to east.

A. Uh-huh.

Q. Then the same thing three sections to the south.

A. Yes, okay.

Q. All right. My thinking being that conceivably this large unit might be approved on the provision that within a year wells would be completed in each of these blocks which would demonstrate that indeed the permeabilities and the productive capacities which are encountered in the Fruitland bear out what has been demonstrated on the northern side, and upon failure to complete wells in these blocks, or upon failure to complete in these blocks that bore out that information, that they would be eliminated from the tight sands findings.

MR. CARR: Point of clarification. When you said drilling in each of these blocks, what do you mean by each of these blocks?

Q. Okay, let's --

A. You mean --

Q. Let's say, for example, we decide this today, or a decision is made today that all of this unit belongs in. Then within a year the completion of a well in Section 33 of 31 North, 7 West, demonstrating in situ gas permeability of less than 0.1 of a millidarcy and productive capacity lower than that spelled in Federal regs, would demonstrate that that block should be retained.

A. that's this central block that's like --

Q. Yes.

A. -- miles -- north/south dimension, three miles.

Q. Right, but upon failure to complete such a well in here, that central block would be thrown out.

And the same --

A. And the same thing for the southern block.

Q. -- thing for the southern block.

A. I would only say that at this point we don't have any plans to drill that far south within the next year, and that if those were thrown out and not prejudice us at some future point going in, I would not object to that greatly. I think that undoubtedly at some point in the future

a well will be drilled down there and information will be forthcoming, but information is not easy to obtain.

Perhaps we could go off the record for just a moment, I'll tell you --

Q. Okay, let's --

A. -- about something we have done.

Q. Okay, let's go off the record.

(Thereupon discussion was had off the record.)

MR. STAMETS: Let's go back on the record.

Q. We were talking about making blocks out of this thing.

Let me ask one further question, then, Mr. Blackwood. Is it possible that this type of a concept, the block concept, could result in the somewhat speedier development or testing of the Fruitland in those blocks than just simply authorizing the entire unit as a whole?

A. Yes, Mr. Stamets, I think the block concept would provide impetus for us do additional permeability testing within each of the additional blocks in order to

qualify those blocks for the tight reservoir treatment. I think it would, would speed up the development.

Q. Would you mention a period of time under normal business practices, one year?

A. I would prefer two years. We've had a difficult time obtaining the necessary drilling rigs. As a matter of fact, we're still drilling at this date, and barely will finish our 1980 drilling program the last three or four days of the year.

I would recommend that we had a two year period in which to take permeability information on each of these additional blocks.

Q. Okay. Thank you. Based on a phone call that I got from FERC since we had the last hearing, I'd like to ask you a couple of questions concerning the protection provided for any aquifers in the area by the Division's and the U. S. Geological Survey's casing and cementing practices.

In general, what's the average depth of the Fruitland in this area?

A. The average depth to the top of the Fruitland is around 2900 feet and to the base, around 3100 feet.

Q. Okay. Now, in drilling these wells what would your normal casing program be?

A. We normally run 9-5/8ths inch casing for surface casing. Let me look at a -- to about 200 to 250 feet. Then we drill a 7-7/8ths inch hole, or larger, and generally run 7-inch -- well, for Mesaverde wells, which are going to go deeper, we generally run 7-inch casing through the Pictured Cliffs at approximately 3600 feet, and cement back to the surface all the way. We circulate cement clear back to the surface outside our 7-inch casing.

Q. What type of cement, or what volume would you use on the 9-5/8ths? That would be circulated, as well?

A. Yes, that's circulated, as well.

Q. Okay. Now I don't recall this instant if you've discussed fresh water in the original hearing. I presume that you did. Will you referesh my memory on that?

A. Well, fresh water exists in the Fruitland and sometimes in the Pictured Cliffs. The -- we occasionally receive flows of fresh water from the uppermost portion of the Pictured Cliffs or the lowermost part of the Fruitland, so that would be around 3100 feet.

Q. Okay, now obviously having the cement circulated to the surface would protect the shallowest water, that which might lie between 200 feet and 250, and is there any other water below 250 feet until you get to this water

that you're talking about in the Fruitland and Pictured Cliffs?

A. Yes, waters occur in several of the sandstones, particularly the Ojo Alamo sandstone. It carries water in this area.

Q. And that's above the Fruitland?

A. It's above the Fruitland.

Q. How much?

A. How far above the Fruitland?

Q. Yes.

A. Again that varies greatly from area to area, based on the geologic interpretation, but in some areas it's directly above the Fruitland. In other areas it's several hundred feet higher.

Q. Okay. In completing a Fruitland well in this area, what completion techniques would you use?

A. Well, what we have used in the past is to set 4-1/2 inch casing and circulate cement clear back to the surface.

Q. Okay, specifically what I'm talking about is in the treatment of the zone, acidizing, fracturing.

A. We have --

Q. And then obviously, the next question is how are we all assured that we don't frac into and damage the fresh water?

A. Well, the -- we perforate the sandstones which are indicated to be porous and gas productive. We do generally acidize with a small volume of acid, 500 to 1500 gallons of acid, and we do large fracture stimulation jobs of between 50 and 100,000 gallons of water per reservoir, and introduce 50 to 100,000 pounds of sand.

The rates which we use are intended to fracture these to a radius -- excuse me, let me look in my recommendations.

Q. Okay.

A. This radius of propped length, that's propped up after we open a frac, we introduce sand to keep it propped open of 1200 feet in the largest of these frac jobs.

The only statement that I can make about safety to the fresh water zones is that we attempt to perforate as far as possible from the fresh water zones and not to fracture into them because what we're interested in is gas production rather than water production, and it is in our best interest to not fracture into the water zone.

I should also say that the water zones are generally the far from the gas producing zones and it is not likely that these fracture stimulations would fracture into the water zones.

Q. You're speaking of far vertically?

A. Far vertically, yes.

Q. On what order of magnitude?

A. Well, several hundred feet. I don't -- just looking at these cross sections, the Ojo Alamo water zone is higher than any place shown on these cross sections, and I don't -- I don't see any fresh water zones, you know, adjacent to the top of the Fruitland.

Q So what you're saying is where you have these fresh water zones, it's just a rare occurrence, not the predictable sort of thing.

A. The fresh water zone that is continuous and is a large aquifer in the area, is generally several hundred feet higher than our Fruitland formation, and presents no problem.

Q. Okay.

A. A little, small quantities of fresh water occur in the coal beds themselves, but those would not be of sufficient quantities to be useful for agriculture purposes, and actually, would only need to be drained off before the gas from the coals or the coals themselves could be produced.

MR. PADILLA: To your knowledge does anyone use any of this fresh water located close to or in the

coal seams --

A. No, no. The coal seams are occurring at around 3000-foot depths and the Ojo Alamo fresh waters are up around, you know, 2000-foot depths, and even those are not really being used for irrigation or anything like that at this point.

The Ojo Alamo is used, I believe, somewhere in the basin as a source of water to actually waterflood or re-pressure oil and gas reservoirs, but not for agricultural purposes.

Q. The water that you'd be trying to protect would be the Ojo Alamo water, the water above.

A. Yes.

Q. Now you treated these wells to the -- on the north side of the area?

A. Yes.

Q. And did you experience any water inflow problems on those wells?

A. Yes, we did. We believe that the water that we recovered from these wells was from the coal sections in the lowermost part of the Fruitland.

Q. And did it deplete, or is it depleted?

A. It is depleted. It has not totally depleted.

Q. What volumes are we talking about here?

A. Well, we don't -- we get almost no measurable water at the surface, of 1 barrel per day, or something. The water -- the gas bubbles up through the water and comes out as slightly wet gas and then in the separators we separate some of the water out, but it's not -- it's not adequate to flow water. It's just a matter of it impeding the natural gas flow.

Q. If you fraced into any significant water zone, you'd be aware of that immediately and you'd have a well which would not be a producing well in any event.

A. If -- if water were present in such quantities in the Fruitland or Pictured Cliffs, the water would basically become an artesian flow. These zones are over pressured. They contain higher than normal pressures and if we actually encountered a water zone in the Fruitland or Pictured Cliffs wells, I would expect the water either to flow to the surface or the water to fill the pipe almost to the top of the ground level, and we have not encountered anything like that.

Q. What's the nature of the formation above the Fruitland that separates the Fruitland from the Ojo Alamo water?

A. It's a shale.

Q. Would that --

A. The Kirtland shale.

Q. Would that tend to heal up any fractures that were induced in that zone?

A. Well, yes, and the fractures would not be anticipated to go that high; to have that vertical extent.

Q. Your normal fracturing treatment is intended to go out horizontally and not vertically?

A. Well, of course, it obviously fractures both directions, but it's intended to fracture the formation that you're gas is to be produced from.

Q. You've had no indication that they extend upward to any great extent?

A. No, not to any fresh water aquifer.

Q. Not going up 1200 feet?

A. No, no.

Q. Just to refresh my memory, in the original hearing you went through some rather complicated mathematics, engineering, to demonstrate that these wells which had been treated and were downhole commingled probably were well within the limits set out in our regulations relative to in situ permeability and productivity, and that as to the Fruitland there was one well which had not been treated, which bore out all of those figures, is that correct?

A. No, all of the Fruitland wells were treated. The -- I think what you're referring to, in the one Fruitland well which we have within the area, was the one Fruitland hole which was drill stem tested back in the 1950's.

Q. That's the well shown --

A. That's the well shown in yellow.

Q. -- with the yellow square on Exhibit Number One Revised?

A. Yes.

Q. Okay.

A. That -- that well was drill stem tested prior to any stimulation or fracture.

Q. So that well does lend or give validity to the --

A. The permeability factor.

Q. Right, the arithmetic calculations that show that everything should be within the parameters set out.

MR. STAMETS: Are there any other questions of this witness?

MR. CARR: I have no further questions.

MR. STAMETS: He may be excused. Anything further in this case? The case will be taken under advisement.

C E R T I F I C A T E

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

Sally W. Boyd C.S.R.

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 7857 heard by me on 12-10 1980.

Richard L. Stamets Examiner
Oil Conservation Division

Docket No. 36-80

Dockets Nos. 37-80 and 38-80 are tentatively set for November 25 and December 10, 1980. Applications for hearing must be filed at least 22 days in advance of hearing date.

DOCKET: EXAMINER HEARING - WEDNESDAY - NOVEMBER 12, 1980

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 December, 1980, from fifteen prorated pools in Lea, Eddy, and Chaves Counties, New Mexico.

(2) Consideration of the allowable production of gas for December, 1980, from four prorated pools in San Juan, Rio Arriba, and Sandoval Counties, New Mexico.

CASE 7076: Application of Vista Resources, Inc. for an unorthodox gas well location, Rio Arriba County, New Mexico. Applicant, in the above-styled cause, seeks approval for the unorthodox location of its John H. Dashko Federal Well No. 1 to be drilled 2510 feet from the South line and 790 feet from the East line of Section 11, Township 24 North, Range 7 West, Basin-Dakota Pool, the E/2 of said Section 11 to be dedicated to the well.

CASE 7077: Application of Threshold Development Company for a dual completion, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks approval for the dual completion of its Conoco "10" State Com Well No. 1 located in Unit I of Section 10, Township 19 South, Range 29 East, Turkey Track Field, to produce oil from the Wolfcamp formation and gas from the Atoka formation through parallel strings of tubing.

CASE 7046: (Continued from October 15, 1980, Examiner Hearing)

Application of Cotton Petroleum Corporation for downhole commingling, Rio Arriba County, New Mexico. Applicant, in the above-styled cause, seeks approval for the downhole commingling of Chacra and Pictured Cliffs production in the wellbores of wells in the South Blanco-Pictured Cliffs Pool located in Sections 1, 2, 3, 4, 9, 10, 11, 13, 23, and 24, Township 24 North, Range 4 West.

CASE 7078: Application of Conoco Inc. for a dual completion, Lea County, New Mexico. Applicant, in the above-styled cause, seeks approval for the dual completion of its Warren Unit Well No. 82 located in Unit G of Section 35, Township 20 South, Range 38 East, to produce oil from the Blinebry Oil and Gas or Warren-Tubb Pools and the D-K Abo Pool.

CASE 7079: Application of HNG Oil Company for the amendment of Order No. R-5727, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks the amendment of Order No. R-5727 to include the entire Pennsylvanian formation under the compulsory pooling order rather than only the Morrow formation as previously ordered.

CASE 7080: Application of Franks Petroleum, Inc. for an unorthodox gas well location, Lea County, New Mexico. Applicant, in the above-styled cause, seeks approval for the unorthodox location of a well to be drilled 660 feet from the North and East lines of Section 9, Township 21 South, Range 32 East, Hat Mesa-Morrow Gas Pool, the E/2 of said Section 9 to be dedicated to the well.

CASE 7081: Application of Belco Petroleum Corporation for compulsory pooling, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks an order pooling all mineral interests in the Pennsylvanian formation underlying the E/2 of Section 19, Township 23 South, Range 28 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 7070: (Continued from October 29, 1980, Examiner Hearing)

Application of Tesoro Petroleum Corporation for a pilot caustic flood project, McKinley County, New Mexico. Applicant, in the above-styled cause, seeks authority to institute a one-acre pilot caustic flood project in the Hospah Field by the injection of caustic fluid into the Seven Lakes Sand of the Upper Hospah Field at an approximate depth of 300-500 feet through four injection wells in Unit K of Section 1, Township 17 North, Range 9 West.

CASE 7082: Application of Maralo, Inc. and Dalport Oil Corporation for a waterflood project, Lea County, New Mexico. Applicants, in the above-styled cause, seek authority to institute a joint waterflood project on Dalport's Winters lease offsetting Maralo's Jalmat Yates Unit waterflood project by the injection of water into the Yates-Seven Rivers-Queen formations through a well to be jointly drilled at an unorthodox location 1260 feet from the South line and 1250 feet from the West line of Section 7, Township 25 South, Range 36 East, Jalmat Pool.

CASE 7083: Application of Bass Enterprises Production Co. for compulsory pooling, Lea County, New Mexico. Applicant, in the above-styled cause, seeks an order pooling all mineral interests in the Wolfcamp, Cisco, Canyon and Strawn formations underlying the S/2 NE/4 of Section 13, Township 16 South, Range 36 East, Northeast Lovington Field, 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 7005: (Continued from October 29, 1980, Examiner Hearing)

Application of Sol West III for an NGPA determination, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks a new onshore reservoir determination in the Morrow formation for his Turkey Track-Morrow Sand Well No. 1 in Unit I of Section 26, Township 18 South, Range 28 East.

CASE 7038: (Continued from October 29, 1980, Examiner Hearing)

Application of Natura Energy Corporation for compulsory pooling, Lea County, New Mexico. Applicant, in the above-styled cause, seeks an order pooling all mineral interests in the San Andres formation underlying the NE/4 NE/4 of Section 6, Township 19 South, Range 39 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 7073: (Readvertised)

Application of Enserch Exploration, Inc. for pool creation, temporary special pool rules, and assignment of a discovery allowable, Chaves County, New Mexico. Applicant, in the above-styled cause, seeks the creation of a new Fusselman oil pool for its J. G. O'Brien Well No. 1 located 1980 feet from the North line and 660 feet from the West line of Section 31, Township 7 South, Range 29 East, with special rules therefor, including provisions for 80-acre spacing, a limiting gas-oil ratio of 3000 to one and special well location requirements providing for the drilling of wells within 150 feet of the center of a quarter-quarter section. Applicant further seeks approval of a 74.24-acre proration and spacing unit and a discovery allowable for said J. G. O'Brien Well No. 1.

CASE 7084: Application of Harvey E. Yates Company for a unit agreement, Lea County, New Mexico. Applicant, in the above-styled cause, seeks approval for the Duncan Unit Area, comprising 7679 acres, more or less, of State, Federal, and fee lands in Townships 13 and 14 South, Range 35 East.

CASE 7085: Application of Harvey E. Yates Company for designation of a tight formation, Lea County, New Mexico. Applicant, in the above-styled cause, seeks the designation of the Atoka formation underlying portions of Townships 12, 13, and 14 South, Ranges 35 and 36 East, containing 37,760 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 7086: Application of Blackwood & Nichols Company, Ltd. for designation of a tight formation, San Juan and Rio Arriba Counties, New Mexico. Applicant, in the above-styled cause, seeks the designation of the Pictured Cliffs formation underlying portions of Townships 30 and 31 North, Ranges 6, 7, and 8 West, containing 33,500 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 7087: Application of Blackwood & Nichols Company, Ltd. for designation of a tight formation, San Juan and Rio Arriba Counties, New Mexico. Applicant, in the above-styled cause, seeks the designation of the Fruitland formation underlying portions of Townships 30 and 31 North, Ranges 6, 7, and 8 West, containing 33,500 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.

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

BRUCE KING
GOVERNOR
LARRY KEHOE
SECRETARY

March 6, 1981

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

Federal Energy Regulatory Comm.
Department of Energy
825 North Capitol Street, N.E.
Washington, D. C. 20426

Attention: Mr. Howard Kilchrist

Dear Mr. Kilchrist:

Enclosed is a tight formation recommendation for the Commission's consideration which I am sending to you for your handling. Let me know if additional information is required.

Very truly yours,

ERNEST L. PADILLA
General Counsel

ELP/dr

enc.

cc: Campbell & Black, P.A.

United States Department of the Interior

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

MAR 09 1981

Mr. Ernest L. Padilla
Oil Conservation Division
State of New Mexico
P. O. Box 2088
Santa Fe, New Mexico 87501

Dear Mr. Padilla:

This jurisdictional agency concurs in the recommendation of the State of New Mexico, Case No. 7087, Order No. R-6594, dated February 23, 1981, that the described lands in subject order in San Juan and Rio Arriba Counties, New Mexico, be designated as a Section 107 tight formation.

Request this concurrence be included with the recommendation submitted to the Federal Energy Regulatory Commission.

Sincerely yours,

Gene F. Daniel
Deputy Conservation Manager,
Oil and Gas

EXHIBIT C

MAR 13 1981

OIL CONSERVATION DIVISION
SANTA FE

United States Department of the Interior

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

MAR 09 1981

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State of New Mexico
P. O. Box 2088
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Deputy Conservation Manager,
Oil and Gas

EXHIBIT C

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

BRUCE KING
GOVERNOR

LARRY KEHOE
SECRETARY

March 6, 1981

POST OFFICE BOX 2088
STATE LAND OFFICE BUILDING
SANTA FE, NEW MEXICO 87501
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Federal Energy Regulatory Comm.
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825 North Capitol Street, N.E.
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Attention: Mr. Howard Kilchrist

Dear Mr. Kilchrist:

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Very truly yours,

ERNEST L. PADILLA
General Counsel

ELP/dr

enc.

cc: Campbell & Black, P.A.

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.

Blackwood & Nichols Co., Ltd., 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 Fruitland formation in San Juan and Rio Arriba Counties, New Mexico.

After notice and hearing on the application of Blackwood & Nichols Co., Ltd., the Oil Conservation Division hereby recommends that that portion of the Fruitland formation which is described in Exhibit A (being Oil Conservation Division Order No. R-6594) attached hereto and incorporated by reference, be designated a tight formation. 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 United States Geological Survey ratification of this recommendation, respectively.

Respectfully submitted,

ERNEST L. PADILLA
Attorney for the
Oil Conservation Division

VERIFICATION

STATE OF NEW MEXICO)
)ss.
COUNTY OF SANTA FE)

ERNEST L. PADILLA, being first duly sworn, on oath, states that he is an attorney for the Oil Conservation Division of the Energy and Minerals Department of the State of New Mexico; that he has executed the foregoing document with full power and authority to do so; and that the matters and facts set forth therein are true to the best of his information, knowledge and belief.

ERNEST L. PADILLA

Subscribed and sworn to before me, this _____ day of March, 1981.

NOTARY PUBLIC

My Commission Expires:

_____

CERTIFICATE OF SERVICE

I hereby certify that I have this day served a copy of the foregoing Recommendation to Campbell and Black, P.A., Attorneys for Blackwood & Nichols Co., Ltd., in accordance with the requirements of Section 1.17 of the Rules of Practice and Procedure.

Dated this _____ day of March, 1981.

ERNEST L. PADILLA

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

BRUCE KING
GOVERNOR
LARRY KEHOE
SECRETARY

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

February 25, 1981

Re: CASE NO. 7087
ORDER NO. R-6594

Mr. William F. Carr
Campbell, Byrd & Black
Attorneys at Law
Post Office Box 2208
Santa Fe, New Mexico

Applicant:

Blackwood & Nichols Co., Ltd.

Dear Sir:

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

Yours very truly,

JOE D. RAMEY
Director

JDR/fd

Copy of order also sent to:

Hobbs OCD x
Artesia OCD x
Aztec OCD x

Other _____

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February 6, 1981

Mr. R. L. Stamets
Technical Support Chief
Oil Conservation Division
New Mexico Department of
Energy and Minerals
Post Office Box 2088
Santa Fe, New Mexico 87501

Re: Oil Conservation Division Case 7087:
Application of Blackwood & Nichols Co., Ltd.
for Designation of A Tight Formation, San Juan
and Rio Arriba Counties, New Mexico

Dear Dick:

Pursuant to your request, we are enclosing a proposed order in the above-referenced case.

If you have any questions concerning the enclosed, please advise.

Best regards.

Very truly yours,

William F. Carr

WFC:lr

Enclosure

cc: Mr. Charles F. Blackwood

FRUITLAND FORMATION

MEANING AND PURPOSE OF EXHIBITS

Exhibit 1. Required map showing wells producing from the Fruitland Formation and the exact area of this application.

Exhibit 2. Geologic Section shows relationship of the Fruitland Formation with other formations in the area.

Exhibit 3. Federal Regulations - these are the pertinent parts of the regulations protecting fresh water from pollution.

Exhibit 4. State Regulations - these are the applicable regulations showing how fresh water must be protected by use of steel casing, cement etc.

Exhibit 5. Drill Stem Test Analysis uses pressures and rates obtained by D.S.T. to calculate "in situ permeability".

Exhibit 6. Radioactivity Log 33-12 well was used to estimate the reservoir thickness and in the permeability caculation.

Exhibit 7. Fracture Stimulation Recommendation NEBU well No. 203 shows the procedure and cost to increase (stimulate) productivity in this well.

Exhibit 8. Recompletion Report NEBU well No. 201 shows producing interval (last perforations) and fracture stimulation treatment used on this well.

Exhibit 9. Completion Report NEBU well No. 202 shows producing interval (perforations) and Fracture stimulation treatment used on this well.

Exhibit 10. Completion Report NEBU well No. 203 shows how this well was re-worked to shut off water coming from the lower perforations.

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Exhibit 12. Request for allowable NEBU well No. 204 shows wells initial shut in tubing and casing pressure - these initial high pressures require very long shut in time to ever be approuched again.

Exhibit 13. Completion Report NEBU well No. 205 shows producing interval and Fracture stimulation procedure used in this well.

Exhibit 14. Completion Report Yager No. 3 shows producing interval (perforations) and Fracture stimulation procedure used in this well.

Exhibit 15. Completion Report Yager No. 4 shows producing interval (perforations) and Fracture stimulation procedure used in this well.

Exhibit 16. Completion Report Federal No. 3 shows producing interval (perforations) and Fracture stimulation procedure used in this well.

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Supersedes Original Hearing 12-10-80

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Exhibit 17. Cross Section A-A'

Exhibit 18. Cross Section B-B'

Exhibit 19. Cross Section C-C'

Exhibit 20. Supplemental Gas Volume Estimates for October 1980

BLACKWOOD & NICHOLS CO., LTD.
2013 FIRST NATIONAL CENTER WEST
OKLAHOMA CITY, OKLAHOMA 73102

405 235-8505

BEFORE EXAMINER STAMETS
OIL CONSERVATION DIVISION
APPLICANTS EXHIBIT NO. A
CASE NO. 7087
Submitted by BLACKWOOD
Hearing Date 11-12-80

GEOGRAPHICAL AND GEOLOGICAL DESCRIPTION OF THE FORMATION

Geographical

The Fruitland is one of several tight sandstone formations of the San Juan Basin, New Mexico. The San Juan Basin is approximately 80 miles long from the SE to NW and 40 miles wide from SW to NE. The approximate center of the gas production in the San Juan Basin is 25 miles SE of Aztec, New Mexico.

Natural gas has been produced for many years from this basin. The most prolific reservoirs are within the Mesaverde group. The Fruitland formation has not been produced over much of the San Juan Basin because of low permeability, and the high costs of producing the gas.

Blackwood & Nichols Co., Ltd. operates the Northeast Blanco Unit, a 33,500 acre area located on the northeast flank of the San Juan Basin. The Northeast Blanco Unit is located in Townships 30 & 31N and Range 6 & 7W also Sections 25 & 36, T31N-R8W and Sections 1, 12, 13 & 24, T30N - R8W. A Map of the Northeast Blanco Unit is provided.

Geological

The Fruitland formation is upper Cretaceous age and consists primarily of coal and shale with some sandstone stringers. These stringers when located in the basal portion of the Fruitland are sometimes intertounged with the Pictured Cliffs formation below.

A general geologic section of the San Juan Basin is included with this application.

In the Northeast Blanco Unit area the Fruitland formation dips gently to the southwest. It contains coals, shale and tight sandstones. The Fruitland formation in this area contains fluids at above normal pressures. The initial pressures encountered in the Fruitland are approximately 1500-1600 psig @ 3000 feet while the original pressures in the Mesaverde in this area were only 1400-1500 psig at 6000 feet.

The Fruitland formation has been drilled through and logged in over 100 wells from 1950 through 1978 in the Northeast Blanco Unit area. The general characteristics observed when drilling, logging and drill stem testing were those of a very tight reservoir. The data collected indicated that gas was present in certain sandstone stringers and coal seams within the Fruitland formation. The permeabilities were indicated to be so low, however, that only one of the more than 100 wells in the Northeast Blanco Unit attempted a completion in the Fruitland formation prior to 1979. The extremely low permeability indicated and the low price allowed for gas made any completion attempt infeasible because there was no chance that it would be profitable.

The one well completed in the Fruitland formation in the Northeast Blanco Unit prior to 1979 was the Howell 3-B. This well which was located in the SW/4 of section 3, T30N, R7W, Rio Arriba County, New Mexico produced approximately 59,000 Mcf from the Fruitland reservoir and was abandoned in the early 1950's. No other attempt to produce gas from the Fruitland formation were made in the Northeast Blanco Unit area until 1979.

One well west of the Northeast Blanco Unit was drilled and completed by Phillips Petroleum Company in the early 1950's. This well is located in the NE/4 of section 17, T31N, R7W. The well produced approximately 30-40 Mcfpd on initial completion and was declared non commercial. This well has continued , however, to produce low volumes of gas for more than 20 years. This indicates that gas is present and could be developed and produced from the Fruitland formation in this area if a high enough price were established to make these expensive low volume wells profitable.

Blackwood & Nichols Co., Ltd. operates the Northeast Blanco Unit. We have taken all necessary precautions to insure that all fresh water zones are protected and not adversely affected by our operations. Our procedures have been in accord with all State and Federal rules and regulations.

A part of the pertinent Federal regulations are attached. They are the pages 1 through 5 of supplement to U.S.G.S. NTL - 6.
Pages C-6, C-7 & C-8 of New Mexico Oil Conservation Division of the Energy and Minerals Department are also attached.

We believe that compliance with these rules and regulations adequately protects and will not adversely affect or impair any fresh water aquifers that are being used or expected to be used in the foreseeable future for domestic or agricultural water supplies.

Geological and Engineering Data

The Fruitland formation of the northeast flank of the San Juan Basin is composed primarily of coal seams, shales and tight sandstone stringers. This information has been determined from hundreds of logs run on wells drilled for the last 30 years. Electric logs, Gammaray Neution logs, Sonic logs, Formation density logs, Sidewall Neution logs and many other types have been analysed and interpreted over the years to show the coal seams, shales and tight sandstones. These logs have also indicated that natural gas and water (almost fresh enough to drink) is present within the void space of the Fruitland formation.

Pressure information has been obtained in several different ways. A drill stem test was taken on Northeast Blanco Unit well # 33-12 on October 24, 1955. The Fruitland formation was tested from a depth of 3055 feet to 3205 feet. This drill stem test has been analysed and computations have been made that show the permeability to be 0.067 MD/ft/cp on the average. The highest recorded shut in pressure was 1629 psig. A copy of the computerized data analysis is attached. A copy of the log on the Northeast Blanco Unit well # 33-12 is also included as a part of this application.

While drilling over 100 deeper wells in the Northeast Blanco Unit area additional pressure information was obtained. It is necessary to raise the mud weight 11.5 - 12.5 lbs per gallon in order to control the pressure in the Fruitland formation. The pressure which is found in the Fruitland formation is abnormally high for the depth drilled. This abnormally high pressure may also be an indication of low porosity and permeability. A reduction in the original void space of the Fruitland formation may have occured to cause a reduction in the original permeability. Another interpretation could be that this formation was once at a deeper level below the surface and that normal pressures at that deeper level are still trapped even though the Fruitland formation is now found at shallower depths. The permeability required to trap the abnormally high pressure in the Fruitland formation would have to be extremely low.

Flow rates of wells in the area which have recently been produced from the Fruitland formation also prove low permeability. Information about each new shallow gas well in the area of the Northeast Blanco Unit and the adjacent wells is given below along with calculations of stabilized production, production improvement by stimulation etc.

Stabilized production vs depth guidelines.

Blackwood & Nichols Co., Ltd. has drilled five test holes in 1979. These five holes have resulted so far in two Fruitland producers, two Fruitland Pictured Cliffs commingled wells, and one well which has been unsuccessfully attempted in the Pictured Cliffs and the Fruitland formation. This unsuccessful hole has been re-completed in the Fruitland and is now testing gas and water at non commercial rates.

A listing of the five Northeast Blanco Unit wells, with completion information, production information etc. follows. The pipeline production figures are shown. Calculations to approximate "stabilized production rate against atmospheric pressure" have been included.

Two wells the Northeast Blanco Unit well # 202 and # 204 produce commingled from the Fruitland and Pictured Cliffs reservoirs. In order to allocate production by zone 50% of the gas sales have been assigned to each zone.

All the Northeast Blanco Unit wells were stimulated prior to production. The calculated productivity improvements ratio is 10-11. The Western Company has furnished a "Fracture stimulation Recommendation" for the Northeast Blanco Unit well # 203. A copy of this recommended procedure which shows fluids, rates, pressures, proppants, costs etc. is enclosed. In order to approximate stabilized production rates without stimulation computations have been made. A theoretical stabilized production rate to the atmosphere has been calculated in the following manner. The pressure differential between shut in pressure and pipeline pressure has been ascertained for each producing well. This pressure differential is then used with pipeline pressure and actual production to calculate the theoretical stabilized production rate to the atmosphere. The following formula has been used

$$\frac{\Delta p}{\text{Shut in pres.}} = \frac{\text{Production (to the pipeline)}}{\text{Production (to the atmosphere)}}$$

Where Δp = Shut in pressure psig - pipeline pressure psig

Then in order to estimate the"non stimulated" stabilized production rate, the calculated production to the atmosphere has been divided by 10, for wells stimulated in a manner simular to that recommended for the Northeast Blanco Unit well # 203. This factor of 10 is the smaller of the productivity increases calculated by the Western Comapny as being created by the stimulation which has already occured in several wells. A productivity increase of 4 times has been assumed for other stimulation treatments (performed on Palmer Oil & Gas Company wells).

Northeast Blanco Unit well # 201
SW/4 Section 9, T31N-R7W
San Juan County, New Mexico

This well was spudded on June 30, 1979 and completed on July 24, 1979. The Fruitland & Pictured Cliffs zones were perforated and fractured. The well was not capable of commercial production. A small gas flow with large volumes of water resulted. The # 201 well was reworked in the summer of 1980. The previous perforations were shut off. A copy of the Form C-103 showing details of the rework is enclosed. The Fruitland zone was perforated and stimulated from 3482-3494 feet. The initial testing on this well to date still does not indicate acommercial producer. During the initial 8 day test in August, 1980 the well produced 72 Mcf of gas, an average of 9 Mcfpd. When adjusted for "production into the atmosphere" the producing ratio is less than 15 Mcfpd. The 201 is now producing natural gas and water.

Northeast Blanco Unit well # 202
NE/4 Section 11, T31N-R7W
San Juan County, New Mexico
(Fruitland-Pictured Cliffs commingled)

	Mcf	Days	Mcf/pd	Mcfpd/zone
June, 1980	17,584	32	550	275
July, 1980	12,606	24	526	263

Each zone has produced an average of 270 Mcfpd for the last two months into the pipeline. The "production against atmosphere pressure" is estimated to be 395 Mcfpd.

$$\frac{922 - 292}{922} = \frac{270}{\text{Production (atmosphere)}}$$

The well was previously stimulated and productive capacity theoretically increased 10 fold. The pre stimulation "stabilized production rate to the atmosphere" is calculated to be 40 Mcfpd from the Fruitland reservoir. A copy of the completion report is enclosed.

Northeast Blanco Unit well # 203
NW/4 Section 11, T31N-R7W
San Juan County, New Mexico

This well was originally perforated and completed in both the Fruitland and Pictured Cliffs reservoirs in August of 1979. When the well was turned into the pipeline to begin sales it produced so much water that it died. The well would not produce and had to be re-completed during July, 1980. A copy of the re-completion report is enclosed. The well is currently producing gas and water. The volume of water is so great that the well cannot flow continuosly. The 203 is now flowing intermittently from the Fruitland reservoir only from perforations at 3368-3392.

The first sales from this well occurred in August, 1980. The well produced 1193 Mcf in twelve days. The average production was 99 Mcfpd. When adjusted to "non-stimulated" production a 10 Mcfpd rate is obtained. This ratio when adjusted for "production to the atmosphere" rather than into a pipeline does not exceed 15 Mcfpd.

Northeast Blanco Unit well # 204
SW/4 Section 1, T31N-R7W
San Juan County, New Mexico
(Fruitland - Pictured Cliffs commingled)

	Mcf	Days	Mcfpd	Mcfpd/zone
June, 1980	8187	32	252	126
July, 1980	7313	32	229	115

Using 120 Mcfpd/zone as the average production into the pipeline, we calculate that the production to the atmosphere would be 162 Mcfpd.

$$\frac{942 - 246}{942} = \frac{120}{\text{Production (atmosphere)}}$$

This well was stimulated prior to production. If we reduce the 162 Mcfpd/zone by a factor of five based on the theoretical productivity increase obtained by stimulation we estimate 34 Mcfpd. The Fruitland zone is calculated to have 34 Mcfpd "stabilized production rate against atmospheric pressure" in this well. A copy of the completion report is enclosed.

Northeast Blanco Unit well # 205
SE/4 Section 10, T31N-R7W
San Juan County, New Mexico

This well was spudded on July 22, 1979 and originally completed August 7, 1979 as a Pictured Cliffs Producer. When the well was turned into the pipoline it produced too much water and died. It was necessary to re-complete the well in July of 1980. The Pictured Cliffs zone was abandoned and the Fruitland perforated and stimulated on July 18, 1980. The well has recently been put on production. A copy of the re-completion report is enclosed.

This well first produced in August, 1980. The gas sales for a 22 day period were 3334 Mcf, or an average of 152 Mcfpd. When this production is adjusted to "non stimulated" production (a factor of 10) a 15 Mcfpd rate is obtained. The calculation to increase the pipeline production for "stabilized production to the atmosphere" results in approximately 20 Mcfpd.

Tenneco Oil Company now operates three wells adjacent to the north boundary of the Northeast Blanco Unit which produce from the Fruitland reservoir. These wells were originally drilled and completed by Palmer Oil and Gas Company and were purchased by Tenneco Oil Company. The wells and their more recent production are listed below

Tenneco Yager # 3
Sw/4 Section 3, T31N-R7W
San Juan County, New Mexico

	Prod. Mcf.	Days	Mcfpd
June, 1980	2500	24	104
July, 1980	3716	32	116

The Fruitland zone averaged 110 Mcfpd to the pipeline when adjusted for "production to the atmosphere", that would be approximately 140 Mcfpd

$$\frac{1467 - 311}{1467} = \frac{110}{\text{Production (atmosphere)}}$$

This zone was previously stimulated with a trearment which should have increased productivity four times. One fourth of the 140 Mcfpd = 35 Mcfpd. A copy of the completion report is enclosed.

Tenneco Yager # 4
Ne/4 Section 10, T31N-R7W
San Juan County, New Mexico

	Prod. Mcf	Days	Mcfpd
May, 1980	447	31	14
June, 1980	275	23	12

The Fruitland zone averaged only 13 Mcfpd for the period May 1 - June 30, 1980. When this figure is adjusted to show "production to the atmosphere" it becomes 16 Mcfpd. A copy of the completion report is enclosed.

$$\frac{1427 - 268}{1427} = \frac{13}{\text{Production (atmosphere)}}$$

Tenneco Federal # 3
NW/4 Section 10, T31N - R7W
San Juan County, New Mexico

	Prod. Mcf	Days	Mcfpd
June, 1980	286	24	12
July, 1980	319	31	10

The Fruitland has averaged only 11 Mcfpd sales into the pipeline recently. No recent shut in pressure is available from which to compute the "productivity to the atmosphere". If we estimate a 40% increase in productivity to the atmosphere the rate would be 15 Mcfpd. A Copy of the completion report is enclosed.

Summary and Conclusions

For over 30 years the Fruitland formation has been penetrated and logged and occasionally drill stem tested and produced on the northeast flank of the San Juan Basin, New Mexico.

Only one well had produced gas prior to 1979 from the Fruitland formation within the area of the Northeast Blanco Unit. The Howell 3-B well was drilled in March of 1952 - completed at a total depth of 3025 feet in the Fruitland. The well produced a total of approximately 59,000 Mcf and was abandoned.

Since that time over 100 wells have been drilled in the Northeast Blanco Unit. The Fruitland zone was logged and evaluated in each well and was not considered to be commercially productive. All wells drilled from 1953 to 1978 were completed in the Mesaverde or Dakota reservoirs.

One Fruitland well was drilled and completed in 1952 to the west of the Northeast Blanco Unit by Phillips Petroleum Company. The well produced very low volumes of gas (approximately 30 Mcfpd) and was declared to be non commercial. This well is located in the NE NE of Section 17, T31N-R7W, San Juan County, New Mexico. This well has continued to produce for over 25 years and was one of the main reasons that additional shallow wells were drilled in 1978 by Palmer Oil and Gas to the north of the Northeast Blanco Unit.

The results of the Palmer Oil and Gas wells which were completed in the Fruitland were shown earlier in this report. Three of the six shallow wells drilled by Palmer Oil and Gas are now producing from the Fruitland formation. A Fruitland completion was attempted in the State # 2 well but was unsuccessful because of too much water.

Blackwood & Nichols Co., Ltd. attempted five shallow wells along the northern boundary of the Northeast Blanco Unit in 1979. Two of these wells, the # 202 and # 204 were completed as commercial wells in the Fruitland and Pictured Cliffs reservoirs initially. The other three wells were not completed successfully and produced to much water. In 1980 these three wells were re-worked and re-completed in the Fruitland formation only. The difficulties in log interpretation, and completion techniques including cementing, perforating, and stimulating for production raised the cost of these 3 wells significantly above the estimated costs.

All five of the Blackwood & Nichols Co., Ltd. wells are now producing from the Fruitland formation. One well, the # 201, is currently non commercial and the # 203 well is borderline.

The difficulty in analizing logs and the need to re-complete 3 of the 5 Blackwood & Nichols Co., Ltd. wells should also be considered.

In conclusion, it is well established that natural gas occurs in the Fruitland formation in this area. It is also well known that the Fruitland formation is extremely "tight". The Fruitland formation has been by-passed while drilling and completing in the deeper Mesaverde reservoir and Dakota reservoir because of "non commercial" economics. The designation of the Fruitland as a "tight" reservoir will enable gas to be produced which would otherwise be left in the ground as "non commercial".

The calculated non stimulated stabilized "flow rate to the atmosphere"

NEBU well #	Fruitland Form. Mcfpd
201	15
202	40
203	15
204	34
205	20
Palmer Oil & Gas (Tenneco)	
Yager # 3	35
Federal # 3	15
7 well total	174
1 well average	25 Mcfpd per well

All available data collected to this time support the designation of the Fruitland formation in the Northeast Blanco Unit area as a "tight" reservoir. The in situ permeability as measured and calculated from the drill stem test of the Fruitland in the Northeast Blanco Unit well 33-12 was only 0.067 md/ft. The average calculated - non stimulated stabilized production to the atmosphere of the seven producing Fruitland wells in the Northeast Blanco Unit area and just outside the north boundary is 25 Mcf per well per day. The high cost of drilling eleven wells to find seven Fruitland producers and the necessity of expensive stimulation procedures to enhance production should also be noted.

GENERAL GEOLOGIC SECTION

ERA	PERIOD	EPOCH	SAN JUAN BASIN
CENOZOIC	TERTIARY	EOCENE	WASATCH-SAN JOSE
		PALEOCENE	ANIMAS-NACIMIENTO
MESOZOIC	CRETACEOUS	UPPER	McDERMOTT CGL.
			KIRTLAND SH.
			FARMINGTON SS.
			FRUITLAND FM.
			PICTURED CLIFFS SS.
			LEWIS SH.
			MESA-VERDE GROUP: CLIFF HOUSE SS. / MENEFEE SH. / POINT LOOKOUT SS.
			MANCOS SHALE: L. HOSTA SS. / GALLUP SS. / SANASTEE MEM / GREENHORN LS. / GRANEROS SH.
			DAKOTA SS.
		LOWER	BURRO CANYON FM.
	JURASSIC	UPPER	MORRISON FM.
			SAN RAFAEL GROUP: SUMMERVILLE FM. / TODILTO LS. / ENTRADA SS.
		MIDDLE	CARMEL FM.
		LOWER	GLEN CANYON GROUP: NAVAJO SS. / KAYENTA FM. / WINGATE SS.
	TRIASSIC	UPPER	CHINLE SH.
			SHINARUMP CGL.
		MIDDLE LOWER	MOENKOPI SH.
PALEOZOIC	PERMIAN	OCHOA-GUADALUPE	
		LEONARD	De CHELLY SS.
		WOLFCAMP	ORGAN ROCK SH. / CEDAR MESA SS. / HALGAITO SH. / CUTLER ARKOSE
	PENNSYLVANIAN	VIRGIL	UPPER HERMOSA LS.
		MISSOURI	
		DES MOINES	? / LOWER HERMOSA LS.
		ATOKA	MOLAS SH.
		MORROW	
	MISSISSIPPIAN	CHESTER-MERAMEC	
		OSAGE	LEADVILLE LS.
		KINDER HOOK	
	DEVONIAN	UPPER	OURAY LS. / ELBERT FM. / ANETH DOL.
		MIDDLE	
		LOWER	
	SILURIAN		
	ORDOVICIAN		
	CAMBRIAN	UPPER	IGNACIO QTZTE
		MIDDLE	
		LOWER	
PRECAMBRIAN			PRECAMBRIAN IGNEOUS AND METAMORPHICS

BEFORE EXAMINER STAMETS
OIL CONSERVATION DIVISION
APACHE EXHIBIT NO. 2
CASE NO. 7087
Submitted by [signature]
Hearing Date 11-12-80

United States Department of the Interio

GEOLOGICAL SURVEY
FARMINGTON DISTRICT
DURANGO DISTRICT

BEFORE EXAMINER STAMETS
OIL CONSERVATION DIVISION
EXHIBIT NO. 3
CASE NO. 7987
Submitted by
Hearing Date 11-12-80

Supplement to USGS NTL-6

Above Data Required on Well Sign

GENERAL REQUIREMENTS
FOR
OIL AND GAS OPERATIONS ON FEDERAL AND INDIAN LEASES

These requirements apply generally to all oil and gas operations on Federal and Indian leases. They apply specifically to the above-described well. Special requirements that apply and are effective for this well, if any, are check-marked in Section 15 of these General Requirements.

I. GENERAL

A. Full compliance with applicable laws and regulations, with the approved Permit to Drill, and with the approved Surface Use and Operations Plan is required. Lessees and/or operators are fully accountable for the actions of their contractors and subcontractors.

B. Each well shall have a well sign in legible condition from spud date to final abandonment. The sign should show the operator's name, lease name or unit name, well number, location of the well, and the lease serial number.

C. A complete copy of the approved Application for Permit to Drill and the accompanying Surface Use and Operations Plan, along with any conditions of approval, shall be available to authorized personnel at the drillsite whenever active construction or drilling operations are under way.

D. A drilling operations progress report is to be submitted daily from spud date until the well is completed and the Well Completion Report (Form 9-330) is filed. The report should be on paper not less than 5 X 8 inches in size, and each page should identify the well by operator's name, well name and number, and by well location.

E. Immediate notice is required of all blowouts, fires, spills, and accidents involving life-threatening injuries or loss of life. (See NTL-3A.)

F. No construction activities, such as roads, well sites, tank battery sites, pits, or other work involving surface disturbance of previously non-disturbed land will be commenced until a Surface Use and Operations Plan is submitted and approval obtained.

G. If, during operations, any archeological or historical sites, or any object of antiquity subject to the Antiquities Act of June 8, 1906, are discovered, all operations which would affect such sites are to be suspended and the discovery reported promptly to the appropriate office of the Geological Survey.

H. Prior approval of the District Engineer is required for variance from the approved drilling program and before commencing plugging operations, plugback work, casing repair work, corrective cementing operations, or suspending drilling operations indefinitely. Emergency approval may be obtained orally, but such approval does not waive the written report requirements.

I. Blowout prevention equipment is to be installed, tested, and in working order before drilling below the surface casing, and shall be maintained ready for use until drilling operations are completed.

J. All shows of fresh water and minerals will be reported and protected.

K. Well area and lease premises will be maintained in a workmanlike manner with due regard to safety, conservation, and appearance. All waste associated with the drilling operations will be contained and will be buried in place (in a separate trash pit) or removed and deposited in an approved sanitary landfill. All garbage (metal containers will be crushed) and debris left on site will be buried at least two feet deep. All trash and debris will be buried or removed from the site within one month after removal of the drilling rig and/or completion rig, and the wellsite will be kept clean and in an aesthetically satisfactory condition for the life of the well.

L. Unless drilling operations are commenced within one year, approval of an Application for Permit to Drill will expire. A written request for extension may be granted if timely submitted.

2. CONSTRUCTION ACTIVITIES (Refer to Surface Operating Standards for Oil and Gas Exploration and Development--Second Edition)

A. Prior to commencing construction of road, pad, or other associated developments, operator will provide the dirt contractor with a copy of the Surface Use Plan, the conditions of approval, and a copy of Sections 2 and 3 of these General Requirements.

B. No gravel or other related minerals from new or existing pits on Federal land will be used in construction of roads, well sites, etc., without prior approval from the surface management agency.

C. Vegetative materials removed during construction must be disposed of in such manner that it does not detract from the aesthetics of the area and does not accelerate erosion. Vegetation removed during clearing operations should be placed in drainages, washes, gullies, etc., and "walked down" by crawler-type tractor. If there are no drainages in the immediate area, the vegetation should be "walked down" in place. All trash resulting from construction activities will not be piled or left in rows, but will be left so it does not detract from the natural appearance of the area. Any available topsoil encountered during construction should be stockpiled for use in restoring the pit area after the pits are covered. A drainage ditch must be constructed above the cut slope of the pad.

D. Unless otherwise approved, all access roads should be limited to 20 feet in width, excluding turnouts.

(1) Water bars will be constructed on the access road to the well location and conform to surface management agency specifications. The maximum slope distance between water bars will be:

% Slope	Slope Distance
Less than 1%.	.400 feet
1% - 5%	.300 feet
5% - 15%.	.200 feet
15% - 25%	.100 feet
Greater than 25%.	50 feet

When the access road is graded, water bars will be left in the road or replaced immediately upon completion of grading.

E. Each existing fence to be crossed by the permittee will be braced and tied off before cutting so as to prevent slacking of the wire. The opening will be protected as necessary during construction to prevent the escape of livestock and upon completion of construction, the fence will be repaired back to the original standard of the existing fence. A cattleguard will be installed

In any fence where a road is to be regularly traveled. A twelve-foot gate will be installed adjacent to the cattleguard when necessary.

NOTE: Sections 2-C and 2-D above apply primarily to Federal surface. If the land is privately owned, these requirements may be varied to comply with the operator-landowner agreement.

3. DRILLING PITS

A. Mud pits will be constructed so as not to leak, break, or allow discharge of liquids. Pits are not to be located in natural drainage. Any plastic material used to line pits must be removed to below-ground level before pits are covered.

B. All unguarded pits containing liquids will be fenced.

C. Liquids in pits will be allowed to evaporate, or be properly disposed of otherwise, before pits are recontoured. Under no circumstances will pits be cut and drained.

4. CASING AND CEMENTING REQUIREMENTS

A. Surface casing is to be set at sufficient depth to protect fresh water zones and provide well control; and cement circulated to the surface.

B. Intermediate and production casing strings are to be set and cemented as necessary to effectively isolate and seal off all water, oil, gas, or coal-bearing strata encountered in the well down to the casing point.

C. Prior to drilling the plug after cementing, all casing strings shall be pressure tested. Test pressure shall not be less than 600 psi for surface casing, and a minimum of 1,500 psi or 0.2 psi/ft., whichever is greater, for other casing strings. If the pressure declines more than 10 percent in 30 minutes, or if there is other indication of a leak, the casing shall be recemented, repaired, or an additional casing string run, and the casing shall be tested again in the same manner.

D. After cementing but before commencing any tests, the casing string shall stand cemented until the cement has reached a compressive strength of at least 500 psi at the shoe, except that in no case shall tests be initiated until cement has been in place at least 8 hours. WOC time will be recorded in the driller's log.

5. BLOWOUT PREVENTION

A. Blowout preventers and related well control equipment shall be installed, tested, and used in such manner necessary to prevent blowouts. All wells must be equipped with at least one blowout preventer while drilling below surface casing.

B. While drill pipe is in use, ram-type blowout preventers shall be actuated to test proper functioning once each trip, but in no event less than once each day. The annular-type blowout preventer shall be actuated on the drill pipe at least once each week.

C. Blowout preventers are to have proper rams for the operations being performed. Casing rams are required when running casing.

D. Blowout preventers are to have handwheels installed.

E. A choke line and a kill line are to be properly installed. The kill line is not to be used as a fill-up line.

F. The accumulator system shall have a pressure capacity to provide for repeated operation of hydraulic preventers.

G. Drill string safety valve(s) to fit all pipe in the drill string are to be maintained on the rig floor while drilling operations are in progress.

H. Blowout prevention drills are to be conducted as necessary to assure that equipment is operational and that each crew is properly trained to carry out emergency duties. All BOP tests and drills are to be recorded in the driller's log.

I. The maximum pressure to be allowed on blowout preventers during well control operations is to be posted for each casing string.

J. The characteristics, use, and testing of drilling mud and the conduct of related drilling procedures shall be such as are necessary for well control. Quantities of mud materials sufficient to insure well control shall be maintained, readily accessible for use at all times.

K. From the time drilling operations are initiated and until drilling operations are completed, a member of the drilling crew or the toolpusher shall maintain rig floor surveillance at all times, unless the well is secured with blowout preventers or cement plugs.

6. REPORTS

A. The following reports shall be filed with the District Engineer within 15 days after the work is completed:

(1) Five copies of Sundry Report, Form 9-331, giving complete information concerning:

(a) Setting of each string of casing. Show size, grade and weight of casing set, size hole, depth set, amount and type of cement used, whether cement circulated, top of cement behind casing if determined, depth of cementing tools if used, casing test method and results, and date work was done. Show spud date on first report submitted.

(b) Intervals tested, perforated, acidized, or fractured, and results obtained. Show date work was done.

(2) Five copies of Well Completion Report, Form 9-330. Show formation tops, drill stem test information, completion data, and production tests. Show all oil and gas zones and important water sands under Item 37. Data on water sands should include rate of water inflow and elevation to which water rose in hole.

(3) Two copies of all electrical and radioactivity logs run.

7. DRILLER'S LOG

A. The following shall be entered in the daily driller's log:

(1) Blowout preventer pressure tests, including test pressures and results.

(2) Blowout preventer tests for proper functioning.

(3) Blowout prevention drills conducted.

(4) Casing run, including size, grade, weight and depth set.

(5) How pipe was cemented, including amount of cement, type, whether cement circulated, location of cementing tools, etc.

(6) Waiting on cement time for each casing string.

(7) Casing pressure tests after cementing, including test pressure and results.

8. DRILLSTEM TESTS

A. Estimated amounts of oil and gas recovered and/or produced during drillstem tests are to be shown in the driller's log and reported in accordance with NTL-4.

9. GAS FLARING

A. Approval is granted to flare gas while drilling and completion testing.

B. When gas is used for drilling, the blooey line will be located where no damage to vegetation will occur. If this is not possible, an earthen baffle will be constructed to keep the heat and residue within the operating area.

C. Failure to request permission to vent gas after 60 days following the date the well is completed will result in compensation due the United States being the full value of the gas so wasted. (See NTL-4.)

10. WATER DISPOSAL

A. An application for approval of the disposal method for water production from all new wells must be filed with the District Engineer pursuant to Section VII of NTL-28. Failure to timely file such application will be considered an incident of non-compliance and will be grounds for issuing a shut-in order until the application is submitted.

11. SAFETY

A. All rig heating stoves are to be of the explosion-proof type.

B. Drilling rig engines should have water-cooled exhausts.

C. Rig safety lines are to be installed.

D. Hard hats must be utilized.

12. SUBSEQUENT OR CHANGE OF PLANS

A. Any additional construction, re-construction, or alterations of facilities, including roads, gathering lines, batteries, etc., which will result in the disturbance of new ground, will require the filing of a suitable plan and prior approval by the Survey after clearance with the surface management agency.

13. REMOVAL OF DRILLING RIG

A. Unless a well has been properly cased and cemented, or properly plugged, the drilling rig must not be moved from the drillsite without prior approval from the Survey.

14. ABANDONMENT

A. If the well is dry and is to be plugged, approval of the proposed plugging program may be obtained orally; however, oral approval must be confirmed in writing by immediately filing a Notice of Intention to Abandon on Form 9-331 in quintuplicate with the District Engineer. The report should show the total depth reached, the reason for plugging, and the proposed intervals, by depths, where cement plugs are to be placed, type of plugging mud, etc.

B. Upon completion of approved plugging, erect a regulation well marker which should not be less than 4 inches in diameter and extend at least 4 feet above general ground level. Heap up the dirt around the base of the marker about 12 inches to take care of any settling of the cellar. The top of the marker must be closed or capped. The following minimum information shall be permanently placed on the marker with a plate, cap, or welded bead:

(1) Operator
(2) Well number and name
(3) Section, Township and Range
(4) Footage location

If approval is obtained to omit the dry hole marker, casings should be cut off four feet below ground level.

C. Within 15 days after plugging the well, a Subsequent Report of Abandonment is to be filed on Form 9-331 in quintuplicate, showing the manner in which the well was plugged, including depths where casing was cut and pulled, intervals (by depths) where cement plugs were placed, and the date plugging was completed. When all surface restoration work is completed, advise the District Office so that a field inspection of the wellsite can be made.

D. If, upon abandonment of wells on Federal surface, the retention of the well pad and/or access road is not considered necessary for the management and multiple use of the natural resources, they will be ripped a minimum of 12" in depth. After ripping, water bars will be installed as stated in 2-D-(1). All ripped surfaces are to be protected from vehicular travel by construction of a dead-end ditch and earthen barricade at the entrance to these ripped areas. (Reseeding of the affected areas may be required.)

E. Surface restoration after abandonment of wells on non-Federal surface normally will be in accordance with the operator-landowner agreement; however, minimum Federal restoration requirements on private surface-Federal minerals will be required.

15. SPECIAL STIPULATIONS

The following special requirements apply and are effective when checked:

☐ A. _____ surface casing should be set at _____ feet and cement circulated to the surface.

☐ B. Ram-type blowout preventers and related control equipment shall be pressure tested with water to the rated working pressure of the stack assembly (except that the annular-type preventer may be tested to 70 percent of rated working pressure) (a) when installed; (b) before drilling possible abnormally-pressured zones; and (c) following repairs that require disconnecting a pressure seal in the assembly.

☐ C. Minimum required fill of cement behind the _____ casing is to _____.

☑ D. All above-ground permanent structures and equipment will be painted a non-glare color that simulates the natural color of the site, as follows:

- ☐ Brown, Federal Standard 595a-30318
- ☑ Green, Federal Standard 595a-34127
- ☐ Gray, Federal Standard 595a-36357
- ☐ Sand, Federal Standard 5952-30277

☐ E. A kelly cock will be installed and maintained in operable condition.

☐ F. The District Office is to be notified in sufficient time for a representative to witness cementing of the _____ casing.

☐ G. A Communitization Agreement covering the acreage dedicated to the well must be filed for approval with the U. S. Geological Survey, P. O. Box 26124, Albuquerque, New Mexico 87125. The effective date of the agreement must be prior to any sales.

☐ H. Compacted areas will be plowed or ripped before reseeding. Reseeding of the disturbed lands is required upon completion of drilling and completion activities and abandonment of the well. All seeding will be done between July 1 and September 15. Seeding will be done with a disc-type drill with two boxes for various seed sizes. The drill rows will be eight to ten inches apart. The seed will be planted not less than one-half inch deep or more than one inch deep. The seeder will be followed with a drag, packer, or roller to insure uniform coverage of the seed, and adequate compaction. Drilling of the seed will be done on the contour where possible, not up and down the slope. Where slopes are too steep for contour drilling, a "cyclone" hand-seeder or similar broadcast seeder will be used. Seed will then be covered to the depth described above by whatever means is practical.

If, in the opinion of the surface management agency, the seeding is unsuccessful, the lessee/operator may be required to make subsequent seedings until revegetation is successful.

Species to be planted in pounds pure-live-seed per acre:

☑ Seed Mix No. 1
Crested Wheatgrass (Agropyron desertorum)----------2½
Smooth Brome (Bromus inermis)----------2½
Fourwing Saltbush (Dewinged) (Atriplex canescens)---------- ½
Nomad Alfalfa (Medicago sitiva)----------1

☐ Seed Mix No. 2
Crested Wheatgrass (Agropyron desertorum)----------3½
Fourwing Saltbush (Dewinged) (Atriplex canescens)----------1
Sand Dropseed (Sporobolus cryptandrus)----------3/4
Alkali Sacaton (Sporobolus airoides)----------3/4

☐ Seed Mix No. 3
Fourwing Saltbush (Dewinged) (Atriplex canescens)----------1
Sand Dropseed (Sporobolus cryptandrus)----------1½
Alkali Sacaton (Sporobolus airoides)----------1½
Shad Scale (Atriplex confertifolia)----------3/4

☐ Seed Mix No. 4--NIPP
Indian Ricegrass----------1
Sand Dropseed----------1
Galletta----------2

☐ Seed Mix No. 5--NIPP
Alkali Sacaton----------1
Sand Dropseed----------1
Galletta----------2

☐ Seed Mix No. 6--BIA

		Minimum % PLS accept.
Alkali Sacaton	1	76%
Sand Dropseed	1	76%
Galletta	2	55%

PLS (Pure Live Seed) = Germination X Purity

After drilling is completed, the pad will be seeded with the recommended seed mix. Seed will be drilled to a depth of not less than ¼ inch and not more than 3/4 inch, followed by a drag or packer. Compacted areas will be plowed (disced) to a depth of 4-6 inches before seeding. Areas too steep to be drilled will be broadcast seeded with a "cyclone" hand-held seeder or similar device, using 150% of the recommended drilled rate of seed per acre. The cut slope will be dressed up and seeded according to the above stipulation.

☐ I. No well and/or production equipment within the irrigable fields of the Navajo Indian Irrigation Project will exceed two feet above the natural ground surface elevation, and will be adequately barricaded for safety.

☐ J. Any production piping systems shall be installed with at least four feet of cover.

☐ K. In addition to the well-control equipment stipulated in Section 5, either an annular blowout preventer or a rotating head must be used while drilling below surface casing to. _____.

☑ L. Other:

See special stips

DIRECTORY OF FEDERAL PERSONNEL
OIL AND GAS OPERATIONS IN FARMINGTON AND DURANGO DISTRICTS

Surface Use and Rehabilitation

Bureau of Land Management
P. O. Box 568, or
900 La Plata Highway
Farmington, New Mexico 87401

Office hours: 7:45 a.m. to 4:30 p.m.

Office phones: (505) 325-3581, 325-3582, and 325-2922

Names of people involved with Oil and Gas Operations:

Bob Calkins, Area Manager
Bob Moore, Lands & Minerals Supervisor
Russ Pigors, Inspector
Bob Harler, Inspector
Steve Friedman, Inspector

Drilling and Producing Operations

U. S. Geological Survey--Oil and Gas Operations
P. O. Box 959, or
3535 East 30th Street
Farmington, New Mexico 87401

Office hours: 8:00 a.m. to 4:30 p.m.

Office phones: (505) 325-4572 or 325-4573

Home Phones

Jim Sims, District Supervisor.....
Errol Becher, Petroleum Engineer.....325-3886
Hildred Kuchera, Petroleum Engineer.....325-3448
Bill Spence, Petroleum Engineer.....327-2193
Ray Swanson, Petroleum Engineering Technician.....325-8189
Ken Baker, Petroleum Engineering Technician.....327-2170
Fred Edwards, Petroleum Engineering Technician.....325-7885
Andrew Stump, Environmental Scientist.....327-0507
George Carlson, Environmental Scientist.....325-0757

U. S. Geological Survey--Oil and Gas Operations
Federal Building
701 Camino del Rio
Durango, Colorado 81301

Office hours: 8:00 a.m. to 4:30 p.m.

Office phone: (303) 247-5144

Home Phones

Carl Barrick, Petroleum Engineer.....259-0628
Terry Galloway, Petroleum Engineering Technician.....247-3646
Randall Walker, Petroleum Engineering Technician.....247-0487
John Keller, Environmental Scientist.....247-5308
Donald Englishman, Environmental Scientist.....563-4314

Each well drilled on any communitized tract shall be located in the approximate geographical center of the combined units with a tolerance of 150 feet for topographical conditions, but in any event shall not be located closer than 330 feet to the outer boundaries of the proposed proration unit or communitized tract.

RULE 105. PIT FOR CLAY, SHALE, AND DRILL CUTTING

In order to assure a supply of proper material for mud-laden fluid to confine oil, gas, or water to their native strata during the drilling of any well, operators shall provide before drilling is commenced an adequate pit for the accumulation of drill cuttings.

RULE 106. SEALING OFF STRATA

(a) During the drilling of any oil or natural gas well, all oil, gas, and water strata above the producing horizon shall be sealed or separated in order to prevent their contents from passing into other strata.

(b) All fresh waters and waters of present or probable value for domestic, commercial, or stock purposes shall be confined to their respective strata and shall be adequately protected by methods approved by the Division. Special precautions by methods satisfactory to the Division shall be taken in drilling and abandoning wells to guard against any loss of artesian water from the strata in which it occurs, and the contamination of artesian water by objectionable water, oil, or gas.

(c) All water shall be shut off and excluded from the various oil and gas bearing strata which are penetrated. Water shut-offs shall ordinarily be made by cementing casing.

RULE 107. CASING AND TUBING REQUIREMENTS

(a) Any well drilled for oil or natural gas shall be equipped with such surface and intermediate casing strings and cement as may be necessary to effectively seal off and isolate all water-, oil-, and gas-bearing strata and other strata encountered in the well down to the casing point. In addition thereto, any well completed for the production of oil or natural gas shall be equipped with a string of properly cemented production casing at sufficient depth to ensure protection of all oil- and gas-bearing strata encountered in the well, including the one(s) to be produced.

Sufficient cement shall be used on surface casing to fill the annular space behind the casing to the top of the hole, provided however, that authorized field personnel of the Division may, at their discretion, allow exceptions to the foregoing requirement when known conditions in a given area render compliance impracticable.

All cementing shall be by pump and plug method unless some other method is expressly authorized by the Division.

All cementing shall be with conventional-type hard-setting cements to which such additives (lighteners, densifiers, extenders, accelerators, retarders, etc.) have been added to suit conditions in the well.

Authorized field personnel of the Division may, when conditions warrant, allow exceptions to the above paragraph and permit the use of oil-base casing packing material in lieu of hard-setting cements on intermediate and production casing strings; provided however, that when such materials are used on the intermediate casing string, conventional-type hard-setting cements shall be placed throughout all oil- and gas-bearing zones and throughout at least the lowermost 300 feet of the intermediate casing string. When such materials are used on the production casing string, coventional-type hard-setting cements shall be placed throughout all oil- and gas-bearing zones and shall extend upward a minimum of 500 feet above the uppermost perforation or, in the case of an open-hole completion, 500 feet above the production casing shoe.

All casing strings shall be tested and proved satisfactory as provided in paragraph (c) below.

(b) After cementing, but before commencing tests required in paragraph (c) below, all casing strings shall stand cemented in accordance with Option 1 or 2 below. Regardless of which option is taken, the casing shall remain stationary and under pressure for at least eight hours after the cement has been placed. Casing shall be "underpressure" if some acceptable means of holding pressure is used or if one or more float valves are employed to hold the cement in place.

OPTION 1

Allow all casing strings to stand cemented a minimum of eighteen (18) hours prior to commencing tests. Operators using this option shall report on Form C-103 the actual time the cement was in place before initiating tests.

OPTION 2

(May be used in the counties of San Juan, Rio Arriba, McKinley, Sandoval, Lea, Eddy, Chaves, and Roosevelt only.) Allow all casing strings to stand cemented until the cement has reached a compressive strength of at least 500 pounds per square inch in the "zone of interest" before commencing tests, provided however, that no tests shall be commenced until the cement has been in place for at least eight (8) hours.

The "zone of interest" for surface and intermediate casing strings shall be the bottom 20 percent of the casing string, but shall be no more than 1000 feet nor less than 300 feet of the bottom part of the casing unless the casing is set at less than 300 feet. The "zone of interest" for production casing strings shall include the interval or intervals where immediate completion is contemplated.

To determine that a minimum compressive strength of 500 pounds per square inch has been attained, operators shall use the typical performance data for the particular cement mix used in the well, at the minimum temperature indicated for the zone of interest by Figure 107-A, Temperature Gradient Curves. Typical performance data used shall be that data furnished by the cement manufacturer or by a competent materials testing agency, as determined in accordance with the latest edition of API Code RP 10 B "Recommended Practice for Testing Oil-Well Cements."

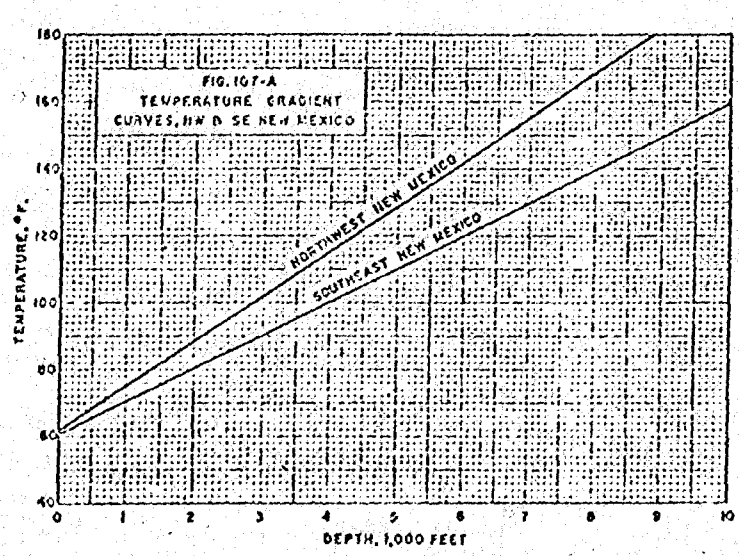


Figure 107-A

Operators using the compressive strength criterion (Option 2) shall report the following information on Form C-103:

(1) Volume of cement slurry (cu. ft.) and brand name of cement and additives, percent additives used, and sequence of placement if more than one type cement slurry is used.

(2) Approximate temperature of cement slurry when mixed.

(3) Estimated minimum formation temperature in zone of interest.

(4) Estimate of cement strength at time of casing test.

(5) Actual time cement in place prior to starting test.

(c) All casing strings except conductor pipe shall be tested after cementing and before commencing any other operations on the well. Form C-103 shall be filed for each casing string reporting the grade and weight of pipe used. In the case of combination strings utilizing pipe of varied grades or weights, the footage of each grade and weight used shall be reported. The results of the casing test, including actual pressure held on pipe and the pressure drop observed shall also be reported on the same Form C-103.

(1) Casing strings in wells drilled with rotary tools shall be pressure tested. Minimum casing test pressure shall be approximately one-third of the manufacturer's rated internal yield pressure except that the test pressure shall not be less than 600 pounds per square inch and need not be greater than 1500 pounds per square inch. In cases where combination strings are involved, the above test pressures shall apply to the lowest pressure rated casing used. Test pressures shall be applied for a period of 30 minutes. If a drop of more than 10 percent of the test pressure should occur, the casing shall be considered defective and corrective measures shall be applied.

BEFORE EXAMINER STAMETS
OIL CONSERVATION DIVISION
APPLICANT'S EXHIBIT NO. 4
CASE NO. 7087
Submitted by BLACKWOOD
Hearing Date 11-12-80

BEFORE EXAMINER STAMETS
OIL CONSERVATION DIVISION
APPLICANT'S EXHIBIT NO. 5
CASE NO. 7087
Submitted by BLACKWOOD
Hearing Date 11-12-80

JOHNSTON

Schlumberger

computerized data analysis

COMPANY BLACKWOOD & NICHOLS WELL NORTH EAST BLANCO #33-12 TEST NO. 1
COUNTY SAN JUAN STATE NEW MEXICO

F.R. # 00095 C

JOHNSTON
Schlumberger

COMPUTERIZED DATA ANALYSIS

MAY 20, 1980

GENTLEMEN:

THE ENCLOSED TEST APPEARS TO BE A GOOD MECHANICAL DRILL STEM TEST DURING WHICH THE TOOLS DID FUNCTION PROPERLY. THE FORMATION PRODUCED ENOUGH RESERVOIR FLUID FOR PROPER IDENTIFICATION. RESERVOIR PRESSURE DRAWDOWN WAS SUFFICIENT AND AN ADEQUATE SHUT-IN BUILD-UP DID OCCUR FOR RELIABLE QUANTITATIVE ANALYSIS. RESERVOIR PARAMETERS WERE CALCULATED BY THE HORNER METHOD.

1. FLOW RATE: A FLOW RATE OF 35 MCF/DAY OF GAS WAS NOTED DURING THIS TEST.

2. RESERVOIR PRESSURE: EXTRAPOLATION OF THE SHUT-IN PRESSURE BUILD-UP INDICATES A MAXIMUM RESERVOIR PRESSURE OF 1677 P.S.I.G. AT RECORDER DEPTH.

3. PERMEABILITY: THE CALCULATED TRANSMISSIBILITY FACTOR OF 106.45 MD.-FT./CP. INDICATES AN AVERAGE EFFECTIVE PERMEABILITY TO GAS OF 0.067 MD. FOR THE REPORTED 20 FOOT NET INTERVAL. THE CALCULATIONS WERE BASED ON A SLOPE OF 139 P.S.I./LOG CYCLE OBTAINED FROM THE SHUT-IN BUILD-UP PLOT. IT WAS ASSUMED FOR THESE CALCULATIONS: (A) GAS GRAVITY 0.70, (B) VISCOSITY .0125 CP., (C) AND GAS DEVIATION FACTOR .855. THESE FIGURES WERE OBTAINED FROM THE AVAILABLE TECHNICAL LITERATURE.

4. WELLBORE DAMAGE: THE CALCULATED DAMAGE RATIO OF 5.5% INDICATES THAT WELLBORE DAMAGE IS PRESENT AT THE TIME AND CONDITIONS OF THIS TEST. THE PRESSURE DROP DUE TO DAMAGE IS ESTIMATED TO BE 121 P.S.I.

5. RADIUS OF INVESTIGATION: THE CALCULATED RADIUS OF INVESTIGATION OF THIS TEST IS 5.0 FEET BASED ON AN ASSUMED POROSITY OF 10%, COMPRESSIBILITY OF 1.26×10^{-3}, AND OTHER ASSUMPTIONS MADE IN NUMBER 3 ABOVE.

6. GENERAL COMMENTS: THE FORMATION EXHIBITS THE CHARACTERISTICS OF RELATIVELY LOW PERMEABILITY EFFECTIVE TO THE RESERVOIR FLUID AND INDICATES THE PRESENCE OF WELLBORE DAMAGE.

Dennis Myren

DENNIS MYREN
RESERVOIR EVALUATION
DEPARTMENT

BLACKWOOD & NICHOLS
NORTH EAST BLANCO #33-12, SAN JUAN COUNTY, NEW MEXICO
TEST #1, 3055' TO 3205'

FIELD REPORT # 00095 C

Gas Reservoir Engineering Data

JOHNSTON

Instrument No. L-436

Field Report No. 00095 C

Damage Ratio	DR	5.57		Effective Transmissibility TO GAS	Kh / μ	106.45	Md.ft. / Cp.
Maximum Reservoir Pressure	P_o	1677	P.S.I.G.	Flow Rate ESTIMATED	Q_g	35	MCF/day
Slope of Shut-in Curve	M_g	139	PSI/log cycle	Flow Rate	Q	-	
Potentiometric Surface (Datum Plane, Sea Level)	PS	-	ft.	Pressure Gradient		0.523	PSI/ft.
Radius of Investigation		5.0	ft.	K (Effective to GAS)		0.067	Md.

SLOPE M_G = 1677 - 1538 = 139

Assumptions made for Calculations for Gas Recoveries

1. Q_g is taken as steady state flow and unless stated otherwise at standard conditions 14.7 P.S.I. and 60°F.
2. P_f is final formation flowing pressure at steady state flow.
3. Formation flow is taken as single phase flow. If liquid (condensate) is produced at surface, condensation is assumed to have occurred in drill pipe.
4. Radial flow is assumed.
5. Unless given, gas specific gravity is assumed to be 0.7 (air 1.0) and having pseudo critical temperature at 385° Rankin and pseudo critical pressure of 666 P.S.I.A.
6. Other standard radial flow, steady state assumptions.

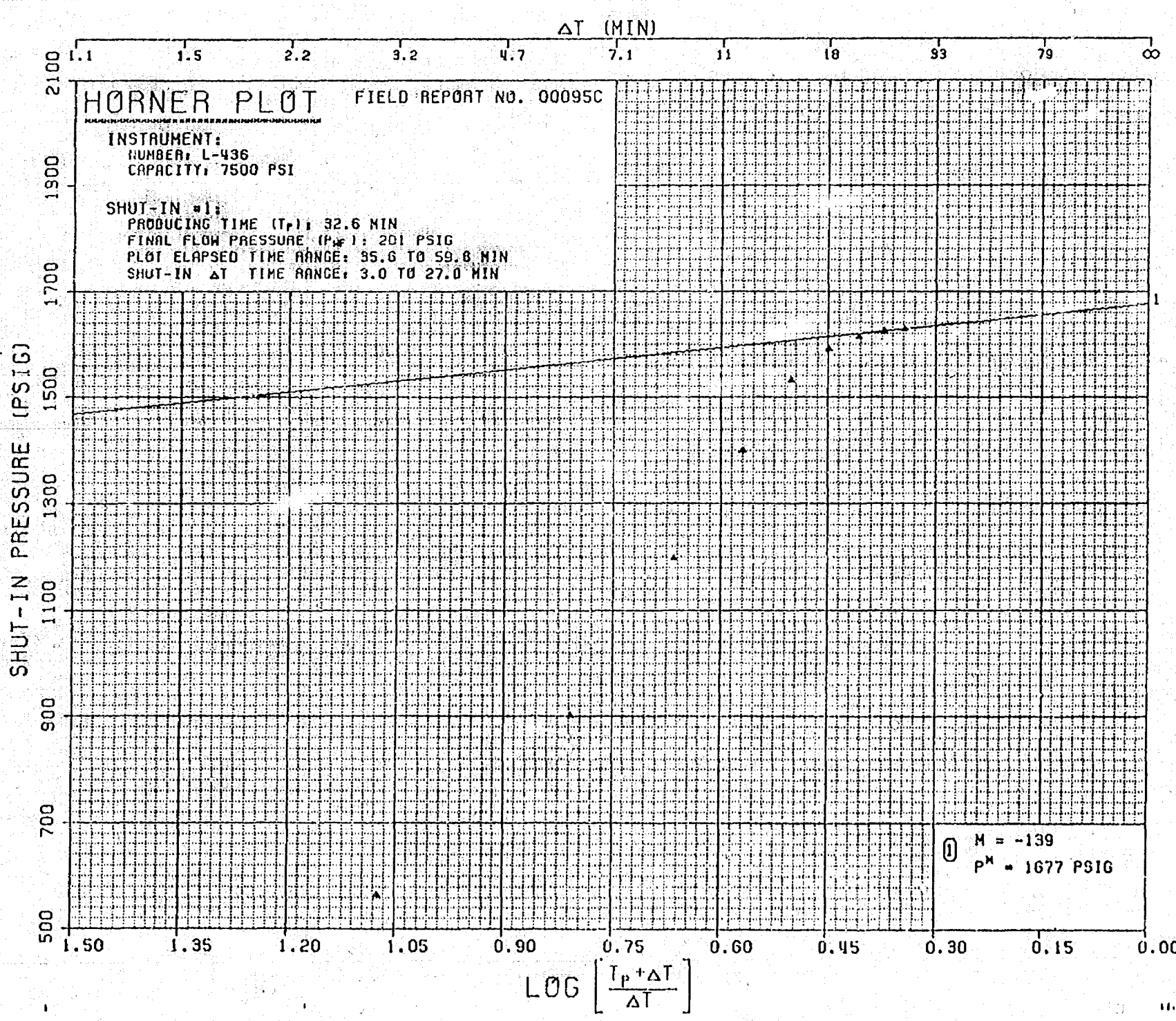
Empirical Equations:

1. $EDR = \dfrac{P_s^2 - Pf}{M_g(\log T + 2.65)}$, where $M_g = \dfrac{P_1^2 - P_{10}^2}{\text{Log Cycle}}$

2. Transmissibility $\dfrac{Kh}{\mu Z} = \dfrac{1637^\circ T_f Q_g}{M_g}$

3. P.S. = [P_o × 2.309 ft./PSI] − [Recorder depth to sea level.]

4. Radius of Investigation, $r_i = \sqrt{\dfrac{Kt}{40\phi(1 - S_w)\mu c}}$ where t = time in days


ΔT (MIN)
1.1
1.5
2.2
3.2
4.7
7.1
11
18
93
79
∞
HØRNER PLØT
FIELD REPØRT NØ. 00095C
INSTRUMENT:
NUMBER: L-436
CAPACITY: 7500 PSI
SHUT-IN #1:
PRODUCING TIME (T_p): 32.6 MIN
FINAL FLOW PRESSURE (P_{wf}): 201 PSIG
PLØT ELAPSED TIME RANGE: 35.6 TØ 59.8 MIN
SHUT-IN ΔT TIME RANGE: 3.0 TØ 27.0 MIN
SHUT-IN PRESSURE (PSIG)
2100
1900
1700
1500
1300
1100
900
700
500
M = -139
P^M = 1677 PSIG
1.50
1.35
1.20
1.05
0.90
0.75
0.60
0.45
0.30
0.15
0.00
LØG $\left[\frac{T_p+\Delta T}{\Delta T}\right]$

FIELD REPORT NO. 00095C

INSTRUMENT:

NUMBER: L-436

CAPACITY: 7500 PSI

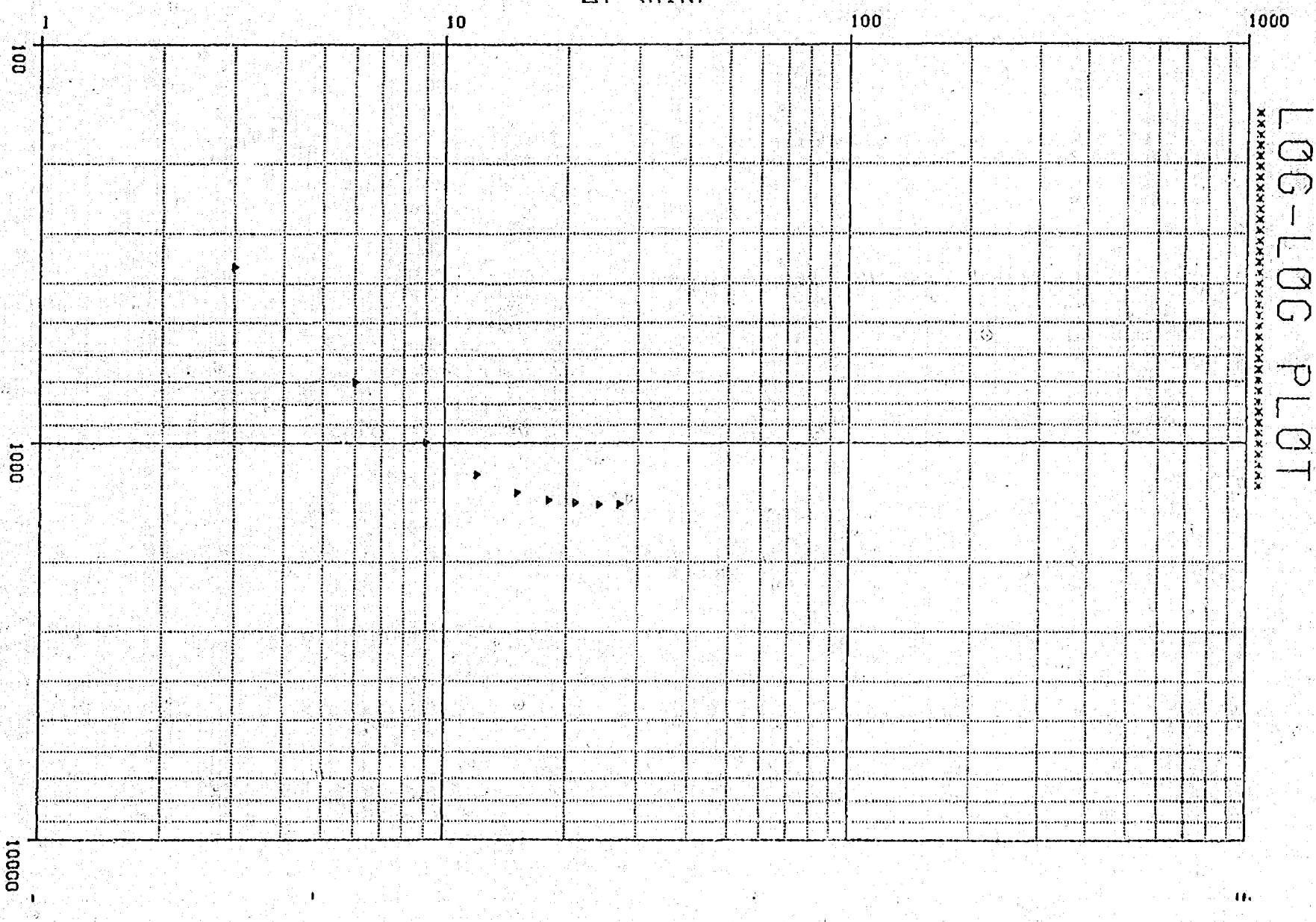
SHUT-IN #1:

FINAL FLOW PRESSURE (P_{WF}): 201 PSIG

PLOT ELAPSED TIME RANGE: 35.6 TO 59.6 MIN

SHUT-IN ΔT TIME RANGE: 3.0 TO 27.0 MIN

LOG-LOG PLOT



WELL IDENTIFICATION

COMPANY:	BLACKWOOD & NICHOLS 2Ø13 FIRST NATIONAL CENTER WEST OKLAHOMA CITY, OKLAHOMA 731Ø2	CUSTOMER:	SAME
WELL:	NORTH EAST BLANCO #33-12	LOCATION:	-
TEST INTERVAL:	3Ø55' TO 32Ø5'	FIELD:	BLANCO
TEST NO:	1	TEST DATE:	1Ø-24-55
COUNTY:	SAN JUAN	STATE:	NEW MEXICO
TECHNICIAN:	MORRIS BOWEN	TEST APPROVED BY:	MR. W.J. LINTON

EQUIPMENT AND HOLE DATA

TEST TYPE:	DUAL PACKERS			DRILL PIPE LENGTH:	-	FT.
				DRILL PIPE I.D.:	-	IN.
ELEVATION:	-		FT.	DRILL COLLAR LENGTH:	-	FT.
TOTAL DEPTH:	32Ø5		FT.	DRILL COLLAR I.D.:	-	IN.
MAIN HOLE/CASING SIZE:	9 7/8		IN.	PACKER DEPTHS:	3Ø5Ø & 3Ø55	FT.
RAT HOLE/LINER SIZE:	-		IN.		&	FT.
FORMATION TESTED:	-				&	FT.
NET PROD. INTERVAL:	-		FT.	DEPTHS REF. TO:	-	
POROSITY:	-		%			

TEST TOOL CHAMBER DATA

SAMPLER PRESSURE: - PSIG
RECOVERED OIL GRAVITY: API @ DEG. F.
RECOVERY GOR: FT3/BBL.

SAMPLE CHAMBER CONTENTS

FLUID	VOLUME	RESIST. (OHM-M)	MEAS. TEMP. (DEG F.)	CHLOR. (PPM)
GAS:	- FT.3			
OIL:	- CC			
WATER:	CC			
MUD:	CC			
FILTRATE:				
TOTAL LIQUID:	- CC			

MUD DATA

TYPE: MUD
WEIGHT: 11.4 LB/GAL.
VISCOSITY: 63 SEC.
WATER LOSS: - CC

FLUID	RESIST (OHM-M)	TEMP (DEG F)	CHLOR (PPM)
MUD:	-	-	
FILTRATE:	-	-	-

REMARKS

NO. OF REPORTS REQUESTED: 6

FIELD REPORT NO. ØØØ95C

SURFACE INFORMATION

DESCRIPTION(RATE OF FLOW)		TIME	PRESSURE PSIG	SURFACE CHOKE
STRONG BLOW OF AIR TO SURFACE IMMEDIATELY. TO SURFACE IN 1Ø MINUTES.	GAS	-	Ø	1"

CUSHION TYPE: -	- FT	- PSIG	3/4 IN. BOTTOM CHOKE

RECOVERY INFORMATION

RECOVERY	FEET	BARRELS	%OIL	%WATER	%OTHERS	API GRAV.	DEG.	RESIST	DEG.	CHL PPM
-	-	-	-	-	-	-	-	-	-	-

FIELD REPORT NO. ØØØ95C

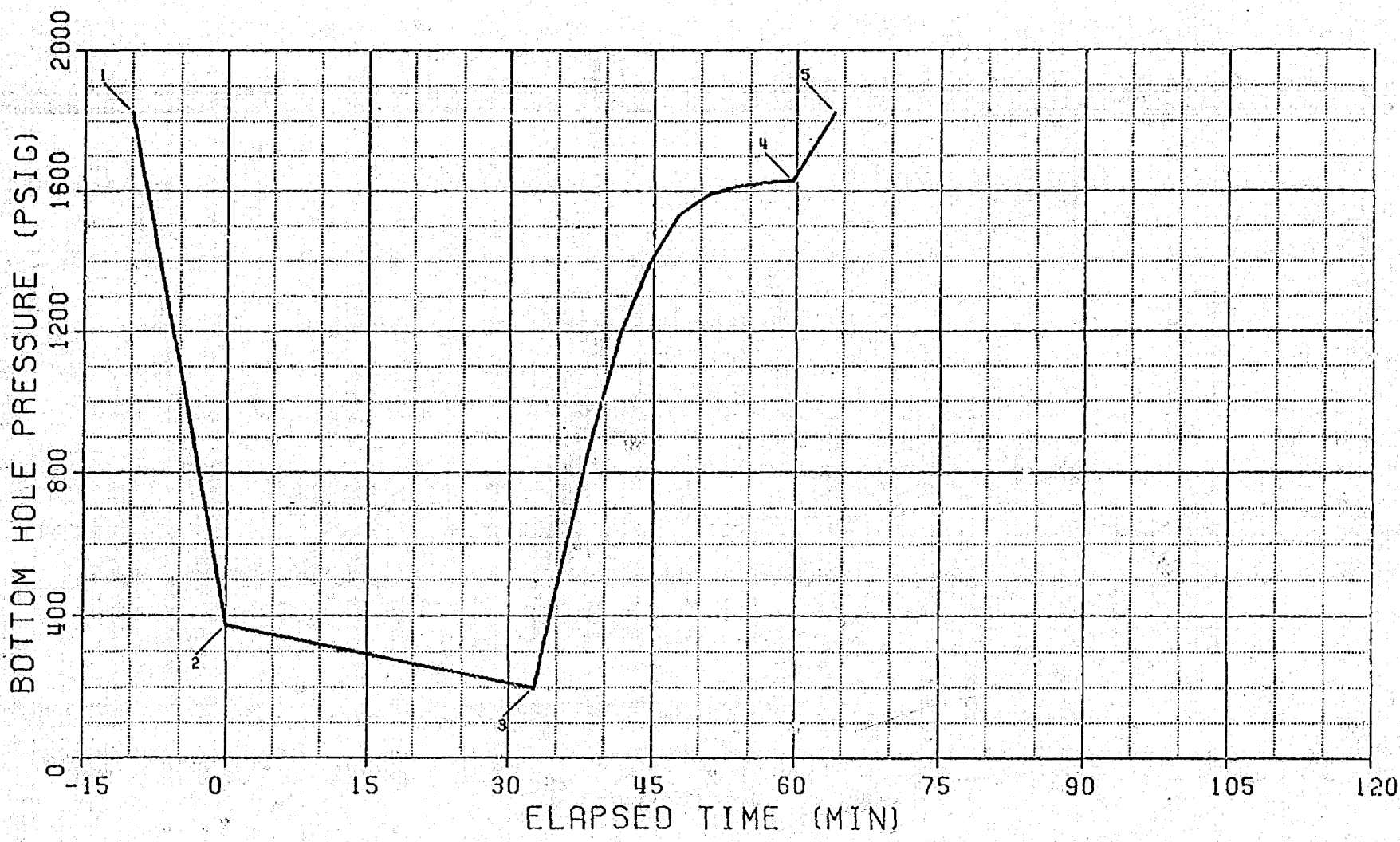
PRESSURE LOG

FIELD REPORT NO. 00095C

INSTRUMENT:

NUMBER: L-436

CAPACITY: 7500 PSI



BOTTOM HOLE PRESSURE AND TIME DATA

INSTRUMENT NO.: L-436 CAPACITY (PSI): 75ØØ
PORT OPENING:— BOTTOM HOLE TEMP (F): 11Ø

EXPLANATION	LABELED POINT	PRESSURE (PSIG)	ELAPSED TIME (MIN)
HYDROSTATIC MUD	1	1825	
START FLOW	2	375	Ø.Ø
END FLOW & START SHUT-IN	3	2Ø1	32.6
END SHUT-IN	4	1629	59.6
HYDROSTATIC MUD	5	1825	

* SUMMARY OF FLOW PERIODS *

FLOW PERIOD	ELAPSED TIME AT START (MIN)	ELAPSED TIME AT END (MIN)	DURATION OF FLOW (MIN)	PRESSURE AT START (PSIG)	PRESSURE AT END (PSIG)
1	Ø.Ø	32.6	32.6	375	2Ø1

* SUMMARY OF SHUT-IN PERIODS *

SHUT-IN PERIOD	ELAPSED TIME AT START (MIN)	ELAPSED TIME AT END (MIN)	DURATION OF SHUT-IN (MIN)	PRESSURE AT START (PSIG)	PRESSURE AT END (PSIG)	FINAL FLOW PRESSURE (PSIG)	PRODUCING TIME (MIN)
1	32.6	59.6	27.Ø	2Ø1	1629	2Ø1	32.6

FIELD REPORT NO. ØØØ95C
INSTRUMENT NO. L-436

FIELD REPORT NO. ØØØ95C
INSTRUMENT NO. L-436

TEST PHASE : FLOW PERIOD # 1

ELAPSED TIME (MIN)	DELTA TIME (MIN)	FLOWING PRESSURE (PSIG)
Ø.Ø	Ø.Ø	375
32.6	32.6	2Ø1

TEST PHASE : SHUT-IN PERIOD # 1

1. FINAL FLOW PRESSURE ["P_{WF}"] = 2Ø1 PSIG
2. PRODUCING TIME ["T_p"] = 32.6 MIN

ELAPSED TIME (MIN)	DELTA TIME ["DT"] (MIN)	SHUT-IN PRESSURE ["P_{WS}"] (PSIG)	LOG [(T_p+DT)/DT]	DELTA PRESSURE [P_{WS} - P_{WF}]
32.6	Ø.Ø	2Ø1		Ø
35.6	3.Ø	565	1.Ø74	364
38.6	6.Ø	9Ø2	Ø.8Ø8	7Ø1
41.6	9.Ø	1198	Ø.665	997
44.6	12.Ø	14ØØ	Ø.57Ø	1199
47.6	15.Ø	1532	Ø.5Ø2	1331
5Ø.6	18.Ø	1591	Ø.449	1390
53.6	21.Ø	1614	Ø.4Ø7	1413
56.6	24.Ø	1625	Ø.373	1424
59.6	27.Ø	1629	Ø.344	1428

Western Petroleum Services

BEFORE EXAMINER STAMETS
OIL CONSERVATION DIVISION
APPLICANTS EXHIBIT NO. 7
CASE NO. 7087
Submitted by BLACKWOOD
Hearing Date 11-13-80

FRACTURE STIMULATION RECOMMENDATION

FOR

BLACKWOOD & NICHOLS CO., LTD

NEBU NO. 203

PICTURED CLIFFS AND FRUITLAND FORMATIONS

BLANCO PICTURED CLIFFS FIELD

SAN JUAN COUNTY, NEW MEXICO

Sec.11, T31N, R7W

Prepared for:
Mr. Loos
Blackwood & Nichols Co., LTD
Farmington, New Mexico

Prepared by:
Randy LaFollette
The Western Company
Denver, Colorado

August 12, 1980

Service Point:
Farmington, New Mexico
505-327-6222

DISCUSSION:

The customer requested fracture stimulation designs for the Pictured Cliffs and Fruitland zones in the #203 well. Mini Max III-30 gel is recommended with a 2% condensate phase for fluid loss control. Mini Max III is a titanate cross-linked hydroxy-propyl guar gum gel featuring very low leak-off, perfect proppant support and neutral pH.

Figure I shows the anticipated rate-pressure relationship for treatment via 4½" casing. At the recommended rate of 30 BPM, a surface pressure of 2,600 psi is expected. Treatment with 100,000 gallons of Mini Max III-30/2% HC and 190,000# 10/20 mesh sand is recommended to yield a propped length of 972 feet. Average sand concentration in the fracture is .73#/ft^2 (see Exhibit II). Figure II shows the McGuire and Sikora productivity increase chart. With the reservoir and fracture parameters given, a theoretical 10 fold production increase is calculated.

The expected rate-pressure graph for the Fruitland is presented in Figure III. At the recommended 17 BPM rate, a surface treating pressure of 2,700 psi is expected. Treatment with 40,000 gallons of Mini Max III-30/2% HC and 76,000# 10/20 mesh sand is recommended to yield a propped length of 1,200 feet. Average sand concentration in the fracture is .75#/ft^2 (see Exhibit II). Figure IV shows the McGuire-Sikora graph. After scaling, an 11 fold productivity increase is calculated.

WELL DATA:

Formation:	Pictured Cliffs
Average Depth To Zone:	3,500 ft.
Zone Height:	133 ft.
Casing Size:	4½"
Perforated Interval:	3456, 3478, 3492, 3518, 3534, 3554, 2 jspf, .34" diameter
Bottom Hole Temperature:	120° F
Fracture Gradient:	.65 psi/ft
Bottom Hole Fracture Pressure:	2,275 psi
Bottom Hole Pressure:	1,375 psi
Overburden:	900 psi
Hydrostatic Head:	1,515 psi with fresh water
ISDP (fresh water):	760 psi
Porosity:	10%
Permeability:	.06 md
Well Spacing:	160 acres

TREATMENT PROCEDURE:

It is recommended that the Pictured Cliffs zone be fracture stimulated via 4½" casing with 100,000 gallons of Mini Max III-30/2% HC gel containing 190,000# 10/20 mesh sand. Average anticipated injection rate and surface treating pressure are 30 BPM and 2,600 psi, respectively. Stage fluid and sand as follows:

1. Pump 20,000 gallons of Mini Max III-30/2% HC as a pad to initiate the fracture and establish sufficient fracture width to accept sand. (Add 1#/1000 B-5.)

2. Pump 20,000 gallons of Mini Max III-30/2% HC with 1 ppg 10/20 mesh sand. (Add 1#/1000 B-5.)

3. Pump 20,000 gallons of Mini Max III-30/2% HC with 2 ppg 10/20 mesh sand. (Add 2#/1000 B-5.)

4. Pump 20,000 gallons of Mini Max III-30/2% HC with 3 ppg 10/20 mesh sand. (Add 2#/1000 B-5.)

5. Pump 20,000 gallons of Mini Max III-30/2% HC with 3½ ppg 10/20 mesh sand. (Add 2#/1000 B-5.)

6. Cut sand, start flush with 500 gallons of Mini Max III-30 gel.

7. Continue to flush to top perforation with 1,815 gallons of fresh water.

8. Shut in for at least 6 hours to allow gel to break and fracture to heal and recover treating fluid load.

NOTE: All gel to contain 2% condensate, 1 gal/1000 Aquaflow, 1 gal/1000 Adocide.

TREATMENT PROCEDURE:

Treating Conductor	4½" casing
Injection Rate	30 BPM
Expected Surface Treating Pressure	2,600 psi
Total Pumpable Volume of Mini Max III-40 Gel Phase	100,000 gallons
Total Pumpable Volume of Condensate	2,000 gallons
Total Pumpable Volume of Fresh Water Flush & Reserve	5,000 gallons
Total 10/20 Mesh Sand Required	190,000#

Auxiliary Materials:

161# B-5 gel breaker

105 gallons Adocide bactericide

105 gallons Aquaflow surfactant

COST ESTIMATE:

100,500 gallons of Mini Max III-30/2% HC @ .24/gal	$24,120.00
161# B-5 @ 2.15/lb	346.15
105 gallons Adocide @ 29.40/gal	3,087.00
105 gallons Aquaflow @ 25.85/gal	2,714.25
Chemical Delivery Charge @ .68/T mi x 3.5 T x 75 mi	178.50
190,000# 10/20 Sand @ 5.25/cwt	9,975.00
Sand Pumping Charge @ .70/cwt	1,330.00
Proppant Delivery Charge @ .68/T mi x 95 T x 75 mi	4,845.00
30 BPM Master Mixer @ 760.00	760.00
1,912 HHP @ 3.15/HHP	6,022.80
Mileage Charge @ 1.90/unit mi x 6 units x 75 mi	855.00
Sandmaster @ 875.00	875.00
Ratiometer @ 134.00	134.00
TOTAL	$55,242.70

Subject to terms and conditions in the published price schedule of The Western Company of North America.

WELL DATA:

Formation:	Fruitland
Average Depth To Zone:	3,380 ft.
Zone Height:	42 ft.
Casing Size:	4½" - 10.5#
Perforated Interval:	3368, 3374, 3384, 3392, 2 jspf, .34" diameter
Bottom Hole Temperature:	120° F
Fracture Gradient:	.9 psi/ft
Bottom Hole Fracture Pressure:	3,050 psi
Bottom Hole Pressure:	1,375 psi
Overburden:	1,675 psi
Hydrostatic Head:	1,450 psi with fresh water
ISDP (fresh water):	1,600 psi
Porosity:	10%
Permeability:	.06 md
Well Spacing:	160 acres

TREATMENT PROCEDURE:

It is recommended that the Fruitland zone be fracture stimulated via 4½" casing with 40,000 gallons of Mini Max III-30/2% HC gel and 76,000# 10/20 mesh sand. Average anticipated injection rate and surface treating pressure are 17 BPM and 2,700 psi, respectively. Stage fluid and proppant as follows:

1. Pump 8,000 gallons of Mini Max III-30/2% HC as a pad to initiate the fracture and establish sufficient fracture width to accept sand. (Add 1#/1000 B-5.)

2. Pump 8,000 gallons of Mini Max III-30/2% HC with 1 ppg 10/20 mesh sand. (Add 1#/1000 B-5.)

3. Pump 8,000 gallons of Mini Max III-30/2% HC with 2 ppg 10/20 mesh sand. (Add 2#/1000 B-5.)

4. Pump 8,000 gallons of Mini Max III-30/2% HC with 3 ppg 10/20 mesh sand. (Add 2#/1000 B-5.)

5. Pump 8,000 gallons of Mini Max III-30/2% HC with 3½ ppg 10/20 mesh sand. (Add 2#/1000 B-5.)

6. Cut sand, start flush with 500 gallons of Mini Max III-30 gel.

7. Continue to flush to top perforation with 1,750 gallons of fresh water.

8. Shut in for at least 6 hours to allow gel to break and fracture to heal and recover treating fluid load.

NOTE: All gel to contain 2% condensate, 1 gal/1000 Aquaflow, 1 gal/1000 Adocide.

TREATMENT REQUIREMENTS:

Treating Conductor	4½" casing
Injection Rate	17 BPM
Expected Surface Treating Pressure	2,700 psi
Total Pumpable Volume of Mini Max III-30 Gel Phase	40,000 gallons
Total Pumpable Volume of Condensate	800 gallons
Total Pumpable Volume of Fresh Water Flush & Reserve	5,000 gallons
Total 10/20 Mesh Sand Required	76,000#

Auxiliary Materials:

42 gallons Aquaflow surfactant

42 gallons Adocide bactericide

65# B-5 gel breaker

COST ESTIMATE:

40,000 gallons of Mini Max III-30/2% HC @ .24/gal	$ 9,600.00
65# B-5 @ 2.15/lb	139.75
42 gallons Adocide @ 29.40/gal	1,234.80
42 gallons Aquaflow @ 25.85/gal	1,085.70
Chemical Delivery Charge @ .68/T mi x 1.5 T x 75 mi	76.50
76,000# 10/20 Sand @ 5.25/cwt	3,990.00
Sand Pumping Charge @ .70/cwt	532.00
Proppant Delivery Charge @ .68/T mi x 38 T x 75 mi	1,938.00
17 BPM Master Mixer @ 730.00	730.00
1,125 HHP @ 3.15/HHP	3,543.75
Mileage Charge @ 1.90/unit mi x 6 units x 75 mi	855.00
Ratiometer @ 134.00	134.00
TOTAL	$23,859.50

Subject to terms and conditions in the published price schedule of The Western Company of North America.

FIGURE I

COMPANY Blackwood & Nichols

WELL #203

DEPTH 3,500'

TREATING STRING 4½"

PERFORMATIONS 12 - .34" holes

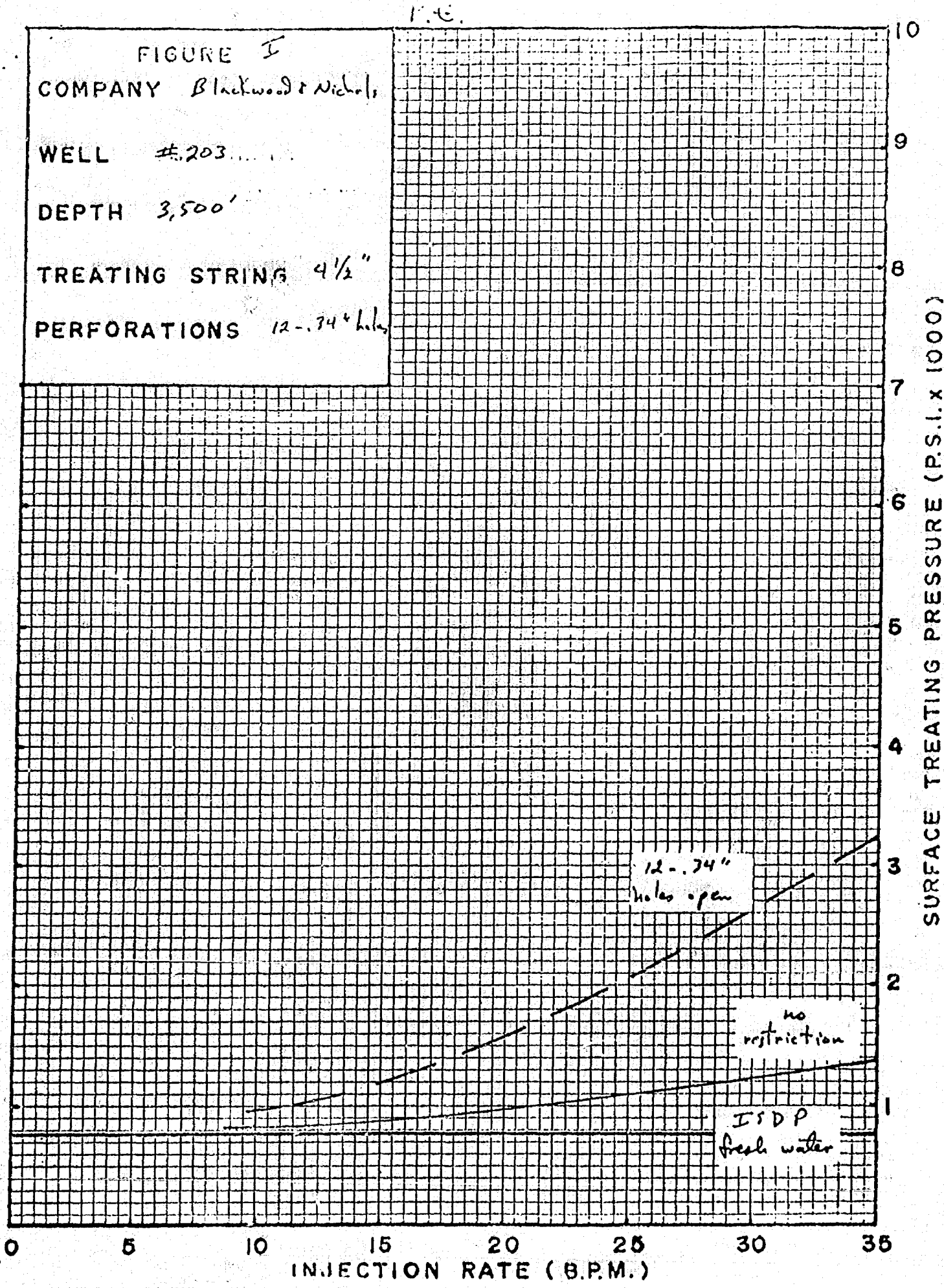
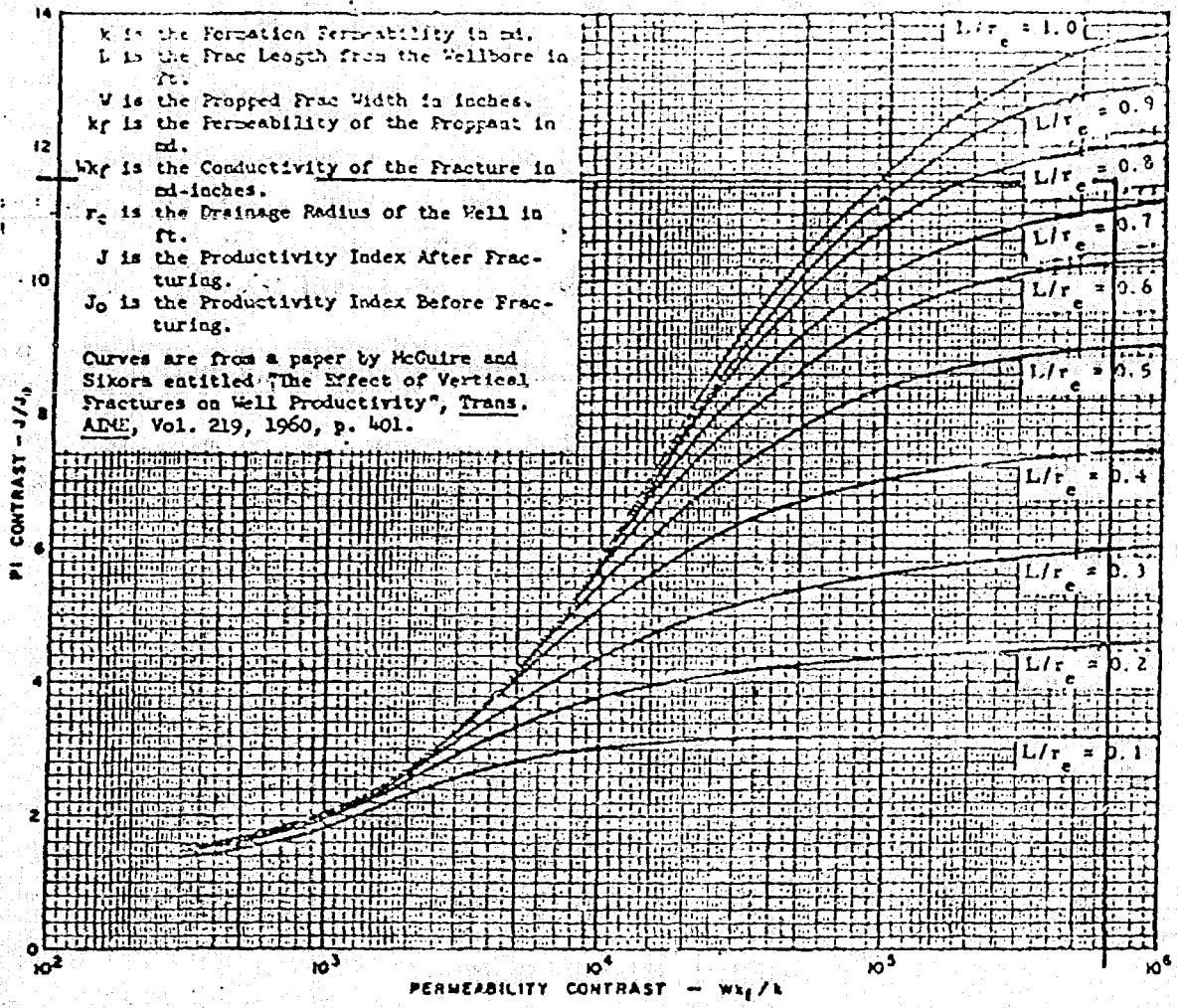


FIGURE II



INCREASES IN PRODUCTION FROM VERTICAL FRACTURES

$J/J_o = 10$ after scaling

Note: This graph is based on a well spacing (A) of 40 acres and a wellbore radius (r_w) of 3 inches. It can be converted to other well spacing and wellbore radii by use of the following scaling factors:

Well Spacing	Drainage Radii	Scaling Factors for Abscissa (Wx_f/k)	Scaling Factors for Ordinate (J/J_o)
For spacing shown and 3-inch wellbore radius.			
10 Acres	330 ft	2.00	1.11
20 Acres	467 ft	1.42	1.05
40 Acres	660 ft	1.00	1.00
80 Acres	933 ft	0.71	0.95
160 Acres	1320 ft	0.50	0.91
320 Acres	1867 ft	0.35	0.87
640 Acres	2640 ft	0.25	0.84
For other spacing (A) and wellbore radii (r_w).			
A	$104\sqrt{A}$	$\sqrt{40/A}$	$\frac{3.095}{\log(.472(r_e/r_w)}$

FIGURE III

COMPANY Blackwood & Nichols

WELL #203

DEPTH 3,380'

TREATING STRING 4½"

PERFORATIONS 8-.34" holes

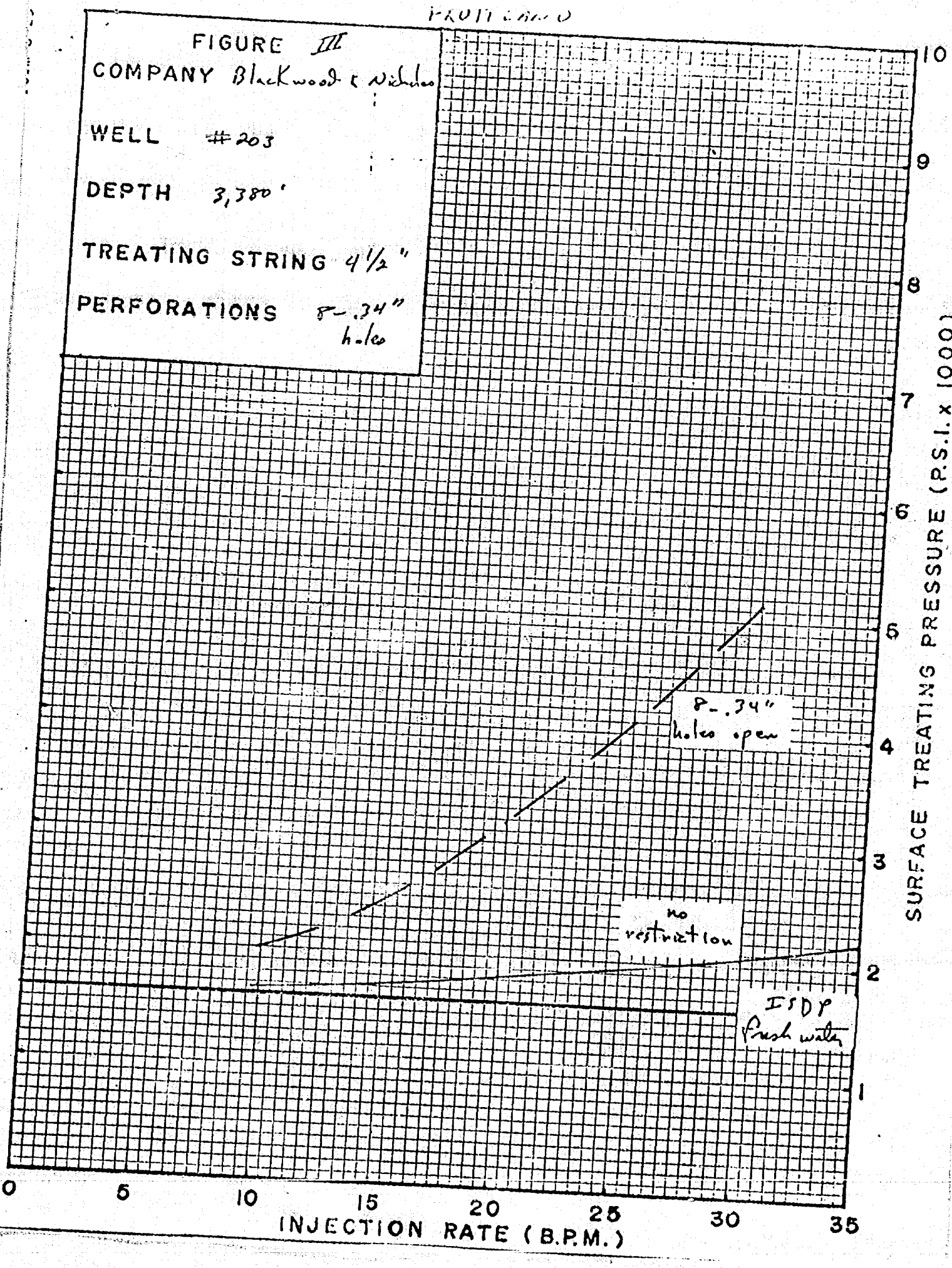
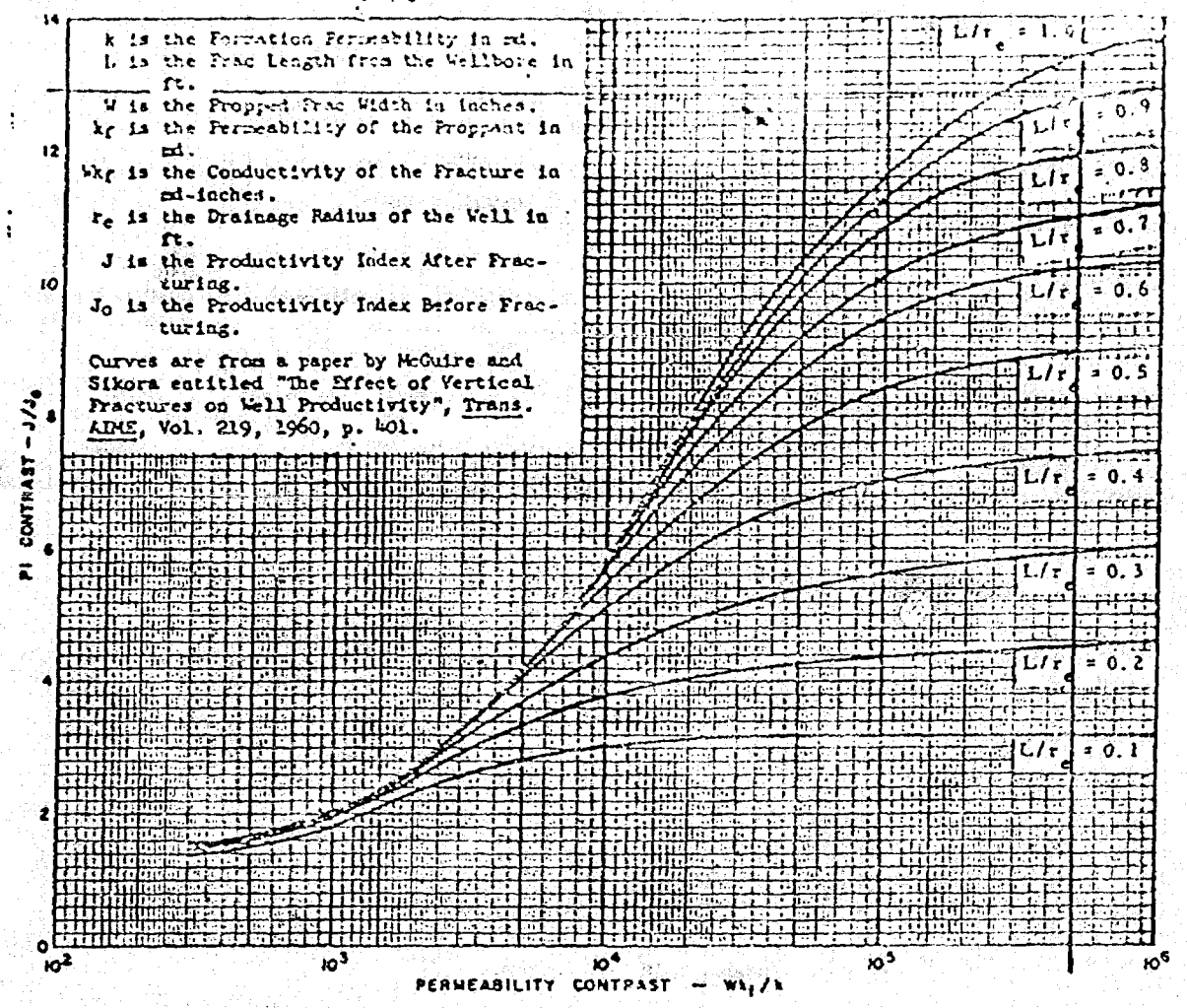


FIGURE IL



INCREASES IN PRODUCTION FROM VERTICAL FRACTURES

$J/J_o = 11$ after scaling

Note: This graph is based on a well spacing (A) of 40 acres and a wellbore radius (r_w) of 3 inches. It can be converted to other well spacing and wellbore radii by use of the following scaling factors:

Well Spacing	Drainage Radii	Scaling Factors for Abscissa (Wk_f/k)	Scaling Factors for Ordinate (J/J_o)
For spacing shown and 3-inch wellbore radius.			
10 Acres	330 ft	2.00	1.11
20 Acres	467 ft	1.42	1.05
40 Acres	660 ft	1.00	1.00
80 Acres	933 ft	0.71	0.95
160 Acres	1320 ft	0.50	0.91
320 Acres	1867 ft	0.35	0.87
640 Acres	2640 ft	0.25	0.84
For other spacing (A) and wellbore radii (r_w).			
A	$104\sqrt{A}$	$\sqrt{40/A}$	$\frac{3.095}{\log(.472)(r_e/r_w)}$

EXHIBIT I

THE WESTERN COMPANY

PROPPANT PROFILE STUDY

PERFECT SUPPORT FLUIDS

FLUID STUDIED - MINI MAX III 30/2%HC
TOTAL VOLUME - 108616 GAL
FLUID PENETRATION - 1121 FT

PERM. TO STIMULATION FLUID - .060	FRAC. PRESSURE - 2275
PERM. TO RESERVOIR FLUID - .060	RESERVOIR PRESSURE - 1375
LEAK-OFF FLUID VISCOSITY - 1.00	N PRIME - .690
RESERVOIR FLUID VISCOSITY - .01	K PRIME - 0.013000
RESERVOIR FLUID COMP. - 4.00E-04	YOUNGS MODULUS - 5.00E+06
STIMULATION FLUID C-III - 0.00080	WIDTH - .396
FRACTURE HEIGHT - 133	INJECTION RATE - 30.0
COMBINED C - 0.00060	

FLUID VOLUME (GAL)	SURFACE PROPPANT CONC (LB/GAL)	LOCATION IN FRACTURE (FT)	FRACTURE PROPPANT CONC (LB/FT^2)	CUMLATIVE PROPPANT (LB)
20000	.00	972 TO 1121	.000	0
20000	1.00	795 TO 972	.425	20000
20000	2.00	582 TO 795	.705	60000
20000	3.00	320 TO 582	.862	120000
20000	3.50	0 TO 320	.821	190000

USED 4.63 UNITS

EXHIBIT II

THE WESTERN COMPANY

PROPPANT PROFILE STUDY

PERFECT SUPPORT FLUIDS

FLUID STUDIED - MINI MAX III 30/2% HC
TOTAL VOLUME - 43446 GAL
FLUID PENETRATION - 1377 FT

PERM. TO STIMULATION FLUID - .060
PERM. TO RESERVOIR FLUID - .060
LEAK-OFF FLUID VISCOSITY - 1.00
RESERVOIR FLUID VISCOSITY - .01
RESERVOIR FLUID COMP. - 4.40E-04
STIMULATION FLUID C-III - 0.00080
FRACTURE HEIGHT - 42
COMBINED C - 0.00083

FRAC. PRESSURE - 3050
RESERVOIR PRESSURE - 1375
N PRIME - .655
K PRIME - 0.024000
YOUNGS MODULUS - 5.00E+06
WIDTH - .383
INJECTION RATE - 17.0

FLUID VOLUME (GAL)	SURFACE PROPPANT CONC (LB/GAL)	LOCATION IN FRACTURE (FT)	FRACTURE PROPPANT CONC (LB/FT^2)	CUMLATIVE PROPPANT (LB)
8000	.00	1203 TO 1377	.000	0
8000	1.00	994 TO 1203	.455	8000
8000	2.00	736 TO 994	.739	24000
8000	3.00	411 TO 736	.880	48000
8000	3.50	0 TO 411	.810	76000

4.76 UNITS

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NEW MEXICO OIL CONSERVATION COMMISSION

Form C-103
Supersedes Old C-102 and C-103
Effective 1-1-65

5a. Indicate Type of Lease
State ☐ Fee ☒

5. State Oil & Gas Lease No.

SUNDRY NOTICES AND REPORTS ON WELLS

(DO NOT USE THIS FORM FOR PROPOSALS TO DRILL OR TO DEEPEN OR PLUG BACK TO A DIFFERENT RESERVOIR. USE "APPLICATION FOR PERMIT —" (FORM C-101) FOR SUCH PROPOSALS.)

1. OIL WELL ☐ GAS WELL ☒ OTHER.

7. Unit Agreement Name
Northeast Blanco Unit Agrmt. #1, Sec. 929

2. Name of Operator
Blackwood & Nichols Co., Ltd.

8. Farm or Lease Name
Northeast Blanco Unit

3. Address of Operator
P. O. Box 123, Durango, Co. 81301

9. Well No.
201

4. Location of Well
UNIT LETTER M, 990 FEET FROM THE South LINE AND 1030 FEET FROM THE West LINE, SECTION 9 TOWNSHIP 31N RANGE 7W NMPM.

10. Field and Pool, or Wildcat
So. Los Pinos Fruitland-PC

15. Elevation (Show whether DF, RT, GR, etc.)
6652' GL

12. County
San Juan

16. Check Appropriate Box To Indicate Nature of Notice, Report or Other Data

NOTICE OF INTENTION TO:		SUBSEQUENT REPORT OF:	
PERFORM REMEDIAL WORK ☐	PLUG AND ABANDON ☐	REMEDIAL WORK ☐	ALTERING CASING ☐
TEMPORARILY ABANDON ☐		COMMENCE DRILLING OPNS. ☐	PLUG AND ABANDONMENT ☐
PULL OR ALTER CASING ☐	CHANGE PLANS ☐	CASING TEST AND CEMENT JOB ☐	
OTHER ☐		OTHER Water encroachment ☒	

17. Describe Proposed or Completed Operations (*Clearly state all pertinent details, and give pertinent dates, including estimated date of starting any proposed work*) SEE RULE 1103.

7-21-80 3697' PBTD. Pulled 2 3/8" tubing. Ran Gamma Ray and Neutron Logs. Set drillable bridge plug at 3549'. Tested perforation at 3560' - 3588', no decrease in water. Set cement retainer at 3536'. Shut off water and gas. Set drillable cement retainer at 3373'. Squeeze cemented perforations 3441' - 3449', with 50 sacks neat cement, squeezed off at 2500 PSI.

7-22-80 3697' PBTD. Drilled retainer at 3373' and cement to 3459'.

7-23-80 3697' PBTD. Perforated 4 1/2" csg. 3482' - 3494' with 11 holes. Versagel fractured with 30,350 gals. water and 30,000 lbs. 10-20 sand. Maximum pressure 2450 PSI, average treating pressure 2300 PSI, average injection rate 17.5 bbls/min.

7-25-80 3697' PBTD. Reran 111 jts. 2 3/8" 4.7# J-55 EUE tubing set at [illegible]

BEFORE EXAMINER STAMETS
OIL CONSERVATION DIVISION
EXHIBIT NO. 8
CASE NO. 7087
Submitted by Blackwood
Hearing Date 11-12-80

18. I hereby certify that the information above is true and complete to the best of my knowledge and belief.

SIGNED R. C. Lamb for DeLasso Loos TITLE District Manager DATE 7-28-80

APPROVED BY _____ TITLE _____ DATE _____

CONDITIONS OF APPROVAL, IF ANY:

Form 9-331
Dec. 1973

Form Approved.
Budget Bureau No. 42-R1424

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUNDRY NOTICES AND REPORTS ON WELLS

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

1. oil well ☐ gas well ☒ other

2. NAME OF OPERATOR
Blackwood & Nichols Co., Ltd.

3. ADDRESS OF OPERATOR
P.O. Box 1237, Durango, Co. 81301

4. LOCATION OF WELL (REPORT LOCATION CLEARLY. See space 17 below.)
AT SURFACE: 1070' F/NL - 1760' F/EL
AT TOP PROD. INTERVAL: Same
AT TOTAL DEPTH: Same

5. LEASE
NM 03358

6. IF INDIAN, ALLOTTEE OR TRIBE NAME

7. UNIT AGREEMENT NAME
Northeast Blanco Unit #1, Sec. 929

8. FARM OR LEASE NAME
Northeast Blanco Unit

9. WELL NO.
202

10. FIELD OR WILDCAT NAME
South Los Pinos PC

11. SEC., T., R., M., OR BLK. AND SURVEY OR AREA
B-11-31N-7W

12. COUNTY OR PARISH: San Juan
13. STATE: New Mexico

14. API NO.

15. ELEVATIONS (SHOW DF, KDB, AND WD)
6440' GL

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

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

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

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

8-15-79 Perforated two holes per foot per interval; 3272', 3282', 3292', 3306', 3318', 3402', 3412', 3420', 3428', 3440', 3446', 3452', 3474'; twenty-six holes. Mini-Max II fractured with 48,000 gals of gelled water, 80,000 lbs 10-20 sand, 500 gallons 10% acetic acid. Ten HCL ball sealers. Maximum treating pressure 3000 PSI; Average treating pressure 1300 PSI; Average injection rate 26 bbls/min.

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

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

SIGNED DeLasso Loobtle TITLE District Manager DATE 8-21-79

(This space for Federal or State office use)

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

*See Instructions on Reverse Side

BEFORE EXAMINER STAMETS
OIL CONSERVATION DIVISION
APPLICANT'S EXHIBIT NO. 9
CASE NO. 7087
Submitted by BLACKWOOD
Hearing Date 11-12-80

Form 9-331
Dec. 1973

Form Approved.
Budget Bureau No. 42-R1424

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUNDRY NOTICES AND REPORTS ON WELLS

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

1. oil well ☐ gas well ☒ other

2. NAME OF OPERATOR
Blackwood & Nichols Co., Ltd.

3. ADDRESS OF OPERATOR
P.O. Box 1237, Durango, Colo. 81301

4. LOCATION OF WELL (REPORT LOCATION CLEARLY. See space 17 below.)
AT SURFACE: 990' F/NL - 1490' F/EL
AT TOP PROD. INTERVAL: Same
AT TOTAL DEPTH: Same

5. LEASE
NM 03358

6. IF INDIAN, ALLOTTEE OR TRIBE NAME

7. UNIT AGREEMENT NAME
NEBU Agrmt. No. 1, Sec. 929

8. FARM OR LEASE NAME
Northeast Blanco Unit

9. WELL NO.
203

10. FIELD OR WILDCAT NAME
South Los Pinos-Fruitland - PC

11. SEC., T., R., M., OR BLK. AND SURVEY OR AREA
C-11-31N-7W

12. COUNTY OR PARISH
San Juan

13. STATE
New Mexico

14. API NO.
30-045-23485

15. ELEVATIONS (SHOW DF, KDB, AND WD)
6546' GL

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

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

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

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

7-13-80 3630' PBTD. Pulled 2 3/8" tubing, Ran Gamma Ray and Neutron Logs. Set Retrievamatic Packer at 3496'. Well made water thru tubing.

7-15-80 3630' PBTD. Reset packer at 3459'. Well making water thru tubing and between tubing and 4 1/2" csg. Reset packer at 3393'. Well making water thru tubing. Dry gas between tubing and 4 1/2" csg. Set cement retainer at 3409'.

7-16-80 3630' PBTD. Set Retrievamatic at 3405', pressured up to 2000 PSI, held OK.

7-17-80 3630' PBTD. Reran 108 jts. 2 3/8" 4.7# J-55 EUE tubing; 3356' landed at 3366'.

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

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

SIGNED Lucas Loos TITLE District Manager DATE 7-28-80

(This space for Federal or State office use)

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

*See Instructions on Reverse Side

BEFORE EXAMINER STAMETS
OIL CONSERVATION DIVISION
APPLICANT'S EXHIBIT NO. 10
CASE NO. 7087
Submitted by BLACKWOOD
Hearing Date 11-12-80

BEFORE EXAMINER STAMETS
OIL CONSERVATION DIVISION
APPLICANT'S EXHIBIT NO. 11
CASE NO. 7087
Submitted by BLACKWOOD
Hearing Date 11-12-80

BLACKWOOD & NICHOLS CO., LTD.
P.O. BOX 1237
DURANGO, COLORADO 81301
(303) 247-0728

Drilling Report - Pictured Cliffs

Northeast Blanco Unit Well No. 204 LOCATION: 830' F/SL - 990' F/WL
Sec. 1-T31N-R7W
San Juan County, New Mexico
Elevation: 6546' GL

8-8-79 Moved Four Corners Drilling Company's rig on location and rigging up.

8-9-79 350', sand. Nippled up, tested 9 5/8" casing to 800 PSI for thirty minutes; held O.K. Spudded 12¼" hole at 10:30 A.M., 8-8-79. Ran 5 jts 9 5/8" 36.00# H-40 casing; 204' set at 217'. Cemented with 150 sacks class B cement with 1/4# flocele per sack and 2% $CaCl_2$. Plug down 4:00 P.M., 8-8-79; cement circulated. 1/4° at 217'.

8-10-79 1930' sand. 3/4° @ 721', 1° @ 1242', 2° @ 1682'.

8-11-79 2572', sand. 1½° at 2307'.

8-12-79 3128', sand. Mud wt. 10.6#, vis. 43.

8-13-79 3600', shale. Mud wt. 10.6#, vis. 40. 1° at 3128', 1° at 3600'. Laying down 3½" drill pipe.

8-14-79 3680' TD, shale. Mud wt. 10.6# Vis. 48. Ran 113 jts 4½" 10.50# K-55 casing; 3675' set at 3686'. Float collar at 3635'; cemented with 265 sacks Howco Lite cement with 1/4# flocele per sack, followed with 222 sacks 50-50 Pozmix with 2% gel and 1/4# flocele per sack. Plug down 2:15 PM, 8-13-79. Rig released.

8-18-79 3680' TD; 3640' PBTD. Moved Drake Well Services rig on location and rigged up. Picked up 2 3/8" tubing with 3 7/8" bit. Cleaned out to 3640'. Tested 4½" casing to 3400 PSI for thirty minutes, held OK. Spotted 500 gals 10% acetic acid. Ran Gamma Ray Correlation and Cement Bond logs. Perforated two holes per foot per interval; 3404', 3412', 3420', 3428', 3442', 3498', 3518', 3530', 3538', 3548' 3574' 3598' - twenty-four holes. Preparing to fracture.

8-19-79 3680' TD; 3640' PBTD. Mini-Max II fractured with 48,048 gallons gelled water. 75,000 lbs 10-20 sand. Maximum treating pressure 2000 PSI; Average treating pressure 1600 PSI; Average Injection rate 28 bbls/min. Dropped ten HCl ball sealers. Final shut-in pressure 650 PSI. Well now cleaning up.

8-20-79 3640' PBTD. Going in hole with tubing, cleaning out.

8-21-79 3640' PBTD. Cleaning out, preparing to land 2 3/8" tubing.

8-22-79 3640' PBTD. Cleaned out to 3640'. Ran 119 jts 2 3/8" 4.7# J-55 EUE tubing; 3569' landed at 3580'. Seating nipple at 3550'. Released rig 2:00 PM, 8-21-79.

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	GAS		
OPERATOR			
PRORATION OFFICE			

NEW MEXICO OIL CONSERVATION COMMISSION
REQUEST FOR ALLOWABLE
AND
AUTHORIZATION TO TRANSPORT OIL AND NATURAL GAS

Form C-104
Supersedes Old C-104 and C-1
Effective 1-1-65

BEFORE EXAMINER STAMETS
OIL CONSERVATION DIVISION
APPLICANTS EXHIBIT NO. 12
CASE NO. 7087
Submitted by BLACKWOOD
Hearing Date 11-12-80

I. Operator: Blackwood & Nichols Co., Ltd.

Address: P.O. Box 1237, Durango, Colorado 81301

Reason(s) for filing (Check proper box)
- New Well [X]
- Recompletion [ ]
- Change in Ownership [ ]
- Change in Transporter of: Oil [ ] Dry Gas [ ] Casinghead Gas [ ] Condensate [ ]
- Other (Please explain)

If change of ownership give name and address of previous owner _____

II. DESCRIPTION OF WELL AND LEASE

Lease Name	Well No.	Pool Name, Including Formation	Kind of Lease	Lease No.
Northeast Blanco Unit	204	South Los Pinos PC	State, Federal or Fee Fee	

Location: Unit Letter M ; 830 Feet From The South Line and 990 Feet From The West

Line of Section 1 Township 31N Range 7W , NMPM, San Juan County

III. DESIGNATION OF TRANSPORTER OF OIL AND NATURAL GAS

Name of Authorized Transporter of Oil [X] or Condensate [ ]	Address (Give address to which approved copy of this form is to be sent)
Inland Corporation	P.O. Box 1528 Farmington, New Mexico 8740
Name of Authorized Transporter of Casinghead Gas [ ] or Dry Gas [XX]	Address (Give address to which approved copy of this form is to be sent)
El Paso Natural Gas Company	P.O. Box 990 Farmington, New Mexico 8740

If well produces oil or liquids, give location of tanks.	Unit	Sec.	Twp.	Rge.	Is gas actually connected?	When
					No	

If this production is commingled with that from any other lease or pool, give commingling order number: _____

IV. COMPLETION DATA

Designate Type of Completion – (X)	Oil Well	Gas Well	New Well	Workover	Deepen	Plug Back	Same Res'v.	Diff. Res'v.
		X	X					

Date Spudded	Date Compl. Ready to Prod.	Total Depth	P.B.T.D.
8-8-79	8-21-79	3680'	3640'
Elevations (DF, RKB, RT, GR, etc.)	**Name of Producing Formation**	**Top Oil/Gas Pay**	**Tubing Depth**
6546' GL	Fruitland - P.C.	3404"	3580'
Perforations			**Depth Casing Shoe**
3404' - 3598' Twenty-four holes			3686'

TUBING, CASING, AND CEMENTING RECORD

HOLE SIZE	CASING & TUBING SIZE	DEPTH SET	SACKS CEMENT
12 1/4"	9 5/8"	217'	150
7 7/8"	4 1/2"	3686'	487

V. TEST DATA AND REQUEST FOR ALLOWABLE (Test must be after recovery of total volume of load oil and must be equal to or exceed top allowable for this depth or be for full 24 hours)

OIL WELL

Date First New Oil Run To Tanks	Date of Test	Producing Method (Flow, pump, gas lift, etc.)	
Length of Test	**Tubing Pressure**	**Casing Pressure**	**Choke Size**
Actual Prod. During Test	**Oil - Bbls.**	**Water - Bbls.**	**Gas - MCF**

GAS WELL

Actual Prod. Test - MCF/D	Length of Test	Bbls. Condensate/MMCF	Gravity of Condensate
Q=4476	Three Hours		
Testing Method (pitot, back pr.)	**Tubing Pressure (Shut-in)**	**Casing Pressure (Shut-in)**	**Choke Size**
Back Pr	1420	1420	3/4"

VI. CERTIFICATE OF COMPLIANCE

I hereby certify that the rules and regulations of the Oil Conservation Commission have been complied with and that the information given above is true and complete to the best of my knowledge and belief.

DeLasso Loos
(Signature)
District Manager
(Title)
8-30-79
(Date)

OIL CONSERVATION COMMISSION

APPROVED _____, 19____

BY _____

TITLE _____

This form is to be filed in compliance with RULE 1104.

If this is a request for allowable for a newly drilled or deepe well, this form must be accompanied by a tabulation of the devist tests taken on the well in accordance with RULE 111.

All sections of this form must be filled out completely for all able on new and recompleted wells.

Fill out only Sections I, II, III, and VI for changes of ow well name or number, or transporter, or other such change of condit

Form 9-331
Dec. 1973

Form Approved.
Budget Bureau No. 42-R1424

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUNDRY NOTICES AND REPORTS ON WELLS

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

1. oil well ☐ gas well ☒ other

2. NAME OF OPERATOR
Blackwood & Nichols Co., Ltd.

3. ADDRESS OF OPERATOR
P. O. Box 1237, Durango, Co. 81301

4. LOCATION OF WELL (REPORT LOCATION CLEARLY. See space 17 below.)
AT SURFACE: 1180' F/SL - 925' F/EL
AT TOP PROD. INTERVAL: Same
AT TOTAL DEPTH: Same

5. LEASE
NM 03358

6. IF INDIAN, ALLOTTEE OR TRIBE NAME

7. UNIT AGREEMENT NAME
NEBU Agrmt. No. 1, Sec. 929

8. FARM OR LEASE NAME
Northeast Blanco Unit

9. WELL NO.
205

10. FIELD OR WILDCAT NAME
South Los Pinos Fruitland - PC

11. SEC., T., R., M., OR BLK. AND SURVEY OR AREA
P-10-31N-7W

12. COUNTY OR PARISH
San Juan

13. STATE
New Mexico

14. API NO.
30-045-23601

15. ELEVATIONS (SHOW DF, KDB, AND WD)
6560' GL

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

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

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

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

7-18-80 3620' PBTD. Pulled 2 3/8" tubing, ran Gamma Ray and Neutron Logs. Set cement retainer at 3430'. Tested 4 1/2" csg. to 3000 PSI for 10 minutes, held OK. Perforated 3350' - 3362' with 11 holes. Versagel fractured with 300 gals. 15% HCL acid and 28,640 gals. water, 30,000 lbs. 10-20 sand. Maximum pressure 2700 PSI, average teating pressure 2200 PSI, average injection rate 15 bbls/min.

7-20-80 3620' PBTD. Reran 107 jts. 2 3/8" 4.7# J-55 EUE tubing; set at 3339'.

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

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

SIGNED Debasso Loos TITLE District Manager DATE 7-28-80

(This space for Federal or State office use)

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

*See Instructions on Reverse Side

BEFORE EXAMINER STAMETS
OIL CONSERVATION DIVISION
APPLICANTS EXHIBIT NO. 13
CASE NO. 7087
Submitted by BLACKWOOD
Hearing Date 11-12-80

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OPERATOR	1	1

Form C-105
Revised 1-1-65

NEW MEXICO OIL CONSERVATION COMMISSION
WELL COMPLETION OR RECOMPLETION REPORT AND LOG

5a. Indicate Type of Lease: State ☐ Fee ☒

5. State Oil & Gas Lease No.

7. Unit Agreement Name

8. Farm or Lease Name: Yager

9. Well No.: 3

10. Field and Pool, or Wildcat: Undesignated PC&SO. Los Pinos Fruitland Extension

12. County: San Juan

TYPE OF WELL

TYPE OF COMPLETION: NEW WELL [Y] WORK OVER ☐ DEEPEN ☐ PLUG BACK ☐ DIFF. RESVR. ☐ OTHER

OIL WELL ☐ GAS WELL [X] DRY ☐ OTHER

Name of Operator: Palmer Oil & Gas Company

Address of Operator: P. O. Box 2564, Billings, Montana, 59103

Location of Well: UNIT LETTER N LOCATED 800 FEET FROM THE South LINE AND 1850 FEET FROM THE West LINE OF SEC. 3 TWP. 31N RGE. 7W NMPM

Date Spudded	16. Date T.D. Reached	17. Date Compl. (Ready to Prod.)	18. Elevations (DF, RKB, RT, GR, etc.)	19. Elev. Cashinghead
8/2/77	8/11/77	10/25/77	6597 KB	

Total Depth	21. Plug Back T.D.	22. If Multiple Compl., How Many	23. Intervals Drilled By →	Rotary Tools	Cable Tools
3669	3647	two		0-TD	

Producing Interval(s), of this completion — Top, Bottom, Name
ctured Cliffs - 3361-3391
uitland: 3155-65, 3182-3209, 3219-27, 3233-39, 3245-51, 3258-63, 3267-71, 3275-95

25. Was Directional Survey Made: No

Type Electric and Other Logs Run
chlumberger - No open hole logs run - ran CBL-GR & TDT thru casing

27. Was Well Cored: No

CASING RECORD (Report all strings set in well)

CASING SIZE	WEIGHT LB./FT.	DEPTH SET	HOLE SIZE	CEMENTING RECORD	AMOUNT PULLED
9 5/8"	36#	237'	13 3/4"	250 sacks	
7 "	20#	3652'	8 3/4"	700 sacks	

LINER RECORD

SIZE	TOP	BOTTOM	SACKS CEMENT	SCREEN
None				

30. TUBING RECORD

SIZE	DEPTH SET	PACKER SET
2 3/8"	3413	3318' Model "D"
1½"	3232	none

Perforation Record (Interval, size and number)

3361-3391
3155-65
3182-3209
3219-27
3233-39
3245-51
3258-63
3267-71
3275-95
(1 shot/foot)

32. ACID, SHOT, FRACTURE, CEMENT SQUEEZE, ETC.

DEPTH INTERVAL	AMOUNT AND KIND MATERIAL USED
3361-3391	1000 gals. 15% MR-1
3361-3391	52,700 gals gelled wtr; 45,000# 10-2

PRODUCTION

Date First Production	Production Method (Flowing, gas lift, pumping — Size and type pump)	Well Status (Prod. or Shut-in)
SI	Flowing	SI

Date of Test	Hours Tested	Choke Size	Prod'n. For Test Period →	Oil — Bbl.	Gas — MCF	Water — Bbl.	Gas — Oil Ratio

Flow Tubing Press.	Casing Pressure	Calculated 24-Hour Rate →	Oil — Bbl.	Gas — MCF	Water — Bbl.	Oil Gravity — API (Corr.)
- SITP 1293 - SITP 1421	PC - SICP 1478					

Disposition of Gas (Sold, used for fuel, vented, etc.)
Will be sold

Test Witnessed By

List of Attachments

DEC 27 1977
OIL CON. COM.
DIST. 3

I hereby certify that the information shown on both sides of this form is true and complete to the best of my knowledge and belief.

SIGNED Robert D Ballantine TITLE Drilling Supt. DATE 12/2/77

BEFORE EXAMINER STAMETS
OIL CONSERVATION DIVISION
APPLICANTS EXHIBIT NO. 14
CASE NO. 7087
Submitted by BLACKWOOD
Hearing Date 11-12-80

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NEW MEXICO OIL CONSERVATION COMMISSION

WELL COMPLETION OR RECOMPLETION REPORT AND LOG

Form C-105
Revised 1-1-65

5a. Indicate Type of Lease: State ☐ Fee ☒

5. State Oil & Gas Lease No.

a. TYPE OF WELL

b. TYPE OF COMPLETION: NEW WELL ☒ WORK OVER ☐ DEEPEN ☐ PLUG BACK ☐ DIFF. RESVR. ☐ OTHER ☐ — OIL WELL ☐ GAS WELL ☒ DRY ☐ OTHER

7. Unit Agreement Name

8. Farm or Lease Name: Yager

2. Name of Operator: Palmer Oil & Gas Company

9. Well No.: No. 4

3. Address of Operator: P. O. Box 2564, Billings, Montana 59103

10. Field and Pool, or Wildcat: Undesignated PC & S. Los Pinos Fruit. Ext.

4. Location of Well: UNIT LETTER E LOCATED 1450 FEET FROM THE N LINE AND 835 FEET FROM THE E LINE OF SEC. 10 TWP. 31N RGE. 7W NMPM

12. County: San Juan

15. Date Spudded	16. Date T.D. Reached	17. Date Compl. (Ready to Prod.)	18. Elevations (DF, RKB, RT, GR, etc.)	19. Elev. Cashinghead
12/16/78	1/15/78	3/21/78	6601 GL, 6612 KB	

20. Total Depth	21. Plug Back T.D.	22. If Multiple Compl., How Many	23. Intervals Drilled By	Rotary Tools	Cable Tools
3603'	3599'	two	→	0-TD	

24. Producing Interval(s), of this completion — Top, Bottom, Name
3197-3276 - Fruitland
3350-3517 - Pictured Cliffs

25. Was Directional Survey Made: no

26. Type Electric and Other Logs Run
Schlumberger - FDC/CNL-GR

27. Was Well Cored: no

28. CASING RECORD (Report all strings set in well)

CASING SIZE	WEIG. LB./FT.	DEPTH SET	HOLE SIZE	CEMENTING RECORD	AMOUNT PULLED
8-5/8"	24#	220'	12-1/4"	250 SX	
5-1/2"	14#	3602'	7-7/8"	200 SX	

29. LINER RECORD

SIZE	TOP	BOTTOM	SACKS CEMENT	SCREEN

30. TUBING RECORD

SIZE	DEPTH SET	PACKER SET
2-3/8"	3310'	3310'
1"	3157'	

31. Perforation Record (Interval, size and number)
L Pictured Cliffs: 3495, 3500, 3503, 3515, 3517
J Pictured Cliffs: 3350', 3352, 3355, 3365, 3367, 3382.
Fruitland: 3197-3204, 3208-26, 3232-48, 3262-76 (1 shot/foot)

32. ACID, SHOT, FRACTURE, CEMENT SQUEEZE, ETC.

DEPTH INTERVAL	AMOUNT AND KIND MATERIAL USED
3517-3382'	500 gal. 15% HCL; foam frac
	w/2102 bbls 70% foam & 120,000# 10/20
	sd, 1,826 MMCF Nitrogen
3197-3276	Natural

33. PRODUCTION

Date First Production: shut in
Production Method (Flowing, gas lift, pumping — Size and type pump): flowing
Well Status (Prod. or Shut-in): shut in

Date of Test	Hours Tested	Choke Size	Prod'n. For Test Period →	Oil — Bbl.	Gas — MCF	Water — Bbl.	Gas — Oil Ratio
FR- 3/21/78 PC 3/14/78	3 hrs						

Flow Tubing Press.	Casing Pressure	Calculated 24-Hour Rate →	Oil — Bbl.	Gas — MCF	Water — Bbl.	Oil Gravity — API (Corr.)
FR-SITP 1425 PC-SITP 1475	FR-SICP 1427					

34. Disposition of Gas (Sold, used for fuel, vented, etc.)
to be sold

Test Witnessed By: Joe Elledge

35. List of Attachments

36. I hereby certify that the information shown on both sides of this form is true and complete to the best of my knowledge and belief.

SIGNED James G. Routson TITLE Petroleum Engineer DATE 3/28/78

BEFORE EXAMINER STAMETS
OIL CONSERVATION DIVISION
APPLICANT'S EXHIBIT NO. 15
CASE NO. 7087
Submitted by BLACKWOOD
Hearing Date 11.12.80

Form 9-330
(Rev. 5-63)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUBMIT IN DUPLICATE (See other instructions on reverse side)

Form approved.
Budget Bureau No. 42-R355.5.

WELL COMPLETION OR RECOMPLETION REPORT AND LOG*

5. LEASE DESIGNATION AND SERIAL NO.: NM-28749

6. IF INDIAN, ALLOTTEE OR TRIBE NAME:

7. UNIT AGREEMENT NAME:

8. FARM OR LEASE NAME: Federal

9. WELL NO.: No. 3

10. FIELD AND POOL, OR WILDCAT: Undesignated PC and S. Los Pinos Fruitland Ext.

11. SEC., T., R., M., OR BLOCK AND SURVEY OR AREA: SW¼NE¼ Sec. 10-31N-7W

1a. TYPE OF WELL: OIL WELL ☐ GAS WELL ☒ DRY ☐ Other

b. TYPE OF COMPLETION: NEW WELL ☒ WORK OVER ☐ DEEP-EN ☐ PLUG BACK ☐ DIFF. RESVR. ☐ Other

2. NAME OF OPERATOR: Palmer Oil & Gas Company

3. ADDRESS OF OPERATOR: P. O. Box 2564, Billings, Montana 59103

4. LOCATION OF WELL (Report location clearly and in accordance with any State requirements)*
At surface: 1850' FNL, 1640' FEL
At top prod. interval reported below: same
At total depth: Same

14. PERMIT NO. | DATE ISSUED

12. COUNTY OR PARISH: San Juan | 13. STATE: New Mexico

15. DATE SPUDDED	16. DATE T.D. REACHED	17. DATE COMPL. (Ready to prod.)	18. ELEVATIONS (DF, RKB, RT, GR, ETC.)*	19. ELEV. CASINGHEAD
3/27/78	4/4/78	5/13/78	6539 GL, 3550 KB	

20. TOTAL DEPTH, MD & TVD	21. PLUG, BACK T.D., MD & TVD	22. IF MULTIPLE COMPL., HOW MANY*	23. INTERVALS DRILLED BY	ROTARY TOOLS	CABLE TOOLS
3630'	3585'	two	→	0-TD	

24. PRODUCING INTERVAL(S), OF THIS COMPLETION—TOP, BOTTOM, NAME (MD AND TVD)*
3325-3522 - Pictured Cliffs
3106-3264 - Fruitland

25. WAS DIRECTIONAL SURVEY MADE: no

26. TYPE ELECTRIC AND OTHER LOGS RUN: no open hole logs were run

27. WAS WELL CORED: no

28. CASING RECORD (Report all strings set in well)

CASING SIZE	WEIGHT, LB./FT.	DEPTH SET (MD)	HOLE SIZE	CEMENTING RECORD	AMOUNT PULLED
8-5/8"	24#	252' KB	12-1/4"	225 sx	
5-1/2"	14#	3630'	7-7/8"	350 sx	

29. LINER RECORD

SIZE	TOP (MD)	BOTTOM (MD)	SACKS CEMENT*	SCREEN (MD)

30. TUBING RECORD

SIZE	DEPTH SET (MD)	PACKER SET (MD)
2-3/8"	3300'	
1"	3209'	

31. PERFORATION RECORD (Interval, size and number)
PC - 3325, 3326, 3328, 3332, 3344, 3351, 3483, 3486, 3516, 3522 (1 shot each)
Fr - 3106-20, 3130-36, 3150-90, 3198-3214, 3228-36, 3252-56, 3260-64 (1 sh/ft)

32. ACID, SHOT, FRACTURE, CEMENT SQUEEZE, ETC.

DEPTH INTERVAL (MD)	AMOUNT AND KIND OF MATERIAL USED
3325-3522	500 gal 15% HCl. Foam fraced w/120,000 10/20 sd, 1,336,500 scf N_2.
3106-3264 - no	treatment

33.* PRODUCTION

DATE FIRST PRODUCTION	PRODUCTION METHOD (Flowing, gas lift, pumping—size and type of pump)	WELL STATUS (Producing or shut-in)
shut in	flowing	shut-in

DATE OF TEST	HOURS TESTED	CHOKE SIZE	PROD'N. FOR TEST PERIOD →	OIL—BBL.	GAS—MCF.	WATER—BBL.	GAS-OIL RATIO
5/13/78	3 hrs	3/4"			FR 78 PC 225		

FLOW. TUBING PRESS.	CASING PRESSURE	CALCULATED 24-HOUR RATE →	OIL—BBL.	GAS—MCF.	WATER—BBL.	OIL GRAVITY-API (CORR.)
PC 138 FR. 38	FCP 599			1806 624		

34. DISPOSITION OF GAS (Sold, used for fuel, vented, etc.): to be sold

TEST WITNESSED BY: Joe Elledge

35. LIST OF ATTACHMENTS

36. I hereby certify that the foregoing and attached information is complete and correct as determined from all available records

SIGNED Robert D. Ballantyne TITLE Production Sup't DATE 5/30/78
Robert D. Ballantyne

*(See Instructions and Spaces for Additional Data on Reverse Side)

BEFORE EXAMINER STAMETS
OIL CONSERVATION DIVISION
APPLICANTS EXHIBIT NO. 16
CASE NO. 7087
Submitted by ENGLEWOOD
Hearing Date 11-12-80

Supplemental Gas Volume estimates for

October Gas Sales 1980

Northeast Blanco Unit Well No.	Gas Sales	Fruitland	Days	15,025 Mcfpd	14,73 Mcfpd
201	1054	1054	32	33	34
202*	9573	4787	32	150	153
203	588	588	30	20	21
204*	7119	3560	32	111	113
205	1714	1714	32	54	55

*The Fruitland and Pictured Cliffs formations are being produced commingled in these 2 (two) wells (202 & 204). The production has been assigned equally to each formation.

Northeast Blanco Unit Well No. 201
October production 34 Mcfpd.
The estimated stabilized production to the atmosphere = 1500/ (1500-300) x 34 = 43Mcfpd. The 43 Mcfpd is after stimulation. The flow improvement should be at least 4 times because of stimulation. Therefore the "non stimulated stabilized production rate to the atmosphere" is estimated to be 11 Mcfpd.

Northeast Blanco Unit Well No. 202
October Production rate (Fruitland) 153 Mcfpd.
The estimated stabilized production rate (stimulated) to the atmosphere is calculated to be 1478/ (1478-310) x 153 = 194Mcfpd. The stimulation procedure theoretically improved the producing capacity by a factor grater than 4. Therefore the "non stimulated stabilized production rate to the atmosphere" is estimated to be 48 Mcfpd for October, 1980 from the Fruitland formation.

Northeast Blanco Unit Well No. 203
October production averaged 21 Mcfpd.
The estimated stabilized production rate to the atmosphere is 1475/ (1475-310) x 21 = 27Mcfpd. The stimulation procedure used on this well has been calculated to show that the production should have been increased 10 fold. Therefore the estimated "non stimulated stabilized production rate to the atmosphere" is calculated to be 3 Mcfpd.

Northeast Blanco Unit Well No. 204
October production averaged 113 Mcfpd from the Fruitland.
The estimated stabilized production rate to the atmosphere is 1420/ (1420-310) x 113 = 145Mcfpd. The well was stimulated prior to production in a manner to increase the productivity at least 4 times. Therefore the estimated "non stimulated stabilized production rate to the atmosphere" is 36Mcfpd.

Northeast Blanco Unit Well No. 205
October production averaged 55 Mcfpd.
The estimated stabilized production rate to the atmosphere is estimated to be 1475/ (1475-310) x 55 = 70Mcfpd. This well was stimulated in a manner which should have increased productivity at least 4 times. Therefore the "non stimulated stabilized production rate to the atmosphere" is 18Mcfpd.

In October the 5 Northeast Blanco Unit wells averaged 75 Mcfpd per well actual gas sales from the Fruitland formation. All of these wells have been stimulated by fracturing.

The estimated average per well stabilized production(prior to stimulation and adjusted to zero line pressure) is 23 Mcfpd .

This average of 23 Mcfpd per well is down from the 25 Mcfpd per well calculated for the wells in this area from July production.

BEFORE EXAMINER STAMETS
OIL CONSERVATION DIVISION
APPLICANTS EXHIBIT NO. 20
CASE NO. 7087
Submitted by Bradbury
Hearing Date 12/10/80

CAMPBELL AND BLACK, P.A.
LAWYERS

JACK M. CAMPBELL
BRUCE D. BLACK
MICHAEL B. CAMPBELL
WILLIAM F. CARR

POST OFFICE BOX 2208
JEFFERSON PLACE
SANTA FE, NEW MEXICO 87501
TELEPHONE (505) 988-4421

October 23, 1980

Mr. Joe D. Ramey
Director
Oil Conservation Division
New Mexico Department of
Energy & Minerals
Post Office Box 2088
Santa Fe, New Mexico 87501

Case 7087

Re: Application of Blackwood & Nichols Co., Ltd. for Designation of Tight Formation under Section 107 of the NGPA -- Fruitland Formation

Dear Mr. Ramey:

Enclosed in triplicate is the application of Blackwood & Nichols Company in the above-referenced matter with all exhibits required by the Commission's Special Rules and Procedures for Tight Formation Designation attached.

Blackwood & Nichols Co., Ltd. requests that this matter be docketed for hearing on November 12, 1980.

Very truly yours,

William F. Carr

WFC:lr

Enclosures

cc: Mr. Charles Blackwood

BEFORE THE

OIL CONSERVATION DIVISION

NEW MEXICO DEPARTMENT OF ENERGY AND MINERALS

IN THE MATTER OF THE APPLICATION OF
BLACKWOOD & NICHOLS COMPANY, LTD.,
FOR DESIGNATION OF TIGHT FORMATION,
SAN JUAN AND RIO ARRIBA COUNTIES,
NEW MEXICO

CASE 7087

A P P L I C A T I O N

COMES NOW, BLACKWOOD & NICHOLS COMPANY, LTD., 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 Fruitland 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 Fruitland formation underlying the following described lands situated in San Juan and Rio Arriba Counties, New Mexico:

Township 30 North, Range 7 West, N.M.P.M.
Sections 2 through 21: All
Section 22: W/2 W/2
Section 29: N/2

Township 30 North, Range 8 West, N.M.P.M.
Section 1: All
Section 12: All
Section 13: All
Section 24: All

Township 31 North, Range 6 West, N.M.P.M.
Section 6: Lots 8, 9, 10 and 11, S/2
Section 7: All
Sections 18 through 20: All
Section 30: All

Township 31 North, Range 7 West, N.M.P.M.
Section 1: Lots 5, 6, 7 and 8, S/2
Sections 9 through 16: All
Sections 19 through 36: All

Township 31 North, Range 8 West, N.M.P.M.
Section 25: All
Section 36: All

Containing a total of 33,500 acres, more or less.

2. The Fruitland 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 average depth of the top of the Fruitland formation is 2800 feet and the stabilized production rate, against atmospheric pressure, of wells completed for production in said formation, without stimulation, is not expected to exceed 79 mcf of gas per day.

4. No well drilled into the Fruitland formation in the above-described area is expected to produce, without stimulation, more than five barrels of crude oil per day.

5. Attached to this application and incorporated herein by reference is a complete set of exhibits which applicant proposes to offer or introduce at the hearing on this application, together with a statement of the meaning and purpose of each exhibit. (See report entitled "Geographical and Geological Description of the Formation"). These exhibits cover all aspects of the required evidentiary date described in Section D of the Oil Conservation Division's Special Rules and Procedures for Tight Sand Formation Designation under Section 107 of the Natural Gas Policy Act of 1978.

WHEREFORE, Applicant prays that this application be set for hearing before a duly appointed examiner of the Oil Conservation Division and that after notice and hearing as required by law, the Division enter its order recommending to the Federal Energy Regulatory Commission that pursuant to 18 CFR, Section 271.701-705, that the Fruitland formation underlying the above-described land be designated a tight formation, and making such other and further provisions as may be proper in the premises.

Respectfully submitted,

CAMPBELL & BLACK, P.A.

By William F. Carr

William F. Carr
Attorneys for Applicant
Post Office Box 2208
Santa Fe, NM 87501
Telephone: (505) 988-4421

Certificate of Service

I hereby certify that 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 State Geological Survey at Post Office Box 26124, Albuquerque, New Mexico, 87125, on this 23rd day of October, 1980.

William F. Carr

William F. Carr

BEFORE THE

OIL CONSERVATION DIVISION

NEW MEXICO DEPARTMENT OF ENERGY AND MINERALS

IN THE MATTER OF THE APPLICATION OF
BLACKWOOD & NICHOLS COMPANY, LTD.,
FOR DESIGNATION OF TIGHT FORMATION,
SAN JUAN AND RIO ARRIBA COUNTIES,
NEW MEXICO

CASE 7087

A P P L I C A T I O N

COMES NOW, BLACKWOOD & NICHOLS COMPANY, LTD., 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 Fruitland 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 Fruitland formation underlying the following described lands situated in San Juan and Rio Arriba Counties, New Mexico:

Township 30 North, Range 7 West, N.M.P.M.
Sections 2 through 21: All
Section 22: W/2 W/2
Section 29: N/2

Township 30 North, Range 8 West, N.M.P.M.
Section 1: All
Section 12: All
Section 13: All
Section 24: All

Township 31 North, Range 6 West, N.M.P.M.
Section 6: Lots 8, 9, 10 and 11, S/2
Section 7: All
Sections 18 through 20: All
Section 30: All

Township 31 North, Range 7 West, N.M.P.M.
Section 1: Lots 5, 6, 7 and 8, S/2
Sections 9 through 16: All
Sections 19 through 36: All

Township 31 North, Range 8 West, N.M.P.M.
Section 25: All
Section 36: All

Containing a total of 33,500 acres, more or less.

2. The Fruitland 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 average depth of the top of the Fruitland formation is 2800 feet and the stabilized production rate, against atmospheric pressure, of wells completed for production in said formation, without stimulation, is not expected to exceed 79 mcf of gas per day.

4. No well drilled into the Fruitland formation in the above-described area is expected to produce, without stimulation, more than five barrels of crude oil per day.

5. Attached to this application and incorporated herein by reference is a complete set of exhibits which applicant proposes to offer or introduce at the hearing on this application, together with a statement of the meaning and purpose of each exhibit. (See report entitled "Geographical and Geological Description of the Formation"). These exhibits cover all aspects of the required evidentiary date described in Section D of the Oil Conservation Division's Special Rules and Procedures for Tight Sand Formation Designation under Section 107 of the Natural Gas Policy Act of 1978.

WHEREFORE, Applicant prays that this application be set for hearing before a duly appointed examiner of the Oil Conservation Division and that after notice and hearing as required by law, the Division enter its order recommending to the Federal Energy Regulatory Commission that pursuant to 18 CFR, Section 271.701-705, that the Fruitland formation underlying the above-described land be designated a tight formation, and making such other and further provisions as may be proper in the premises.

Respectfully submitted,

CAMPBELL & BLACK, P.A.

By William F. Carr
William F. Carr
Attorneys for Applicant
Post Office Box 2208
Santa Fe, NM 87501
Telephone: (505) 988-4421

Certificate of Service

I hereby certify that 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 State Geological Survey at Post Office Box 26124, Albuquerque, New Mexico, 87125, on this 23rd day of October, 1980.

William F. Carr
William F. Carr

Dockets Nos. 42-80 and 43-80 are tentatively set for December 30, 1980 and January 14, 1981. Applications for hearing must be filed at least 22 days in advance of hearing date.

DOCKET: EXAMINER HEARING - WEDNESDAY - DECEMBER 10, 1980

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 January, 1981, from fifteen prorated pools in Lea, Eddy, and Chaves Counties, New Mexico.

(2) Consideration of the allowable production of gas for January, 1981, from four prorated pools in San Juan, Rio Arriba, and Sandoval Counties, New Mexico.

CASE 7095: In the matter of the hearing called by the Oil Conservation Division on its own motion to permit Bill G. Isler, United States Fidelity and Guranty Company, and all other interested parties to appear and show cause why the Spears State Well No. 2 in Unit B of Section 28, Township 11 South, Range 27 East, Chaves County, should not be plugged and abandoned in accordance with a Division-approved plugging program.

CASE 7096: Application of Read & Stevens, Inc. for a unit agreement, Lea County, New Mexico. Applicant, in the above-styled cause, seeks approval for the North Baum Unit Area, comprising 637 acres, more or less, of State lands in Township 13 South, Ranges 32 and 33 East.

CASE 7097: Application of Mesa Petroleum Co. for a unit agreement, Lea County, New Mexico. Applicant, in the above-styled cause, seeks approval for the Jackson Unit Area, comprising 2,560 acres, more or less, of State lands in Township 24 South, Range 33 East.

CASE 7098: Application of The Wiser Oil Company for a dual completion, Lea County, New Mexico. Applicant, in the above-styled cause, seeks approval for the dual completion of its McQuatters Well No. 4 located in Unit G of Section 11, Township 21 South, Range 36 East, to produce oil from the Oil Center-Glorieta and Hardy-Drinkard Pools through parallel strings of tubing.

CASE 7077: (Continued from November 25, 1980, Examiner Hearing)

Application of Threshold Development Company for a dual completion, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks approval for the dual completion of its Conoco "10" State Com Well No. 1 located in Unit I of Section 10, Township 19 South, Range 29 East, Turkey Track Field, to produce oil from the Wolfcamp formation and gas from the Atoka formation through parallel strings of tubing.

CASE 7089: (Continued from November 25, 1980, Examiner Hearing)

Application of Summit Energy, Inc. for a waterflood project, Lea County, New Mexico. Applicant, in the above-styled cause, seeks authority to institute a waterflood project by the injection of water into the Blinebry formation through its Gulf Bunin Well No. 2 located in Unit C of Section 13, Township 21 South, Range 37 East.

CASE 7099: Application of Harvey E. Yates Company for a unit agreement, Lea County, New Mexico. Applicant, in the above-styled cause, seeks approval for the Duncan Unit Area, comprising 7,679 acres, more or less, of State, Federal, and fee lands in Townships 13 and 14 South, Range 35 East.

CASE 7100: Application of Harvey E. Yates Company for downhole commingling, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks approval for the downhole commingling of Atoka and Morrow production in the wellbore of its Travis 24 State Com Well No. 1 in Unit H of Section 24, Township 18 South, Range 28 East.

CASE 7101: Application of Consolidated Oil & Gas, Inc. for downhole commingling, Rio Arriba County, New Mexico. Applicant, in the above-styled cause, seeks approval for the downhole commingling of Gallup and Basin-Dakota production in the wellbore of its Tribal "C" Well No. 4-E in Unit H of Section 6, Township 26 North, Range 3 West.

CASE 7102: Application of Consolidated Oil & Gas, Inc. for approval of infill drilling and an exception to Rule 9(E) of Order No. R-1670-T, San Juan County, New Mexico. Applicant, in the above-styled cause, seeks a finding that the drilling of its Jacquez Well No. 2 to be located in Unit K of Section 2, Township 31 North, Range 13 West, is necessary to effectively and efficiently drain that portion of the proration unit which cannot be so drained by the two existing wells on the unit. Applicant further seeks an exception to Rule 9(E) of Division Order No. R-1670-T to permit calculating the proration unit's allowable on the basis of three Mesaverde wells on the unit.

CASE 7103: Application of E. L. Latham, Jr. for compulsory pooling, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks an order pooling all mineral interests in the Wolfcamp thru Pennsylvanian formations underlying the N/2 of Section 7, Township 22 South, Range 26 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 7104: Application of Conoco Inc. for the amendment of Orders Nos. R-4633 and WFX-462, Lea County, New Mexico. Applicant, in the above-styled cause, seeks the amendment of Division Orders Nos. R-4633 and WFX-462, which authorized the injection of water into applicant's Maljamar Mitchell Waterflood Project in Section 5, Township 17 South, Range 32 East. The amendments sought would include carbon dioxide in the injection authorization for said project.

CASE 7105: Application of C and 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 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 7106: Application of C and 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 S/2 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 7107: Application of C and E Operators, Inc. for compulsory pooling and a non-standard proration unit, San Juan County, New Mexico. Applicant, in the above-styled cause, seeks an order pooling all mineral interests in the Mesaverde formation underlying a 158.54-acre non-standard gas proration unit comprising the SW/4 of Section 9, Township 30 North, Range 11 West, to be dedicated to a well to be drilled at a standard location thereon. Also to be considered will be the cost of drilling and completing said well and the allocation of the cost thereof as well as actual operating costs and charges for supervision, designation of applicant as operator of the well, and a charge for risk involved in drilling said well.

CASE 7090: (Continued from November 25, 1980, Examiner Hearing)

Application of Dorchester Exploration, Inc. for directional drilling and an unorthodox gas well location, Chaves County, New Mexico. Applicant, in the above-styled cause, seeks authority to re-enter the old Union Hill Well No. 1, the surface location of which is 2310 feet from the North and West lines of Section 27, Township 12 South, Range 28 East, and to directionally drill in an indeterminate direction from a kick-off point at 7300 feet, bottoming said well at an approximate depth of 8100 feet in the Mississippian formation less than 330 feet away from the surface location. The W/2 of said Section 27 would be dedicated to the well.

CASE 6668: (Continued from November 25, 1980, Examiner Hearing)

In the matter of Case 6668 being reopened pursuant to the provisions of Order No. R-6139 which order promulgated temporary special rules and regulations for the South Culebra Bluff-Bone Spring Pool in Eddy County, New Mexico, including a provision for 80-acre spacing units. Operators in said pool may appear and show cause why the pool should not be developed on 40-acre spacing units.

CASE 7092: (Continued from November 25, 1980, Examiner Hearing)

Application of Delta Drilling Company for pool extension, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks the extension of the South Culebra Bluff-Bone Spring Pool to include all of Sections 2, 11, 13, 14, 23, and 24, Township 23 South, Range 28 East.

CASE 7056: (Continued and Readvertised)

Application of Getty Oil Company for the extension of vertical limits of the Jalmat Pool, Lea County, New Mexico. Applicant, in the above-styled cause, seeks the contraction of the vertical limits of the Langlie-Mattix Pool and the downward extension of the vertical limits of the Jalmat Pool to a depth of 3740 feet, subsurface, under the NW/4 SW/4 of Section 3, Township 24 South, Range 36 East.

CASE 7108: Application of HNG Oil Company for compulsory pooling, Lea County, New Mexico. Applicant, in the above-styled cause, seeks an order pooling all mineral interests in the Wolfcamp and Pennsylvanian formations underlying the S/2 of Section 32, Township 21 South, Range 35 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 7109: Application of Alpha Twenty-One Production Company for approval of infill drilling, Lea County, New Mexico. Applicant, in the above-styled cause, seeks a finding that the El Paso Tom Federal Well No. 1 located 330 feet from the North and West lines of Section 33, Township 25 South, Range 37 East, is necessary to effectively and efficiently drain that portion of an existing proration unit in the Langlie-Mattix Pool which cannot be so drained by the existing well(s).

CASE 7110: Application of Alpha Twenty-One Production Company for approval of infill drilling, Lea County, New Mexico. Applicant, in the above-styled cause, seeks a finding that the El Paso Tom Federal Well No. 3 located 1650 feet from the North and West lines of Section 33, Township 25 South, Range 37 East, is necessary to effectively and efficiently drain that portion of an existing proration unit in the Langlie-Mattix Pool which cannot be so drained by the existing well(s).

CASE 7111: Application of Alpha Twenty-One Production Company for approval of infill drilling, Lea County, New Mexico. Applicant, in the above-styled cause, seeks a finding that the El Paso Tom Federal Well No. 2 located 1650 feet from the North line and 330 feet from the West line of Section 33, Township 25 South, Range 37 East, is necessary to effectively and efficiently drain that portion of an existing proration unit in the Langlie-Mattix Pool which cannot be so drained by the existing well(s).

CASE 7112: Application of Alpha Twenty-One Production Company for approval of infill drilling, Lea County, New Mexico. Applicant, in the above-styled cause, seeks a finding that the Harrison Federal Well No. 3 located 1980 feet from the North line and 660 feet from the West line of Section 27, Township 25 South, Range 37 East, is necessary to effectively and efficiently drain that portion of an existing proration unit in the Jalmat Gas Pool which cannot be so drained by the existing well(s).

CASE 7086: (Continued from November 12, 1980, Examiner Hearing)

Application of Blackwood & Nichols Company, Ltd. for designation of a tight formation, San Juan and Rio Arriba Counties, New Mexico. Applicant, in the above-styled cause, seeks the designation of the Pictured Cliffs formation underlying portions of Townships 30 and 31 North, Ranges 6, 7, and 8 West, containing 33,500 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 7087: (Continued from November 12, 1980, Examiner Hearing)

Application of Blackwood & Nichols Company, Ltd. for designation of a tight formation, San Juan and Rio Arriba Counties, New Mexico. Applicant, in the above-styled cause, seeks the designation of the Fruitland formation underlying portions of Townships 30 and 31 North, Ranges 6, 7, and 8 West, containing 33,500 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 7046: (Continued and Readvertised)

Application of Cotton Petroleum Corporation for downhole commingling, Rio Arriba County, New Mexico. Applicant, in the above-styled cause, seeks approval for the downhole commingling of Chacra and Pictured Cliffs production in the wellbores of wells in the South Blanco-Pictured Cliffs Pool located in Sections 1 thru 4, 9 thru 14, and 23 and 24, Township 24 North, Range 4 West.

****

DOCKET: COMMISSION HEARING - THURSDAY - DECEMBER 11, 1980 Docket No. 41-80

OIL CONSERVATION COMMISSION - 9 A.M. - ROOM 205
STATE LAND OFFICE BUILDING, SANTA FE, NEW MEXICO

CASE 7025: (DE NOVO)

Application of Southland Royalty Company for compulsory pooling, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks an order pooling all mineral interests in the Pennsylvanian formation underlying the W/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.

Upon application of Southland Royalty Company this case will be heard De Novo pursuant to the provisions of Rule 1220.

CASE 7008: (DE NOVO)

Application of Coronado Exploration Corp. for eight compulsory poolings, Chaves County, New Mexico. Applicant, in the above-styled cause, seeks an order pooling all mineral interests in the San Andres formation underlying eight 40-acre proration units, being the NE/4 NE/4 of Section 4 and the NW/4 NE/4 of Section 5, both in Township 12 South, Range 28 East, and the NW/4 SE/4 of Section 6, the Section 32, and the SE/4 NW/4 of Section 33, all in Township 11 South, Range 28 East, each 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 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.

Upon application of Tenneco Oil Company this case will be heard De Novo pursuant to the provisions of Rule 1220.

CASE 6965: (DE NOVO)

Application of Supron Energy Corporation for a non-standard gas proration unit, Rio Arriba County, New Mexico. Applicant, in the above-styled cause, seeks approval of a 160-acre non-standard Mesaverde and Dakota gas proration unit comprising the SE/4 of Section 8, Township 25 North, Range 3 West, to be dedicated to a well to be drilled at a standard location thereon.

Upon application of Curtis J. Little and Beartooth Oil and Gas Company this case will be heard De Novo pursuant to the provisions of Rule 1220.

CASE 6896: (DE NOVO)

Application of John E. Schalk for a non-standard gas proration unit and an unorthodox gas well location, Rio Arriba County, New Mexico. Applicant, in the above-styled cause, seeks approval of a 160-acre non-standard Blanco Mesaverde gas proration unit comprising the NE/4 of Section 8, Township 25 North, Range 3 West, to be dedicated to his Gulf Well No. 2 to be drilled at an unorthodox location 1925 feet from the North line and 790 feet from the East line of said Section 8.

Upon application of Curtis J. Little and Beartooth Oil and Gas Company this case will be heard De Novo pursuant to the provisions of Rule 1220.

CASE 6996: (Continued from November 25, 1980, Examiner Hearing)

Application of John E. Schalk for compulsory pooling, Rio Arriba County, New Mexico. Applicant, in the above-styled cause, seeks an order pooling all mineral interests in the Blanco Mesaverde Pool underlying the NE/4 of Section 8, Township 25 North, Range 3 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.

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. 7087
Order No. R- 6594

APPLICATION OF BLACKWOOD & NICHOLS CO., LTD. FOR DESIGNATION OF A TIGHT FORMATION, SAN JUAN AND RIO ARRIBA COUNTIES, NEW MEXICO.

ORDER OF THE DIVISION

BY THE DIVISION:

This cause came on for hearing at 9:00 a.m. on November 12, 1980, at Santa Fe, New Mexico, before Examiner Richard L. Stamets.

NOW, on this _____ day of _____, 1980, 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, Blackwood & Nichols Co., Ltd. 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 Fruitland formation underlying the following lands situated in San Juan and Rio Arriba Counties, New Mexico, hereinafter referred to as the Fruitland formation, be designated as a tight formation in said Federal Energy Regulatory Commission's regulations:

Township 30 North, Range 7 West, N.M.P.M.
Sections 2 through 10: All
Section 16: W/2
Sections 17 through 21: All
Section 29: N/2

Township 30 North, Range 8 West, N.M.P.M.
Section 1: All
Sections 12 ~~and 13~~ 13: All
~~Section 13: All~~
Section 24: All

approximately 18 miles ~~from~~ east of the city of Aztec,

Township 31 North, Range 6 West, N.M.P.M.
Section 6: Lots 8, 9, 10 and 11, S/2
Section 7: All
Sections 18 through 20: All
Section 30: All

Township 31 North, Range 7 West, N.M.P.M.
Section 1: Lots 5, 6, 7 and 8, S/2
Sections 9 through 16: All
Sections 19 through 36: All

Township 31 North, Range 8 West, N.M.P.M.
Section 25: All
Section 36: All

(3) That the Fruitland formation underlies all of the above-described lands; that the formation consists of primarily coal seams, shales and tight sandstone stringers; that the top of such formation is found at an average depth of 2800 feet below the surface of the area set out in Finding No. (2) above; and that the thickness of such formation varies with an average thickness of 300 feet within said area.

(4) That the type section for the Fruitland formation for the proposed tight formation designation is found at a depth of from approximately 2926 feet to 3224 feet on the Laserlog dated July 30, 1978, from the Northeast Blanco Unit Well No. 17-A located in Unit D of Section 9, Township 30 North, Range 7 West, Rio Arriba County, New Mexico.

(5) That the following described wells produce natural gas in commercial quantities from the Fruitland formation within the proposed area:

Northeast Blanco Unit Well #202	NE/4, Section 11, T-31-N, R-7-W, San Juan County, New Mexico
Northeast Blanco Unit Well #204	SW/4, Section 1, T-31-N, R-7-W, San Juan County, New Mexico

(6) That the Fruitland formation underlying the above described lands has been penetrated by in excess of one hundred ~~other~~ wells, none of which produced natural gas in commercial quantities from the Fruitland formation.

(7) That the evidence presented in this case demonstrated that no well formerly or currently completed in the Fruitland formation within the proposed area exhibited permeability, gas

productivity, or crude oil productivity 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.

(8) That based on analysis of available data from existing wells within the proposed area and utilizing generally and customarily accepted petroleum engineering techniques and measurements:

(a) The estimated average in situ gas permeability throughout the pay section of the Fruitland formation is expected to be 0.1 millidarcy or less; and

(b) The stabilized production rate, against atmospheric pressure, of wells completed for production in the Fruitland formation, without stimulation, is not expected to exceed production levels determined by reference to well depth, as found in the table set out in 18 C.F.R. §271.703(c)(2)(B) of the regulations; and

(c) No well drilled into the formation is expected to produce, without stimulation, more than five barrels of crude oil per day.

(9) That within the proposed area there is the Ojo Alamo aquifer, found at depths of approximately 2000 feet or approximately 800 feet above the Fruitland formation.

(10) That existing State of New Mexico and Federal Regulations relating to casing and cementing of wells will assure that development of the Fruitland formation will not adversely affect said aquifers.

(11) That the Fruitland formation, or any portion thereof, as described herein, is not currently being developed by infill drilling as defined in 18 C.F.R. §271.703(b)(6) of the regulations.

(12) That the Fruitland formation within the proposed area 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 Fruitland formation underlying the following described lands in San Juan and Rio Arriba Counties, New Mexico, be designated as a tight formation:

Township 30 North, Range 7 West, N.M.P.M.
Sections 2 through 10: All
Section 16: W/2
Sections 17 through 21: All
Section 29: N/2

Township 30 North, Range 8 West, N.M.P.M.
Section 1: All
Sections 12 ~~and 13~~ 13: All
~~Section 13: All~~
Section 24: All

Township 31 North, Range 6 West, N.M.P.M.
Section 6: Lots 8, 9, 10 and 11 and S/2
Section 7: All
Sections 18 through 20: All
Section 30: All

Township 31 North, Range 7 West, N.M.P.M.
Section 1: Lots 5, 6, 7 and 8 and S/2
Sections 10 through 16: All
Sections 19 through 36: All

Section 9: S/2
Section 10: S/2

Township 31 North, Range 8 West, N.M.P.M.
Section 25: All
Section 36: All

(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.

STATE OF NEW MEXICO
OIL CONSERVATION DIVISION

JOE D. RAMEY
Director