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

Application

Transcripts

Small Exhibits



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

April 9, 1981

PRIS 1981

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

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OIL CONSERVATION DIVISION SANTA FE

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. Edrivner 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 & VICHOLS CO., LTD. FOR DESIGNATION OF A TIGHT FORMATION, SAN JUAN AND RIO ARRIBA COUNTIES, NEW HEXICO.

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 public 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 Axtec, 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

-2-Case No. 7087 Order No. R-6594

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 1G: S/2
Sections 11 through 16: All
Sections 19 through 36: All

TOWNSHIP 31 NORTH, RANGE 8 WEST, NMPH 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 dopth 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

-3-Case No. 7087 Order No. R-6594

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 atimulation, against atmospheric pressure, as found in the table set out in 18 C.F.R. §271.703(n)(2)(8) 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)(8) 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.

-4-Case No. 7087 Order No. R-6594

- (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 comenting 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 follow-ing 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, NAPM 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 5/2 Section 7: All Sections 18 through 20: All Section 30: All -5-Case No. 7087 Order No. R-6594

TOWNSHIP 31 NORTH, RANGE 7 WEST, NMPM Section 1: Lots 5, 6, 7 and 8 and S/2 Section 9: S/2

Section 10: 5/2 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 becassary.

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

STATE OF NEW MEXICO DIVISION

JOE D. RAMEY Director

Pd/

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BLACKWOOD & NICHOLS CO., LTD.

2013 FIRST NATIONAL CENTER WEST OKLAHOMA CITY, OKLAHOMA 73102

405 235 8505

	BEFORE MALE OTALETS OIL COLUMN DATABLETS
	CASE NO. 7087
100	Submitted by Blackwood
F	Hearing Date 12/0/80 RUITLAND FORMATIO

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.

(A)

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

Ap Production (to the pipeline)
Shut in pres. Production (to the atmosphere)

Where Ap = 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 Fruit-land & 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)

A kadiga daga kataban sa kacamatan sa	Mcf	Days	Mcf/pd	Mcfpd/zone
June, 1980	17,584	32	550	275
July, 1980	12,606	24	526	263
and Table 10 Table Table 1 and the second				

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.

922 - 292 270 922 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 continuously. 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 July, 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.

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

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 recompletion 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

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

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

원 사회의 이 교육의 교육이 하고 있어 가지를 보냈다.	Prod. Mcf	Days	Mcfpd
May, 1980	3 47	31	14
		00	10
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.

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

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

	Prod. Mcf	Days	Mcfpd
June, 1980	286	24	12
July, 1930	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 almosphere"

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

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BEFORE EXAMINER STAMETS
OIL CONSERVATION DIVISION
OF LOCATEXHIBIT NO. 2
CASE NO. 1687
Submitted by Xack...

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 pressure sures 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

GEOLOGICAL SURVEY
FARHINGTON DISTRICT
DURANGO DISTRICT

OIL CONSERV			
Opplicants EXHI	1. 1.6. 1.8		area () area ()
	7087		
Submitted by	Black	word_	
Hearing Date_	12/10	180	

Supplement to USGC 17:3

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. GEHERAL

- 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.
- 8: 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.

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- I. Blumout prevention equipment is to be instilled, tested, and in most, 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.
- Will area and lease premises will be maintained in a work-mailike 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.
 - 8. 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. Vegetition removed during clearly operations should be placed in drainages, washes, guilles, 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 plied 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:

3	Slope		Slope Distance
			0.00 (2.24
less lk -	St.		400 feet 300 feet
 52 -	15%		200 feet
158 -	25% .	0 252	100 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 stacking of the wire. The opening will be protected as necessary during construction to prevent the escape of live-stock and upon completion of construction, the fence will be repaired back to the original standard of the existing fence. A cattleguard will be installed

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In any fence where a road is to be regularly traveled. A twelve-foot gute 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. Hud 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.

CASING AND CEMENTING REQUIREMENTS

- A. Surface casing is to be set at sufficient depth to protect fresh witer zones and provide well control; and cement circulated to the surface.
- B. Intermediate and production casing strings are to be set and committed as necessary to effectively isolate and seal off all water, oil, gas, or coalbearing strata encountered in the wall down to the casing point.
- C. Prior to drilling the pluy after cementing, all casing strings shall be pressure tasted. Test pressure shall not be less than 600 pall for surface casing, and a minimum of 1,500 pall or 0.2 pal/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.

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5. BLOWOUT PREVENTION

- A. Blowout preventers and related well control equipment shall be installed, tasted, 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.
- 8. 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 hand-heels 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. Orill 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 energency duties. All BOP tests and drills are to be recorded in the driller's log.
- 1. 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 peopler 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 filled 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.

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- (b) Intervals tested, perforated, acidized, or fractured, and results obtained. Show date work was done.
- (2) Five copies of Wall 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 sends 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 coment sirculated, location of cementing tools, etc.
 - (6) Walting on cement time for each casing string.
 - (7) Casing pressure tests after cementing, including test pressure and results.

8. DRILLSTEH 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 bloody line will be located where no damage to vegetation will occur. If this is not possible, an earthen biffle 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 dispusal method for water production from all new wells must be filed with the District Englieer pursuant to Section VII of NTC-28. Fullure to timely file such application will be considered an incident of non-compliance and will be grounds for issuing a shut-hi 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, battaries, etc., which will result in the disturbance of new ground, will require the filling of a sultable plan and prior approval by the Survey after clearance with the surface transperent agency.

13. REHOVAL 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. ABANDONHENT

- 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 Rotice 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 cament plugs are to be placed, type of plugging mud, etc.
- 8. Upon completion of approved plugging, erect a regulation well marker which should not be less than a inches in diameter and extend at least a 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:

. Operator

Well number and name

(3) Section, Township and Range (4) Footage location

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

- C. Within 15 days after plugging the well; a Subsequent Report of Abandonment is to be filed on Form 9-3]] 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. (Resededing 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 operatur-landowner agreement; however, minimum federal restoration requirements on private surface-federal minerals will be required.

15. SPECIAL STIPULATIONS

	surface casing should be set atfeet and cement
	circulated to the surface.
	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.
1	Minimum required fill of cement behind the casing is to
1	All above-ground permanent structures and equipment will be noted a non-ylara color that simulates the natural color of the site, as follows:
	Brown, Federal Standard 595a-30318 Green, Federal Standard 595a-34127
	Green, Federal Standard 595a-34127 Gray, Federal Standard 595a-36357 Sand, Federal Standard 5952-30277
	A kelly cock will be installed and maintained in operable condition.
	The District Office is to be notified in sufficient time for a representat to witness commenting of the casing.
	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, Albuquarque, New Mexico 87125. The effective date of the agreement must be prior to any sales.

[] H. Compacted areas will be plosed or ripped before revealing. Rescuting of the disturbed lands is regulred upon completion of dilling and completion activities and abandonment of the well. All seeding will be denot between July 1 and September 15. Scooling 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 drug, packer, or than one linch deep. The seeder will be followed with a drag, passes, or roller to insure uniform coverage of the seed, and adequate corpaction. Drilling of the seed will be done on the contour where possible, not up and down the slope. Where slopes are too stelly for contour drilling, a "cyclone" hand-seeder or similar broadcast seeder will be used. Seed will cyclone" hand-seeder or similar broadcast seeder will be used. 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 HIX No. 2 Shad Scale (Acriplex confertifolia) ------3/4 Seed HIX No. 5--NIPP Hinimum & PLS accept. 76% 552 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 a 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.

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

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 racing in.

L. Other:

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DISCHORT OF FLOCRAL PERSONNEL OIL AND GAS OPERATIONS IN FARMINGTON AND DURANGO DISTRICTS

Surface Use and Rehabilitation

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

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

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

Hames of people involved with Oll and Gas Operations:

Bob Calkins, Area Hanager Bob Hoore, Lands & Himerals Supervisor Russ Pigurs, Inspector Bob Harler, Inspector Steve Friedman, Inspector

Drilling and Producing Operations

U. S. Gooligical Survey--Olf and Gas Operations P. O. Box 959, or 3535 East 30th Street Farnington, New Mexico 87401

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

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

Hare Phones

Jim Sims, District Supervisor	
Errol Becher, Petroleum Englinear	325-3386
Mildred Kuchera, Petroleum Englacer	
Bill Spence, Petraleum Englneer	
Ray Swanson, Petroleum Engineering Yechnician	
Ken Baker, Petroleum Englneering Technician	
fred Edwards, Petroleum Englineering Technician	325-7885
Andrew Stunp, Environmental Scientist	327-0507
George Carlson, Environmental Scientist	

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

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

Office phone: (303) 247-5144

Home Phones

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RULE 105. PLT FOR CLAY, SHALE, AND DRILL CUITING

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

RULE 105, STALING OFF STRATA

- (A) During the drilling of any oil or natural gas well, all oil, gas, and water strats above the producing horizon shall be sealed or separated in order to prevent their contents from passing into other strate.
- (b) All fresh vaters and waters of present or probable value for domestic, connected, or stock purposes shall be confined to their respective strata and shall be adequirely 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 arcesian vater from the strata in which it occurs, and the contamination of artesian vater by objectionable water, oil, or gas.
- (c) All water shall be shut off and excluded from the various oil and gas bearing strate which are penetrated. Mater shut-offs shall ordinarily be made by committing casing.

RULE 1018 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 atrata 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 coment shall be used on surface casing to fill the animal space lability 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 coments 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 cenents 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 (.) below, all casing strings shall stand comented 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 cument in place.

OPTION 1

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

BEFORE EXAMINER STAMETS
OIL CONSERVATION DIVISION

Opplicate EXHIBIT NO. 4

CASE NO. 7087

Submitted by Sectional

Hearing Date 12/10/80

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The "zone of interest" for sorface and intermediate cosing strings shall be the bottom 20 percent of the casing string, but shall be no more than 1000 feet not 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 there immediate completion is contagnated.

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 perticular cement mixd in the well, at the minimum temperature indicated for the zone of interest by Figure 107-6. Temperature Cradient Jures. Typical performance data used shall be that data furnished by the cement randacturer or by a competent materials testing against, as determined in accordance with the latest edition of API Code IP 10 B "Recommended Practice for Testing Oil-Hell Coments."

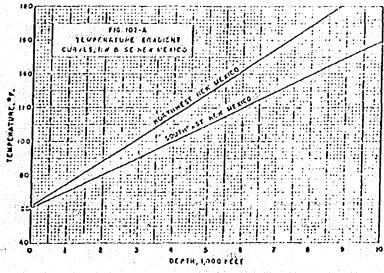


Figure 107-A

Operators using the compressive strength criterion (Option 2) shall report the following information on Form C-101:

- (1) Volume of cement blucry (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 coment sturry when mixed.
- (3) Eutimated wintimum formation temperature in zone of interest.
- · (4) Escinate of cement strength at time of casing test.
 - (5) Actual time coment in place prior to starting Lest,

(c) All casing strings except conductor pipe shall be tested after comenting and before commenting 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 walls drilled with record tools shall be pressure tested. Minimum casing test precedure shall be approximately one-third of the manufacturer's raied 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 ensing used. Tust 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) Code states to well a differ the tools only be to relative that in soler test of the control of a partial of at least one (1) love before consenting my further operation of 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-theh Ob shall be tabed.
- (2) All gas wells equipped with costing larger in size than 2 7/8-inch on shall be tubed.
- (3) Tubing shall be set as mear the bettom as practical and tubing Perforactions shall not be weether 200 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 vasce will bot be carried that the
- (e) The Division's District Supervisors or their representatives shall have anthority to approve (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 correstive or pressure problems exist which might make the tubingless method of completion undesirable,
 - (4) The well will not be a dual completion,
 - (3) The tubing used as a substitute for casing will be either 2 3/S-inch Op or 2 7/8-inch OD.

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

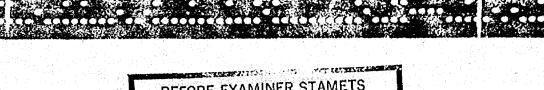
- (a) Blowout preventers shall be installed and maintained in good working order on all drilling rigs operating in areas of known high pressures at or above the projected depth of the well and in all areas where pressures which will be encountered are unknown, and on all workever rigs working on wells in which high pressures are known to evide
- (b) Blowert 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 filling Form C-101, Application for Pensit to Drill, Deepen, or Plug Back, or Form C-103, Sundry Notices, for any operation requiring blowout prevention equipment in accordance with or Form C-103, Sundry Notices, for any operation requiring blowout prevention program for the well. The program Sections (A) and (b) above, shall submit a proposed blowout prevention program for the well. The program Sections (A) and (b) above, shall submit a proposed blowout prevention program for the well modification is necessary. Sections (A) and (b) above, shall submit a proposed blowout prevention program for the well. The program is submitted may be sudified by the District Supervisor if, in his judgment, such modification is necessary.

In pulling outside strings of casing from any oil or gas vell, the space outside the casing left in the RULE 110. PULLING OUTSIDE STRINGS OF CASING in pulling oneside strings of casing from any out or gas very the space outside the casing fetc in choice shall be kept and left full of mud-laden fluid or cenent of adequate specific gravity to seal off all fresh and sait vater strata and any strata bearing oil or gas not producing.

(a) Any well which is drilled or deepened with rotary tools shall be made at reasonably frequent intervals to determine the deviation from the vertical. Such tests shall be made at least once each 500 intervals to determine the deviation from the vertical. A tabulation of all deviation tests run, sworn to feet or at the first bit change neceeding 500 feet. A tabulation of all deviation to Transport Oil and feet or at the first bit change neceeding 500 feet. A tabulation of anil Authorization to Transport Oil and feet or at the first bit change neceeding for Allowable anil Authorization to Transport Oil and notatized, shall be filed with form 0-104, Request for Allowable anil Authorization to Transport Oil and notatized, shall be filed with form 0-104, Request for Allowable anil Authorization to Transport Oil and feet or at the first bit change neceeding for the filed with form 0-104, Request for Allowable anil Authorization to Transport Oil and feet or at the first bit change neceeding to the filed with form 0-104, Request for Allowable anil Authorization to Transport Oil and feet or at the first bit change neceeding to the filed with form 0-104, Request for Allowable anil Authorization to Transport Oil and feet or at the first bit change neceeding to the filed with form 0-104, Request for Allowable anil Authorization to Transport Oil and feet or at the filed with form 0-104, Request for Allowable anil Authorization to Transport Oil and feet or at the filed with form 0-104, Request for Allowable anil Authorization to Transport Oil and feet or at the filed with form 0-104, Request for Allowable anil Authorization to Transport Oil and feet or at the filed with form 0-104, Request for Allowable anil Authorization to Transport Oil and feet or at the filed with form 0-104, Request for Allowable anil Authorization to Transport Oil and feet or at the filed with form 0-104, Request for Allowable anil Authorization to Transport Oil and feet or at the filed with feet or at the filed with feet or at the filed with feet or

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computerized data analysis



BEFORE EXAMINER STAMETS OIL CONSERVATION DIVISION

Quality EXHIBIT NO. _5

CASE NO 7087

Submitted by Blueby one

Hearing Date ________

F.R. # 00095 C

STATE NEW MEXICO

COMPANY BLACKWOO & NICHOLS WELL



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 Q.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 5.57 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 $5.0~\rm FEET$ BASED ON AN ASSUMED POROSITY OF 10%, COMPRESSIBILITY OF 1.26 \times 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.

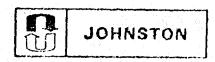
DENNIS MYREN
RESERVOIR EVALUATION
DEPARTMENT

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

FIELD REPORT # 00095 C

In making any interpretation, our employees will give Customer the benefit of their best judgment as to the carrect 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 of any interpretations, and wa shall not be liable or responsible, except in the case of gross or wilful negligence on our part, for any loss, casts, damages or expenses incurred or sustained by Customer resulting from any interpretation made by any of our agents or employees.

Gas Reservoir Engineering Data



Instrument No. L-436

Field Report No. 00095 C

Damage Ratio DR	5.57	Effective Transmissibility <u>Kh</u> ΤΟ GAS μ	106:45	Md-ft. Cp.
Maximum Reservoir Pressure	1677 P.S.I.G.	Flow Rate Q. EST IMATED	35	MCF 'day
Slope of Shut-in Curve Mg	139 PSI /log cycle	Flow Rate		
Potentiometric Surface (Datum Plane, Sed Level) PS		Pressure Gradient	0.523	PSI/ft.
Radius of Investigation	5.0 ft.	K (Effective to GAS)	0.067	Mđ.

Assumptions made for Calculations for Gas Recoveries

- 1. Q. is taken as steady state flow and unless stated otherwise at standa sinditions 14.7 P.S.I. and 60°F.
- 2. P, 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:

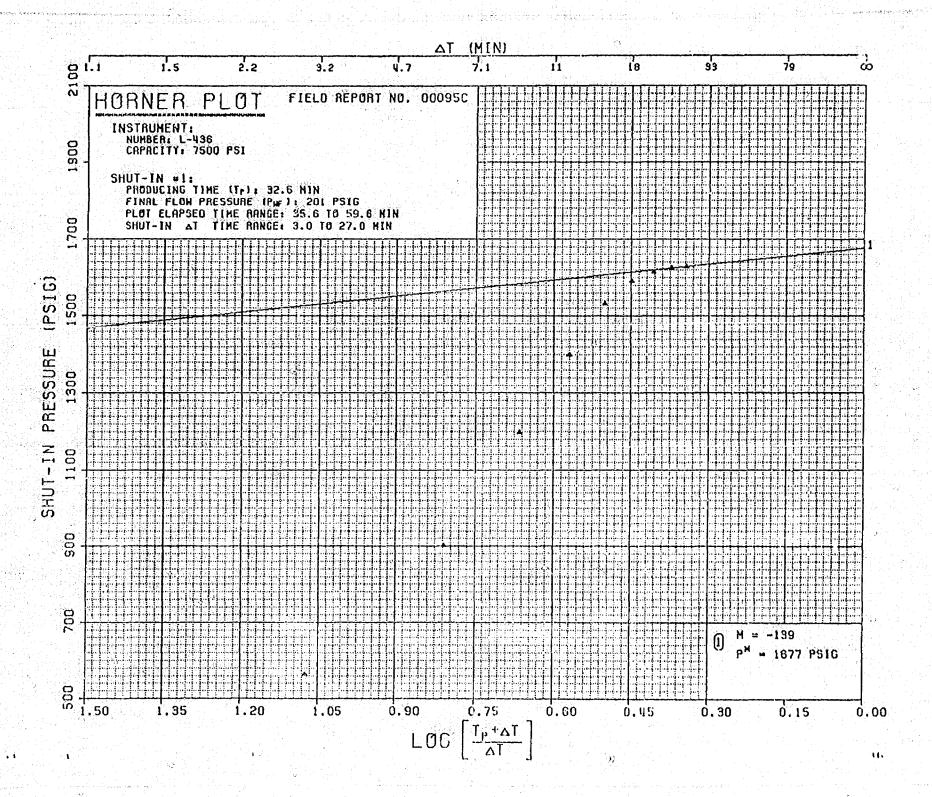
1. EDR =
$$\frac{P_0^2 - P_1^2}{M_a(\log T + 2.65)}$$
 where $M_a = \frac{P_1^2 - P_{10}^2}{\log \text{Cycle}}$

2. Transmissibility
$$\frac{Kh}{\mu Z} = \frac{1637^{\circ}T_{\chi}Q_{\chi}}{M_{\chi}}$$

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

4. Radius of Investigation,
$$r_{tr} = \sqrt{\frac{Kt}{40\phi(1-S_w)\mu c}}$$
 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 wilful 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.



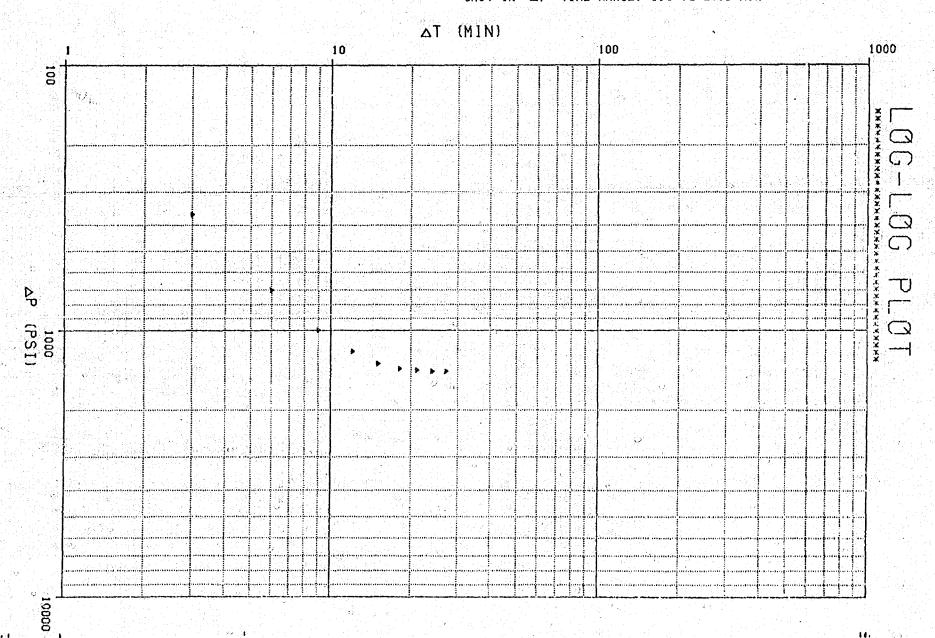
FIELD REPORT NO. 00095C INSTRUMENT:
NUMBER: L-436
CAPACITY: 7500 PSI

SHUT-IN #1:

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

PLOT ELAPSED TIME RANGE: 35.6 TO 59.6 MIN

SHUT-IN AT TIME RANGE: 3.0 TO 27.0 MIN



```
---- WELL IDENTIFICATION -
                           BLACKWOOD & NICHOLS
2013 FIRST NATIONAL CENTER WEST
OKLAHOMA CITY, OKLAHOMA 73102
NORTH EAST BLANCO #33-12
3055' TO 3205'
                                                                                        CUSTOMER:
                                                                                                            SAME
                                                                                        LOCATION:
TEST INTERVAL:
TEST NO:
COUNTY:
TECHNICIAN:
                                                                                        FIELD:
                                                                                                            BLANCO
                                                                                        TEST DATE: 18-24-55
STATE: NEW MEXICO
TEST APPROVED BY: MI
                           SAN JUAN
MORRIS BOWEN
                                                                                                                         MR. W.J. LINTON
                                                               EQUIPMENT AND HOLE DATA
                                                                                        DRILL PIPE LENGTH: -
DRILL PIPE I.D.: -
DRILL COLLAR LENGTH: -
DRILL COLLAR I.D.: -
PACKER DEPTHS:
TEST TYPE:
                        DUAL PACKERS
ELEVATION:
TOTAL DEPTH:
MAIN HOLE/CASING SIZE:
RAT HOLE/LINER SIZE:
FORMATION TESTED:
                                                                               FT.
IN.
                                          32.05
                                          9 7/8
                                                                                                                                   3Ø5Ø &
                                                                                                                                                     3.855
                                                                                IN.
NET PROD. INTERVAL:
POROSITY:
                                                                                        DEPTHS REF. TO:
                          -- TEST TOOL CHAMBER DATA
                                                                                                                                    MUD DATA
SAMPLER PRESSURE:
RECOVERED OIL GRAVITY:
RECOVERY GOR:
                                                                             PSIG
                                                                                                              TYPE:
WEIGHT:
VISCOSITY:
WATER LOSS:
                                                                                                                                                  LB/GAL.
SEC.
CC
TEMP CHLOR
(DEG F) (PPM)
                                                                             DEG. F.
FT3/BBL.
                                                    API @
                                                                                                                                             63
                                                                                                                                  RESIST
                                SAMPLE CHAMBER CONTENTS
                                                                                                                                                                 CHLOR
                                                                                                               FLUID
                                                                                                                                   (M-M)
                                                            MEAS.
RESIST. TEMP.
(OHM-M) (DEG F.)
FLUID
                                            VOLUME
                                                                                           CHLOR.
                                                                                                               MUD:
FILTRATE:
                                                                                           (PPM)
                                            - FT.3
GAS:
                                            - cc
OIL:
WATER:
MUD:
FILTRATE:
                                               CC
TOTAL LIQUID:
                                            - cc
                                                                            - REMARKS
```

FIELD REPORT NO.

ØØØ95C

NO. OF REPORTS REQUESTED:

SURFACE INFORMATION

DESCRIPTION(RATE OF FLOW)

STRONG BLOW OF AIR TO SURFACE IMMEDIATELY. GAS - Ø 1"

TO SURFACE IN 10 MINUTES.

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

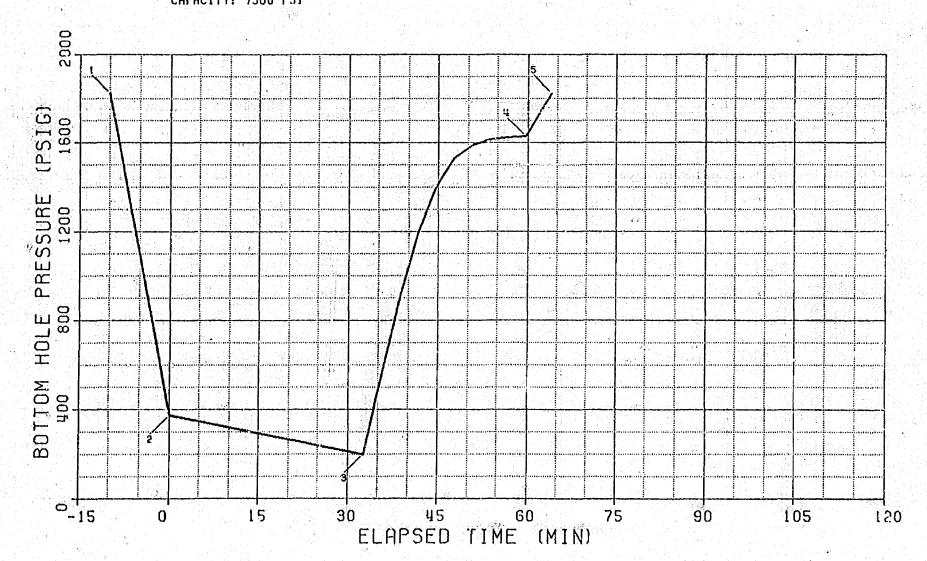
RECOVERY INFORMATION

RECOVERY FEFT BARRELS XOIL XWATER ZOTHERS GRAV. DEG. RESIST DEG. PPM

FIELD REPORT NO. 88895C

PRESSURE LOG

FIELD REPORT NO. 00095C INSTRUMENT:
NUMBER: L/M36
CAPACITY: 7500 PSJ



BOTTOM HOLE PRESSURE AND TIME DATA

 I	N	S	T	R	U	M	E	١	ľ	T		N	0	إزا	Ġ.	L	-	4	3	6	
þ	ብ	R	т		ሰ	р	F	٨	1	T	N	C		-							

BOTTOM HOLE TEMP (F): 7500

LABELED POINT PRESSURE (PSIG) ELAPSED TIME (MIN) EXPLANATION HYDROSTATIC MUD START FLOW END FLOW & START SHUT-IN END SHUT-IN HYDROSTATIC MUD 1 2 3 4 5 1825 375 2Ø1 1629 1825 Ø.Ø 32.6 59.6 * SUMMARY OF FLOW PERIODS * FLOW PERIOD AT START (MIN) AT END (MIN) DURATION OF PRESSURE AT FLOW (MIN) START (PSIG) PRESSURE AT END (PSIG) 201 0.0 32.6 32.6 375

* SUMMARY OF SHUT-IN PERIODS *

	ELAPSED ELAPSED	D DURATION OF	PRESSURE PRES	SURE FINAL FLOW	
SHUT-IN	TIME AT TIME AT	T SHUT-IN	AT START AT	END PRESSURE	PRODUCING
PERIOD	START (MIN) END (MIN	N) (MIN)	(PSIG) (PS	IG) (PSIG)	TIME (MIN)
****	******	********	****** ***	**** *****	**********
				그리 하고 하네요 얼굴을 모르는데?	
1	32 6 50 6	6 27 A	201 16	29 2 8 1	32 K

FIELD REPORT NO. 80095C INSTRUMENT NO. L-436

PAGE 2

FIELD REPORT NO. 80095C INSTRUMENT NO. L-436

TEST PHASE : FLOW PERIOD # 1

DELTA TIME (MIN) Ø.Ø 32.6 Ø.Ø 32.6

TEST PHASE : SHUT-IN PERIOD # 1

1. FINAL FLOW PRESSURE ["P "] = 201
2. PRODUCING TIME ["T "] = 32.6 MIN

ELAPSED TIME (MIN)	DELTA TÎME ("DT") (MIN)	SHUT-IN PRESSURE ["P "] WS (PSIG)	LOG ((T +DT)/DT)	DELTA PRESSURE (P - P) WS WF
32↓6	g g	201		
35.6	3.Ø	565	1.074	364
38.6	6.Ø	902	Ø.808	701
41.6	9.Ø	1198	Ø.665	997 \\
44.6	12.Ø	1400	Ø.57Ø	1199
47.6	15.Ø	$\begin{array}{c} 1532 \\ 1591 \end{array}$	ø.5ø2	1331
50.6	18.Ø		ø.449	139 <i>0</i>
53.6 56.6 59.6	21.Ø 24.Ø 27.0	1614 1625	Ø. 407 Ø. 373	i 4 i 3 i 4 2 4

Supplemental Gas Volume estimates for

October Gas Sales 1980

Northeast Blanco Unit	Well No.	Gas Sales	Fruitland	Days	15,025	14,73
201		1054	1054	32	Mcfpd	Mcfpd
202*		9573	4787	32	150	153
203		588	588	30	20	21
204* 205		7119	3560 1714	32 32	1 <u>1</u> 1	113 66

*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/ $(1475-310) \times 55 = 70$ Mcfpd. 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.

Western Petroleum Services

BEFORE EXAMINER STAMETS
OIL CONSERVATION DIVISION

Copplicants EXHIBIT NO. 7

CASE NO. 1087

Submitted by Blackwood

Hearing Date 12/12/80

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

410 17th Street • Suite 1920 • Denver, Colorado 80202 • Phone 303/623-6037

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%/ft² (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#/ft² (see Exhibit II). Figure IV shows the McGuire-Sikora graph. After scaling, an il fold productivity increase is calculated.

WELL DATA:

Formation:

Average Depth To Zone:

Zone Height:

Casing Size:

Perforated Interval:

Bottom Hole Temperature:

Fracture Gradient:

Bottom Hole Fracture Pressure:

Bottom Hole Pressure:

Overburden:

Hydrostatic Head:

ISDP (fresh water):

Porosity:

Permeability:

Well Spacing:

Pictured Cliffs

3,500 ft.

133 ft.

Ž1²11

3456, 3478, 3492, 3518, 3534,

3554, 2 jspf, .34" diameter

120° F

.65 psi/ft

2,275 psi

1,375 psi

900 psi

1,515 psi with fresh water

760 psi

10%

.06 md

160 acres

WELL DATA:

Formation:

Average Depth To Zone:

Zone Height:

Casing Size:

Perforated Interval:

Bottom Hole Temperature:

Fracture Gradient:

Bottom Hole Fracture Pressure:

Bottom Hole Pressure:

Overburden:

Hydrostatic Head:

ISDP (fresh water):

Porosity:

Permeability:

Well Spacing:

Pictured Cliffs

3,500 ft.

133 ft.

1,1,11

3456, 3478, 3492, 3518, 3534,

3554, 2 jspf, .34" diameter

120° F

.65 psi/ft

2,275 psi

1,375 psi

900 psi

1,515 psi with fresh water

760 psi

10%

.06 md

160 acres

 $^{2}\eta$

1

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:

- 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. Primp 20,000 gallons of Mini Max III-30/2% HC with 2 ppg 10/20 mesh sand. (Add 20/1000 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 $3\frac{1}{2}$ 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

Injection Rate

Surface Treating Pressure

Total Pumpable Volume of Mini Max III-40 Gel Phase

Total Pumpable Volume of Condensate

Total Pumpable Volume of Fresh Water Flush & Reserve

Total 10/20 Mesh Sand Required

30 BPM

2,600 psi

100,000 gallons

5,000 gallons

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 @ 2.15/16.	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 ннр @ 3.15/ннр	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:

Average Depth To Zone:

Zone Height:

Casing Size:

Perforated Interval:

Bottom Hole Temperature:

Fracture Gradient:

Bottom Hole Fracture Pressure:

Bottom Hole Pressure:

Overburden:

Hydrostatic Head:

ISDP (fresh water):

Porosity:

Permeability:

Well Spacing:

Fruitland

3,380 ft.

42 ft.

434 - 10.5#

3368, 3374, 3384, 3392,

2 jspf, .34" diameter

120° F

.9 psi/ft

. 3,050 psi

1,375 psi

1,675 psi

1,450 psi with fresh water

1,600 psi

10%

.06 md

160 acres

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 TREATMENT PROCEDURE: sand. Average anticipated injection rate and surface treating pressure are 17 BPM and 2,700 psi, respectively. Stage fluid and proppent as follows:

- Pump 8,000 gallons of Mini Max III-30/2% HC as a pad to initiate the rump o, uou gallons or mini max 111-30/2% no as a pad to initiate the fracture and establish sufficient fracture width to accept sand. (Add 18/1000 R-5.)
- Pump 8,000 galions of Mini Max III-30/2% HC with 1 ppg 10/20 mesh sand.
 (Add 18/1000 R-5) 1#/1000 B-5.)
- Pump 8,000 gallons of Mini Max III-30/2% HC with 2 ppg 10/20 mesh sand.
- Pump 8,000 gallons of Mini Max III-30/2% HC with 3 ppg 10/20 mesh sand.
- Pump 8,000 gallons of Mini Max III-30/2% HC with 3½ ppg 10/20 mesh sand.
- 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.
- 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 Adoctide.

TREATMENT REQUIREMENTS:

Treating Conductor

Injection Rate

17 BPM

Expected Surface Treating Pressure

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

- 32

. .

40,000 gallons of Mini Max III-30/2% HC @ .24/gal	\$ 9,600.00
65# B-5 @ 2.15/1b	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

Mileage Charge @ 1.90/unit mi x 6 units x 75 mi

17 BPM Master Mixer @ 730.00

1,125 ннр @ 3.15/ннр

Ratiometer @ 134.00

1,938.00

3,543.75

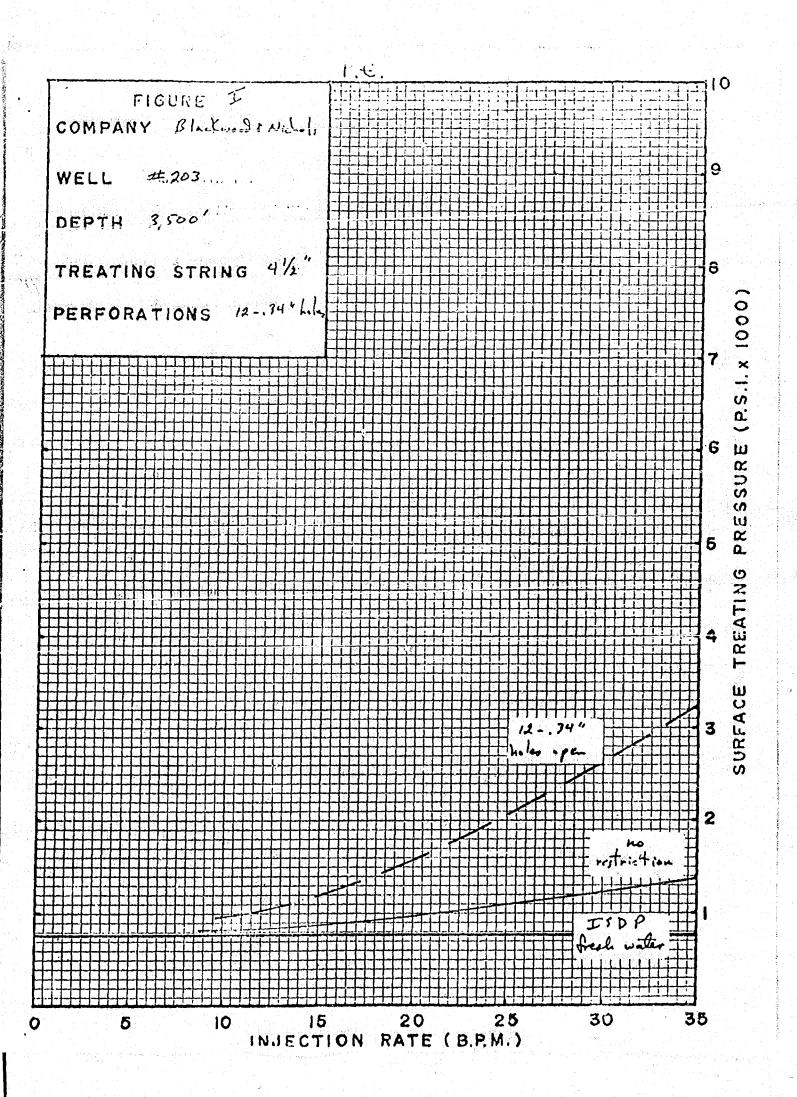
134.00

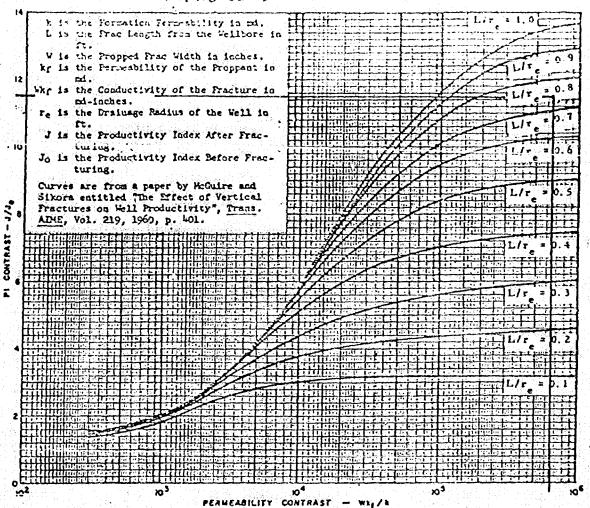
855.00

730.00

TOTAL \$23,859.50

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





INCREASES IN PRODUCTION FROM VERTICAL FRACTURES

5/50 = 10 after scaling

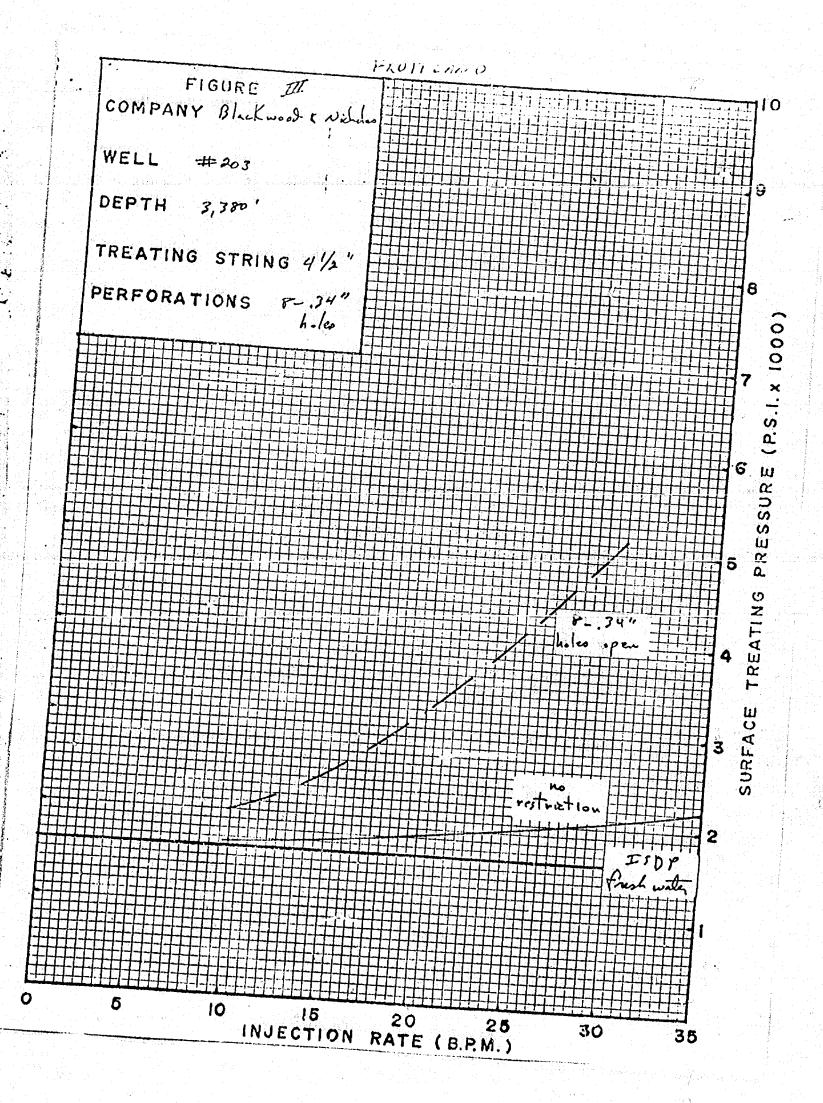
Note: This graph is based on a well spacing (A) of 40 acres and a wellbore radius (rw) of 3 inches. It can be converted to other well spacing and wellbore radii by use of the following scaling factors:

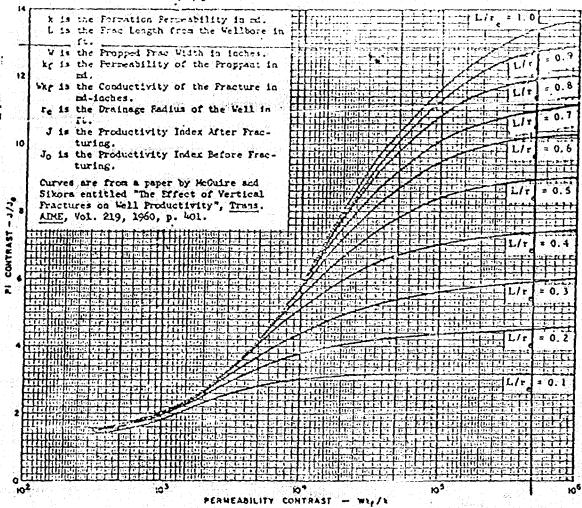
	રો જેવા જિલ્લા કે	Scaling Fas	Factors for	
Well Spacing	Drainage Radii	Abscissa (Wk _f /k)	Ordinate (J/J _o)	
For 1	pacing shown and	3-inch wellbore re	idius.	
10 Acres	330 ft	2,00 1,42	1.11 1.05	
20 Acres	467 (t 660 (t	1.00	1.00	
80 Acres	933 (t 1320 (t	0.71 0.50	0.95 0.91	
320 Acres	1867 ft 2640 ft	0.35 0.25	0.87 0.84	

For other spacing (A) and wellbore radii (rw).

A 104 A A 40/A. 3,095 log(.472)(re/rw)

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INCREASES IN PRODUCTION FROM VERTICAL PHACTURES

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

	Scaling Fa		tors for
Well	Drainage	Abscissa	Ordinate (J/J _o)
Spacing	Radii	(Wk _f /k)	
For spa	cing shown and	3-inch wellbore ra	dlus.
10 Acres	330 ft	2.00	1.11
20 Acres	467 (t	1.42	1.05
	660 (t	1.00	1.00
80 Acres	933 ft	0.71	0.95
	1320 ft	0.50	0.91
320 Acres	1867 ft	0. 35	0.87
	2640 ft	0. 25	0.84

For other spacing (A) and wellbore radii (rw).

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EXHIBIT I

THE WESTERN COMPANY

PROPERNT PROFILE STUDY PERFECT SUPPORT FLUIDS

FLUID STUDIÉD - MINI MAX III 30/2%HC TOTAL VOLUME - 108616 GAL FLUID FENETRATION - 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 RESERVO)P PRESSURE - 1375 RESERVUIR PRESSURE - 1373 N PPIME - .690 K PRIME - 0.013000 YOUNGS MODULUS - 5.00E+06 WIDTH - .396 INJECTION RATE - 30.0

FLU1D VOLUME (SBL)	SURFACE PROPPANT CONC (LB/GAL)	LOCATION IN FRACTURE (FT)	FRACTURE PROPEANT CONC (LB/FT^E)	CURLOTIVE PROPERNT (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	.868	120000
20000	3,50	0 TO 320	.821	190000

4.63 UNITS USED

EXHIBIT I

THE WESTERN COMPANY

CROPPART 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 FRAC. PRESSURE - 3050

PERM. TO RESERVOIR FLUID - .060 RESERVOIR PRESSURE - 1375

PERM. TO RESERVOIR FLUID VISCOSITY - 1.00 RESERVOIR FLUID VISCOSITY - .01 PRIME - 0.024000

RESERVOIR FLUID VISCOSITY - 4.40E-04 RESERVOIR FLUID COMP. - 4.40E-04 MIDTH - .383

RESERVOIR FLUID C-III - 0.00080 INJECTION RATE - 17.0

STIMULATION FLUID C-III - 42

FRAC. PRESSURE - 3050

RESERVOIR PRESSURE - 3050

RESERVOIR PRESSURE - 1375

PLUID FLUID	SURFACE PROPPANT CONC	LOUATION IN FRACTURE (FT)	FRACTURE FROEPANT CONC (LE/FT^2)	CUMLATIVE PROFFANT (LE)
(GAL)(?	(LB/GAL)	1203 TD 1377	.000 455	8000 0
\$000 8000	.00 1.00 2.00	994 TD 1509 736 TD 1994	.739 .880	24000 48000 76000
8000 8000	3.00 3.50	411 TO (36 0 TO 411	.810	

4.76 UNITS

		C-102 == J C-103 Ellective 1-103
		Effective 1-1-65 Sa. Indicate Type of Lease
ND REPORTS ON THE		State Oil 6 Gas Lease No.
FORM C-101) FOR BUCH PROPOSALE.	RESERVOIR.	annullillilli
	13	Unit Agreement Name ortheast Blanco Unit
301		
		Northeast Blanco Uni Well No. 201
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*See Instructions on Reverse Side

Delasso Loobite District Manager DATE (This space for Federal or State office use)

reby certify that the foregoing is true and correct

APPROVED BY

CONDITIONS OF APPROVAL IF ANY

DEPARTURE STATES	
DEPARTMENT OF THE INTERIOR	Folm Approved
GEOLOGICAL THE INTERIOR	5. LEASE Rudget Bureau No. 42-F
- LOCOGICAL SURVEY	NM 03350
SUNDBY	6. IF INDIAN
SUNDRY NOTICES AND REPORTS ON WELLS (Do not use this form for proposals to drill or to deepen or plug back to a different 1. oil 8as Well 1. gas	6. IF INDIAN, ALLOTTEE OR TRIBE NAME
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1 all such proposals.) deepen or plug back to a different	7. UNIT AGREEMENT NAME
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	9. WELL NO.
3. ADDRESS OF OPERATOR P.O. BOY 120-	
P.O. Roy Make	10. FIELD 203
P.O. Box 1237, Durango, Colo. 81301 4. LOCATION OF WELL (REPORT LOCATION CLEARLY. See space 17 AT SURFACE: 990' F/NT	10. FIELD OR WILDCAT NAME
below) WELL (REPORT LOCATION	
AT SURFACE.	11. SEC., T., R., M., OR BLK, AND SURVEY OR AREA
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13. CHECK APPROPRIATE BOY	2. COUNTY OR PARISH 13. STATE San Juan
16. CHECK APPROPRIATE BOX TO INDICATE NATURE OF NOTICE,	4. API NO. New Mexico
Provide NOTICE,	20.04
REQUEST FOR APPROVAL TO: SUPESSION	30-045-23485
TEST WATER SHUT OFF SUBSEQUENT REPORT OF:	ELEVATIONS (SHOW DF, KDB, AND WD)
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17. DESCRIBE PROPOSED OR COMPLETED OPERATIONS (Clearly state all per measured and true vertical depths for all markers and zones pertinent to this Retrices.) Pulled 2 3/8" to be a second of the sec	illy drilled give and give pertinent data
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between tubing and 4 1/2" csg. Reset packer at 3459'. Well mak thru tubing. Dry gas between tubing and 4 1/2" csg. Reset packer at 3409'. 7-16-80 3630' PBTD. Set Retrievamatic at 3405', press 3366'. Reran 108 jts. 2 3/8" 4.7# J-55 Elebautage sets.	csg. Ser war water
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District Management	7-28-80

See Instructions on Reverse Stat

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.

350', sand. Nippled up, tested 9 5/8" casing to 800 PSI for thirty minutes; held O.K. Spudded 12%" 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% CaCl₂. Plug down 4:00 P.M., 8-8-79; cement circulated, 1/4° at 217'.

8-10-79 1930' sand. 3/40 @ 721', 1° @ 1242', 2° @ 1682'.

8-11-79 2572', sand. 140 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'.

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 1/40 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 44" 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 HC1 ball sealers. Final shut-in pressure 650 PSI. Well

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 EUR tubing; 3569' landed at 3580'. Seating nipple at 3550'. Released rig

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BEFORE EXAMINER STAMETS
OIL CONSERVATION DIVISION

Applicate EXHIB. 12

CASE NO. 7087

Submitted by Alachusod

Hearing Date 121e180

28

UNITED STATES

UNITED STATES DEPARTMENT OF THE INTERIOR GEOLOGICAL SURVEY	5. LEASE NM 03358 6. IF INDIAN, ALLOTTEE OR TRIBE NAME
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.)	7. UNIT AGREEMENT NAME NEBU Agrmt, No. 1, Sec. 929 8. FARM OR LEASE NAME
1. oil gas 🛛 other	Northeast Blanco Unit 9. WELL NO.
2. NAME OF OPERATOR Blackwood & Nichols Co., Ltd. 3. ADDRESS OF OPERATOR P. O. Box 1237, Durango, Co. 81301	205 10. FIELD OR WILDCAT NAME South Los Pinos Fruitland - PC 11. SEC T. R. M. OR BLK. AND SURVEY OR AREA
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	P-10-31N-7W 12. COUNTY OR PARISH 13. STATE San Juan New Mexico 14. API NO.
16. CHECK APPROPRIATE BOX TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA	30-045-23601 - 15. ELEVATIONS (SHOW DF, KDB, AND WD) 6560' GL
REQUEST FOR APPROVAL TO: SUBSEQUENT REPORT OF: TEST WATER SHUT-OFF	(NOTE: Report results of multiple completion or zone change on Form 9–330.)
including estimated date of starting any proposed work. If well is dir measured and true vertical depths for all markers and zones pertinent 7-18-80 3620' PBTD. Pulled 2 3/8" tubing, ran G cement retainer at 3430'. Tested 4 1/2" held OK. Perforated 3350' - 3362' with with 300 gals. 15% HCL acid and 28,640 g sand. Maximum pressure 2700 PSI, average average injection rate 15 bbls/min.	amma Ray and Neutron Logs. Set csg. to 3000 PSI for 10 minutes 11 holes. Versage1 fractured als. water, 30,000 lbs. 10-20
-20-80 3620' PBTD. Keran 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 folegoing is true and correct	7-28-80
	المحسنين المستحد
(This space for Federal or State office	DATE

BEFORE EXAMINER STAMETS OIL CONSERVATION DIVISION

Capticonta EXHIBIT NO. 13

Submitted by Blackwood

NEW MEXICO OIL-CONSERVATION COMMISSION Storics 2 WELL COMPLETION OR RECOMPLETION REPORT AND LOG 5, Bonts DU & Cos Lesse No. ***COMPLETION OR RECOMPLETION REPORT AND LOG 5, Bonts DU & Cos Lesse No. ***COMPLETION OR RECOMPLETION REPORT AND LOG ***COMPLETION ***COMPLETI	DISTRIBUTIO	5							C-105	
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CASING RECORD (Report of Il shrings, set in well) ASING SIZE WEIGHT LB./FT. DEPTH SET HOLE SIZE CEMENTING RECORD AMOUNT PULLED 9 5/8" 36# 23/1 13 3/4" 250 Sacks 7 " 20# 3652" 8 3/4" 700 Sacks LINER RECORD 30. TUBING RECORD SIZE TOP BOTTON SACKS CEMENT SCREEN SIZE DEPTH SET PACKER SET NONE 2 3/8" 3413 3318" Model "ID" 11 1			J, J	, -,, ,-,, ,.	7, 2272 2	1, 3230-	65,326	(-/1, 3H)	1-95	NO
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Test Hows Tested Chole Size Prod'n. For Oil - Bbl. Cit? - CF Water - Bbl. Gas - Oil Ratio white Press Bbl. Ca.: - Pressure Calculated 24- Oil - Bbl. Cap - Not 1 3 1, Noter - Bbl. Oil Gravity - API (Corr.) SITP 1423 PC - SICP 1478 Hows Rate Position of Gas (Sold, Leed for fuel, Versed, etc.) Will be sold Oil COM. Oil COM. Oil COM.	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	#EIGHT LB./ #EIGHT LB./ 36# 20# LII TOP #Interval, size and 3233-3 3245-5 3258-6 3275-9	Ole logs C: FT: DEP1 30 NER RECORD BOTTOM number) 9 1 3 (1 s)	run - ran Cl SING RECORD (Re TH SET HO 237' 652' SACKS CEMENT	BL-GR & T port all string DLE SIZE 3 37411 8 37411 . SCREEN 32. DEPTH 3361- 3361-	30. 30. 31. 2 3/8" 1 12" ACID, SHOT, INTERVAL	Casing SENTING R SO SACK OO SACK FRACTUR AU 100	TUBING REDEPTH SET 3413 3232 F. CEMENT SMOUNT AND K	CORD PACE 33181 NON NON NON NON NON NON NON NON NON NO	KER SET Mode [11]D11 IE C.
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SITP 1421 PC -SICP 14/P position of Gas (Sold, ized for fuel, verify, etc.) Will be sold of Attachments OIL COM: OIL COM:	SIZE None reproduction SIZE None reproduction SIZE None reproduction SIZE None reproduction SIZE None reproduction SIZE None Record (8361-3391) SIZE NONE Record (8361-3391) SIZE NONE Record (8361-3391) SIZE NONE Record (8361-3391) SIZE NONE SIZE SIZE NONE SIZE NONE SIZE SIZE NONE SIZE SIZE NONE SIZE SIZE	## No open h ## No open h ### WEIGHT LB./ 36# 20# LII TOP //nternal, size and 3233-3 3245-5 3258-6 3275-9 3267-7 Product	Ole logs C: FT. DEP1 30 NER RECORD BOTTOM number) 1 1 1 The control of t	run - ran Cl SING RECORD (Re TH SET HO 23/7 1. 652 652 652 FACKS CEMENT PROD Duving, gas lift, pump	BL-GR & T port oll string LE SIZE 3 3/4" 8 3/4" SCREEN 32. DEPTH 3361- 3361- DUCTION Ding - Size and	30. 30. 2 3/8) 2 3/8) 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	E FRACTURE AND S2,70	TUBING REDEPTH SET 3413 3232 EF, CEMENT SHOUNT AND KOUNT	CORD PAC 3318 NO	KER SET Mode ("D") Re C. AL USED ; 45,000#1
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ol Attochments Control of the Contro	SIZE None 1155-65 1182-3209 219-27 1151-71293 SITP 1421	WEIGHT LB./ WEIGHT LB./ 36# 20# LII TOP Vinternal, size and 3233-3 3245-5 3258-6 3275-9 3267-7 Product Ca. : Pressure PC -SICP 14	Ole logs Critical Critical Control Colculated 2 House Rate 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Fun - ran Cl ASING RECORD (Re TH SET HO 237' 1. 652'	BL-GR & T port oll string DLE SIZE 3 37411 8 37411 SCREEN 32. DEPTH 3361- 3361- DUCTION Ding - Size and	DT thru can be set in well) CEM 2: 70 30. SIZE 2 3/80 1 1211 ACID, SHOT, INTERVAL 3391 3391	FRACTUR 100 52,70	TUBING REDEPTH SET 3413 3232 E. CEMENT SHOUNT AND KID gals. 100 gals. 96 Well States - Bbl.	Was Well Cor NO AMOU CORD PAC 33181 non OUEEZE, ET IND MATERIA 15% MR-1 11ed wtr	KER SET Mode [11] MC USED 145,000#1
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BEFORE EXAMINER STAMETS
OIL CONSERVATION DIVISION

CASE NO. 7087

Submitted by Black wood

Hearing Date 12 10 80

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DISTRIBUTION		•			Porm (Revis	+4 1-1-62 2-102
SANTA PE		NEW MEXICO	OIL CONSERVATION	COMMISSION	Sa, Indica	19 Type of Lease
FILE	WELL		R RECOMPLETION		OG Brate	
J.S.G.S.					S, State O	Il & Gas Lease No.
PERATOR					TITI	ANTININI N
TYPE OF WELL						reament Name
	#	##.(X)			7. 01.11	
. TYPE OF COMPLE	TION	water file	DAY OTHER		8. Farm or	Leose Name
WELLIAL OVE	n beeren	PLUS DI BACK RE	SVA. OTHER		Yage	
Namesol Operator Palmer	011 & Gas Comp	anv			9. Well No.	
Address al Operator	ott o das comp				10. Field o	and Pool, or Wildcal
P. O. B	ox 2564, Billi	ngs, Montana !	59103		Undes Los P	ignated PC & S. inos Fruit. Ext
Location of Well						
IVACTOCO E	1450		N LINE AND	835		
			THITA	THITIKIT	12. County	millilli
E LINE OF	ecc. 10 TWP.	31N mer. 7W	IIIII wann		San Ju	
		145	eady to Prod.) 18. El	evalions <i>(DF, RKB, R</i> 01 GL, 6612 k		Elev. Cashinghead
, Total Depth	1/15/78 21. Piug Back		I Multiple Compl., How	23. Intervals . F	olary Tools	, Cable Tools
3603'	3599		^{K∞ny} two	Drilled By	O-TD	
), of this completion —	Top, Bottom, Name				25. Was Directional Surve
3197-3276 -	Pictured Clif	ř.				no
Type Electric and O					27. ¥	Vas Well Cored
Schlumbergei	r - FDC/CNL-GR		ing the second of the second o	1 34 44		no
			RD (Report all airings a			
8-5/8"	WEIG. LB./FT.	DEPTH SET	12-1/4"	CEMENTING F	CORD	AHOUNT PULLED
	24#	220'		250 sx		
	14#	3602	7-7/8"	200 sx		
5-1/2"	14#	3602'	7-7/8"	200 s×		
5-1/2"			7-7/8"			
5-1/2"	LINER	RECORD		30.	TUBING REC	The state of the s
5-1/2"	LINER			30. Size	DEPTH SET	PACKER SET
5-1/2"	LINER	RECORD		30.		The state of the s
5-1/2" SIZE Perforation Record (I	LINER F	RECORD SACKS CE	EMENT SCREEN	30. SIZE 2-3/8" 1"	DEPTH SET 33101 31571 E, CEMENT SQ	PACKER SET 3310' UEEZE, EYC.
5-1/2" SIZE Perforation Record (I	LINER F TOP SC Interval, size and number 5: 3495, 3500	RECORD SACKS CE	SCREEN 32. AC 3517 DEPTH IN	30. SIZE 2-3/8" 1" ID, SHOT, FRACTURE TERVAL A	DEPTH SET 33101 31571 E, CEMENT SQ HOUNT AND KIN	PACKER SET 3310' UEEZE, EYC.
5-1/2" SIZE Perforation Record (I	LINER F	RECORD SACKS CE	SCREEN SCREEN 32. AC 3517 DEPTH IN	30. SIZE	DEPTH SET 33101 31571 E, CEMENT SQ HOUNT AND KIN Gal. 158 1	PACKER SET 3310' UEEZE, EYC. O MATERIAL USED ICL; foam frac
SIZE Perforation Record () Ictured Cliff ictured Cliff	INER F TOP 80 Interval, size and number (5: 3495, 3500, 5: 3350', 3352 3382. 07-3204, 3208-2	RECORD SACKS CE 377 SACKS CE 379 SACKS CE 370 SACKS CE 370 SACKS CE 370 SACKS CE	3517 DEPTH IN 3367, 3517-3	30. 2-3/8" 1" IIO, SHOT, FRACTUR TERVAL AN 382' 500 W/2102 bb1s 5d, 1,826 M	DEPTH SET 3310' 3157' EE, CEMENT SO HOUNT AND KIN gal. 15% H 70% foam MCF Nitros	PACKER SET 3310 UEEZE, EYC. TO MATERIAL USED ICL: Foam frac E 120,000# 10/2
5-1/2" size Perforation Record (I ictured Cliff ictured Cliff ultland: 319	tiner of the and numbers: 3495, 3500, 3352, 3382.	RECORD SACKS CE 377 SACKS CE 379 SACKS CE 370 SACKS CE 370 SACKS CE 370 SACKS CE	32. AC 3517 DEPTH IN 3367, 3517-3 3262-76 3197+3	30. 2-3/8" 1" IIO, SHOT, FRACTUR TERVAL AN 382' 500 W/2102 bb1s 5d, 1,826 M	DEPTH SET 3310' 3157' EE, CEMENT SO HOUNT AND KIN gal. 15% H 70% foam MCF Nitros	PACKER SET 3310 UEEZE, EYC. TO MATERIAL USED ICL: Foam frac E 120,000# 10/2
5-1/2" size Perforation Record () ictured Cliff ictured Cliff ultland: 319	nterval, size and numbers: 3495, 3500, 3352, 3382. (1 shot/foot)	3503, 3515, 2, 3355, 3365, 26, 3232-48, 3	3517 DEPTH IN 3367, 3517-3	30. 2-3/8" 1" IIO, SHOT, FRACTUR TERVAL AI 382' 500 W/2102 bbls sd, 1.826 M 276 Natu	DEPTH SET 3310' 3157' SE, CEMENT SO HOUNT AND KIN Gal. 15% H 70% foam MCF Nitrog ral	PACKER SET 3310 UEEZE, EYC. TO MATERIAL USED ICL: Foam frac E 120,000# 10/2
5-1/2" size Perforation Record () ictured Cliff ictured Cliff ultland: 319	nterval, size and numbers: 3495, 3500, 55: 3350', 3352, 37-3204, 3208-2 (1 shot/foot)	3503, 3515, 2, 3355, 3365, 26, 3232-48, 3	32. AC 3517 DEPTH IN 3367, 3517-3 3262-76 3197+3 PRODUCTION	30. 2-3/8" 1" IIO, SHOT, FRACTUR TERVAL AI 382' 500 W/2102 bbls sd, 1.826 M 276 Natu	DEPTH SET 3310' 3157' SE, CEMENT SO HOUNT AND KIN Gal. 15% H 70% foam MCF Nitrog ral	PACKER SET 33101 UEEZE, EYC. O MATERIAL USEO ICL: foam frac E 120,000# 10/2 IEN (Prod. or Shut-in)
SIZE Perforation Record (I ictured Cliff ictured Cliff ultland: 319 • First Production shut in	INER F TOP 80 Interval, size and number 5: 3495, 3500, 5s: 3350', 3352, 3382, 17-3204, 3208-2 (1 shot/foot) Production M f1c Hours Tested Ch	RECORD SACKS CE 17) , 3503, 3515, 2, 3355, 3365, 26, 3232-48, 3	32. AC 3517 DEPTH IN 3367, 3517-3 3262-76 3197+3 PRODUCTION (t, pumping - Size and t)	30. SIZE 2-3/8"	DEPTH SET 33101 31571 EE, CEMENT SQ HOUNT AND KIN gal. 15% H 70% foam MCF Nitrogral	PACKER SET 33101 UEEZE, EYC. O MATERIAL USEO ICL: foam frac E 120,000# 10/2 IEN (Prod. or Shut-in)
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SIZE Perforation Record (I ictured Cliff ic	LINER F TOP	RECORD OTTOM SACKS CE 17) , 3503, 3515, 2, 3355, 3365, 26, 3232-48, 3 ethod (Flowing, gas li) owling oke Size Prod'n. Frest Per	3517 32. AC 3517 DEPTH IN 3367, 3517-3 362-75 3197=3 PRODUCTION (t, pumping - Size and to	30. SIZE 2-3/811 111 CID, SHOT, FRACTUR TERVAL AI 3821 500 W/2102 bb1s sd, 1.826 M 276 Natu	DEPTH SET 33101 31571 E. CEMENT SQ. HOUNT AND KING Gal. 15% H 70% foam MCF Nitrogral Well Status shut	PACKER SET 3310' UEEZE, EYC. IO MATERIAL USEO ICL: foam frac E 120,000# 10/2 IEN I (Prod. or Shut-in) In
SIZE Perforation Record (I ictured Cliff ictured Cliff ultland: 315 • First Production shut in of Test 7/21/78 STUP 1475	ILINER F TOP SC Interval, size and number (S: 3495, 3500, 3382. (1 shot/foot) Production M flc Hours Tested Ch 3 hrs Casing Piessure Cu Ho ER-SJCP 1427 old, used for fuel, venter	RECORD OTTOM SACKS CE 17) , 3503, 3515, 2, 3355, 3365, 26, 3232-48, 3 cthod (Flowing, gas II) owling oke Size Prod'n. Frest Per liculated 24- OII - Bb wr Rate	3517 DEPTH IN 3367, 3517-3 1262-75 3197+3 PRODUCTION (t, pumping - Size and to	30. SIZE 2-3/811 111 IID, SHOT, FRACTUR TERVAL AI 3821 500 W/2102 bb1s sd, 1.826 M 276 Natu Water Bb	DEPTH SET 33101 31571 E, CEMENT SQ MOUNT AND KIN Gal. 15% to 70% foam MCF Nitrogral Well Status shut Gater - Bbl. 1. Oil	PACKER SET 3310' UEEZE, EYC. 10 MATERIAL USED ICL: foam frac 5 120,000# 10/2 ICL: 10 Gas—Oil Ratio Gravity — API (Corr.) y
SIZE Perforation Record (I ictured Cliff ictured Cliff ultland: 315 First Production Shut in of Test 3/24/78 W Tubbe Pleas Siff 1425 SIFF 1425 SIFF 1425 SIFF 1425 SIFF 1425	LINER F TOP SC Interval, size and number (s: 3495, 3500, 3382. ()7-3204, 3208-2 (1 shot/foot) Production M flc Hours Tested Ch 3 hrs Casing Piessure Cu Ho ER-SJCP 1427	RECORD OTTOM SACKS CE 17) , 3503, 3515, 2, 3355, 3365, 26, 3232-48, 3 cthod (Flowing, gas II) owling oke Size Prod'n. Frest Per liculated 24- OII - Bb wr Rate	3517 DEPTH IN 3367, 3517-3 1262-75 3197+3 PRODUCTION (t, pumping - Size and to	30. SIZE 2-3/811 111 IID, SHOT, FRACTUR TERVAL AI 3821 500 W/2102 bb1s sd, 1.826 M 276 Natu Water Bb	DEPTH SET 33101 31571 E, CEMENT SQ MOUNT AND KIN Gal. 15% t 70% foam MCF Nitrog ral Well Statu shut Gater - Bb.	PACKER SET 3310' UEEZE, EYC. 10 MATERIAL USED ICL: foam frac 5 120,000# 10/2 ICL: 10 Gas—Oil Ratio Gravity — API (Corr.) y
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size Perforation Record (I Ictured Cliff Ic	nterval, size and numbers: 3495, 3500, 3352, 3382, 37-3204, 3208-2 (1 shot/foot) Production Market Character Charac	RECORD OTTOM SACKS CE 17) , 3503, 3515, 2, 3355, 3365, 26, 3232-48, 3 ethod (Flowing, gas II) owling oke Size Prod'n. F Test Per lewated 24. OII - Bb wr Rate etd, etc.)	32. AC 3517 DEPTH IN 3367, 3517-3 262-76 3197+3 PRODUCTION (t, pumping - Size and to local condition) (t) Gos - MCF	30. SIZE 2-3/8" 1" ID, SHOT, FRACTUR TERVAL A 382" 500 W/2102 bb1s Sd, 1.826 M 276 Natu YPE PUMP) Gas - MCF W Water Bb	DEPTH SET 33101 31571 E. CEMENT SQ. HOUNT AND KIN gal. 15% h 70% foam MCF Nitrogral Well Status shut fater - Bbl. 1. Oil est Wilneased B Joe Elledg	PACKER SET 3310 USEEZE, EYC. NO MATERIAL USED ICL; foam frac \$ 120,000# 10/2 ICD (Prod. or Shut-in) In Gas—Oil Ratio Gravity — API (Corr.) y e

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BEFORE EXAMINER STAMETS
OIL CONSERVATION DIVISION
Opplied EXHIBIT NO. 15

Submitted by Bocowood

Hearing Date 12/10/80

ميرو فرقعي والرابي أني أيرواء والرامزي أأي الرائال الراسفيات وأفيح فيك فيحاف فالعمام

DEPARTMENT OF THE INTERIOR GEOLOGICAL SURVEY WELL COMPLETION OR RECOMPLETION REPORT AND LOG* IN TYPE OF WELL: WARE OTHER OTHER OTHER OTHER OTHER	Form P-110 (Mar L-64)		า เม่าว	ŁD ST	ATFS	1 48U8	T IN DUPLICA.	For	m sporoved. Iget Bureau No. 42-2355.6.
WELL COMPLETION OR RECOMPLETION REPORT AND LOG* A TYPE OF VELL *** *** *** *** *** *** *** *** ***		DEPA	RTMENT	OF T	HE IN	TERIOR	structio	ns on 5. LEASE DESIGNATION	NATION AND STREET NO.
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2. Palmer Oil 8. Gas Company 3. Anneases over preserve 4. A.	LA TYPE OF W	erri Erri	OIT. GAS				2 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -		CENT MANS
### Palmer Oil & Gas Company Palmer Oil & Gas Company P. O. Box 2564, Billings, Montana 59103 10. Annotation of the proof of the			EN DEEL-		ESVA.	Other			777 - 14 P
P. 0. Box 2564, Billings, Montana 59103 At souther or well (Rigori location desiry and in secondance with any Bigle requirements)* At souther 1850° FML, 1640° FEL At top prod. laterral reported below Same At total depth Same 14. FERRIT No. DITT ISSUED 12. COUNTY OR 33. STATE 3		TOTAL CONTRACTOR	as Compan	y			•	9. WELL NO.	
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At total depth Same 14. Firmit No.		and the A. Treat of the	The second second second second	in accorda	nce with a	iny State require	menta)*	Undes i gna	ted PC and S. Lo
14. PREMITT NO. DITE INSCRIPT ON 12. COUNTY OR 18. STATE 18. DATE 1970050 16. DATE 7D. REACHED 17. DATE COUNT. (Ready to prod.) 18. ELECTROSE (or, see, ar. ce, arc.) 19. ELET. CREMERED 37/778 4/4/78 4/4/78 4/4/78 4/4/78 4/4/77 18. DATE 7D. REACHED 17. DATE COUNT. (Ready to prod.) 18. ELETATIONS (or, see, ar. ce, arc.) 19. ELET. CREMERED 3630 35.85 22. DY BULLOUT 22. DY BULLOUT 22. DY BULLOUT 22. DY BULLOUT 23. DY BULLOUT 0-7D								OR AREA	
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3/27/78 4/4/78 5/13/78 5/13/78 6533 GL, 3550 KB 6. TYCLE DEFT. NO. A TYD 21. FLOC. BACK FD., NO. A TYD 22. FF MOUTTIFLE COMPT 23 INTERVILES. BOTAST TOOLS CABLE TOOLS 3630' 3585' D-TD 22. FLOC. BACK FD., NO. A TYD 12. FF MOUTTIFLE COMPT 23 INTERVILES. BOTAST TOOLS CABLE TOOLS 3630' D-TD 25. WAS DESCRIVED 18 OF THIS COMPLETION 18 OF THIS				14.	PREMIT NO	, <u>, , , , , , , , , , , , , , , , , , </u>	ATE INSCED		18. state New Mexico
3630' 3585' BOW MANY A PERDECIMENTALISATION OF THIS COMPLETION—TOP, BOTTON, NAME (ND AND TYD)* 3325-3522 - PICTURED CLIFFS 3326-3264 - Fruitland no open hole logs were run CASINO RECORD (Report all strings red in well) CASINO RECORD (Report all strings red in well	3/27/78	4/4/7	8	5/13/	/78		6539 GL	, 3550 KB	
1. PRODUCTION 1. PRODUCTION 2. NAS DEPECTION. 3325-3522 - Pictured Cliffs 1. NAS VELL COLEGE 1. NAS VE		A CONTRACT OF THE CONTRACT OF		0 & TYO 1	BOM I	MANT [®]			CABLE TOOLS
TYPE ELECTRIC AND OTHER LACE RUN NO open hole logs were run CASING RECORD (Report all strings sed in well) CASING RECORD (Report all strings sed in well) CASING RECORD (Report all strings sed in well) R-5/8" 24# 252 KB 12-1/4" 225 SX 5-1/2" 14# 36 30 7-7/8" 350 SX	3325-352	AVAL(8), or TH 2 - Pictur	ed Cliffs	TOP, BOTTO)		The second of the second			25. WAS DIRECTIONAL SUBJECT MADE
CASING RECORD (Report all strings ret in well) CASING RECORD (Report all strings ret in well) CASING RECORD (Report all strings ret in well) CASING RECORD CASING RECORD RECORD RECORD CASING RECORD RECORD RECORD RECORD CASING RECORD RECO	and the second of the second	and the state of			1,3		(f.r./ <u> </u>	62	
CASING RECORD (Report all strings set in well) CASING RECORD (Report all strings set in well) 8-5/8" 24# 252' KB 12-1/4" 225 SX 5-1/2" 14# 3630' 7-7/8" 350 SX LINER RECORD ADOLTH SET (MD) LINE RECORD LINE RECORD LINER RECORD LINER RECORD ADOLTH SET (MD) LINER RECORD ADOLTH SET (MD) LINER RECORD LINER RECORD LINE RECORD LINER RECORD ADOLTH SET (MD) ADOLT SET (MD) ADOLTH SET (MD) ADOLTH SET (MD) ADOLTH SET (MD) ADOLTH SET (MD) ADOLT SET (MD) AD		 1 Despite the St. 1997. 	The Section of the Section						
8-5/8" 24# 252' KB 12-1/4" 225 sx 5-1/2" 14# 3630" 7-7/8" 350 sx LINER RECORD BLES TOF (MD) SOTTOM (MD) SACES CEMENT* SCREEN (MD) SIZES DEPTH BET (MD) FACETE SET (MD)						حنست حود مانشناسات			1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Second Size Depth Second Size Depth Set (MD) PACKE SET (MD) Size Depth Set (MD) PACKE SET (MD) Size Depth Set (MD) PACKE SET (MD) PAC								TING RECORD	ANOUNT PULLED
DEFTER PRODUCTION PRODUCTIO									
LINER RECORD 30. TUBING RECORD									
2-3/8" 3300			LINER RECO	RD		<u> </u>	30.	TUBING RECORD	
11 3209'	BIER	tor (MD)	BOTTON (ND)	BACKS	CEMENT'	SCREEN (MD)			PACKER SET (MD)
PRODUCTION PRO			<u> </u>]					
3483, 3486, 3516, 3522 (1 shot each) r - 3106-20, 3130-36, 3150-90, 3198-3214, 3228-36, 3252-56, 3260-64 (1 sh/ft) ** ** ** ** ** ** ** ** **					<u> </u>	82.			UEEZE, ETC.
r - 3106-20, 3130-36, 3150-90, 3198-3214, 3228-36, 3252-56, 3260-64 (1 sh/ft) ** ** ** ** ** ** ** ** **									ره . از و منخسختند تسمید کندندند
3228-36, 3252-56, 3260-64 (sh/ft) PRODUCTION PRODU		To a state of the form of the			4 40 kg s 9	3325-352	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		
THE PRODUCTION PRODUCTION METHOD (Flowing, gas lift, pumping—size and type of pump) Shut—In Flowing Shut—In	3228-3	6, 3252-56	, 3260-64	(sh/	ft)	3101-326		- 3-4, 44 × 5×4 ×	
THE FIRST PRODUCTION PRODUCTION METHOD (Flowing, gas lift, pumping—size and type of pump) Shut—In Flowing Shut—In Shut—In Shut—In Shut—In Shut—In Shut—In Shut—In FR 78 PC 225 W. TURING PRESSURE CALCULATED OIL—BBL. GAS—NCF. WATER—BBL. GAS—NCF. WATER—BBL. GAS—NCF. WATER—BBL. GAS—NCF. WATER—BBL. GAS—NCF. FR 78 PC 225 W. TURING PRESSURE CALCULATED OIL—BBL. GAS—NCF. WATER—BBL. GIL GRAVITY-AFI (CORE.) 38 FCP 599 DISPOSITION OF GLE (Sold, used for fuct, vented, etc.) TABLE WITNESSED BY LIST OF ATTACHMENTS					PROI	DECEN N			
Shut In flowing Shut-in THE OF TRATE BOURS TRATED CHOKE SIZE PROD'N, YOR TRATE PROD'N, YOR		HON PRO	DUCTION METHOD	(Flowing,			s lyps of pump)	- WELL STAT	Us (Producing or
5/13/78 3 hrs 3/4" TRAT PERIOD FR 78 PC 225 TWO TURNES CHARGE PRESENCE CALCULATED OIL—BEL. GAS—NCE WATER—BEL. OIL GRAVITY-API (CORR.) 38 FCP 599 TO be sold LIST OF ATTACHMENTS TRAT WITNESSED BY JOE Elledge		T = 1 = 1 = 1 = 1							shut-in
W. TURING PRESE. CASING PRESEURE CALCULATED OIL—BEL. GAS WATER—BEL. OIL GRAVITY-AFT (CORR.) 1806 624				TRET		OIL-BBL.	r Billion File Comment	1	618-OLD #7210
to be sold List of Attachments Doe Elledge	W. TUBLING PRIMAG.	CTEING SPREEL	CALCULATE 24-MOUR R		·18¢.	186			ORAVITT-API (COAR.)
List of Attacaments			r fuel, vented, et	c.)					
그 중 다른 교육학교로 하는 이 물을 잃으면 하는 것이 아버지는 그 나는 사람들이 가는 것 같은 것 같은 것 같은 것 같습니다.					ng ning	: en		J Joe Ella	edge .
I hereby certify that the foregoing and attached information is complete and accept to different the foregoing and attached information is complete and accept to different the foregoing and attached information is complete and accept to different the foregoing and attached information is complete and accept to different the foregoing and attached information is complete and accept to different the foregoing and attached information is complete and accept to different the foregoing and attached information is complete and accept the foregoing and attached information is complete and accept the foregoing and attached information is complete and accept the foregoing and attached information is complete and accept the foregoing and attached information is complete and accept the foregoing and attached information is complete.						أحداث الأنظام الأوليديية			
SIONED Robert D. Ballantyne Production Sup't DATE 5/30/78	Ω.	a till	Bullanti						

BEFORE EXAMINER STAMETS
OIL CONSERVATION DIVISION
Opplies DEXHIBIT NO. 16
CASE NO. 2587
Bubmitted by Blocksond
Hee 12/10/80

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

EXAMINER HEARING

12 November 1980

IN THE MATTER OF:

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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

APPEARANCES

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

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15	Applicant Exhibit One, Map	
16	Applicant Exhibit Two, Section	
17	Applicant Exhibit Three, Regulations	
18	Applicant Exhibit Four, Regulations	
19	Applicant Exhibit Five, Analysis	9
20	Applicant Exhibit Six, Log	10
21	Applicant Exhibit Seven	10
22	Applicant Exhibit Eight	
23 24	Applicant Exhibit Nine	
25	Applicant Exhibit Ten	
26	Applicant Exhibit Eleven	
27	Applicant Exhibit Twelve	
28	Applicant Exhibit Thirteen	interior National alternation

Applicant Exhibit Fourteen Applicant Exhibit Fifteen Applicant Exhibit Sixteen -16

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 re-

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:

flect.

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

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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.

Have you prepared certain exhibits for introduction in this case?

Yes, I have.

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?

Yes, they have.

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

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.

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 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 Northeust 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

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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 ce 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

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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

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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.

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, --

Yes.

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

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13 1 2 Yes. 3 MR. STAMETS: It would seem as though 4 there would be no necessity in covering all of those again, 5 but perhaps we should go to the back and let you ---All right, 7 MR. STAMETS: -- summarize what the re-8 ာ sults of those were. 10 I would love to. 11 MR. STAMETS: And --12 Let me just state --13 MR. STAMETS: -- everything that you've 14 included in here, in Exhibit A, is your statement and your 15 testimony. 16 Yes, that's right. A. 17 MR. STAMETS: Okay. 18 19 I'd be more than happy not to read the 20 rest of this into the record, satisfactory. 21 MR. STAMETS: I think that would be 22 just fine. 23 Okay. Let's just -- why don't we skip 24 over here then to summary and conclusions, if that's all 25 right. 26 MR. STAMETS: I'm tickled to death. 27 28 Okay. A.

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

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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

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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 in-

cluding 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.

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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

Northeast Blanco Well Number 202, 40 Mcf

Northeast Blanco 203, 15 Mcf per day.

Northeast Blanco Well 204, 34 Mcf per day.

Northeast Blanco Well 205, 20 Mcf per

Palmer Oil and Gas or Tenneco No. 3,

35 Mcf per day,

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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 nonstimulated 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 The high cost of drilling eleven wells well per day.

to find seven Fruitland producers, and the necessity of expensive stimulation procedures to enhance production should

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

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

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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?

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.

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:

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.

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

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?

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?

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.

A. That's right.

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

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on the exhibit?

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.

Okay, they're slightly shaded in there.

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

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

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 --

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.

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

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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?

Mell, 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.

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.

If the 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.)

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CERTIFICATE

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.

Saveyles. Boyd CSR.

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

chard V. Slame F. Examiner

Oll Conservation Division

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STATE OF NEW MEXICO ENERGY AND MINERALS DEPARTMENT OIL CONSERVATION DIVISION 2 STATE LAND OFFICE BLDG. SANTA FE, NEW MEXICO 3 12 November 1980 EXAMINER HEARING 5 6 IN THE MATTER OF: Application of Blackwood & Nichols 8 Company, Ltd., for designation of a) CASE tight formation, San Juan and Rio Arriba Counties, New Mexico. 7087 9 10 BEFORE: Richard L. Stamets 11 12 TRANSCRIPT OF HEARING 13 14 APPEARANCES îõ 16 For the Oil Conservation Ernest L. Padilla, Esq. 17 Division: Legal Counsel to the Division State Land Office Bldg. 18 Santa Fe, New Mexico 87501 19 20 William F. Carr, Esq. For the Applicant: CAMPBELL & BLACK P. A. 21 Jefferson Place

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Santa Fe, New Mexico 87501

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Cross Examination by Mr. Chavez	2
EXHIBITS	
Applicant Exhibit A, Summary	
Applicant Exhibit One, Map	
Applicant Exhibit Two, Section	
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Applicant Exhibit Eleven	
Applicant Exhibit Twelve	
Applicant Exhibit Thirteen	
2	INDEX CHARLES F. BLACKWOOD Direct Examination by Mr. Carr Cross Examination by Mr. Stamets Cross Examination by Mr. Chavez EXHIBITS Applicant Exhibit A, Summary Applicant Exhibit One, Map Applicant Exhibit Two, Section Applicant Exhibit Three, Regulations Applicant Exhibit Four, Regulations Applicant Exhibit Five, Analysis Applicant Exhibit Six, Log Applicant Exhibit Six, Log Applicant Exhibit Eight Applicant Exhibit Fight Applicant Exhibit Ten Applicant Exhibit Ten Applicant Exhibit Ten Applicant Exhibit Ten Applicant Exhibit Eleven Applicant Exhibit Eleven Applicant Exhibit Eleven Applicant Exhibit Eleven

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EXHIBITS

Applicant Exhibit Fourteen Applicant Exhibit Fifteen Applicant Exhibit Sixteen

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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. STANETS: The record shall so re-

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:

flect.

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

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		We ar	e seeking	that the	area of the	
Northeast	Blanco Un	it be de	signated a	ı tight r	eservoir for	the
ruitland	formation	under t	he categor	v 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?

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. Stameter

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 inde 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.

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

A ...

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 and not adversely affected by our operations. Our procedures have been in accord with all State and Federal rules and have been in accord with all State and Federal regulations regulations. A part of the pertinent Federal regulations are attached, Exhibit Three. They are pages 1 through 5 of are attached, Exhibit Three. They are pages 1 through 5 of

pages C-6, C-7, and C-8 of the New 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

「Marie Carlot Carlot

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 24(2), 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

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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

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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.

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, --

Yes.

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

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		ies.		
A CONTRACTOR		MR. STANETS	3: It would	seem as though
there woul	d be no n			f those again,
		ald go to the l		
	A.	All right.		
		MR. STAMET	S: summar	rize what the re-
sults of t	hose were			
		I would lo	ve to.	
		MR. STAMET	es: And	
		Let me jus	st state	
		MR. STAMET	rs: every	thing that you've
included:	in here,	in Exhibit A,	is your stat	ement and your
test1mony				A CONTRACTOR OF THE CONTRACTOR
		Yes, that	's right.	
		MR. STAME!		요리는 그의 회를 발견하다. 그는 사람들이 어느 되었다.
		I'd be mo	re than happy	not to read the
rest of t	his into	the record, s	atisfactory.	
연구한테르트 (15년) 일본 등 등 기원회		MR. STAME	THE REPORT OF THE SECOND	that would be
just fine				
	A.	Okay. Le	et's just '	why don't we skip
over here	4.4 (9.5)	summary and c		
right.				
		mr. Štami	ers: I'm tic	kled to death.
	A.	Okay.		
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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

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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.

per day.

day.

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

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

Palmer Oil and Gas or Tenneco No. 3,

35 Mof per day.

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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.
- 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.
- 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?

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No.

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

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.

Yes, that's correct.

MR. STAMETS: Okay, these exhibits will

be admitted.

MR. CARR: We have nothing further on

direct.

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CROSS EXAMINATION

BY MR. STAMETS:

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.

- 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-

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that.

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?

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?

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

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

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 Q. Okay.

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

CROSS EXAMINATION

BY MR. CHAVEZ:

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.

A. That's right.

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 -- 1 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.

- 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 --
- O 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.

O 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.

A 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.

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.

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

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.)

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CERTIFICATE

I, SALLY W. BOYD, C.S.R., DO HERERY 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 cerliff, he	the foregoing is
a complete record of	He proceedings in
the Examiner hearing	of Case I-o.
heard by me on	
	, Examiner

Oil Conservation Division

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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 CASE tight formation, San Juan and Rio 7087 Arriba Counties, New Mexico. 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			1
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CAMPBELL & BLACK P. A. Jefferson Place		Legal Counsel to t State Land Office	he Division Bldg.
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	INDEX	
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	Direct Examination by Mr. Carr	
	Cross Examination by Mr. Stamets	14
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Applicant	Exhibit 19, Cross Section	. 9
Applicant	Exhibit 20, Supplement	11
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MR. STAMETS: We'll call now Case 7087.

MR. PADILLA: Application of Blackwood

Ltd. for designation of a tight forma-

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 one 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.

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 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:

Mr. Blackwood, will you now refer to

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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'.

That's our Exhibit Number Eighteen. Q.

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

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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

B-B'.

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.

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.
 - Ω On Exhibit Eighteen.
 - A. On Exhibit Eighteen, the cross section

sive 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

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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 repre-

0. Will you now refer to Exhibit Nineteen, cross section C-C', and review that for Mr. Stamets?

sent a Pictured Cliffs sandstone stringer,

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

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.

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 bot-

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 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.

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.

mar of other

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 nonstimulated, 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

will be admitted.

 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.

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.

On 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

MR. CARR: I have nothing further of this witness on direct.

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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?

Mell, 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 not 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.

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.
 - 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.

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?

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greatly. I think that undoubtedly at some point in the future

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3	a well will be drilled a
	a well will be drilled down there and information will be forthcoming, but information is not ear
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6	Just a Ferhaps we could
	Just a moment, I'll tell you
8	Okay, let's .L
9	about something we have done. Okay, lett-
10	Okay, let's go off the record.
12	(Thereupon discussion was
14	off the record.)
15	마이트를 보고 있는 경기를 받는 것이다. 그렇게 살아보고 있는 것이 되었습니다. 그 사람들은 사람들은 그를 모르는 것이다. 그리고 있다.
16 17 cor	d. MR. STAMETS: Let's go back on the

go back on the re-

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?

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

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18 qualify those blocks for the tight reservoir treatment. think it would, would epend up the development. Would you mention a period of time under 1 2 I would prefer two years. We've had a normal business practices, one year? 3 difficult time obtaining the necessary drilling rigs. As a 4 matter of fact, we're still drilling at this date, and barely 5 6 will finish our 1980 drilling program the last three or four 7 8 I would recommend that we had a two year 9 period in which to take permeability information on each of days of the year. 10 11 Thank you. Based on a phone call 12 these additional blocks. that'I got from FERC since we had the last hearing, I'd like 13 to ask you a couple of questions concerning the protection 14 15 provided for any aquifers in the area by the Division's and the U. S. Geological Survey's casing and cementing practices. 16 17 In general, what's the average depth of 18 19 The average depth to the top of the 20 the Fruitland in this area? Fruitland is around 2900 feet and to the base, around 3100 21 22 Okay. Now, in drilling these wells what 23 · 24 feet. 25 would your normal casing program be? 26 27 28

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.

@ 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.

o 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 Ckay, 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

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that you're talking about in the Fruitland and Pictured Cliffs?

A Yes, waters occur in several of the sand-

stones, particularly the Ojo Alamo sandstone. It carries water in this area.

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.

Okay, specifically what I'm talking about is in the treatment of the zone, acidizing, fracturing.

A. We have --

And then obviously, the next question is how are we all assured that we don't frac into and damage the fresh water?

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

which are indicated to be porous and gas productive. We do

recommendations.

Well, the -- we perforate the sandstones

Q Ckay.

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.

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1	You're speaking of far vertically?
2	Par vertically, yes.
3	A. of magnitude?
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5	gregories and the fire of the left transfer of the specific times of the specific and the specific transfer to
6	Mell, several hard water just looking at these cross sections, the Ojo Alamo water just looking at these cross sections,
7	just looking at these cross sections, 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,
8	· Deliver State of the second
9	and I don't adjacent to the top of the Fruitland. adjacent to the top of the Fruitland. So what you're saying is where you have
10 11	g so what you're say. Q so what you're say. Q these fresh water zones, it's just a rare occurrence, not these fresh water zones.
12	these fresh water zones, it's Just
13	the predictable sort of thing. The fresh water zone that is continuous The fresh water zone that is continuous
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15	The fresh water. A The fresh water. A generally several and is a large aquifer in the area, is generally several and is a large aquifer in the area, is generally several and is a large aquifer in the area, is generally several and is a large aquifer in the area, is generally several and is a large aquifer in the area, is generally several and is a large aquifer in the area, is generally several and is a large aquifer in the area, is generally several and is a large aquifer in the area, is generally several and is a large aquifer in the area, is generally several and is a large aquifer in the area, is generally several and is a large aquifer in the area, is generally several and is a large aquifer in the area, is generally several and is a large aquifer in the area, is generally several and is a large aquifer than our Fruitland formation, and pre-
16	hundred feet higher than our Fruitza.
17	sents no problem.
18	Q Okay.
19	Q Okay. A little, small quantities of fresh A little, small quantities of fresh
2	A little, small quantities and have a little, small quantities to be useful for agriculture
	water occur in the coal beds themson water occur in the coal beds themson water occur in the coal beds themson be of sufficient quantities to be useful for agriculture be of sufficient quantities to be useful for agriculture be of sufficient quantities to be useful for agriculture could only need to be drained off
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	before the gas from the course
	be produced.
	26 MR. PADILLA: TO Y
7	anyone use any of this 22

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27 28 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 water flood or re-pressure oil and gas reservoirs, but not for agricultural purposes.

- On The water that you'd be trying to protect would be the Ojo Alamo water, the water above.
 - A. Yes.
- 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.
 - And did it deplete, or is it depleted?
- A. It is depleted. It has not totally de-

강사 본 시방 (강화택생 1호 레스트) 이 제

A. Well, we don't -- we get almost no

What volumes are we talking about here?

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?

M. It's a shale.

1 2 Would that --3 The Kirtland shale. Would that tend to heal up any fractures 5 that were induced in that zone? 6 7 Well, yes, and the fractures would not be anticipated to go that high; to have that vertical extent. 8 9 Your normal fracturing treatment is intended to go out horizontally and not vertically? 10 11 Well, of course, it obviously fractures 12 both directions, but it's intended to fracture the formation 13 that you're gas is to be produced from. 14 You've had no indication that they ex-15 tend upward to any great extent? 16 17 No, not to any fresh water aquifer. 18 Not going up 1200 feet? 19 No, no. 20 Just to refresh my memory, in the origi-21 nal hearing you went through some rather complicated mathe-22 matics, engineering, to demonstrate that these wells which 23 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?

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26 No, all of the Fruitland wells were 3 treated. The -- I think what you're referring to, in the one Fruitland well which we have within the area, was the 5 one Fruitland hole which was drill stem tested back in the 6 1950's. 7 That's the well shown --8 9 That's the well shown in yellow. 10 Q. -- with the yellow square on Exhibit 11 Number One Revised? 12 Yes. 13 Okay. 14 That -- that well was drill stem tested 15 prior to any stimulation or fracture. 16 So that well does lend or give validity 17 18 to the --19 The permeability factor. 20 Right, the arithmethic calculations that 21 show that everything should be within the parameters set out. 22 MR. STAMETS: Are the e any other ques-23 tions of this witness? 24 I have no further que tons. MR. CARR: 25 MR. STAMETS: He may be excused. 26 27 thing further in this case? The case will be taken under advisement.

Page	22000		27	
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CERTIFICATE

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

Sally W. Boyd C.S.R.

Oll Conservation Division

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UNITED STATES OF AMERICA BEFORE THE FEDERAL ENERGY REGULATORY COMMISSION

NGPA SECTION 107 TIGHT FORMATION RECOMMENDATION	AND	100 (100 (100 (100 (100 (100 (100 (100		
STATE OF NEW MEXICO OIL)	Docket	No.	
CONSERVATION DIVISION OF THE ENERGY AND MINERALS DEPARTMENT				

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)
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 a March, 1981.	nd sworn to before me, this day o
My Commission Exp	NOTARY PUBLIC
	ERTIFICATE OF SERVICE
for Blackwood & M:	ify that I have this day served a copy of th dation to Campbell and Black, P.A., At≀orney chols Co., Ltd., in accordance with the ction 1.17 of the Rules of Practice and
Dated this	day of March, 1981.
	ERNEST L. PADILLA

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1 2 3	ENERGY AND OIL CONSI STATE LA SANTA	OF NEW MEXICO MINERALS DEPARTMENT ERVATION DIVISION AND OFFICE BLDG. FE, NEW MEXICO Ecember 1980	
5		INER HEARING	
7 8 9 10	IN THE MATTER OF: Application of Bla Company, Ltd., for tight formation, S Arriba Counties, N	ckwood & Nichols designation of a an Juan and Rio	CASE 7087
12 13 14 15 16 17		IPT OF HEARING	
18	and the second of the second o	ARANCES	
19 20 21 22	For the Oil Conservation Division:	Ernest L. Padilla Legal Counsel to State Land Offic Santa Fe, New Me	e Bldg.
23 24 25	For the Applicant:	William F. Carr, Esq. CAMPBELL & BLACK P. A. Jefferson Place Santa Fe, New Mexico 87501	
26 27 28			

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va yi jirin in	2 3 INDEX CHARLES F. BLACKWOOD
6 7 8	Direct Examination by Mr. Carr
9 10 11 12 13	
14 15 16	EXHIBITS
17 18 19 20 21 22	Applicant Exhibit One, Map Applicant Exhibit 17, Cross Section Applicant Exhibit 18, Cross Section Applicant Exhibit 19, Cross Section Applicant Exhibit 19, Cross Section Applicant Exhibit 20, Supplement
23 44 5	

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MR. STAMETS: We'll call now Case 7087

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 renswear him in, it might be appropriate at this time.

ation 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-

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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

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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.
 - O. 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

102-A.

B-B'.

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 Mortheast 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, Fruit-land --

- Q Could you tell us what well you're talking about when you say this --
 - A. Okay. Let's take, for example, Well
 - Ω On Exhibit Eighteen.
 - A On Exhibit Eighteen, the cross section

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

ર્લનો લાભ માં મેકાનું કરે કહ્યું છે. તે કહ્યું કરોકો કહ્યું છે. જે લાગુ કરો છે. માટે લાગ્યું કરો છે. માટે લેવો

equivalent to the massive Pictured Cliffs sandstone. Inasmuclas 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.

0. 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 oc-

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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.

Mr. Blackwood, if for the purposes of this application you were asked to select a type log, which log would it be?

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?

In 17-A? Let's see, the base would be at 32 -- about 3224, and the top is about 2926.

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27 28 MR. STAMETS: Thank you.

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.

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?

Exhibit Twenty is supplement to the gas volume estimates which were made previously in the former

This is an attempt to update the gas hearing. 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 nonstimulated, 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 periday.

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

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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.

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?

Yes, it does.

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

Yes.

Were revised Exhibit One and Exhibits Seventeen through Twenty prepared by you or under your direction and supervision?

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.

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CROSS EXAMINATION

BY MR. STAMETS:

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?

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.

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

- Just a minute. Okay.
- And then another between Sections 6 and 7, in the township immediately to the south.
 - Now let me see if I understand what

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you're saying.

You have -- one of these lines you put between Section 19 and 30.

Q.

A. .

A. On the west side of the unit.

Q. Right, and then run it -- run it from west to east.

Uh-huh.

Right.

 $oldsymbol{Q}_i$ 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?

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16 Okay, let's --1 You mean --Let's say, for example, we decide this 2 today, or a decision is made today that all of this unit be-3 4 longs in. Then within a year the completion of a well in 5 Section 33 of 31 North, 7 West, demonstrating in situ gas 6 permeability of less than 0.1 of a millidarcy and productive 7 capacity lower than that spelled in Federal regs, would de-8 9 monstrate that that block should be retained. that's this central block that's like ---10 11 A. -- miles -- north/south dimension, three 12 yes. Q. 13 A. 14 Right, but upon failure to complete such 15 miles. a well in here, that central block would be thrown out. 16 17 And the same --And the same thing for the southern 18 19 Λ. 20 -- thing for the southern block. block. I would only say that at this point we 21 Ü. don't have any plans to drill that far south within the next 22 23 year, and that if those were thrown out and not prejudice 24 us at some future point going in, I would not object to that 25 I think that undoubtedly at some point in the future 26 27 28

17 1 a well will be drilled down there and information will be 2 forthcoming, but information is not easy to obtain. 3 Perhaps we could go off the record for 4 just a moment, I'll tell you --5 6 Okay, let's --7 -- about something we have done. 8 Okay, let's go off the record. 9 10 , (Thereupon discussion was had 11 off the record.) 12 13 14 MR. STAMETS: Let's go back on the re-15 16 cord. 17 We were talking about making blocks out. 18 of this thing. 19 Let me ask one further question, then, 20 Mr. Blackwood. Is it possible that this type of a concept, 21 the block concept, could result in the somewhat speedier 22 development or testing of the Fruitland in those blocks than 23 just simply authorizing the entire unit as a whole? 24 Yes, Mr. Stamets, I think the block con-25 λ. 26 cept would provide impetus for us do additional permeability 27 testing within each of the additional blocks in order to 28

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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.

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.

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.
- 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.

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

20 that you're talking about in the Fruitland and Pictured Cliffs? Yes, waters occur in several of the sand-1 stones, particularly the Ojo Alamo sandstone. It carries 2 3 4 And that's above the Fruitland? water in this area. 5 It's above the Fruitland. 6 7 How much? How far above the Fruitland? 8 Q. 9 Again that varies greatly from area to 10 Yes. area, based on the geologic interpretation, but in some areas 11 12 it's directly above the Fruitland, In other areas it's 13 14 several hundred feet higher. Okay. In completing a Fruitland well 15 in this area, what completion techniques would you use? 16 well, what we have used in the past is 17 to set 4-1/2 inch casing and circulate cement clear back to 18 19 Okay, specifically what I'm talking about 20 the surface. 21 is in the treatment of the zone, acidizing, fracturing. 22 23 We have --And then obviously, the next question 24 A. is how are we all assured that we don't frac into and damage 25 26 27 the fresh water? 28

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.

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.

On what order of magnitude?

Mell, 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.

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.

The water that you'd be trying to protect would be the Ojo Alamo water, the water above.

A. Yes.

Ω 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.

And did it deplete, or is it depleted?

A. It is depleted. It has not totally de-

pleted.

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 Q What volumes are we talking about here?

Mell, we don't -- we get almost no measurable water at the surface, of I 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.

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.

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25 Would that --The Kirtland shale. 2 would that tend to heal up any fractures A. 3 4 that were induced in that zone? Well, yes, and the fractures would not 5 be anticipated to go that high; to have that vertical extent. 6 Your normal fracturing treatment is in-7 8 tended to go out horizontally and not vertically? Well, of course, it obviously fractures 9 both directions, but it's intended to fracture the formation 10 11 that you're gas is to be produced from. 12 You've had no indication that they ex-13 14 tend upward to any great extent? No, not to any fresh water aquifer. 15 16 Not going up 1200 feet? 17 Q. No, no. Just to refresh my memory, in the origi-18 nal hearing you went through some rather complicated mathe-19 20 matics, engineering, to demonstrate that these wells which 21 had been treated and were downhole commingled probably were 22 well within the limits set out in our regulations relative to 23 in situ permeability and productivity, and that as to the 24 Fruitland there was one well which had not been treated, which 25 26 bore out all of those figures, is that correct? 27 28

No, all of the Fruitland wells were 3 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 6 1950's. 7 That's the well shown ---Q. 8 That's the well shown in yellow. 10 -- with the yellow square on Exhibit 11 Number One Revised? 12 Yes. 13 Okay. 14 That -- that well was drill stem tested 15 prior to any stimulation or fracture. 16 So that well does lend or give validity 17 to the --18 19 The permeability factor. 20 Right, the arithmetic calculations that 21 show that everything should be within the parameters set out, 22 MR. STAMETS: Are there any other ques-23 tions of this witness? MR. CARR: I have no further questions. 25 MR. STAMETS: He may be excused. Any-26 thing further in this case? The case will be taken under 27 28 advisement.

CERTIFICATE

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

Sally W. Boyd C.S.R.

I do hereby certify that the foregoing is a complete record of the proceedings in the Examinar hearing of Case 10, 7087, heard by me on 12-10 19.80.

Oll Conservation Division

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 Maxico.
 - (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, Exeminer 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 0il 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 ap previously ordered.
- CASE 7080: Application of Franks Petroleum, Inc. for an unorthodox gas well location, Les 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 Rear 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 c. pulsory 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-scre 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 prace offsetting Maralo's Jalmar 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 by section 7, Township 25 South, lange 36 East, Jalmat Pool.

CASE 7083: Application of Bass Enterprises Production Co. for compulsory recling, 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 NCPA 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 1 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 ellocation 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, Eunge 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 provation and spacing unit and a discovery allowable for said J. G. O'Brien Well

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 Hexico.

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 271,701-703.

CASE 7036: Application of Blackwood & Nichole 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 GFR 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 1505) 827-2434

Federal Energy Regulatory Comm. Department of Energy 825 North Capital 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 CONSTRUCTION SANTA SE

GEOLOGICAL SURVEY

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

MAR 0 9 1981

Mr. Ernest L. Padilla 011 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,

Cener Dance C Gene F. Daniel Deputy Conservation Manager,

011 and Gas

EXHIBIT C



United States Department of the Interior Cus Devision

GEOLOGICAL SURVEY

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

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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 (505) 827-2434

Federal Energy Regulatory Comm.
Department of Energy
825 North Capitol Street, N.E.
Washington, D. C. 20426

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ERNEST L. PADILLA General Counsel

ELP/dr

enc.

cc: Campbell & Black, P.A.

UNITED STATES OF AMERICA BEFORE THE FEDERAL ENERGY REGULATORY COMMISSION TO SEE

NGPA SECTION 107 TIGHT FORMATION RECOMMENDATION)):				
STATE OF NEW MEXICO DIL))	Docke	∍t No.		
CONSERVATION DIVISION OF)				1.0
THE ENERGY AND MINERALS)				
DEPARTMENT)			100 to 400 ot.	Barrelli -

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 di

VERIFICATION

ERNEST L. PADILLA, being first duly sworn, on wath, 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.

	POURCE IN A STATE OF	
	ERNEST L. PADILLA	
Subscribed and March, 1981.	sworn to before me, this	day of
	NOTARY PUBLIC	
My Commission Expir	es:	
<u>C</u> É	RTIFICATE OF SERVICE	
foregoing Recommend for Blackwood & Nic	fy that I have this day serve ation to Campbell and Black, hols Co., Ltd., in accordance tion 1.17 of the Rules of Pra	P.A., Attorneys with the
Dated this	day of March, 1981.	
	ERNEST (PADILLA	
Awakawa jarah jajir bang lah	r Majalon di Barata da Lora da Galego eta 180	



BRUCE KING LARRY KEHDE

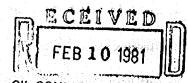
STATE OF NEW MEXICO ENERGY AND MINERALS DEPARTMENT OIL CONSERVATION DIVISION

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	Applicant:
Santa Fe, New Mexico	Blackwood & Nichols Co., Ltd
Dear Sir: Enclosed herewith are two Division order recently en Yours very truly, JOE D. RAMEY Director	copies of the above-referenced in the subject case.
JDR/fd	
Copy of order also sent	기 식을 보고 있다. 그는 사람이 하는 것은 같이 있다는 것이다. 1985년 - 1일 등 하는데 그는 사람들이 그 것이다.
Hobbs OCD x Artesia OCD x Aztec OCD x	

CAMPBELL, BYRD & BLACK, P.A.

JACK M. CAMPBELL
HARL D. BYRD
BRUCE D. BLACK
MICHAEL B. CAMPBELI
WILLIAM F. CAHN
BRADFORD C. BERGE
WILLIAM G. WARDLE



OIL CONSERVATION DIVISION
SANTA FE
JEFFERSON PLACE

SUITE I - 110 NORTH GUADALUPE POST OFFICE BOX 2208 SANTA FE. NEW MEXICO 87501 TELEPHONE: (505) 988-4421 TELECOPIER: (505) 983-6043

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:1r

Enclosure

cc: Mr. Charles F. Blackwood

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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.

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Page 2

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Supersedes Organia 12-10-80 Hearing 12-10-80 Exhibit 14. Completion Report Yager No. 3 shows producing interval (perforations) and Fracture stimulation procedure used in this well.

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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 GLACKLOOD

Hearing Date 11-17-80

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-ROW 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.

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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, 131N, 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.

The Fruitland formation of the northeast flank of the San Juan Basin is composed Geological and Engineering Data ine rruitiand formation of the northeast flank of the san Juan Basin is composed primarily of coal seams, shales and tight sandstone stringers. This information primarily of coal seams, shales and tight sandstone stringers. This information 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 has been determined from hundreds of logs run on wells drilled for the last 30 has been determined from hundreds of logs run on wells drilled for the last 30 has been determined from hundreds of logs run on wells drilled for the last 30 has been determined from hundreds of logs run on wells drilled for the last 30 has been determined from hundreds of logs run on wells drilled for the last 30 has been determined from hundreds of logs run on wells drilled for the last 30 has been determined from hundreds of logs. Sonic logs. Formation density logs. years. Electric logs, Gammaray Neution logs, Sonic logs, Formation density logs, years. Electric logs, Gammaray Neution logs have been analysed and interpreted Sidewall Neution logs and many other types have been analysed and interpreted sidewall Neution logs and many other types have been analysed and interpreted sidewall Neution logs and many other types have been analysed and interpreted sidewall Neution logs and many other types have been analysed and interpreted sidewall Neution logs. over the years to show the coal seams, shales and tight sandstones. These logs have also indicated that natural day and platfor (almost face) and platfor (almost face). over the years to show the coal seams, shales and tight sandstones. These roys 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 rressure 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 test was taken on Northeast Blanco Unit well # 3055 feet to 3205 feet. This Fruitland formation was tested from a depth of 3055 feet to 3205 feet. This fruitland formation was tested from a depth of 3055 feet to 3205 feet. This first test has been analysed and committations have been made that show the depth of 3055 feet. rrulliand tormation was tested from a depth of 3000 feet to 3200 feet. This that show the drill stem test has been analysed and computations have been made that show the drill stem test has been analysed and computations have been made that show the drill stem test has been analysed and computerized. The highest recorded shut in 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 as pressure was 1629 psig. A copy of the lon on the Northeast Blanco Unit well # 33-12 is also included as a copy of the lon on the Northeast Blanco Unit well # 33-12 is also included as pressure was 1029 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 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 pressure information was obtained. It is necessary to raise the mud weight 11.5 pressure in the Fruitland formation. 12.5 lbs per gallon in order to control the pressure in the Fruitland formation is abnormally high pressure may also be an indication of low depth drilled. This abnormally high pressure may also be an indication of the Fruitland formation and permeability. A reduction in the original void space of the Fruitland porosity and permeability. A reduction in the original void space of the fruitland porosity and permeability. depth drilled. Inis abnormally high pressure may also be an indication of low porosity and permeability. A reduction in the original void space of the Fruitland porosity and permeability. An eduction in the original permeability. An formation may have occured to cause a reduction was once at a deeper level below other interpretation could be that this formation was once at a still transed even the surface and that normal pressures at that deeper level are still transed even other 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 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 though the Fruitland formation would 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 Fruitriow rates of wells in the area which have recently peen produced from the fruit-land 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 helow along with calculations of stabilized production, production improvement by have to be extremely low. gas were in the area of the northeast planto unit and the adjacent werrs is given below along with calculations of stabilized production, production improvement by stimulation etc.

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 holes have resulted so far in two well which has been unsuccessfully attempted cliffs comminded wells and one well which has been unsuccessfully attempted Stabilized production vs depth guidelines. notes have resurced so far in two registrand producers, two registrand rectarged Cliffs commingled wells, and one well which has been unsuccessfully attempted to the Distinct Cliffs and the Emilitiand formation. This inclines selection has been unsuccessful halp has in the Pictured Cliffs and the Fruitland formation. This unsuccessful hole has in the rictured Cliffs and the rruitiand formation. Inis unsuccessful notes been re-completed in the Fruitland and is now testing gas and water at non

A listing of the five Northeast Blanco Unit wells, with completion information, 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 prescure" have been included. sure 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

Ap Production (to the pipeline)
Shut in pres. = Production (to the atmosphere)

Where Ap = 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 recommedided 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	1/,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.

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

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 continuously. 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.

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

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 recompletion 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 011 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 011 and Gas Company and were purchased by Tenneco 011 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

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

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. M	cf Da	ıys 💮	Mcfpd
May, 1980		447		1	14
June, 1980	The strain of a strain section of the strain section sec	275	2	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.

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

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 we11	#		Fruitland For Mcfpd	rm.
201 202			15 40	
203 204	ale el la companya de la companya d La companya de la co		15	
205			34 20	
Palmer 011	& Gas			
(Tenneco) Yager #	3		35	
Federal		7 well total	$\frac{15}{174}$	
		1 well average		d 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

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BEFORE EXAMINER STAMETS OIL CONSERVATION DIVISION
ACCURATES EXHIBIT NO. 2
CASE NO. 7087
Submitted by Stack 1, 2005
Hearing Date 11-12-80

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United States Department of the Interio

GEOLOGICAL SURVEY FARHINGTON DISTRICT DURANGO DISTRICT

Hearing Date II-12-80 Submitted by Anna Submitted CASE NO. Te ST

WANTE EXHIBIT NO. 3

Supplement to USGS NT46 NOISING DILLEMANDER OF THE SUPPLEMENT OF T

BEFORE EXAMINER STAMETS

Above Data Required on Well Sign

GENERAL REQUIREMENTS 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. Inmediate notice is required of all blocouts, fires, spills, and accidents involving life-threatening injuries or loss of life. (See NYL-3A.)
- 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.
- C. 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.

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- 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.
- 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.
 - Vegetative materials removed during construction must be disposed of in such manner that it does not distract from the aesthetics of the area and does not accelerate erosion. Vegetation removed during clearing operations should be placed in drainages, washes, guilles, etc., and 'walked down' by crawler-type tructor. 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 disch 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:

	\$ 51o	p e		√ \$	lope	Distance
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54	- 151		**************************************		2	00 feet
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When the access road is graded, water bars will be left in the road or replaced immediately upon completion of grading.

E. Each existing fance 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 live-stock 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

- 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.
- are covered. B. All unguarded pits containing liquids will be fenced.
- Liquids in pits will be allowed to evaporate, or be properly disposed of ciquios 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.

- 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. 4. CASING AND CEMENTING REQUIREMENTS
 - 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 to tested. Test pressure shall not be less than 600 psi for surface 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, casing, and a minimum of 1,500 psi or 0,2 psi/ft., whichever is greater, in the for other casing strings. If the pressure declines more than 10 percent in for other casing string shall be assumed that the casing string run, and the casing recemented, repaired, or an additional casing string run, and the casing shall be ested 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 stand cemented until the cement has reached a compressive strength of at stand cemented until the shoe, except that in no case shall tests be initiated 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 delilier's long. In the driller's log.

5. BLOWOUT PREVENTION

- A. Blowout preventers and related well control equipment shall be installed, 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 caselon.
- 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 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 day. The annular-type blowout preventer shall be actuated on the drill pipe at least once each week.
- Blowout preventers are to have proper rams for the operations being performed.

 Casing rams are required when running casing.
- Blowout preventers are to have handwheels installed,
- 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.
- The accumulator system shall have a pressure capacity to provide for repeated operation of hydraulic preventers.

- Orill 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.
- 1. 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 filled 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:
 - (i) 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.
 - How pipe was cemented, including amount of cement, type, whether cement circulated, location of cementing tools, etc.
 - (6) Walting on cement time for each casing string.
 - (7) Casing pressure tests after cementing, including test pressure and results.

8. DRILLSTEH TESTS

Estimated amounts of oll 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:
- 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.: Fallure 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 well 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

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. REHOVAL OF DRILLING RIG

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. ABANDONHENT

- 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 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 in quintuplicate with the District Engineer. The report should show the total depth reached, the reason for plugging, and the proposed intervials, 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 parmanently placed on the marker with a plate, cap, or welded bead:

() Uperator (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 C. Within 15 days after plugging the well, a Subsequent Report of Abandonment to be filed on form 9-331 in quintuplicate, showing the manner in which the where cament plugs were casing was cut and pulled, intervals 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 in depth. After ripping, water bars will be ripped a minimum of 120 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 sederal restoration requirements on private surface-federal minerals will be 15. SPECIAL STIPULATIONS The following special requirements apply and are effective when checked: 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 or rated working pressure) (a) when installed; (b) before drilling possible disconnecting a pressure seal in the assembly. C. Hinimum required fill of cement behind the D. All above-ground permynent 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 casing. G. A Communitization Agreement covering the acreage dedicated to the well must be filled for approval with the U. S. Geological Survey, P. O. Box 26124, be prior to any sales.

The effective date of the agreement must

PLS (Pure Live Seed) - Germination X Purity

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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 I inch and not more than 3/1 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. seeded according to the above stipulation.

1. 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. X. 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. [VI. Other: La spiciel sty's

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

Surface Use and Rehabilitation

Bureau of Land Hanagement P. 0. Box 568, or 900 La Plata Highway Farmington, New Hexico 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 Hanager Bob Hoore, Lands & Hinerals Supervisor Russ Pigors, Inspector Bob Harler, Inspector Steve Friedman, Inspector

Drilling and Producing Operations

U. S. Geological Survey--011 and Gas Operations P. O. Box 959, or 3535 East 30th Street Farmington, New Hexico 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	ilaya Yalabay
Errol Becher, Petroleum Engineer	125-3886
Hildred Kuchera, Petroleum Englneer	325-3448
Bill Spence, Petroleum Englneer	
Ray Swanson, Petroleum Engineering Technician	25-8189
Ken Baker, Petroleum Engineering Technician	
Fred Edwards, Petroleum Engineering Technician3	25-7885
Andrew Stump, Environmental Scientist	27-0507
George Carlson, Environmental Scientist	25-0757

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, Petrolet Terry Galloway, Petrol	um Englneer	Technician	259-0628
kandall Walker, Petrol	leum Englneering	Technician	247-0487
John Keller, Environme Donald Englishman, Env	ental Scientist Vironmental Scien		247-5308 563-4314

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Each well drilled on any communitized tract shall be located in the approximate geographical center of the combined units with a telerance of 150 feet for topographical conditions, but in any event shall not be located closes than 330 feet to the outer boundaries of the proposed provation unit or communitized tract.

RULE 105. PLT 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 on adequate plt 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, connercial, 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 arcesian water from the strata in which it occurs, and the contamination of arcesian 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 shuf-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 scal 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 inpracticable.

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 varrant, 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 reminion 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 serings 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 easing 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

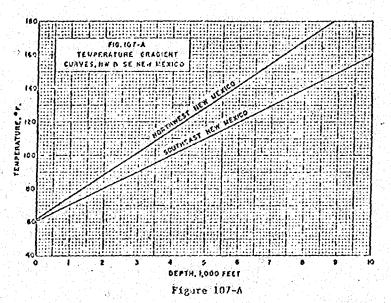
Allow all casing strings to stand cemented a minimum of eighteen (18) hours prior to commencing tests. Operators using this option shall report on Form C-103 the actual time the coment was in place before initiating tests.

OPTION 2

(May be used in the counties of San Juan, Rio Arriba, McKfaley, Sandoval, Lea, Eddy, Chaves, and Roosevelt only.) Allow all casing strings to stand commented until the cement has reached a compressive strength of at least 500 pounds per square such 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 (6) 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 Coments."



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 coment slurry when mixed.
- (3) Estiluted minimum formation temperature in zone of interest.
- (4) Estimate of cement strength at time of casing test.
- (5) Actual time curent 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 hald on pipe and the pressure drop observed shall also be reported on the same Form C-103.

(1) Casing atrings 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 sivings are involved, the above test pressures shall apply to the lowest pressure rated easing 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
APPLICATISEXHIBIT NO. 4

CASE NO. 7087

Submitted by Brankusses

Hearing Date 11-12-80

COMPANY BLACKWOOD & NICHOLS WELL NORTH EAST WEARICE BEFORE EXAMINER STAMETS OIL CONSERVATION DIVISION WELLST FXHIBIT NO. CASE NO. 1087 Submitted by Lake Kusson Hearing Date 11-12-80 JOHNSTON COUNTY -

F.R. # 00095 C

STATE NEW MEXICO

COMPUTERIZEO DATA ANALYSIS

MAY 20, 1930

GENTLEMEN

THE ENCLOSED TEST APPEARS TO BE A GOOD MECHANICAL DRILL STEM TEST OURING 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. WELBORE DAMAGE: THE CALCULATED DAMAGE RATIO OF 5.57 INDICATES THAT WELBORE 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 X 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.

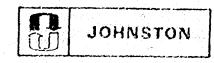
DENNIS MYREN
RESERVOIR EVALUATION
DEPARTMENT

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

FIELD REPORT # 00095 C

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 of any interpretations, and we shall not be liable or responsible, except in the case of gross or wilful 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.

Gas Reservoir Engineering Data



Instrument No. L-436

Field Report No. 00095 C

Damage Ratio DR	5.57	Effective Transmissibility TO GAS	<u>Κ</u> h μ	106:45	Md·lt. Cp.
Maximum Reservoir Pressure Po	1677 P.S.I.G.	Flow Rate ESTIMATED	Q	35	MCF day
Slope of Shut-in Curve Ma	139 PSI/log cycle	Flow Rate	Q		
Potentiametric Surface (Datum Plane, Sea Level) PS		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 is taken as steady state flow and unless stated otherwise at standard conditions 14.7 P.S.I. and 60°F.
- 2. P, 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 665 P.S.I.A.
- 6. Other standard radial flow, steady state assumptions.

Empirical Equations:

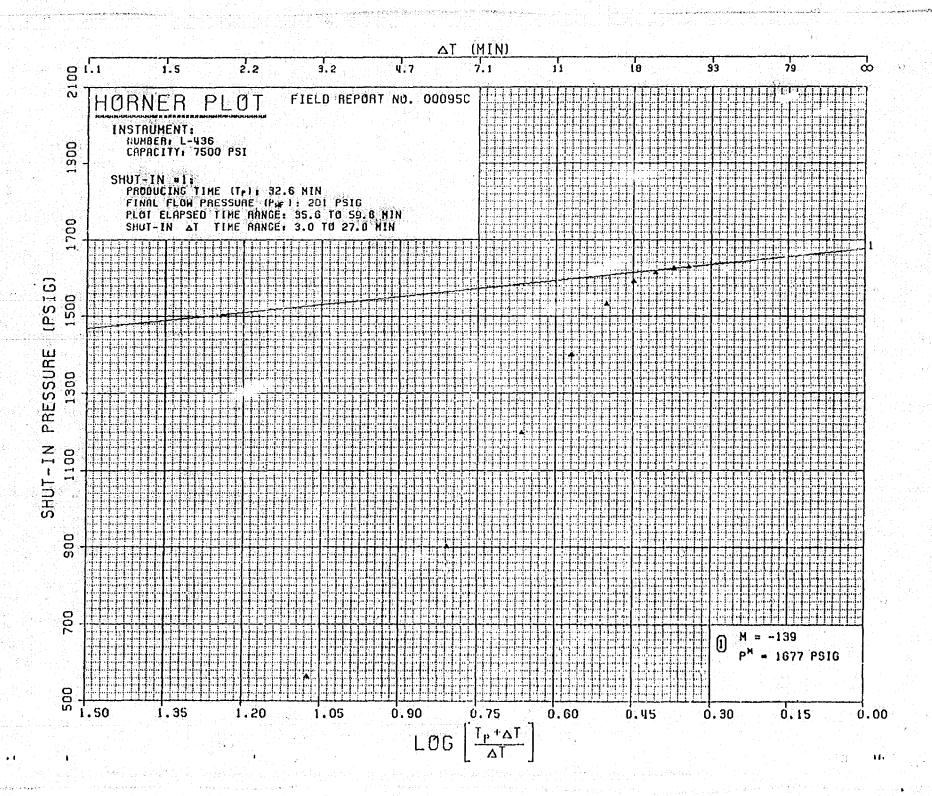
1. EDR =
$$\frac{P_s^2 - P_l^2}{M_g(\log T + 2.65)}$$
 where $M_g = \frac{P_s^2 - P_{lo}^2}{\log \text{Cycle}}$

2. Transmissibility
$$\frac{Kh}{\mu Z} = \frac{1637^{\circ}T_{\ell}Q_{\ell}}{M_{e}}$$

3. P.S. =
$$\left[P_o \times 2.309 \text{ ft./PSI}\right]$$
 = $\left[\text{Recorder depth to sea level.}\right]^{1/3}$

4. Radius of Investigation,
$$r_{ij} = \sqrt{\frac{Kt}{40d(1 - S_w)\mu c}}$$
 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 upinions based an 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 wilful 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.

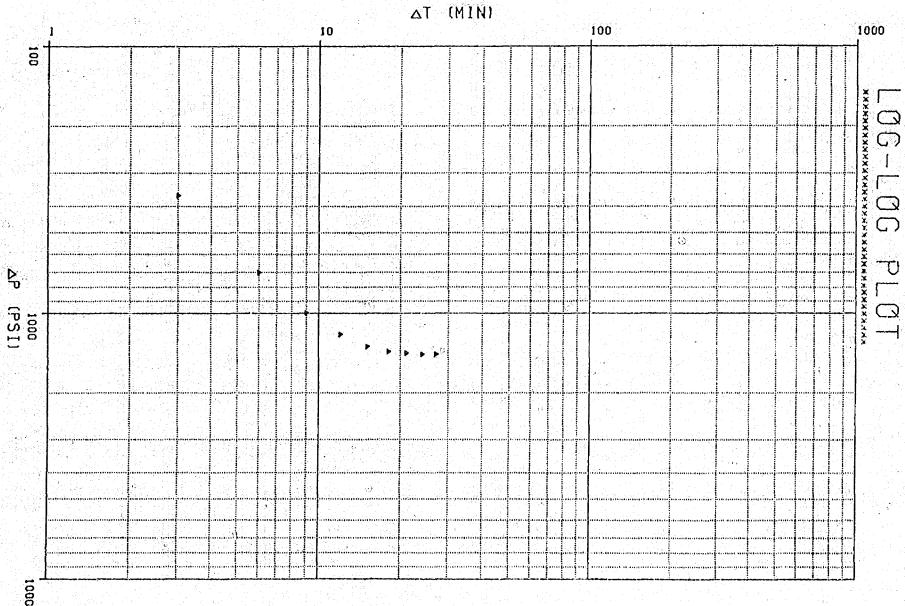


FIELD REPORT NO. 00095C INSTRUMENT:
NUMBER: L-436
CAPACITY: 7500 PSI

SHUT-IN #1:

FINAL FLOW PRESSURE (PRF): 201 PSIG PLOT ELAPSED TIME RANGE: 35.6 TO 59.6 MIN

SHUT-IN AT TIME RANGE: 3.0 TO 27.0 MIN



16.

```
---- WELL IDENTIFICATION ----
                          BLACKWOOD & NICHOLS
2013 FIRST NATIONAL CENTER WEST
OKLAHOMA CITY, OKLAHOMA 73102
NORTH EAST BLANCO #33-12
3055' TO 3205'
 COMPANY:
                                                                                      CUSTOMER:
                                                                                                         SAME
                                                                                                                                                   WELL:
TEST INTERVAL:
TEST NO:
COUNTY:
                                                                                      LOCATION:
                                                                                                         BLANCO
                                                                                      FIELD:
                                                                                      TEST DATE: 18-24-55
STATE: HEW MEXICO
TEST APPROVED BY: MI
                          SAN JUAN
TECHNICIAN:
                          MORRIS BOWEN
                                                                                                                      MR. W.J. LINTON
                                                              EQUIPMENT AND HOLE DATA
                                                                                      DRILL PIPE LENGTH:
DRILL PIPE I.D.:
DRILL COLLAR LENGTH:
DRILL COLLAR I.D.:
PACKER DEPTHS:
TEST TYPE:
                          DUAL PACKERS
                                                                                                                                                              FT.
                                                                                                                                                              IN.
ELEVATION:
TOTAL DEPTH:
MAIN HOLE/CASING SIZE:
RAT HOLE/LINER SIZE:
FORMATION TESTED:
NET PROD. INTERVAL:
                                                                             FT.
FT.
IN.
                                                                                                                                                              FT.
                                          3205
                                                                                                                                                              IN.
FT.
FT.
                                         9 7/8
                                                                                                                               3050 &
                                                                                                                                                3855
                                                                                      DEPTHS REF. TO:
POROSITY:
           ----- TEST TOOL CHAMBER DATA -
                                                                                                                             - MUD DATA
                                                                                                           TYPE:
WEIGHT:
VISCOSITY:
SAMPLER PRESSURE:
RECOVERED OIL GRAVITY:
RECOVERY GOR:
                                                                           PSIG
DEG. F.
FT3/BBL.
                                                                                                                                MUD
                                                                                                                                                  LB/GAL.
SEC.
CC
                                                   API @
                                                                                                                                   11.4
63
                                                                                                            WATER LOSS:
                                                                                                                              RESIST
                               SAMPLE CHAMBER CONTENTS
                                                                                                                                            TEMP CHLOR
                                                                                                                               (OHM-M)
FLUID
                                           VOLUME
                                                          MEAS.
RESIST. TEMP.
(OHM-M) (DEG F.)
                                                                                         CHLOR.
                                                                                                            MUU:
                                                                                                           FILTRATE:
                                                                                         (PPM)
                                           - FT
- CC
CC
CC
GAS:
                                             FT.3
OIL:
WATER:
MUD:
FILTRATE:
TOTAL LIQUID:
                                                                             REMARKS
```

NO. OF REPORTS REQUESTED: 6

FIELD REPORT NO. ØØ895C

. .

DESCRIPTION(RATE OF FLOW)

TIME
PRESSURE
PSIG
STRONG BLOW OF AIR TO SURFACE IMMEDIATELY. GAS
TO SURFACE IN 10 MINUTES.

CUSHION TYPE:

RECOVERY

RECOVERY

FEET BARRELS

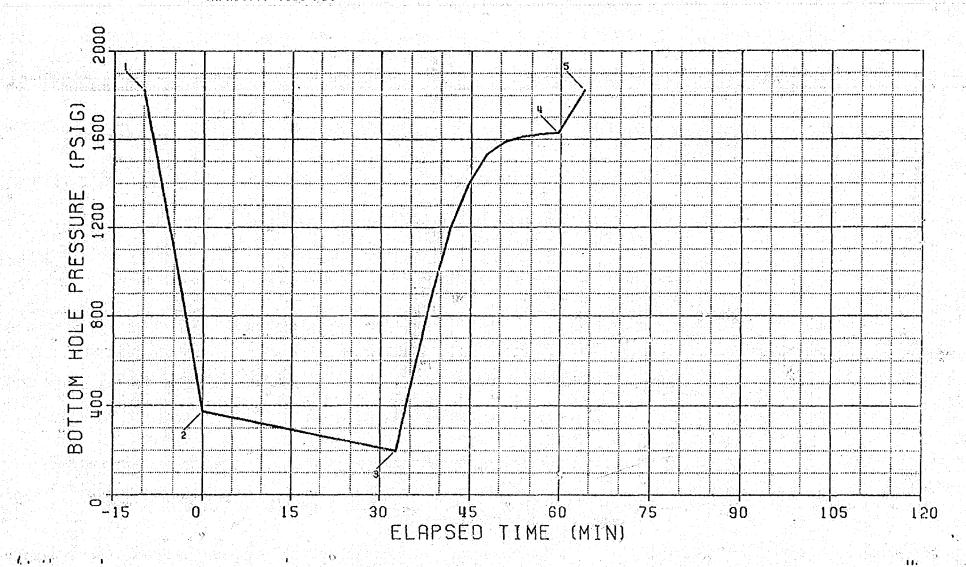
SURFACE
PSIG
PRESSURE
PSIG
CHOKE
PSIG
3/4 IN. BOTTOM CHOKE

API
GRAV. DEG. RESIST DEG. PM

FIELD REPORT NO. ØØØ95C

PRESSURE LOG

FIELD REPORT NO. 00095C INSTRUMENT:
NUMBER: L-436
CAPACITY: 7500 PS1



BOTTOM HOLE PRESSURE AND TIME DATA

INSTRUMENT NO.: L-436 PORT OPENING:-

CAPACITY (PSI): BOTTOM HOLE TEMP (F): 75ØØ 11Ø

EXPLANATIO)N **********	ABELED POINT	PRESSURE (P	SIG) ELAPSE	D TIME (MI	(N)
HYDROSTATIC MUD START FLOW END FLOW & START S END SHUT-IN HYDROSTATIC MUD	HUT-IN	1 2 3 4 5	1825 375 201 1629 1825		Ø.Ø 32.6 59.6	
*************** * SUMMARY OF FLOW **************	********* PERIODS *					
FLOW PERIOD AT ST	ART (MIN) A	LAPSED TIME T END (MIN)	DUC TON OF	PRESSURE AT START (PSIG		IG)
	Ø.Ø	32.6	32.6	375	2ø1	
**************************************	***********************************					
ELAPSED SHUT-IN TIME AT PERIOD START (MI	TIME AT N) END (MIN	(MIM)	AT START (PSIG)	AT END (PSIG)	INAL FLOW PRESSURE (PSIG)	PRODUCING TIME (MIN)
1 32.6	59.6	27.0	2Ø1	1629	2Ø1	32.6

FIELD REPORT NO. 88895C INSTRUMENT NO. L-436

TEST PHASE : FLOW PERIOD # 1

ELAPS	SED	TIM		(M	TIME IN)		SIG)
****	MIM)	***	*	****	****		375
	ø.	Ø	Thate with Fig. 4.	ali dalam dan Kabupatan	g.g	u sverki te kurtesibal Alji jar	281 212
	~~.			3	2.6		

TEST PHASE : SHUT-IN PERIOD # 1

1. FINAL FLOW PRESSURE ["P "] = 2Ø1 PSIG
2. PRODUCING TIME ["T "] = 32.6 MIN

	2. PRODUCING TIME	["T "] = 32.0 MAN		DELTA PRESSURE
ELAPSED TIME	DELTA TIME ["DT"] (MIN)	SHUT-IN PRESSURE ["P "] (PSIG) ***********************************	LOG [(T +DT)/DT]	WS WF
**********		201	1.074 Ø.808	364 701 997 1199 1331 1390
32.6 35.6 38.6	9.0 3.0 6.0	565 982 1198	ø.665	1199 1199
41.6	6.0 9.0 12.0	า ผู้ขึ้น 1532	ø.57ø ø.5ø2 ø.449	1390 1390 1413
44.6 47.6	15.Ø 18.Ø	1591 1614	Ø.407 Ø.373	1424 1428
50.6 53.6 56.6	21.0 24.0 27.0	1625 1629	Ø.314	



Western Petroleum Services

BEFORE EXAMINER STAMETS
OIL CONSERVATION DIVISION

APPLICANTS EXHIBIT NO. 7

CASE NO. 7087

Submitted by Blackson

Hearing Date 11-12-80

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

Street • Suite 1920 • Denver, Colorado 80202 • Phone 303/623-6037

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%/ft² (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%/ft² (see Exhibit II). Figure IV shows the McGuire-Sikora graph. After scaling, an 11 fold productivity increase is calculated.

WELL DATA:

Formation:

Average Depth To Zone:

Zone Height:

Casing Size:

Perforated Interval:

Bottom Hole Temperature:

Fracture Gradient:

Bottom Hole Fracture Pressure:

Bottom Hole Pressure:

Overburden:

Hydrostatic Head:

ISDP (fresh water):

Porosity:

Permeability:

Well Spacing:

Pictured Cliffs

3,500 ft.

133 ft.

41211

3456, 3478, 3492, 3518, 3534,

3554, 2 jspf, .34" diameter

120° F

.65 psi/ft

2,275 psi

1,375 psi

900 psi

1,515 ps1 with fresh water

760 psi

10%

.06 md

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:

- 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

Injection Rate

Expected Surface Treating Pressure 4½" casing

30 BPM

Total Pumpable Volume of Mini Max III-40 Gel Phase Total Pumpable Volume of Condensate 2,600 psi

100,000 gallons

Total Pumpable Volume of Fresh Water Flush & Reserve

Total 10/20 Mesh Sand Required 2,000 gallons 5,000 gallons

190,000#

Auxiliary Materials:

1610 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
1617 B-5 @ 2.15/1b	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 нир @ 3.15/нир	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
	\$55,242.70

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

WELL DATA:

Formation:

Average Depth To Zone:

Zone Height:

Casing Size:

Perforated Interval:

Bottom Hole Temperature:

Fracture Gradient:

Bottom Hole Fracture Pressure:

Bottom Hole Pressure:

Overburden:

Hydrostatic Head:

ISDP (fresh water):

Porosity:

Permeability:

Well Spacing:

Fruitland

3,380 ft.

42 ft.

412" - 10.5#

3368, 3374, 3384, 3392,

2 jspf, .34" diameter

120° F

.9 psi/ft

. 3,050 psi

1,375 psi

1,675 psi

1,450 psi with fresh water

1,600 psi

10%

.06 md

160 acres

1.1

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:

- 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.)
- Pump 8,000 gallons of Mini Max III-30/2% HC with 3 ppg 10/20 mesh sand. (Add 2#/1900 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

Injection Rate

17 BPM

Expected Surface Treating Pressure

70 tal Pumpable Volume of Mini Max III-30 Gel Phase

Total Pumpable Volume of Condensate

Total Pumpable Volume of Fresh Water Flush & Reserve

Total 10/20 Mesh Sand Required

76,000#

Auxiliary Materials:

42 gallons Aquaflow surfactant

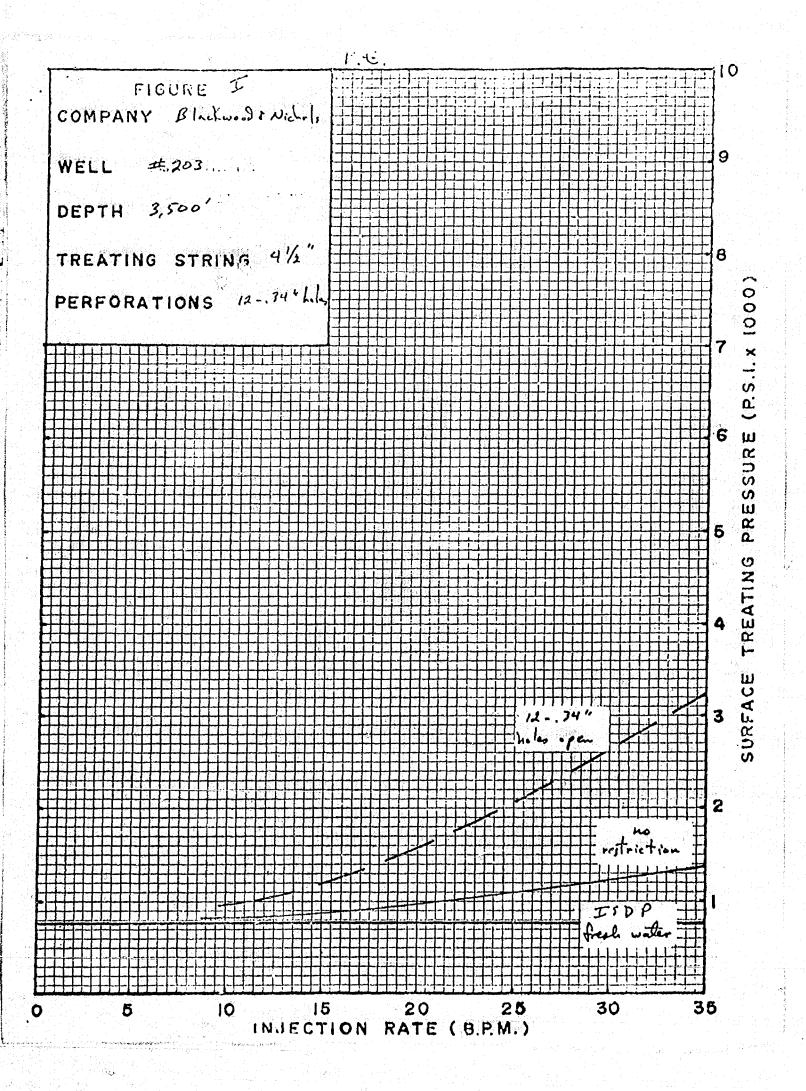
42 gallons Adocide bactericide

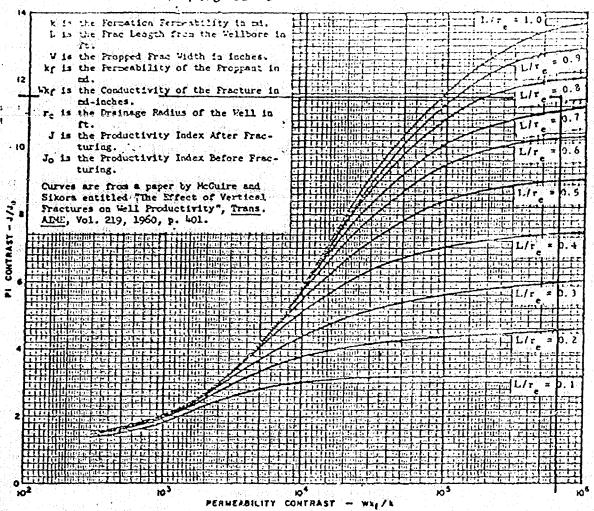
65# B-5 gel breaker

COST ESTIMATE:

40,000 gallons of Mini Max III-30/2% HC @ .24/gal	\$ 9,600.00
65# B-5 @ 2.15/1b	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 КНР @ 3.15/НЯР	3,543.75
Mileage Charge @ 1.90/unit mi x 6 units x 75 mi	855.00
Ratiometer @ 134.00	134.00
게 보고 있다. 이 시간 100 개발을 받는 것이 되는 것 	\$23,859.50

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





INCREASES IN PRODUCTION FROM VERTICAL FRACTURES

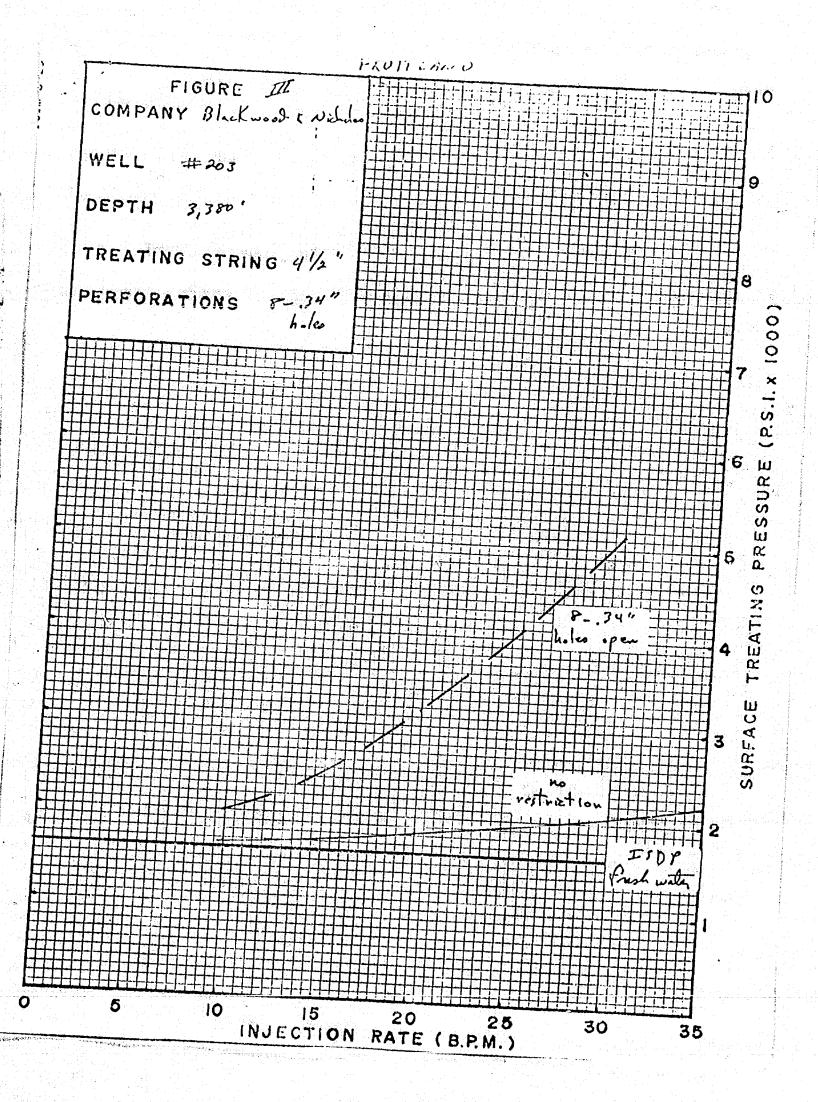
J/J. = 10 after scaling

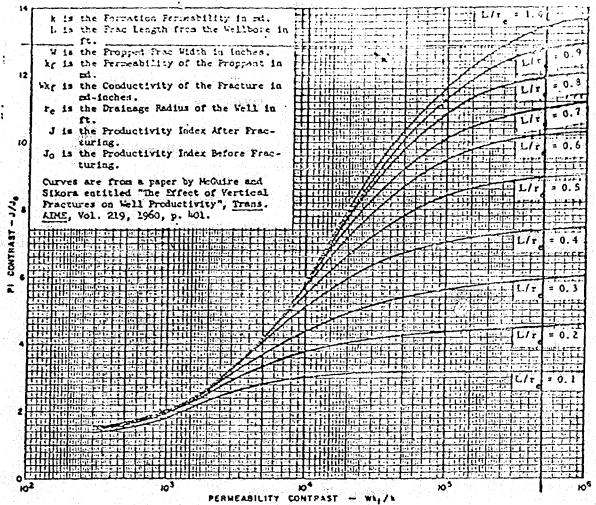
Note: This graph is based on a well spacing (A) of 40 acres and a wellbore radius (rw) of 3 inches. It can be converted to other well spacing and wellbore radii by use of the following scaling factors:

		Scaling Fa	ctors for
Well Spacing	Drainage Radii	Abscissa (Wk _/ /k)	Ordinate (J/J _o)
For spa	cing shown and	J-inch wellbore r	adius,
10 Acres	330 ft	2, 00	1.11
20 Acres	467 (t 660 (t	1.42 1.00	1.05 1.00
80 Acres	933 (t 1320 (t	0.71 0.50	0.95 0.91
320 Acres	1867 ft	0.35	0.87 0.84
640 Acres	2640 lt	0. 25	V. 04

For other spacing (A) and wellbore radii (rw).

A 104 A A 40/A. 3, 095





INCREASES IN PRODUCTION FROM VERTICAL FRACTURES

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

		Scaling Fa	Factors for	
Well Spacing	Drainage Radii	Abscissa (Wk _f /k)	Ordinate (J/J _o)	
For s	pacing shown and J-1	nch wellbore r	dius.	
10 Acres	330 ft	2,00	1.11	
20 Acres	467 (t 660 (t	1.42 1.00	1.05 1.00	
40 Acres	933 (t	0.7i	0.95	
160 Acres	1320 fc 1867 ft	0.50 0.35	0.91 0.87	
640 Acres	2640 ft	0. 25	0.84	

For other spacing (A) and wellbore radii (rw).

A 104 A A 40/A. 3.095

EXHIBIT I

THE WESTERN COMPANY

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-111 - 0.00080
FRACTURE HEIGHT - 133
COMBINED C - 0.00060

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

FEUID VOLUME (GAL)	SURFACE PROPPANT CONC (LE/GAL)	LOCATION IN FRACTURE (FT)	FRACTURE PROPPANT CONC (LB/FT^2)	CUMLATIVE PROPPANT (LB)
20000	.00	972 (0 1121	.000	
20000	1.00	795 TO 972	.425	20000
20000	2.00	582 TO 795	.705	60000
20000	3.00	320 70 582	.862	120000
50000	3.50	0 TD 320	.821	190000

USED 4.63 UNITS

. .

EXHIBIT I

THE WESTERN COMPANY

PROPPART 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
FERM. TO RESERVOIR FLUID - .060
LEAK-DFF 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 (LBYGAL)	LOCATION IN FRACTURE (FT)	FRACTURE FROFFANT CONC (LB/FT^2)	CUMLATIVÉ PROPPANT (LB)
8000	.00	1203 TD 1377	.000	ü
8000	1.00	994 TD 1203	.455	8000
8000	2.00	736 TD 994	.739	24000
8000	3.VO	411 TD 736	.880	48000
8000	3.50	0 70 411	.810	76000

4.76 UNITS

DISTRIBUTION SANTA FE NEW MEXICO OIL CONSERVATION CONMISSION	Fem. C+163 Supersedes Old G-102 and G-103	
FILE	Effective 1-2-65	
U.S.G.S. LAND OFFICE OPERATOR	State	
SUNDRY NOTICES AND REPORTS ON WELLS		
OIL GAS X OTHER-	7. Unit Agreement Name Northeast Blanco Unit Aprint: #1 Sec. 929	
. Name of Operator Blackwood & Nichols Co., Ltd Address of Operator	8. Farmor Lease Name Northeast Blanco Unit	
P. O. Box 123, Durango, Co. 81301	9. Well No. 201 10. Field a d Pool, or Wildcat	
UNIT LEYTER M 990 FEET FROM THE SOUTH LINE AND 1030 FEET	So. Los Pinos Fruitland	
15. Elevation (Show whether DF, RT, GR, etc.) 6652 GL Check Appropriate Box To Indicate Nature of Notice, Report of	12. County San Juan	
Describé Proposed or Completed Operations (Clearly state all pertinent details, and give pertinent dates, included		
7-21-80 3697' PBTD. Pulled 2 3/8" tubing. Ran Gamma Ray and Neu bridge plug at 3549'. Tested perforation at 3560' - 3588 Set cement retainer at 3536'. Shut off water and gas. S retainer at 3373'. Squeeze cemented perforations 3441' - neat cement, squeezed off at 2500 PSI.	', no decrease in water. et drillable cement	
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 with 30,350 gals. water and 30,000 lbs. 10-20 sand. Maxim average treating pressure 2300 PSI, average injection rate	mum pressure 2450 PSI,	
7-25-80 3697' PBTD. Reran 111 jts. 2 3/8" 4.7# J-55 FJE (BEFORE)	EXAMINER STAMETS SERVATION DIVISION	
	ARRUMANTEXHIBIT NO. 8	
	EXTENSION TO THE RESERVE TO THE RESE	
A0200A35 CASE NO.	7087	
CASE NO. Thereby certify that the information above is true and complete to the best of my knowledge and belief.	7087	

*

See Instructions on Reverse

APPLICANTE XHIBIT NO. 9

Submitted by BACKUDEN

Hearing Date 11-12-80

CASE NO. 7087

DEPARTMENT OF THE INTERIOR	5. LEASE NN 03358		
GEOLOGICAL SURVEY	6. IF INDIAN, ALLOTTEE OR TRIBE NAME		
SUNDRY NOTICES AND REPORTS ON WELLS	7. UNIT AGREEMENT NAME		
(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.)	NEBU Agrmt. No. 1, Sec. 929 8. FARM OR LEASE NAME		
1. oil	Northeast Blanco Unit 9. WELL NO.		
2. NAME OF OPERATOR Blackwood & Nichols Co., Ltd.	203 : : : : : : : : : : : : : : : : : : :		
3. ADDRESS OF OPERATOR P.O. Box 1237, Durango, Colo. 81301	South Los Pinos-Fruitland - PC 11. SEC., T., R., M., OR BLK. AND SURVEY OR		
4. LOCATION OF WELL (REPORT LOCATION CLEARLY. See space 17	AREA		
below.) AT SURFACE: 990' F/NL - 1490' F/EL AT TOP PROD. INTERVAL: Same AT TOTAL DEPTH:	C-11-31N-7W : 12. COUNTY OR PARISH 13. STATE San Juan :- New Mexico		
16. CHECK APPROPRIATE BOX TO INDICATE NATURE OF NOTICE.	14. API NO.		
REPORT, OR OTHER DATA	30-045-23485 15. ELEVATIONS (SHOW DF, KDB, AND WD) 6546 GL		
REQUEST FOR APPROVAL TO: SUBSEQUENT REPORT OF:	0340 GL		
TEST WATER SHUT OFF			
SHOOT OR ACIDIZE			
REPAIR WELL [] [] PULL OR ALTER CASING [] []	(NOTE: Report results of multiple completion or zone change on Form 9-330.)		
MULTIPLE COMPLETE	그리스 지나 한 사용했습니다를 개몇 계리 그는 너는		
CHANGE ZONES.			
(other) Subsequent of water encroachment	고 하는 그 가는 그 이 목표 선생이 가능한 경험하는 이 중이다. 또 하는 그 아이들은 독려왔다며, 곳이 화장 중국자 중이 나는		
 DESCRIBE PROPOSED OR COMPLETED OPERATIONS (Clearly state including estimated date of starting any proposed work. If well is dimeasured and true vertical depths for all markers and zones pertinent 7-13-80 3630' PBTD. Pulled 2 3/8" tubing, Ran Retrievamatic Packer at 3496'. Well ma 	Gamma Ray and Neutron Logs. Set		
7-15-80 3630' PBTD. Reset packer at 3459'. We between tubing and 4 1/2" csg. Reset p thru tubing. Dry gas between tubing an at 3409'.	acker at 3393'. Well making water		
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		
Subsurface Safety Valve: Manu. and Type	Set @'Ft.		
8-1-harehy certify that the loregoing is true and correct			
signifo Le Casso Japolasso Loositle District Mai	nage 6ATE 7-28-80		
(This space for Federal or State office	e Use)		
PPROVED BYTITLE	DATE		
ONDITIONS OF APPROVAL, IF ANY:	BEFORE EXAMINER STAMETS OIL CONSERVATION DIVISION		
*See Instructions on Reverse Sid	MPLICANTES EXHIBIT NO. 10		
	CASE NO. 7087		
	Submitted by BLACKUSO		
	Hearing Date 11-12-80		

BEFORE EXAMINER STAMETS OIL CONSERVATION DIVISION

EXHIBIT NO. 11 BLACKWOOD & NICHOLS CO., LTD.

P. O. BOX 1237

CASE NO. 7087

DURANGO, COLORADO 81301

Submitted by KLACKWOOD

(303) 247-0728

Hearing Date 11-12-80

Drilling Report - Pictured Cliffs

Northeast Blanco Unit Well No. 204 LOCATIO

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 0.K. Spudded 12½" 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% CaCl₂. Plug down 4:00 P.M., 8-8-79; cement circulated. 1/4° at 217'.

8-10-79 1930' sand. 3/40 @ 721', 10 @ 1242', 20 @ 1682'.

8-11-79 2572', sand. 110 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 3';" 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 aid. 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.

OISTRIDUTION SANTA FE		L CONSERVATION COMMISSION	Poim C-104
FILE	KEWUE	ST FOR ALLOWABLE	Supersedes Old C-104 and Ellective 1-1-65
U.S.G.S.	AUTHORIZATION TO T	RANSPORT OIL AND BEFORE	JERASAINED CTAMETO
LAND OFFICE			ISERVATION DIVISION
TRANSPORTER OIL		OIL CON	ISERVATION DIVISION
OPERATOR GAS		APPLICATE	EXHIBIT NO. 12
PRORATION OFFICE		an in associ	
Operator		GASE NO). 7087
Blackwood &	Nichols Co., Ltd.	Submitte	ed by K. Aexwood
Address	Maria de la compansión de	Hearing	Date 11-12-80
Reason(s) for filing (Check proper	37. Durango, Colorado	81301 Other resease explains	
New Walt	Change in Transporter of:		
Recompletion Change in Ownership	OII DÝÝ	>== (
Charle an owner anity	Casinghead Gas Con	densate	
If change of ownership give name			
and address of previous owner			
DESCRIPTION OF WELL AN	D LEASE		
Lease Name	Well No. Pool Name, Including	Formation Kind of La	Lease
Northeast Blanco Uni	t 204 South Los Pir	nos PC Stote, Fed	eral of Fee Fee
Location			
Unit Letter M	Feet From The South	ine and 990 Feet Fro	om The West
			e Jawa Jaja Wali Patra Batan Talah A
Line of Section 1	rownship 31N Range	7W , ммрм, Sa	in Juan Cou
DESIGNATION OF TRANSPO	RTER OF OIL AND NATURAL G	JAS	
Name of Authorized Transporter of C	or Condensate	Address (Give address to which app	proved copy of this form is to be sent)
Inland Corporation Name of Authorized Transporter of C	Casingheud Gas 🔲 or Dry Gas XX	P.O. Box 1528 Farm	sington. New Mexico 87
	and the contract of the contra	보다.그렇는 당한 이 길림없는 것이 없어서 하다.	
El Paso Natural Gas			nington, New Mexico 874
If well produces all or liquids, give location of tanks.	Unit Sec. Two. Rge.		When the product with the product of
dive location of tores.		l No	
	with that from any other lease or pool	, give commingling older numbers	
COMPLETION DATA	. Oil Well Gas Well	New Well Workover Deepen	Plug Back Same Res'v. Diff, R
Designate Type of Complet	ton = (X)		
Date Spudded	Date Compl. Ready to Prod.	X Total Depth	P.B.T.D.
8-8-79	8-21-79		
Elevations (DF, RKB, RT, GR, etc.)		36801 Top Olly Gos Pay	Tubing Deoth
6546' GL	Fruitland - P.C.	3404"	3580°
Perforations	Irruiciand - P.C.	3404	Depth Casing Shoe
	enty-four holes		3686'
		ID 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
		Name of the second of the seco	
TEST DATA AND REQUEST F	OR ALLOWABLE (Test must be a	after recovery of total volume of load o	il and must be equal to or exceed top a
OIL WELL	able for this d	epth or be for full 24 hours)	
Date First New Oil Run To Tanks	Dote of Yest	Producing Method (Flow, pump, gas	lift, etc.)
Length of Teet	Tubing Pressure	Casing Pressure	Choke Size
Actual Prod. During Test	Oll Bbls.	Water - Bble.	Goe • MCF
		L	
GAS WELL Actual Prod. Test-MCF/D	Length of Teat	Bbls, Condensate/MMCF	Gravity of Condensals
	In the Control of	But Concensulation with the	Charles of Annoansals
Q=4476 Testing Method (pliot, back pr.)	Three Hours Tubing Preseure (Shut-in)	Cosing Pressure (Shut-im)	Choke Size
			3/4"
Back Pr	1420	1420	
CERTIFICATE OF COMPLIAN	UB OOD AND AND AND AND AND AND AND AND AND AN	OIL CONSERV	ATION COMMISSION
		APPROVED	, 19
nereby certify that the rules and commission have been commission bever	regulations of the Oil Conservation with and that the information given	[[
bove is true and complete to the	with and that the information given a beat of my knowledge and belief.	BY	
		TITLE	
		((
1)		This form is to be filed in	compliance with AULE 1104.
	O- DeLasso Loos	II	wable for a newly drilled or deepe anied by a tabulation of the deviat
· · · · · · · · · · · · · · · · · · ·	1166)	thats taken on the well in acco	Mance Mill KAPE 1111
District		All mactions of this form to	uet be filled out completely for all
(11)		able on new and recompleted w	/0110i
8-30-7	A STATE OF THE PERSON NAMED IN COLUMN TWO IS NOT THE PERSON NAMED IN COLUMN TO THE PERSON NAMED	Fill out only Sections 1.	II. III, and VI for changes of own ten or other such change of condit
(De		well name of number, or transpo	Italial Amel agell susuiffe of exitally

Dec. 19/3	Form Approved. Budget Bureau No. 42-R1424
UNITED STATES DEPARTMENT OF THE INTERIOR	5. LEASE
GEOLOGICAL SURVEY	NM 03358
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.)	O. FARM OR LEASE NAME
1. oil gas Well other 2. NAME OF OPERATOR	Northeast Blanco Unit
Blackwood & Nichols Co Ted	205 10. FIELD OR WILDCAT NAME
P. O. Box 1237, Durango, Co. 81301 4. LOCATION OF WELL (REPORT LOCATION CLEARLY, See space 17 below.)	South Los Pinos Fruitland - PC 11. SEC., T., R., M., OR BLK. AND SURVEY OR AREA P-10-31N-7W
AT SURFACE: 1180' F/SL - 925' F/EL AT TOP PROD. INTERVAL: Same AT TOTAL DEPTH: Same	12. COUNTY OR PARISH 13. STATE San Juan New May 1 co
16. CHECK APPROPRIATE BOX TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA	14. API NO. 30-045-23601
REQUEST FOR APPROVAL TO: SUBSEQUENT REPORT OF:	15. ELEVATIONS (SHOW DF, KDB, AND WD) 6560' GL
TEST WATER SHUT OFF	
PULL OR ALTER CASING	(NOTE: Report results of multiple completion or zone change on Form 9-330.)
ABANDON* (other) Subsequent report for water encroachment	
17. DESCRIBE PROPOSED OR COMPLETED OPERATIONS (Clearly state including estimated date of starting any proposed work. If well is directly measured and true vertical depths for all markers and zones pertinent	all pertinent details, and give pertinent dates, ectionally drilled, give subsurface locations and
7-18-80 3620' PBTD. Pulled 2 3/8" tubing, ran Gacement retainer at 3430'. Tested 4 1/2" held OK. Perforated 3350' - 3362' with 1 with 300 gals. 15% HCL acid and 28,640 gas and. Maximum pressure 2700 PSI, average average injection rate 15 bbls/min.	amma Ray and Neutron Logs. Set csg. to 3000 PSI for 10 minutes, I holes. Versagel fractured
7-20-80 3620' PBTD. Reran 107 jts. 2 3/8" 4.7# J	-55 EUE tubing: set at 33301
역 1	지수의 한 전 통통이 자통한 공개인을 위한 중요한다. 1987년 - 1987년
Subsurface Safety Valve: Manu. and Typo	
18. Thereby certify that the folegoing is true and correct	Set @Ft.
SIGNED COSTO TOROLASSO LOOSTITLE DISTRICT Mana	8e 5ATE
(This space for Federal or State office u	· · · · · · · · · · · · · · · · · · ·
APPROVED BY	
	BEFORE EXAMINER STAMETS OIL CONSERVATION DIVISION
원생님 보면 보면 하다 있는데 어느라는 사람들이 가는 이 사람이 되는 사람들이 있는데 하는데 되었다.	LICANTS EXHIBIT NO. 13
grandlere i la francia e e e e e e e e e e e e e e e e e e e	CASE NO. 7087
	Submitted by BLACKWOOD
	Hearing Date 11-12-85

DISTRIBUTIO	N - I		• Authorization			- <u> </u>	evised I-i-85	
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	564 <u>. Billin</u> g	s. Montan	a, 59103				old and Pool, privile ignated PCES land Extensi	
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on Placette and	Other Lour Run	ole logs	run - ran Cl	BL-GR & TD	T thru cas		27, Was Well Cared NO	
hlumberger	Other Logs Aun - No open I	nole logs C/	run - ran Cl ASING RECORD (Re TH SET HO	BL-GR & TD port all strings i	T thru cas	Ing	27. Was Well Cored	
ys Electic and the subsection of the subsection	Other Legs Run - No open I WEIGHT LB./	nole logs	run - ran Cl ASING RECORD (Re TH SET HO 237'	BL-GR & TD	T thru cas set in well) CEMENT 250	Ing	27, Was Well Cared NO	
yse Elecuse and himberger	Other Logs Aun - No open I	nole logs	run - ran Cl ASING RECORD (Re TH SET HO 237' 1	BL-GR & TD port all strings i	T thru cas set in well) CEMENT 250	Ing	27, Was Well Cared NO	
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hlumberger casing size 9 5/8 th 7 II	Other Lege Run - No open I WEIGHT LB./ 36# 20#	ole logs CFT. DEPT 3	run - ran Cl ASING RECORD (Re 14 SET HO 237' 1.	BL-GR & TD port all strings in LE SIZE 3 3/4" B 3/4"	T thru cas set in well) CEMENT 250 700	ing ING RECORD SACKS SACKS	27, Wos Well Cored NO AMOUNT I	PULLED
SIZE	Other Lege Run No open 1 WEIGHT LB./ 36#	nole logs C/FT. DEPY	run - ran Cl ASING RECORD (Re TH SET HO 237'	BL-GR & TD	T thru cas set in well) CEMENT 250 700 30, SIZE	ing ING RECORD SACKS SACKS TUBING DEPTH SE	AMOUNY I	PULLED
pa Electric and a lumberger casing size	Other Lege Run - No open I WEIGHT LB./ 36# 20#	ole logs CFT. DEPT 3	run - ran Cl ASING RECORD (Re 14 SET HO 237' 1.	BL-GR & TD port all strings in LE SIZE 3 3/4" B 3/4"	T thru cas CEMENT 250 700 30. SIZE 2 3/811	ing ING RECORD SACKS SACKS TUBING DEPTH SE 3413	PACKER	PULLED
SASING SIZE 9 5/8 ¹¹ 7 II SIZE None	Other Legs Run - No open 1 WEIGHT LB./ 36# 20# LI	OP TO STAND STANDS STAN	run - ran Cl ASING RECORD (Re 14 SET HO 237' 1.	BL-GR & TD port oll strings s LE SIZE 3 3/4" B 3/4" SCREEN	T thru cas ***In well) CEMENT 250 700 30. SIZE 2 3/811 1 1211	Ing ING HECORD SACKS SACKS TUBING DEPTH SE 3413 43232	RECORD TO PACKED 3318 MO	PULLED
Torotion Record	Other Logs Run - No open h WEIGHT LE./ 36# 20# LI TOP	OP 10gs CA FT. DEPT 31 INER RECORD BOTTOM	run - ran Cl ASING RECORD (Re 14 SET HO 237' 1.	BL-GR & TD port oll strings a LE SIZE 3 3/4" 8 3/4" SCREEN	T thru cas CEMENT 250 700 30. SIZE 2 3/811 1½11 CID, SHOT, FRA	TUBING DEPTH SE 3413 3232 CTURE, CEMEN	PACKER	PULLED a set de) ii pri
SIZE None Theresion Record 3361-3391	Other Legs Run - No open 1 WEIGHT LB./ 36# 20# LI	NOTE POSS CA (FT. DEP) 31 INER RECORD BOTTOM number)	run - ran Cl ASING RECORD (R- IH SET HO 237' 1. 652'	BL-GR & TD port oll strings s LE SIZE 3 3/4" B 3/4" SCREEN	T thru cas cement 250 700 30, size 2 3/811 1 1211 CID, SHOT, FRA	TUBING DEPTH SE 3413 3232 CTURE, CEMEN	RECORD Y PACKER 3318 MO none T SQUEEZE, EYC.	PULLED a set de) ii pri
SIZE None 13162-3209	Other Lege Run - No open 1 WEIGHT LEA. 36# 20# TOP Unterval, size and 3233-3 3245-5 3258-6	Note logs C/FT. DEPY 31 INER RECORD BOTTOM number) 9 1 3 (1 s	run - ran Cl ASING RECORD (Re 14 SET HO 237' 1.	SL-GR & TD port oll strings is LE SIZE 3 3/4" 8 3/4" SCREEN	T thru cas CEMENT 250 700 30. SIZE 2 3/811 1 ½11 CID, SHOT, FRA	TUBING DEPTH SE 3413 3232 CTURE, CEMEN AMOUNT ANI	RECORD Y PACKER 3318 MO none T SQUEEZE, EYC.	SET de)"D"
CASING SIZE 9 5/817 7 II SIZE None Hordion Record 3361-3391 3155-65 3182-3209	Other Leave Hun - No open 1 WEIGHT LEA/ 36# 20# LI TOP (Interval, she and 3233-3 3245-5 3258-6 3275-9	Note logs CA (FT. DEP) SINER RECORD BOTTOM number) 19 11 13 (1 s)	run - ran Cl ASING RECORD (R- IH SET HO 237' 1. 652'	SL-GR & TD port oll strings a LE SIZE 3 3/4" 8 3/4" SCREEN 32. A DEPTH II 3361-3	T thru cas CEMENT 250 700 30. SIZE 2 3/811 1 ½11 CID, SHOT, FRA	TUBING DEPTH SE 3413 3232 CTURE, CEMEN AMOUNT ANI	RECORD T PACKET 33181 MO NO T SQUEEZE, EYC. T KIND MATERIAL L 15% MR-1	SET de l'Oli
House and the state of the stat	Other Lege Run - No open 1 WEIGHT LEA. 36# 20# TOP Unterval, size and 3233-3 3245-5 3258-6	Note logs CA (FT. DEP) SINER RECORD BOTTOM number) 19 11 13 (1 s)	run - ran Cl ASING RECORD (R- 14 SET HO 237' 1. 662' BACKS CEHENT hot/foot)	SL-GR & TD port oll strings a LE SIZE 3 3/4" 8 3/4" SCREEN 32. A DEPTH II 3361-3	T thru cas CEMENT 250 700 30. SIZE 2 3/811 1 ½11 CID, SHOT, FRA	TUBING DEPTH SE 3413 3232 CTURE, CEMEN AMOUNT ANI	RECORD T PACKET 33181 MO NO T SQUEEZE, EYC. T KIND MATERIAL L 15% MR-1	SET de)"D"
SIZE None Marchion Record 3361-3391 3155-65 3182-3209 3219-27	Other Logs Run - No open 1 WEIGHT L 8./ 36# 20# L1 TOP (Interval, size and 3233-3 3245-5 3275-9 3267-7	INER RECORD BOTTOM number) 19 11 13 (1 s)	run - ran Cl ASING RECORD (Record of the set	SCHEEN SCHEEN 32. A DEPTH II 3361-3	T thru cas CEMENT 250 700 30.	TUBING DEPTH SE 3413 3232 CTURE, CEMEN AMOUNT ANI 1000 gals.	RECORD T PACKET 33181 MO NO T SQUEEZE, EYC. T KIND MATERIAL L 15% MR-1	eser de)"D"
SI Electric and in tumberger CASING SIZE 9 5/811 7 II SIZE None Production 10 19-27	Other Logs Run - No open 1 WEIGHT L 8./ 36# 20# L1 TOP (Interval, size and 3233-3 3245-5 3275-9 3267-7	Note logs CA (FT. DEP) 31 INER RECORD BOTTOM number) 19 11 11 11 11 11 11 11 11 11 11 11 11	run - ran Cl ASING RECORD (Record of the set	SCHEEN SCHEEN 32. A DEPTH II 3361-3	T thru cas CEMENT 250 700 30.	TUBING DEPTH SE 3413 3232 CTURE, CEMEN AMOUNT ANI 1000 gals.	RECORD Y PACKED 3318 MO NO T SOUEZE, EYC. OKIND MATERIAL L 15% MR-1 gelled wtr: 4	oseo 5,000#1
SI Electric and in the property of the property of the production	Other Legs Run - No open 1 WEIGHT Lea. 36# 20# TOP Uniterval, size and 3233-3 3245-5 3258-6 3275-9 3267-7	NOTE LOGS CARTER RECORD BOTTOM DEPT BOTTOM Anumber) 19 1 (1 s) 15 71 Choic Size Colculated 2 Row Rate:	run - ran Cl ASING RECORD (Re- 11 SET HO 237' 1. 652' BACKS CEMENT PROD Duling, gas lift, pump Trait Perilod Prod'n. For Trait Perilod	SL-GR & TD port oll strings s LE SIZE 3 3/4" B 3/4" SCREEN 32. A DEPTH II 3361-3 3361-3 OUTION Sing - Size and s Cas The	T thru cas CEMENT 250 700 30. SIZE 2 3/811 1 1211 CID, SHOT, FRA NTERVAL 391 391 51	TUBING DEPTH SE 3413 3232 CTURE, CEMEN AMOUNT ANI 1000 gals. 2,700 gals	RECORD Y PACKED 3318 MO NO T SOUEZE, EYC. OKIND MATERIAL L 15% MR-1 gelled wtr: 4	set de) inpri
SIZE None SIZE None Floretion Record 3361-3391 3155-65 3182-3209 3219-27 IT Tool SIZE None SIZE None	Ca. So Pressure Ca. So Pressure	INER RECORD BOTTOM BOTTOM Inumber) 19 13 (1 si 15 71 Choke Size Calculated 2 Row Rate:	Fun - ran Cl ASING RECORD (Re- 11 SET HO 237' 1. 652' BACKS CEMENT PROD Duling, gas lift, pump Trait Perilod Prod'n. For Trait Perilod	SL-GR & TD pon oil swings s LE SIZE 3 3/4" B 3/4" SCREEN SCREEN DEPTH II 3361-3 3361-3 OUCTION Ding - Size and s Gas - Ho	T thru cas out to well) CEMENT 250 700 30. SIZE 2 3/811 1 1 111 CID, SHOT, FRA NYERVAL 391 391 51	TUBING DEPTH SE 3413 3232 CTURE, CEMEN AMOUNT ANI 1000 gals 2,700 gals Well S	RECORD T PACKET 33181 MO NO T SQUEEZE, EYC. KIND MATERIAL L 15% MR-1 gelled wtr; 4 Gos-Oil Raile Oil Grovity - API (set de) inpri
SITP 1293 SITP 1421 position of Greek Will be s	Ca. op Pressure PC - SilCP 14 Sold, Lied for field Old	INER RECORD BOTTOM Number) 13 (1 s) (2) (1 s) (3) (1 s) (4) (5) (6) (7) (6) (7) (7) (7) (7) (7	Fun - ran Cl ASING RECORD (Re- 11 SET HO 237' 1. 652' BACKS CEMENT PROD Duling, gas lift, pump Trait Perilod Prod'n. For Trait Perilod	SL-GR & TD pon oil swings s LE SIZE 3 3/4" B 3/4" SCREEN 32. A DEPTH II 3361-3 3361-3 OUCTION Oil - Bbl. Gas-Ind	T thru cas centin well) CEMENT 250 700 30. SIZE 2 37811 CID, SHOT, FRA VERVAL 391 391 51 Type pump) COM COM COM	TUBING DEPTH SE 3413 3232 CTURE, CEMEN AMOUNT ANI 1000 gals 2,700 gals Well S	RECORD T PACKET 33181 MO NO T SQUEEZE, EYC. KIND MATERIAL L 15% MR-1 gelled wtr; 4 Gos-Oil Raile Oil Grovity - API (set de) inpri
SIPP 1293 SIPP 1421 Will be S I of Allochoente	Other Logs Run - No open I WEIGHT Le., 36# 20# LI TOP (Interval, she and 3233-3 3245-5 3258-6 3275-9 3267- Product Hours Tested Ca. to Pressure PC 51CP 14 Sold, bard for feel	INER RECORD BOTTOM number) 13 (1 s) (1 s) (2 c) (3 c) (1 s) (3 c) (4 s) (5 c) (6 c) (7 c) (8 c) (8 c) (9 c) (9 c) (1 s)	Fun - ran Cl ASING RECORD (Re- 11 SET HO 237' 1. 652' BACKS CEMENT PROD Duling, gas lift, pump Trait Perilod Prod'n. For Trait Perilod	SL-GR & TD port oll strings is LE SIZE 3 3/4" B 3/4" SCREEN SCREEN SCREEN OUCTION Sing - Size and is OU - BbJ. OU Oli	T thru cas centin well) CEMENT 250 700 30. SIZE 2 37811 CID, SHOT, FRA VICHVAL 391 391 51 Sype pump) CON CON CON CON CON CON CON CON CON CO	TUBING DEPTH SE 3413 3232 CTURE, CEMEN AMOUNT ANI 1000 gals. 2,700 gals Well: Well:	RECORD Y PACKES 3318 MO NO TONE T SOUEZE, EYC. OKIND MATERIAL L 15% MR-1 Gelled wtr: 4 Gos-Oil Raile oil Grovity - API (ed By	set de)"D" seo

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BEFORE EXAMINER STAMETS OIL CONSERVATION DIVISION APPLICANTS XHIBIT NO. 14

CASE NO. 2087

Submitted by G. Sexual

Hearing Date 11-17 - 80

DISTRIBL	ALCENTO TO TO	4			V. C	WKI CHE WALL
SANTA PE						Form C-105
FILE		NEW MEXIC	0.00.00	e 140 - Barris De 1923.		Revised 1-1-65
U.S.G.S.		WELL COMPLETION	O OIL CONSERV	ATION COMMI	SSION	ia. Indicate Type of Lease
LAND OFFICE		1	OK KECOMPE	ETION REPO	RT AND LOG	Biol .
OPERATOR					3	Sivie Oti & Cay Lagae No.
G. TYPE OF NEL					N	
A P. Bankaran	o,i					
D. TYPE OF COM			Ony [7.	Unit Agreement Name
Namesol Operator	OVER DEED	CALL STATE OF	and the second second	HEA		
		BACK L	177. O	MER	8•	Form of Lease Name
. Address of Opera	r Oll & Gas (Ompany				Yager Well No.
						No. 4
Location of Well	BOX 2564, BI	llings, Montana 5	:0102			
					Ür	Field and Pool, or Wildcar
INIT LETTER F	11	FA		4	77	ndesignated PC & s
	LOCATED 14	50 PEET FROM THE	Ň	835		TTTIMININI
THE E LINE O	or sec. 10 y		7777	77777	- PEET PROM	
	16. Date T.D. Par	school in Acc. 7W	Muse Allill	MXIIIII	111111111111111111111111111111111111111	THE STATE OF THE S
12/16/78	1/15/70	2. 31N acc. 7W piched 17. Date Compl. (Rec. 3/21/7) Back T.D. 22. 11	udy to Prod.)	TITITITITI	JIIIIII Sa	n Juan (11111111
20. Total Depth	21. Piug E	3/21/7/	Multiple Compl., H	6601 61	KXB, RT, GR, etc.	19. Elev. Cashicaban
3603'	्र ।	991 22. II	Multiple Compl., H	6601 GL, 6	OIZ KB	T
24. Producing Interval(3197-3276 -	(s), of this completion	- Top, Bolton	two	Drille	als Rolary Tools	Cable Tools
3197-3276 -	Fruitland				> O-TD	
26. Type Electric and C	Pictured Cli	ffs				25. Was Directional Surve
	r - FDC/CNL-G			<u> </u>		
28.	- LUC/CHT-C	R				no
						2 lat 4.4
CASING SIZE		CASING RECOOD	/P		1 ²	7, Was Well Cored
CASING SIZE 8-5/8"	WEIG. LB./FT.	DEPTH SET	(Report all strings		L	7, Was Well Cored NO
8-5/8" 5-1/2"	24#	220'	HOLE SIZE	CENEN	TING RECORD	no
8-5/8"		2201	12-1/4"	250 s	TING RECORD	
8-5/8" 5-1/2"	24#	220'	HOLE SIZE	CENEN	TING RECORD	no
8-5/8" 5-1/2" 9.	24#	220' 3602'	12-1/4"	250 s	TING RECORD	no
8-5/8" 5-1/2" 9.	24# 14# LINER	220' 3602'	12-1/4" 7-7/8"	250 s 200 s	TING RECORD X	AMOUNT PULLED
8-5/8" 5-1/2" 9.	24# 14# LINER	220' 3602'	12-1/4" 7-7/8"	250 s 200 s	TUBING RE	MOUNT PULLED
8-5/8" 5-1/2" 9.	24# 14# LINER TOP B	2201 36021 RECORD OTTOM SACKS CEMEN	12-1/4" 7-7/8"	250 S 200 S	TING RECORD X X TUBING RE DEPTH SET	AMOUNT PULLED
8-5/8" 5-1/2" 9. Size	24# 14# LINER TOP B	2201 36021 RECORD OTTOM SACKS CEMEN	12-1/4" 7-7/8" SCREEN	250 s 250 s 200 s	TUBING RECORD X X TUBING RE DEPTH SET 3310	AMOUNT PULLED CORD PACKER SET 3310
8-5/8" 5-1/2" 9. Size Perforation Record (Interest Cliffs.	24# 14# LINER TOP B	2201 36021 RECORD OTTOM SACKS CEMEN	12-1/4" 7-7/8" SCREEN	250 s 200 s 200 s	TUBING RECORD X X TUBING RE DEPTH SET 3310	AMOUNT PULLED CORD PACKER SET 3310
8-5/8" 5-1/2" 9. SIZE Perforation Record (Inc.) Ictured Cliffs Ictured Cliffs	24# 14# LINER TOP B	2201 36021 RECORD OTTOM SACKS CEMEN	12-1/4" 7-7/8" SCREEN 32. AC DEPTHIN	250 s 250 s 200 s	TUBING RE TUBING RE DEPTH SET 3310' 3157' TURE, CEMENT SC	AMOUNT PULLED CORD PACKER SET 3310' DUEFZE EXC
8-5/8" 5-1/2" 9. Size Perforation Record (Int.) Ictured Cliffs Ictured Cliffs	24# 14# LINER TOP B erval, size and numbe : 3495, 3500, : 3350', 3352	220' 3602' RECORD OTTOM SACKS CEMEN 3503, 3515, 351 355, 3365, 336	12-1/4" 7-7/8" T-7/8" SCREEN 32. AC DEPTH IN	30. 30. 51ZE 2-3/8" 1" 1" 1" 1" 1" 1" 1"	TUBING RE TUBING RE DEPTH SET 3310' 3157' TURE, CEMENT SC AMOUNT AND KI	AMOUNT PULLED CORD PACKER SET 3310' QUEEZE, ETC. NO MATERIAL USED
8-5/8" 5-1/2" 5-1/2" Size Perforation Record (Intered Cliffs ictured Cliffs uitland: 3197-	24# 14# LINER TOP B lerval, size and number: 3495, 3500, 3350', 3352 3382. 3204, 3208-2	220' 3602' RECORD OTTOM SACKS CEMEN 3503, 3515, 351 355, 3365, 336	12-1/4" 7-7/8" T-7/8" SCREEN 32. AC DEPTH IN	30. SIZE 2-3/8" 1" 1" 1" 1" 1" 1" 1"	TUBING RE TUBING RE DEPTH SET 3310' 3157' TURE, CEMENT SC AMOUNT AND KI	AMOUNT PULLED CORD PACKER SET 3310' QUEEZE, ETC. NO MATERIAL USED HCL: foam frac
8-5/8" 5-1/2" 9. Size Perforation Record (Inc.) Ictured Cliffs Ictured Cliffs Ictured Cliffs uitland: 3197-	24# 14# LINER TOP B erval, size and numbe : 3495, 3500, : 3350', 3352	2201 36021 RECORD OTTOM SACKS CEMEN	12-1/4" 7-7/8" SCREEN 12-1/4" 7-7/8" SCREEN 132. AC 7 DEPTH IN 157, 3517-3	250 s 200 s 200 s 30. 51ZE 2-3/8" 1" CID, SHOT, FRAC TERVAL 382' 56 W/2102 bb sd, 1.826	TUBING RECORD X X X TUBING RE DEPTH SET 3310' 3157' TURE, CEMENT SC AMOUNT AND KI 10 gal. 15% to the company of the	AMOUNT PULLED CORD PACKER SET 3310' QUEEZE, ETC. NO MATERIAL USED HCL: foam frac
8-5/8" 5-1/2" 9. SIZE Perforation Record (Inc.) Ictured Cliffs Ictured Cliffs Ultland: 3197-	LINER TOP B Serval, size and number: 3495, 3500, 3350', 3352 33823204, 3208-2 (1 shot/foot)	220' 3602' RECORD OTTOM SACKS CEMEN 3503, 3515, 351 3355, 3365, 336 6, 3232-48, 3262-	12-1/4" 7-7/8" T SCREEN 32. AC DEPTH IN 57, 3517-3	250 s 200 s 200 s 30. SIZE 2-3/8" 1" CID, SHOT, FRAC YERVAL 382' W/2102 bb sd, 1.826	TUBING RE TUBING RE DEPTH SET 3310' 3157' TURE, CEMENT SC AMOUNT AND KI	AMOUNT PULLED CORD PACKER SET 3310' QUEEZE, ETC. NO MATERIAL USED HCL: foam frac
8-5/8" 5-1/2" 9. SIZE Perforation Record (Int.) Ictured Cliffs Ictured Cliffs Ictured Cliffs Ultland: 3197- First Production Shut In	LINER TOP B Serval, size and number: 3495, 3500; 3352; 3382, 3208-2 (1 shot/foot) Production Me flow	220' 3602' RECORD OTTOM SACKS CEMEN 3503, 3515, 351 3355, 3365, 336 6, 3232-48, 3262-	12-1/4" 7-7/8" T SCREEN 32. AC DEPTH IN 57, 3517-3	250 s 200 s 200 s 30. SIZE 2-3/8" 1" CID, SHOT, FRAC YERVAL 382' W/2102 bb sd, 1.826	TUBING RECORD X X TUBING RE DEPTH SET 3310' 3157' TURE, CEMENT SC AMOUNT AND KI 10 gal. 15% 10 1s 70% foam MMCF Nitrog tural	AMOUNT PULLED AMOUNT PULLED CORD PACKER SET 3310¹ QUEEZE, ETC. HO MATERIAL USED HCL: foam frac £ 20,000# 10/20 Jen
8-5/8" 5-1/2" 9. SIZE Perforation Record (Int.) Ictured Cliffs Ictured Cliffs Ictured Cliffs Victored Cliffs First Production Shut In Olympia (170) In House 3/21/70 House	LINER TOP B Serval, size and number: 3495, 3500; 3352; 3382. -3204, 3208-2 (1 shot/foot) Production Me flow	220' 3602' RECORD OFTOM SACKS CEMEN 3503, 3515, 351 3555, 3365, 336 6, 3232-48, 3262- PROCUMENT OF THE PR	12-1/4" 7-7/8" 7-7/8" 32. AC 7 DEPTH IN 57, 3517-3: -76 3197-32 DUCTION Plag - Size and typ	250 s 200 s 200 s 30. SIZE 2-3/8" 1" CID, SHOT, FRAC YERVAL 382' W/2102 bb sd, 1.826	TUBING RECORD X X TUBING RE DEPTH SET 3310' 3157' TURE, CEMENT SC AMOUNT AND KI 10 gal. 15% [15 70% foam MMCF Nitrog tural	AMOUNT PULLED AMOUNT PULLED CORD PACKER SET 3310¹ QUEEZE, ETC. NO MATERIAL USED HCL: foam frac E 120,000# 10/20 Gen
8-5/8" 5-1/2" 9. SIZE Perforation Record (Integral Cliffs Cliff	24# 14# 14# LINER TOP B serval, size and numbe : 3495, 3500, : 3350', 3352 33823204, 3208-2 (1 shot/foot) Production Me flow re Tested Choice 3 hrs	220' 3602' RECORD OFTOM SACKS CEMEN 3503, 3515, 351 3555, 3365, 336 6, 3232-48, 3262- PROCUMENT OF THE PR	12-1/4" 7-7/8" 17 SCREEN 17 SCREEN 17 SCREEN 17 SCREEN 17 32. AC 7 DEPTH IN 157, 3517-3 200CTION 200g - Size and typ	250 s 200 s 200 s 30. SIZE 2-3/8" 1" CID, SHOT, FRACT YERVAL 382' 50 W/2102 bb Sd. 1.826 Na	TUBING RECORD X X TUBING RE DEPTH SET 3310' 3157' TURE, CEMENT SC AMOUNT AND KI 20 gal. 15% to LS 70% foam MMCF Nitrog tural Well Statue Shut	AMOUNT PULLED AMOUNT PULLED CORD PACKER SET 3310' QUEEZE, ETC. HO MATERIAL USED HCL: foam frac & 120,000# 10/20 IEI (Prod. or Shw-in) In
8-5/8" 5-1/2" 9. SIZE Perforation Record (Interpretation Record Cliffs Ictured Cliffs Ictured Cliffs Uitland: 3197- First Production Shut in Interpretation Record (Interpretation Record Cliffs) First Production Record (Interpretation Record Cliffs) First Production Record (Interpretation Record Cliffs) Shut in Record Cliffs Tubble Piese Case	24# 14#	2201 36021 RECORD OTTOM SACKS CEMEN 3503, 3515, 351 3555, 3365, 336 6, 3232-48, 3262- PROCIPO (Flowing, gas lift, pump ving) Test Period Wated 24, Old State of the pump ving Wated 24, Old State of the pump ving Wated 24, Old State of the pump ving	12-1/4" 7-7/8" 7-7/8" SCREEN 17 SCREEN 7 DEPTH IN 57, 3517-3 200CTION Ding - Size and typ OII - Bbl.	250 s 200 s 200 s 30. SIZE 2-3/8" 1" CID, SHOT, FRAC YERVAL 382' W/2102 bb sd, 1.826	TUBING RECORD X X TUBING RE DEPTH SET 3310' 3157' TURE, CEMENT SC AMOUNT AND KI 20 gal. 15% to LS 70% foam MMCF Nitrog tural Well Statue Shut	AMOUNT PULLED AMOUNT PULLED CORD PACKER SET 3310¹ QUEEZE, ETC. NO MATERIAL USED HCL: foam frac E 120,000# 10/20 Gen
8-5/8" 5-1/2" 9. SIZE Perforation Record (Interpretation Record Cliffs Ictured Cliffs Ictured Cliffs Uitland: 3197- First Production Shut in Interpretation Record (Interpretation Record Cliffs) First Production Record (Interpretation Record Cliffs) First Production Record (Interpretation Record Cliffs) Shut in Record Cliffs Tubble Piese Case	24# 14#	2201 36021 RECORD OTTOM SACKS CEMEN 3503, 3515, 351 3555, 3365, 336 6, 3232-48, 3262- PROCIPO (Flowing, gas lift, pump ving) Test Period Wated 24, Old State of the pump ving Wated 24, Old State of the pump ving Wated 24, Old State of the pump ving	12-1/4" 7-7/8" 17 SCREEN 17 SCREEN 17 SCREEN 17 SCREEN 17 32. AC 7 DEPTH IN 157, 3517-3 200CTION 200g - Size and typ	250 s 200 s 200 s 30. SIZE 2-3/8" 1" CID, SHOT, FRACE TERVAL 382' 50 W/2102 bb sd, 1.826 76 Na	TUBING RECORD X X TUBING RE DEPTH SET 3310' 3157' TURE, CEMENT SO AMOUNT AND KI 20 gal. 15% to LS 70% foam MMCF Nitrog tural Well Status Shut	AMOUNT PULLED AMOUNT PULLED CORD PACKER SET 3310' QUEEZE, ETC. HO MAYERIAL USED HCL: foam frac £ 120,000# 10/20 IEI (Prod. or Shw-in) In Gos-Oil Ratio
8-5/8" 5-1/2" 9. SIZE Perforation Record (Int.) Pictured Cliffs Pictured Cliffs Pictured Cliffs Uitland: 3197- First Production Shut in Oi Test 78 Hour 3/1/78 Grant Shup Piece Cas Sirp 1/75 ER- Japosition of Gas (Sold, 18)	LINER TOP B Serval, size and number : 3495, 3500, : 3350', 3352 33823204, 3208-2 (1 shot/foot) Production Mere flow flow re Tested Choin 3 hrs ling Pressure Calculated SICP 1427 Wied for Just, vented,	2201 36021 RECORD OTTOM SACKS CEMEN 3503, 3515, 351 3555, 3365, 336 6, 3232-48, 3262- PROCIPO (Flowing, gas lift, pump ving) Test Period Wated 24, Old State of the pump ving Wated 24, Old State of the pump ving Wated 24, Old State of the pump ving	12-1/4" 7-7/8" 7-7/8" SCREEN 17 SCREEN 7 DEPTH IN 57, 3517-3 200CTION Ding - Size and typ OII - Bbl.	250 s 200 s 200 s 30. SIZE 2-3/8" 1" CID, SHOT, FRACT YERVAL 382' 50 W/2102 bb Sd. 1.826 Na	TUBING RECORD X X TUBING RE DEPTH SET 3310' 3157' TURE, CEMENT SO AMOUNT AND KI 20 gal. 15% to LS 70% foam MMCF Nitrog tural Well Status Shut	AMOUNT PULLED AMOUNT PULLED CORD PACKER SET 3310' QUEEZE, ETC. HO MATERIAL USED HCL: foam frac & 120,000# 10/20 IEI (Prod. or Shw-in) In
8-5/8" 5-1/2" 9. SIZE Perforation Record (Int.) Pictured Cliffs ictured Cliffs uitland: 3197- First Production shut in of Test / 78 3/24/78 STUP 1475 En- Japosition of Gas (Sold, 1995)	LINER TOP B serval, size and numbe : 3495, 3500, : 3350', 3352 33823204, 3208-2 (1 shot/foot) Production Me flow re Tested 3 hrs ling Pressure Calculation	2201 36021 RECORD OTTOM SACKS CEMEN 3503, 3515, 351 3555, 3365, 336 6, 3232-48, 3262- PROCIPO (Flowing, gas lift, pump ving) Test Period Wated 24, Old State of the pump ving Wated 24, Old State of the pump ving Wated 24, Old State of the pump ving	12-1/4" 7-7/8" 7-7/8" SCREEN 17 SCREEN 7 DEPTH IN 57, 3517-3 200CTION Ding - Size and typ OII - Bbl.	250 s 200 s 200 s 30. SIZE 2-3/8" 1" CID, SHOT, FRACE TERVAL 382' 50 W/2102 bb sd, 1.826 76 Na	TUBING RECORD X X X TUBING RE DEPTH SET 3310' 3157' TURE, CEMENT SC AMOUNT AND KI 20 gal. 15% to LIS 70% foam MMCF NItrog tural Well Statue Shut Water — Bbl.	AMOUNT PULLED AMOUNT PULLED CORD PACKER SET 3310' QUEEZE, ETC. HO MATERIAL USEO HCL: foam frac & 120,000# 10/20 IET (Prod. or Shut-in) In Gos-Oil Ratio
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BEFORE EXAMINER STAMETS OIL CONSERVATION DIVISION

ACCHOANTS EXHIBIT NO. 15

CASE NO. 7087

Submitted by BLACK NOOD

Hearing Date 11.12.85

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BEFORE EXAMINER STAMETS OIL CONSERVATION DIVISION

APPLICATES EXHIBIT NO. 11

CAST 10. 7087

-1

Submitted by BLANKOND

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	14,73
		The state of the state of	Mcfpd	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
##. Televiside	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 $1475/(1475-310) \times 21 = 27$ Mcfpd. 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 $1420/(1420-310) \times 113 = 145 \text{Mcfpd}$. 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 36 Mcfpd.

Northeast Blanco Unit Well No. 205 October production averaged 55 Mcfpd.

The estimated stabilized production rate to the atmosphere is estimated to be 1475/ $(1475-310) \times 55 = 70 \text{Mcfpd}$. 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 18 Mcfpd.

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.

CAMPBELL AND BLACK, P.A.

LAWYERS

JACK M. CAMPBELL BRUCE D. BLACK MICHAEL B. CAMPBELL WILLIAM F. CARR POST OFFICE 80X 2208

JEFFERSON PLACE

SANTA FE, NEW MEXICO 87501

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 708)

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:1r

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

APPLICATION

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:

 Applicant is the owner and operator of certain interests in the Fruitland formation underlying the following described lands situated in San Juan and Rio Arrica 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, 8/2

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.
- 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.

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 invoduce 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 ______ day of October, 1980.

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 RÍO ARRIBA COUNTIÉS, NEW MEXICO

CASE 7087

APPLICATION

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:

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Township 30 North, Range 8 West, N.M.P.M. Section 1: All Section 12: All Section 13: Section 24: All A11

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.
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Respectfully submitted, CAMPBELL & BEACK, P.A.

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 23 day of October, 1980.

-3-

Docket No. 40-80

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.H. - 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 E. 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, Bange 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 C 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 Mixico.

 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 011 & 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 Hesaverde 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, deeks 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 4 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 Buan 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 reenter 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 feat, subsurface, under the NW/4 SW/4 of Section 3, Township 24 South, Range 36 East.

- CASE 7108: Application of HNG Dil 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 Hexico. 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 promation 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 projection 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 Pado 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 provation 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

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, Eddy County, New Mexico.

to a well to be drilled at a standard location 35, Township 18 South, Range 29 East, to be dedicated costs and charges for supervision, designation of the cost thereof as well as actual operating applicant as operator of the well, and a charge drilling and completing said well and the allocation of the coat thereof as well as actual operation of applicant as operator of the well, and a charge

Upon application of Southland Royalty Company this case will be heard De Novo purauant to the pro-

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 county, New Mexico. NE/4 of Section 5, both in Township 12 South, Range 28 East, and the NE/4 NE/4 of Section 23, the NE/4 SE/4 of Section 23, the NE/4 SE/4 of Section 28, the NE/4 NE/4 of Section 4 and the Ne/4 SE/4 of Section 28, the SE/4 NE/4 of Section 4 and the NH/4 cost of drilling and completing said wells and the allocation thereon. Also to be considered will be the series of the cost thereof as well as actual dedicated to a well to be drilled at a standard location thereon. Also to be considered will be the coperating costs and charges for supervision, designation of the cost thereof as well as actual 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 (DE NOVO)

CASE 6965:

Application of Supron Energy Corporation for a non-standard gas proration unit, Rio Arriba County, and Dakota gas proration unit comprising the SE/4 of Section 8, Township 25 North, Range 3 West, to

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. (DE NOVO)

CASE 6896:

Application of John E. Schalk for a non-standard gas proration unit and an unorthodox gas well locaacre non-standard Bianco Mesaverde gas proration unit comprising the NE/4 of Section 8, 1925 feet from the North line and 790 feet from the East line of said Section 8. Township 25

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. (Continued from November 25, 1980, Examiner Hearing)

CASE 6996:

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 to a well to be drilled at a standard location 8, Township 25 North, Range 3 West, to be dedicated operating costs and completing said well and the allocation of the cost thereof as well as actual as a charge for risk involved in drilling said well.

Applicant, New Mexico.

Ne

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 DESIGNA-TION 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.

day of NOW, on this 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.

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 authl 13: All

Section 13: All Section 24: All

of Aztec, 18 miles the east of the city

Case No. 7087 Order No. R-

Township 31 North, Range 6 West, N.M.P.M.

Section 6: Lots 8, 9, 10 and 11 MARS / 2 - Section 7: All

Sections 18 through 20: All -

Section 30: All

Section 9:5/2" Suction 1015/2"

Township 31 North, Range 7 West N.M.P.M.

Section 1: Lots 5, 6, 7 and 8 w/S/2

Sections 19 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

- , with the above name exceptions, (6) That the Fruitland formation underlying the above described lands has been penetrated by in excess of one hundred 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

(may reasonably be presumed to have

-3-Case No. 7087 Order No. R-

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.

-4-Case No. 7087 Order No. R-

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 15: 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 5/2
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 guls/2 Sections # through 16: All Sections 19 through 36: All

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

Sustan 10:5/2

JOE D. RAMEY Director