STATE OF NEW MEXICO

ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT

OIL CONSERVATION DIVISION

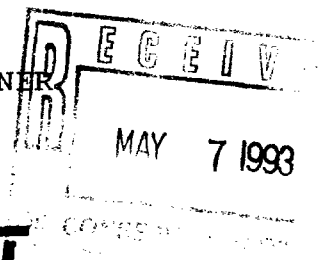
CASE 10,692

EXAMINER HEARING

IN THE MATTER OF:

Application of Pogo Producing Company for special pool rules for the East Loving-Delaware Pool, Eddy County, New Mexico

TRANSCRIPT OF PROCEEDINGS



BEFORE: MICHAEL E. STOGNER, EXAMINER

ORIGINAL

STATE LAND OFFICE BUILDING

SANTA FE, NEW MEXICO

April 8, 1993

A P P E A R A N C E S

FOR THE DIVISION:

ROBERT G. STOVALL
Attorney at Law
Legal Counsel to the Division
State Land Office Building
Santa Fe, New Mexico 87504

FOR THE APPLICANT:

HINKLE, COX, EATON, COFFIELD & HENSLEY
Attorneys at Law
By: JAMES G. BRUCE
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I N D E X

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E X H I B I T S

APPLICANT'S EXHIBITS:

* * *

WHEREUPON, the following proceedings were had at 8:36 a.m.:

EXAMINER STOGNER: Call next case, Number 10,692. And for the record, I'm Michael E. Stogner. I began hearing this case three weeks ago, and I'm here to make a command performance.

MR. STOVALL: Repeat performance? Is that --

EXAMINER STOGNER: Yeah, that too.

MR. STOVALL: Application of Pogo Producing Company for special pool rules for the East Loving-Delaware Pool, Eddy County, New Mexico.

EXAMINER STOGNER: Call for appearances.

MR. BRUCE: Mr. Examiner, Jim Bruce from the Hinkle law firm in Santa Fe.

I have -- Let me explain. I have three witnesses here today. I only intend on examining one, the geologist, Mr. Gary Hoose, but in case the Examiner has any other questions I also have available Mr. William Foshag, who is an engineer, a reservoir engineer, who testified at the last case, and I also have Mr. Richard Wright, who's Pogo Producing Company's manager of operations in this area.

EXAMINER STOGNER: Now, was he also a witness sworn in at the last hearing?

MR. BRUCE: He was not -- Neither Mr. Hoose

nor Mr. Wright were sworn at the last hearing.

EXAMINER STOGNER: Okay, let's have your geology witness stand up to be sworn at this time.

(Thereupon, the witness was sworn.)

GARY HOOSE,

the witness herein, after having been first duly sworn upon his oath, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. BRUCE:

Q. Would you please state your name and city of residence for the record?

A. My name is Gary Hoose, and I live in Midland, Texas.

Q. Who do you work for and in what capacity?

A. Pogo Producing Company, and I'm the division geologist for Pogo in their Midland office.

Q. Have you previously testified before the OCD?

A. I have not.

Q. Would you please outline your educational and employment background?

A. I graduated from Bowling Green State University in 1977 with a bachelor's of science in geology, at which time I took a position as a geologist with Texaco.

I stayed with Texaco until early 1980, at

which time I obtained a position as a geologist with Pogo Producing Company, for whom I've worked ever since, the last several years as division geologist.

Q. And your area of responsibility includes southeast New Mexico?

A. It does.

Q. And are you familiar with the geology in the East Loving-Delaware Pool?

A. I am.

MR. BRUCE: Mr. Examiner, I would tender Mr. Hoose as an expert petroleum geologist.

EXAMINER STOGNER: Mr. Hoose is so qualified.

Q. (By Mr. Bruce) Mr. Hoose, would you please refer to Pogo's Exhibit A and explain for the Examiner its contents?

A. Exhibit A is a type log for the East Loving-Delaware field, being the Pogo Producing Urquidez Number 3 well, located in Section 10 of 23 South, 28 East of Eddy County.

On this type log there are marked the formation tops which are relevant to this case.

Tops are marked, starting with the anhydrite unit overlying the Delaware Mountain group, being at a depth of 2342, and that is drilling depth, Delaware Lime at 2562, Bell Canyon at 2594, Cherry Canyon at

3418, and Brushy Canyon at 4644, with the underlying Bone Spring Formation at 6126.

Q. Approximately how thick is the Brushy Canyon?

A. Approximately 1500 feet thick in this area. In this particular wellbore the Brushy Canyon is 1482 feet thick.

Q. Okay. Would you please refer to Pogo's Exhibit B and discuss its contents for the Examiner?

A. Exhibit B is a compilation of all of the wells in the Loving Delaware, East Pool.

On this exhibit are listed the operator and well name as well as the location of each well and the perforated interval.

All of these wells are completed in the Brushy Canyon Formation. Several have subsequently been turned into water disposal wells.

Q. Where is the water disposal occurring?

A. Disposal occurs in both the Bell Canyon formation and the Cherry Canyon formation, depending on which wellbore we're referring to.

Q. You have all these Brushy Canyon perforations in these well in this pool. Where are the perforations of the wells with respect to the entire Brushy Canyon interval?

A. They're in the lower part of the section.

The shallowest perforation is around 5900 feet, and the deepest perforation in the pool is at 6330 feet.

All of these perforations are in the lowest several hundred feet of the Brushy Canyon formation.

Q. So there's no danger, based on interpretation, that one could be in the Cherry Canyon?

A. Not at all.

Q. Do you have anything further at this time, Mr. Hoose?

A. No, I don't.

Q. In your opinion, is the granting of Pogo's Application in the interests of conservation and the prevention of waste?

A. It is.

Q. And were Exhibits A and B compiled from company records?

A. Exhibit A was from company records.

Exhibit B was -- The information was obtained by visiting the NMOCD district office in Artesia and pulling all of the appropriate state and federal forms and taking the information off of those.

MR. BRUCE: Okay. Mr. Examiner, at this time I would move the admission of Pogo Exhibits A and B.

EXAMINER STOGNER: Exhibits A and B will be admitted into evidence at this time.

MR. BRUCE: And before I forget, Mr. Examiner, I would also like to admit Pogo Exhibit C, which contains a letter of support from Hallwood Energy, and also a fax message from Flare Oil, Inc., which states that they wish to remove their objection.

If you'll recall, they entered an appearance at the original hearing and stated that they objected to the Application.

EXAMINER STOGNER: Okay. Anything else at this time, Mr. Bruce?

MR. BRUCE: I have nothing further at this time, Mr. Examiner.

EXAMINATION

BY EXAMINER STOGNER:

Q. Mr. Hoose, in looking at your type log -- And I assume you're familiar with the overall structure of this particular pool?

A. Yes, I am.

Q. Okay. Now, in looking at the -- your listing and then the type log, I believe the bottom -- or the top of the Bone Spring, I'm sorry, is -- shows up somewhat shallow, I guess, compared to some of the other perfs in your listing.

In fact, it looks like the top of the Bone Spring is at 6240; is that right? I mean 6140.

A. Approximately -- 6126 is where I've picked the top of the Bone Spring in this well, being based on the occurrence of the Bone Spring limestone.

Q. Okay. And just -- Can you give me a general view of that particular pool in which it's -- the dipping direction, severity and such?

A. There is somewhat of a structural nose in there, but the general degree -- direction of dip is dipping back to the east, anywhere between one and two degrees of dip in various places across the pool.

And that also would explain -- and I appreciate your concern -- why some of the perforations listed are below this 6126 number which I referred to. In other words, those perforations are further off to the east and downdip, but still stratigraphically above this Bone Spring marker.

Q. Why did you choose this particular well as your type log?

A. I feel that it's representative of the producing intervals in the field. It is more central to the field than some of the other wells that we have participated in.

Pogo has been in greater than 20 wells out there, of which we've operated nine, and this was the -- We are primarily over on the western portion of the

field. This is one of our easternmost logs, and therefore more central to the entire production of the field.

Q. In Exhibit Number B, which I appreciate that there's a lot of work, a lot of tedious review of files and stuff, did you do that?

A. I directed that.

Q. Were you aware of any of these particular wells, other than the salt water disposal wells, that might have had some perforations higher above and tested the Delaware, say was plugged off or squeezed?

A. To my knowledge, none of these wells have any perforations above the Brushy Canyon formation, other than the water disposal wells.

EXAMINER STOGNER: Okay. Any other questions of this witness?

MR. BRUCE: I have none, Mr. Examiner.

EXAMINER STOGNER: He may be excused. Thank you sir.

Anything else, Mr. Bruce?

MR. BRUCE: Not unless you have any questions of Mr. Wright or Mr. Foshag.

(Off the record)

EXAMINER STOGNER: Mr. Bruce, we don't have anything further.

MR. BRUCE: Okay.

EXAMINER STOGNER: With that, Case Number 10,692 will be taken under advisement.

(Thereupon, these proceedings were concluded at 8:50 a.m.)

* * *

CERTIFICATE OF REPORTER

STATE OF NEW MEXICO)
) ss.
COUNTY OF SANTA FE)

I, Steven T. Brenner, Certified Court Reporter and Notary Public, HEREBY CERTIFY that the foregoing transcript of proceedings before the Oil Conservation Division was reported by me; that I transcribed my notes; and that the foregoing is a true and accurate record of the proceedings.

I FURTHER CERTIFY that I am not a relative or employee of any of the parties or attorneys involved in this matter and that I have no personal interest in the final disposition of this matter.

WITNESS MY HAND AND SEAL April 13th, 1993.

STEVEN T. BRENNER
CCR No. 7

My commission expires: October 14, 1994

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 10692, heard by me on April 8, 1993.

David R. Catanach, Examiner
Oil Conservation Division

STATE OF NEW MEXICO

ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT

OIL CONSERVATION DIVISION

IN THE MATTER OF THE HEARING)
CALLED BY THE OIL CONSERVATION)
DIVISION FOR THE PURPOSE OF)
CONSIDERING:) CASE NO. 10692

APPLICATION OF POGO PRODUCING COMPANY

REPORTER'S TRANSCRIPT OF PROCEEDINGS

EXAMINER HEARING

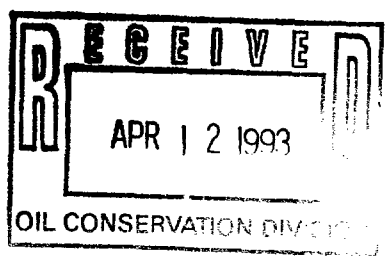
BEFORE: Michael E. Stogner, Hearing Examiner

March 18, 1993

Santa Fe, New Mexico

This matter came on for hearing before the Oil Conservation Division on March 18, 1993, at the Oil Conservation Division Conference Room, State Land Office Building, 310 Old Santa Fe Trail, Santa Fe, New Mexico, before Deborah O'Bine, RPR, Certified Court Reporter No. 63, for the State of New Mexico.

ORIGINAL



I N D E X

March 18, 1993
Examiner Hearing
CASE NO. 10692

E X H I B I T S

E X H I B I T S
-Continued-

A P P E A R A N C E S

FOR THE DIVISION:	ROBERT G. STOVALL, ESQ. General Counsel Oil Conservation Commission State Land Office Building 310 Old Santa Fe Trail Santa Fe, New Mexico 87501
FOR THE APPLICANT:	HINKLE, COX, EATON, COFFIELD & HENSLEY P.O. Box 2068 Santa Fe, New Mexico 87504 BY: JAMES BRUCE ESQ.
FOR FLARE OIL:	MONTGOMERY & ANDREWS, P.A. P.O. Box 2307 Santa Fe, New Mexico 87504 BY: GEORGE GERAN, ESQ.
FOR RB OPERATING COMPANY:	TIM GOODEAU 601 Marienfeld, Suite 102 Midland, Texas 79701

EXAMINER STOGNER: This hearing will come to order. I'll call next case, No. 10692, which is the application of Pogo Producing Company for special pool rules for the East Loving-Delaware Pool in Eddy County, New Mexico.

At this time I'll call for appearances.

MR. BRUCE: Mr. Examiner, Jim Bruce for the Hinkle Law Firm in Santa Fe representing the applicant. I have three witnesses to be sworn.

EXAMINER STOGNER: Are there any other appearances?

MR. GERAN: Mr. Examiner, George Geran, Montgomery & Andrews representing Flare Oil, and we're contesting this application and would ask for minutes, also.

EXAMINER STOGNER: Flare Oil?

MR. GERAN: Right.

EXAMINER STOGNER: How do you spell your last name?

MR. GERAN: Geran, G-E-R-A-N.

EXAMINER STOGNER: Do you have any witnesses, Mr. Geran?

MR. GERAN: No, sir.

MR. GOUDEAU: Tim Goudeau, RB Operating Company, G-O-U-D-E-A-U, with RB Operating Company.

EXAMINER STOGNER: You're just making an appearance here today?

MR. GOUDEAU: Yes, sir. RB Operating fully supports Pogo in their current -- in this case.

EXAMINER STOGNER: Any other appearances?

Will the three witnesses please stand at this time?

(Witnesses sworn.)

EXAMINER STOGNER: Mr. Bruce.

MR. BRUCE: Mr. Examiner, before we begin, Pogo is here today requesting a GOR of 8,000:1 for the East Loving-Delaware Pool. For your information, in 1991 Bird Creek Resources presented a case to the Division requesting a 5,000:1 GOR for the pool. That application was denied by the Division based upon opposition by Oryx Energy Company.

R-9501

At the 1991 hearings, Oryx asserted that the reservoir may have a gas cap but said that another one to two years of data was necessary before we could be certain of the reservoir drive mechanism.

We now have that extra one to two years of data, and we believe it proves this is a solution gas-drive reservoir as Bird Creek originally asserted. Pogo will present testimony from two engineers to prove this, and we will also note for the record that

Oryx does not now oppose this application.

TERRY GANT,

the witness herein, after having been first duly sworn upon his oath, was examined and testified as follows:

EXAMINATION

BY MR. BRUCE:

Q. Would you please state your full name and city of residence.

A. Terry Gant, Midland, Texas.

Q. Who do you work for?

A. I work for Pogo Producing Company. I'm a landman.

Q. Have you previously testified before the OCD as a landman?

A. I have.

Q. Were your credentials accepted as a matter of record?

A. They were.

Q. Are you familiar with the land matters involved in this case?

A. Yes, I am.

Q. Mr. Gant, what is Exhibit 1?

A. Exhibit 1 is going to be a plat showing boundaries of the East Loving-Delaware Pool, which is highlighted in yellow. And then it's also going to be

showing the boundaries of East Herradura Bend, Delaware Pool, which is in pink. It also shows a boundary line basically one mile outside of the existing pool boundary of the East Loving-Delaware Pool.

Q. Were operators and unleased mineral interest owners in the pool and operators of wells within a mile of the pool notified of this application?

A. Yes, they were. Submitted as Exhibit 2 is my Affidavit of Notice which contains notice letters and certified return receipts.

Q. And what what did you do to locate the interested parties?

A. Basically, we checked the OCD file in the prior Bird Creek case in this pool to see who they had notified, and we examined OCD files and industry information to confirm the operators in the area.

We also hired a land broker to examine the county records regarding leased and unleased mineral interest owners within the East Loving Pool boundary. As best we could determine, there are no unleased mineral interest owners within such pool.

Q. What else did you do?

A. Due to the complex mineral ownership within

the East Loving-Delaware Pool, a copy of the application was posted in the Eddy County Courthouse in Carlsbad, New Mexico. Posting was done on March 12th of 1993 through March 18th of '93.

We also advertised the case once in the Current-Argus, a newspaper published in Carlsbad which has a general circulation in Eddy County, New Mexico. A copy of the proof of publication is submitted as Exhibit 3.

Q. Yes, it is Exhibit 3. Have any operators exhibited support for Pogo's position?

A. Yes. Submitted as Exhibit 4 are letters from RB Operating Company, Bird Creek Resources, Inc., and Ray Westall, all supporting Pogo's application.

Also included are letters from C.W. Trainer, Merit Energy Company, Roy E. Kimsey, Jr., Kaiser Frances Oil Company, Mid-Continent Energy, Inc., and Oryx Energy Company all stating that they do not object to our application.

Q. Is RB Operating Company the operator of the largest number of wells in the pool?

A. Yes, they are.

Q. Were Exhibits 1 through 4 prepared by you or compiled from company records?

A. Yes, they were.

Q. In your opinion, is the granting of this application in the interest of conservation and the prevention of waste?

A. Yes, it is.

MR. BRUCE: Mr. Examiner, I'd move the admission of Pogo Exhibits 1 through 4.

EXAMINER STOGNER: Exhibits 1 through 4 will be admitted into evidence at this time.

Before I open up for cross-examination, Mr. Goudeau?

MR. GOUDEAU: Yes, sir.

EXAMINER STOGNER: What is your capacity with RB Operating?

MR. GOUDEAU: I am their region manager now. I have an engineering degree, and I'm a certified engineer in New Mexico and Texas.

EXAMINER STOGNER: Thank you, sir.

Mr. Geran, do you have any questions for this witness?

MR. GERAN: No, sir.

EXAMINATION

BY EXAMINER STOGNER:

Q. In looking at what appears to be a form type of a letter for waivers, was that provided to everybody from Pogo?

A. Which letters, sir?

Q. I'm looking at one particular -- Oryx and C.W. Trainer and the one from Kaiser Frances?

A. Yes, they were, sir.

MR. BRUCE: If I could clarify, on behalf of Pogo, we sent letters out requesting that they return them on firm letterhead, but obviously some companies did not put it on firm letterhead.

EXAMINER STOGNER: Okay.

MR. STOVALL: You gave them some great choices, I got to admit. They either support it or don't object to it.

EXAMINER STOGNER: I guess subsequent to this, when Pogo requested hard letterhead, was that to kind of make your form letter voided or whatever the case may be?

MR. BRUCE: I would hope they would choose one of the options and make it look less unprofessional, Mr. Examiner, but, as I said, they chose to ignore our instructions.

EXAMINER STOGNER: When did the other letter go out asking them to put it on hard letterhead, objection or support?

MR. BRUCE: March 1.

EXAMINER STOGNER: Do you have a copy of

that?

MR. BRUCE: Yes. What can I say, Mr. Examiner.

EXAMINER STOGNER: Is this our copy, or can we have --

MR. BRUCE: If I could keep that, and I'll submit one for the record this afternoon.

EXAMINER STOGNER: I think, yes, for the record.

Q. I believe you stated that this was once -- or this was brought up in a Bird Creek Resources application in 1991?

A. Yes, sir.

Q. Do you happen to have or recall the order number or case?

A. I do have it. Do you have it, Jim?

MR. BRUCE: Mr. Examiner, it's Order No. R-9501 and 9501-A.

EXAMINER STOGNER: I'm going to take administrative notice of that particular case file and order, subsequent order. There might be some information there that could help me better understand this particular application.

MR. STOVALL: Mr. Bruce, this application doesn't seek to do anything that would change

anybody's interest in it?

MR. BRUCE: No, sir.

MR. STOVALL: Good.

EXAMINER STOGNER: I don't have any other questions of this witness then. He may be excused.

Mr. Bruce.

MR. BRUCE: Call Mr. Vanorsdale to the stand.

CHARLES VANORSDALE,

the witness herein, after having been first duly sworn upon his oath, was examined and testified as follows:

EXAMINATION

BY MR. BRUCE:

Q. Will you please state your name and city of residence?

A. Charles Vanorsdale, Midland, Texas.

Q. What is your occupation?

A. I am a senior evaluation engineer with Scott Hickman & Associates.

Q. What is the relationship between you or Scott Hickman & Associates and Pogo in this case?

A. We were retained by Pogo to testify on behalf of certain engineering aspects.

Q. Are you familiar with engineering matters related to the East Loving-Delaware Pool?

A. I am.

Q. Have you previously testified before the Division, Oil Conservation Division, or Oil Conservation Commission as a petroleum engineer?

A. Yes, I have.

Q. Were your credentials accepted as a matter of record?

A. They were.

Q. Have you on behalf of Pogo conducted a study of this pool?

A. Yes.

Q. Have you prepared certain exhibits to present today?

A. I have.

MR. BRUCE: Mr. Examiner, I tender Mr. Vanorsdale as an expert petroleum engineer.

EXAMINER STOGNER: Mr. Vanorsdale is so qualified.

Q. (BY MR. BRUCE) Mr. Vanorsdale, did you testify in the case in this pool on behalf of Bird Creek in 1991?

A. I did.

Q. Briefly, what will the engineering testimony presented by Pogo today show?

A. We will address approximately four major

points. The first being that the East Loving-Delaware Pool is a classical solution gas-drive reservoir, and, as such, its ultimate recovery will be independent of the producing rate.

Second, that reservoir energy is not being wasted and will not be wasted under an 8,000:1 GOR. Previous contention has been presented that there has been a secondary gas cap formed in the reservoir which would deprive the reservoir of energy. And we will show that this is not the case, and the structural position in the reservoir does not predispose the reservoir towards the formation of a secondary gas cap.

Third, I will refer to my previous reservoir simulation work which I did in 1991 and show how that has been updated and accurately reflects the performance of the well which I modeled and refer to my conclusion that was presented in 1991, that no reserves will be lost if production rates are allowed to increase under a higher GOR.

And, fourth, we will demonstrate that there are good oil wells in the pool which are being curtailed while higher GOR wells are allowed to produce at full stream capacity. By increasing the GOR allowable, we will enable producers to produce

their wells at higher, more efficient rates.

As a consequence, the royalty owners and state and federal governments will receive their severance taxes and royalties sooner without significantly increasing fieldwide GOR's or decreasing the ultimate recovery.

Q. What GOR does Pogo request for this pool?

A. 8,000:1 based on the current GOR's in the pool, the anticipated GOR's, and well test data.

Q. Let's move on to your exhibits and discuss the bases of your conclusions. What is Exhibit 5?

A. Exhibit 5 is an excerpt from the book Elements of Petroleum Reservoirs published by the predecessor of the Society of Petroleum Engineers. This exhibit compares reservoir characteristics of solution gas-drive reservoirs and gas cap expansion reservoirs. I will be referring to this exhibit several times, specifically to compare the behavior of the reservoir pressure, oil production rate, and gas:oil ratio as they vary with time and production.

It's important that we assess the reservoir drive mechanism in order to understand what impact that will have on the ultimate recovery of the reservoir.

Q. And you will refer back to this exhibit

several times?

A. Yes.

Q. Is Elements of Petroleum Reservoirs a standard text used by reservoir engineers?

A. It is.

Q. Would you then please move on to Exhibit 6 and discuss its contents to the examiner.

A. Exhibit 6 is an updated exhibit from testimony which I presented in the 1991 hearing. This exhibit is a plot of bottom hole pressure versus time for wells throughout the field, starting with the estimated pressure from the first well in the field completed in 1987, the Brantley #1.

There are several lines shown here which represent the connection of data points for individual wells. The Carrasco 14-1 has had the most pressure tests taken on it, and it shows a pressure history of -- in a two and a half year period of time, pressure drop on the order of 40 percent.

Q. Would you say that this reservoir pressure data is consistent with what you'd expect in a solution gas-drive reservoir?

A. Yes. Referring back to my Exhibit No. 5, a dramatic pressure decline is very characteristic of solution gas-drive reservoirs, and as is shown by the

Carrasco 14-1, pressure decline trend, this is a very dramatic drop.

There are two other lines which are shown on this exhibit representing pressure data collected on the Urquidez #2 and the Urquidez #3 wells. Those are structurally high wells in the field. The two data points for each well were taken upon their completion and again just recently.

Both of these show a pressure decline on the order of 1300 pounds or more, which translates into approximately a 50 percent pressure drop in about a one and a half year period of time. Again, this strongly reinforces that this is a solution gas-drive behavior.

Q. Does the pressure data indicate the formation of a secondary gas cap?

A. No. If there had been a secondary gas cap, structurally high wells such as the Urquidez 2 and 3 would not have exhibited the pressure response that we see here on these pressure tests.

Typically, referring back to Exhibit No. 5, in a gas cap expansion reservoir, the pressure is maintained for quite a few years. As the oil is produced, that gas cap expands to fill the void space and continues to maintain pressure on the oil column.

And this is not the case here.

Q. Would you then move on to Exhibit 7 and identify that for the examiner?

A. Exhibit 7 is a graph of the total field oil production per month divided by the number of producing wells since the completion of the Brantley #1. I've also plotted on this curve the number of active wells since the Brantley #1 was completed in 1987. Plotting the production data this way illustrates the average rate per producing well in an attempt to more or less normalize the data.

As you can see, there are two distinct decline trends here, one during the early development of the field when there were less than 10 producers, and the second during the late development of the field when the well count increased to over 90 wells.

When we normalize the data like this, both trends show the same shape fitted with a hyperbolic decline exponent of .5.

Q. Is production performance data with this hyperbolic decline exponent of this magnitude consistent with a solution gas-drive reservoir?

A. Yes. A hyperbolic decline exponent of .5 is very typical for solution gas-drive reservoirs. For gas expansion reservoirs, the exponent is

typically higher than .5.

In addition to that, if you observe the production rate dropoff, you can see this bears a strong resemblance to production rate dropoff for a solution gas-drive reservoir in my Exhibit No. 5.

Q. Does the production performance data indicate the existence of a secondary gas cap?

A. No. Under gas cap expansion, the production decline would be much more shallow, and, again, if you refer back to Exhibit No. 5, you can see that it is maintained as fairly good rate.

If a secondary gas cap had formed, this second decline trend would have been much shallower than the initial decline trend instead of being identical.

Q. What is Exhibit 8?

A. Exhibit 8 is plot of the total pool cumulative oil production versus the cumulative GOR history. The purpose here again is to point out what type of reservoir drive is present and how effectively that drive is being utilized.

You can see that the GOR rises dramatically in the early period of production out there and then drops dramatically again before leveling out. Although it does start to level out, there was at that

point in time additional development in the field.

In addition to the GOR being plotted here, I also have the well count. You can see how the well count rises sharply. In the same period of time you'll notice the cumulative GOR starting to increase again.

The net result here is that the new wells being added on will gradually increase the poolwide GOR as their individual GOR's rise and then level out.

Q. Is this GOR data you've just presented consistent with what you'd expect from a solution drive gas reservoir?

A. Yes. Again, if you were to take a look at the GOR behavior on this plot versus the GOR behavior shown for a solution gas-drive reservoir on my Exhibit No. 5, and, of course, you have to discount the field developments impact on the overall GOR, the behavior does strongly resemble the solution gas-drive.

Q. Does it indicate a secondary gas cap?

A. No. The cumulative GOR would rise much more sharply if this were a gas cap expansion reservoir.

Q. Would you please move on to Exhibit 9 and identify that for the examiner and discuss what it shows?

A. Exhibit 9 is a structure map of the field contoured on the top of the main producing horizon. I have superimposed on this map color-coded dots representing the average GOR of each well over the 12-month period of October 1991 through September of 1992.

The highest GOR wells are in purple. The two highest are the RB-operated SCB #6 and Pogo's Federal 10 No. 2. The Pogo well is near the structural high in Section 10, and RB's well is in Section 24, essentially at the structural low.

The next six highest GOR wells, which will be colored pink and dark red, are scattered throughout the field. And based on this scatter and the fact that the two highest GOR wells are located at both structurally high and structurally low positions would indicate that there is no relationship between structure and GOR contrary to what you would anticipate for a gas cap expansion reservoir.

Q. Okay. What is Exhibit 10?

A. Exhibit 10 is a structure map, again contoured on the top of the main producing horizon, but I have highlighted a line indicating the path of a cross-section I've prepared. The cross-section extends from the structurally lowest high GOR well,

which is the SCB #6 on the east side of the field, to the structurally highest GOR well, the Urquidez No. 4, which is shown as A' on this plot.

Q. Why did you choose this line of wells?

A. These wells were selected to represent a variety of structural positions throughout the pool and representing wells that have GOR's ranging from high to low.

Q. Then move on to your cross-section, Exhibit 11, and discuss it for the examiner.

A. The cross-section is hung on a Sub C datum, not a formation top, and there's a lot of information presented here.

First, with regards to the logs themselves, you can see that the main pay zones, which I've identified as the Middle Brushy Canyon and the Lower Brushy Canyon, are represented by a series of sand and shale sequences. This is an extremely laminated reservoir and, of course, very complex. Due to the laminations and the fact that the permeability is very low out here, there really is insufficient vertical communication within the reservoir which would enable gas to migrate and form a consolidated gas cap. As a result, you really wouldn't expect to see a gas cap in a reservoir such as this.

One reason that we may have highly variable GOR's in this field is that due to the laminations, there would appear to be certain lenses which are very permeable, enabling them to evolve gas from the oil more easily due to the gas:oil relative permeability.

In addition to depicting the continuity of these two main pay zones, I've also tabulated GOR statistics for the 12 wells that are shown here. And first I'd like to call your attention to the cumulative GOR data. If you just flip through the cross-section, you can see that there's quite a variation all across the field.

Q. What are your observations regarding the tabulated GOR data?

A. Foremost, if you go upstructure, you will notice that there is not an increase in cumulative GOR as you would expect in the presence of a secondary gas cap.

Again, looking at the cumulative GOR's on the individual wells, you will notice that there is no relationship between structural position and GOR. Additionally, you will notice that the GOR itself varies greatly from one well to the next. There is no trend whatsoever. This is undoubtedly a function of the individual sand lenses.

And by comparing the last 12 months of GOR data to the last three months of GOR data, one can infer an idea as to the reservoir drive mechanism. If we had a declining GOR, that would be in line with a solution gas reservoir, whereas a GOR that increased without showing signs of breaking over or leveling off would indicate a gas cap expansion reservoir.

The majority of the wells, when you compare their last 12 months to last 3 months GOR history data, indicate a flat or declining GOR trend, and most of those with increasing GOR's are fairly low in GOR magnitude.

One exception is the Carrasco 14-5. This is a structurally low well and a good producer, but it is typically shut in for up to two weeks each month to comply with the current 284 Mcf per day allowable.

Q. What are your observations regarding the GOR history plots?

A. The history plots themselves support the GOR statistical data. Most show the GOR increasing to a peak and then falling off, which is typical for your solution gas-drive reservoirs.

The few instances in which this is not the case are for wells such as the Carrasco 14-5, which are frequently shut in in order to meet the current

allowable.

Q. In summary, if a secondary gas cap was forming, how would you detect it from your Exhibit 11?

A. The structurally higher wells, which would be shown as you approach A' on the cross-section, would have higher cumulative GOR's, and these GOR's would continue to rise without reaching a peak because gas coming out of solution in the structurally lower wells would migrate to the higher wells and form the secondary gas cap. And, again, this is obviously not the case.

Q. Is there a water drive present in this reservoir?

A. No. Although there is water produced in the field, its production behavior does not indicate an active water drive, nor does the reservoir pressure history suggest pressure maintenance by water drive.

Q. In your opinion, is this pool a solution gas-drive reservoir free of a secondary gas cap?

A. Yes. My comparison of several reservoir behavior patterns to examples in published authoritative literature substantiates this conclusion.

Q. What is Exhibit 12?

A. Exhibit 12 is an excerpt from the book

Applied Petroleum Reservoir Engineering. And this refers back to a statement I made earlier with regards to determining the drive mechanism of the reservoir and its impact on the ultimate recovery.

I will quote the first sentence in the paragraph entitled "Maximum Efficient Rate" in which the authors state: "Many studies indicate that the recovery from true solution gas-drive reservoirs by primary depletion is essentially in independent of both individual well rates and total or reservoir production rates."

And probably to state that more succinctly, if you have proof that you have a solution gas-drive reservoir, its ultimate recovery is it's going to be independent of the rate at which it is produced.

Q. So you're saying that if this pool is produced at higher rates under the 8,000:1 GOR, it will recover the same amount of oil as producing the pool at the lower rates under 2,000:1 GOR?

A. Yes, that's correct.

Q. What would be the benefit of increasing the allowable or increasing the GOR in this pool which would, as some future testimony will show, allow certain wells to produce at higher rates?

A. There are many wells whose oil production

is curtailed due to the current GOR limits. Raising the GOR will eliminate most, if not all, of the curtailment, as well as accelerate the recovery of the reserves, which would have obvious economic benefits.

The accelerator recovery will not have an adverse effect on the field's ultimate recovery, and it will not cause waste. The pool will still produce at essentially the same GOR; however, you will eliminate some future potential problems with regards to mechanical situations.

Q. Would you please move on to your Exhibits 13A through 13D and describe their contents for the examiner.

A. These are updated versions of exhibits I presented in the 1991 hearing based on the results of my reservoir simulation of the Carrasco 14-1.

I've taken my simulation forecasts, and I've shown the match that I obtained prior to that 1991 hearing, and I've also shown the fit of the actual data since that hearing. There is a vertical bar on each one of these exhibits which separates the fit prior to and after the 1991 hearing.

Prior to that hearing, I used a black oil simulator to match about 20-1/2 months of actual production for this particular well through May of

1991. I forecast an additional eight months of data through January 1992. So my comparison of actual to forecast data is valid through January 1992.

Q. Are the results from your simulation work consistent with the data accumulated in the pool since you did this work?

A. Yes. The first exhibit, 13A, is a plot of the oil production rate per month versus time for the Carrasco 14-1. And you can see that the fit is very, very good. The difference between the actual amount of oil produced and what I had forecast was only about 8 percent.

The following exhibit, 13B, is a plot of the cumulative oil production versus time. Again, through January 1992, my forecast was only about 3 percent lower than the actual cumulative production.

The exhibit marked 13C is a plot of the cumulative gas produced versus time. Through January 1992, my forecasts were only about 2 percent lower than the actual cumulative production for this well.

And the last of my model matches, 13D, is a plot of the bottom hole pressure versus time. And in this instance, my forecast is approximately 8 percent higher than the estimated pressure in January 1992.

Given these tolerances on these four

exhibits, I'm confident that my model was consistently and accurately simulating field conditions.

Q. In your opinion, would your simulation results as presented in 1991 at the original hearings still hold true today?

A. Yes. My conclusion from that simulation study was that the ultimate recovery is virtually independent of the production rates. Under a lower GOR allowable, it just took more time to recover the same amount of oil.

Q. Have you reviewed the testimony presented by Oryx at the 1991 hearing?

A. Yes.

Q. What was the basis of Oryx's simulation work?

A. In order for Oryx to maintain a match to the field data, they had to incorporate the formation of a secondary gas cap, and they said that this was directly related to structural position. Even in those cases, the matches that they obtained were not nearly as good as those obtained in my study.

Q. Did you incorporate tilt into your simulation work?

A. Yes. One of the contentions provided by Oryx at that time was that structural position and the

reservoir dip contributed to the formation of a secondary gas cap. Even when I incorporated structure into my simulation, my matches were just as good with as without the tilt.

In my study, I tilted the reservoir up to 7 degrees, and it still showed no appreciable effect. I was able to monitor the gas saturation in a number of blocks throughout my study to see if there was any significant gas migration, and I found none.

Again, that was using a 7-degree dip in the reservoir, whereas the maximum dip that we had measured is approximately 2 degrees.

Q. You stated today that there's no evidence of a gas cap in this field or in this pool; is that correct?

A. Yes. The match that I obtained assumed no secondary gas cap formation.

Q. The match in your simulation?

A. Yes.

Q. What does this lead you to conclude about Oryx's reservoir simulation model?

A. Since the premise upon which they formulated their model was invalid, any results that they would obtain from their simulation would like likewise be invalid.

Q. What was the conclusion of Oryx's simulation?

A. They concluded that increasing the GOR allowable would waste reservoir energy and, as a result, end up in waste of recoverable reserves.

Q. What is your opinion on the conclusion drawn by Oryx?

A. Well, their conclusion would be unfounded, and their matches would be invalid because their simulation was based on an invalid premise, and that was that a secondary gas cap had to form in the reservoir.

Q. Have you compared Oryx's forecast to actual pool data since the last hearing?

A. Yes. And they have inadequately predicted their well's reservoir behavior. Oryx said at that hearing in 1991 that they would need an additional one to two years' worth of data before a proper determination could be made with regards to the drive mechanism. We now have that data, and it all points to the solution gas-drive behavior.

Q. In summary, what is your recommendation regarding the GOR for the East Loving-Delaware Pool?

A. In my opinion, based upon the simulation work that I have performed and my study of the

reservoir production behavior, this field operates under a solution gas-drive without a secondary gas cap. The ultimate recovery of a solution gas-drive reservoir is going to be independent of the rate at which it is produced. So accelerating the recovery of this field by increasing the GOR 8,000:1 will not adversely affect the ultimate recovery.

Q. Were Exhibits 5 through 13 prepared by you or under your direction?

A. They were.

Q. And Mr. Vanorsdale, in your opinion is the granting of this application in the interest of conservation, the prevention of waste, and the protection of correlative rights?

A. Yes.

MR. BRUCE: Mr. Examiner, I'd move the admission of Pogo Exhibits 5 through 13D.

EXAMINER STOGNER: Exhibits 5 through 13D are admitted into evidence at this time.

Thank you, Mr. Bruce.

Mr. Geran, do you have any questions?

MR. GERAN: No, sir.

EXAMINER STOGNER: Mr. Stovall.

MR. STOVALL: No.

EXAMINATION

BY EXAMINER STOGNER:

Q. Help bring me up to snuff on this particular pool. Now, your cross-section and your headings on your Exhibits No. 9 and 10 refer this to --

A. The Middle Brushy Canyon?

Q. Yes. Is that indeed the only producing interval in the Delaware being made up of three groups? Let's see, you've got your Bell Canyon and Cherry Canyon and your Brushy Canyon. In this pool, is this the only producing interval?

A. The Brushy Canyon is the only producing interval, and we have broken that into a Middle and a Lower Brushy Canyon.

Q. How did you break that out? What were your parameters?

A. That was more or less a cooperative agreement between the companies who were involved in the study which I prepared back in 1991. I had information from Oryx, Pogo, RB, and Bird Creek, each of whom provided me with their so-called type logs of the reservoir, and they had each designated certain intervals within the Brushy Canyon. And to simplify things, I broke it down into just the Middle and the Lower Brushy Canyon.

Q. Have you had the opportunity to review the perforation history in all the wells in your pool unless they're shown on Exhibit No. 9?

A. I don't believe I looked at the perfs in all of the wells. We have over 90 wells in the field.

Q. Naturally, you were able to do quite an extensive research all those that are along your A-A' cross-section?

A. Right.

Q. Not being familiar specifically with this pool, but, generally speaking, the Delaware being such a wide range or very thick formation, including all the Delaware mountain groups, are there other Delaware pools that you're aware of that have multiple perforations or produce through all those intervals?

A. Through these particular intervals?

Q. Yes. Even though we'll call them Delaware formations, that still extends all the way through the three groups.

A. Yes, we know that there are other pools which are productive in these particular intervals.

Q. And also the others; is that correct?

A. Yes.

Q. But since you didn't get to study all of the perforated intervals in all of the wells, we don't

know for sure that some of these wells are not perforated in some of the higher groups; is that correct?

A. No. We do know that all of the wells in the field are perforated in what we have called the Middle and the Lower Brushy Canyon. There is an Upper Brushy Canyon which has not been perf'd in the field, to my knowledge.

Q. But you haven't had the opportunity to study those perforated intervals. That's what I heard you say.

A. I have not studied the perforated intervals, but I have asked the operators.

Q. But you have not physically looked at each perforation and looked at those logs to substantiate that claim; is that correct?

A. Not all 90 wells, no.

MR. STOVALL: Do you have knowledge from any source that the other members of the Delaware group have not been -- are not producing in this pool in any well? Can you say with any certainty or high probability?

THE WITNESS: I have been assured by the operators in the field that they are producing only from the Middle and the Lower Brushy Canyon and no

other interval above that.

Q. (BY EXAMINER STOGNER) How many operators are we talking about?

MR. BRUCE: Mr. Gant might be able to answer that.

MR. GANT: There's 13 operators in the field.

Q. (BY EXAMINER STOGNER) I'm asking this witness, though, since we've got a number now, you can claim that all 13 of them have informed you that there are no other perforated intervals higher than this Middle Brushy Canyon?

A. Not all 13 have been in communication with me.

Q. The evidence indicates and what you're claiming today, this being a solution drive, and if the GOR was stepped up to an 8,000:1, and should there be some of these wells that have perforations in a different producing interval, would that have some or could that have some sort of an adverse effect in those particular perforations should those other Cherry Canyon, Bell Canyon, or even Upper Brushy Canyon that have other type of drive mechanism -- could that have some adverse effect to those producing intervals?

A. No, that shouldn't have any impact on the other zones.

Q. So a solution gas-drive throughout the Delaware?

A. I believe so, yes.

Q. Do you have a type log that you provided me today to show me what the Delaware Formation consists of?

A. No, sir, I have not prepared a type log exhibit.

Q. Do you have knowledge of how thick the Delaware is out here?

A. The entire Delaware interval?

Q. That's what this particular pool entails; is that not correct?

A. Not an average number, I do not have that available. There was a type log presented in the 1991 hearings, but I do not have that with me

EXAMINATION

BY MR. STOVALL:

Q. Do you have an idea of the approximate range of thickness of the Delaware member of the entire formation, as it's called?

A. The productive interval that we're talking about in this --

Q. No, no, no. What we want to know is what is the range of the Delaware pool? Do you know what the ranges of the Delaware pool, which includes all the members?

A. Not offhand, no.

Q. Am I correct in assessing your testimony as based upon a detailed study of the Lower and Middle Brushy Canyon producing zones? And based upon that study, you conclude that at least within those zones, that there is no resensitivity that would affect production, and that you produce at whatever GOR the wells are actually at, and it doesn't affect ultimate recovery; correct?

A. That's correct.

Q. Where we're going with this, the next question is, there's a whole lot more to the Delaware than these zones, and at least at the present time they're all considered one pool. So if you modify the GOR, if you increase it, you increase it for the entire pool which includes all the other intervals that we've talked about.

Do you have any basis upon which to render an opinion as to whether or not an increased GOR could adversely affect those other members of the Delaware Formation within this pool?

A. I believe it would not adversely impact the ultimate recovery from the Delaware. I have reviewed information on the Herradura Bend and the Avalon Delaware Fields and reviewed the testimony and exhibits presented there. And in both of those situations, I concurred with the evidence that had been presented that those two were solution gas-drive reservoirs.

Q. And which members of the Delaware were they producing from?

A. I believe that would be the -- I don't recall offhand. I don't have my notes with me.

Q. You don't know if they were the Brushy Canyon or if they were the higher members of the formation?

A. I believe the Brushy Canyon was included.

Q. Were the others included is what I'm more concerned about? What we're concerned about is if you go raise the GOR based upon the Brushy Canyon, and you've got Bell Canyon or Cherry Canyon in there, you may adversely affect them.

A. I believe that the other two hearings that I had mentioned did include the Bell and the Cherry Canyon, and it was the conclusion in the testimony and exhibits presented there, that increasing the GOR

would not adversely impact the ultimate recovery from the Cherry Canyon and the Bell.

MR. STOVALL: Mr. Bruce, is there somebody at Pogo who could, probably just by an examination of OCD records, see what the perforated interval depths are? It would helpful to the examiner to at least know what we're dealing with. Sometime between now and three o'clock would be fine.

MR. BRUCE: We would gladly list the producing intervals in each well in the pool.

MR. STOVALL: You might be able to dispel any concern about the conversation at this point. Of course, as you get later recompletions in those zones there may be another problem. We may be asking some questions, and we're getting kind of speculative answers, it may not be an issue at this point. It may be the assumptions have been made may be valid.

FURTHER EXAMINATION

BY EXAMINER STOGNER:

Q. I have a few more questions, but I want to keep that in mind, and that is information that I think is very detrimental in this particular instance.

But let me, if I could continue -- in this particular pool, do you know what the depth bracket allowable is for a well?

A. No, I do not.

MR. STOVALL: Let me ask another question about the operations. First off, you are not involved in the operations of Pogo or any operator; is that right?

THE WITNESS: No. I was strictly brought in to take a look at the production data and engineering data which would determine what type of reservoir drive mechanism was actually taking place and what the ultimate recovery of this reservoir would be if a higher GOR was permitted.

MR. STOVALL: Mr. Bruce, you have another witness; is that correct?

MR. BRUCE: Yes. We have an engineer from Pogo.

MR. STOVALL: He's familiar with operations; is that right? At least he knows what's going on and how Pogo's operating and can answer some of the more specific operational questions?

EXAMINER STOGNER: Then with that, I don't have any other questions of this particular witness at this point. Perhaps your other witness can enlighten me on some of the overall aspects.

But with this data that we're discussing at this point with the other wells, perhaps what I

visualize is a type log substantiated by our district office, too, showing the tops of the Delaware Formation and the subsequent groups in the Delaware interval. And with that, since the Brushy Canyon has already been -- as your testimony shows today, middle and a lower, what is the upper, for that matter -- I visualize two indicating where the perforated intervals are in each of these wells and perhaps any recompletions or floodbacks or squeeze jobs that might have occurred in any of the upper zones that would have been designated as Delaware.

MR. STOVALL: I think, just as -- so everybody understands where the Division is, it's very timely if you just simply read the cover memo that is attached to this week's docket. It kind of states that there is a broader picture than just an individual pool in this case in some of those concerns.

What we are doing is not only discussing this specific pool, but there are some Delaware issues that are referenced in that memo and for which there has been a committee formed that may broaden the scope of what Pogo has brought today. So this is where the Division is coming from in asking these questions and this information.

With that, I guess we can proceed.

EXAMINER STOGNER: Perhaps the whole pool needs to be redesignated as to Brushy Canyon. That's a possibility.

MR. STOVALL: I think we're through with this witness at this time, Mr. Bruce. You can proceed with your other engineer.

MR. BRUCE: Call Mr. Foshag to the stand.

MR. STOVALL: If it makes you feel any better, Mr. Bruce, we're going to give you the tough cases of the week medal this week.

WILLIAM FOSHAG,

the witness herein, after having been first duly sworn upon his oath, was examined and testified as follows:

EXAMINATION

BY MR. BRUCE:

Q. Would you please state your full name and city of residence for the record?

A. I'm William Foshag. I'm from Houston, Texas.

Q. Who do you work for and in what capacity?

A. I'm a senior reservoir engineer for Pogo Producing Company.

Q. Have you previously testified before the Division?

A. No, I have not.

Q. Would you please outline your educational and work background.

A. I graduated from the Colorado School of Mines in 1984 with a Bachelor of Science Degree in geological engineering. I went to work right out of school for Sonat Exploration Company in Houston, Texas. I worked at Sonat until June of 1991, until I switched jobs and started work as a reservoir engineer for Pogo. And I am a registered engineer in the state of Texas.

Q. Does your area of responsibility at Pogo include southeast New Mexico?

A. Yes.

Q. Are you familiar with engineering matters related to this application?

A. Yes.

MR. BRUCE: Mr. Examiner, I tender Mr. Foshag as an expert engineer.

EXAMINER STOGNER: So qualified.

Q. (BY MR. BRUCE) Again, what GOR does Pogo request for this pool?

A. We're seeking an 8,000:1 GOR.

Q. How does the requested GOR compare with the GOR in the offsetting pool to the north?

A. As I understand, the East Herradura Bend-Delaware Pool currently has a temporary GOR allowable of 10,000:1. It produces from some of the same correlative sands as the wells that we've got producing in the East Loving Delaware Pool, the same Brushy Canyon sands.

Q. Would you please identify Exhibit 14 for the examiner.

A. Exhibit No. 14 is a diagram showing the different sections and the units in the eastern two thirds of Township 23 South, Range 28 East, in Eddy County, New Mexico. I've noted the section numbers in the upper right-hand corner of each of the sections and then the unit numbers labeled A to P within each section.

The purpose of this exhibit is to show the wide range of GOR's that we've got throughout the field within the Delaware. And as you can notice, you look at the wide range of GOR's throughout the field, there doesn't seem to be any concentration really anywhere in the field of low GOR's being in one place in the field and high GOR's being concentrated in another place within the pool.

Also, I'm showing with this exhibit the close proximity of relatively high and relatively

lower GOR's producing right near each other.

If you take a look at, for instance, the wells that Pogo operates, which are basically the wells in the west half of Section 10, I'll direct your attention to Unit C, that's our Federal 10-2 well. It's producing at a GOR of approximately 34,000:1.

Directly to the south of that in Unit F, the GOR on that well is 5,000:1. Our Urquidez 3 well in Unit K directly to the south, 6,000:1. The Urquidez 2 in Unit N to the south of that, we're back up to to 9,000:1. If you go to the east, that's a Pardue Farms 3 well, that's a well that's operated by Oryx. The GOR on that well is way up to 23,000:1.

These GOR's I've taken for the months of October and November of 1992. So they're fairly recent numbers.

Q. Why is this exhibit important? What does it show?

A. It's important because it's showing, again, the wide range of GOR's are not -- the high GOR's and relatively low GOR's are not concentrated really in any particular part of the field. We've got high and low GOR's producing in relatively close proximity.

My thinking on this is it may not be the best way to manage the resource. In a solution drive

reservoir, the best way to manage something like this may be to have an oil allowable rather than, say, a GOR allowable.

Again, you can take a look at what we've got going on in Section 10 with the wide range of GOR's. And I think you'll also see that if you look at the GOR's in Sections 11, 14, and 23. Those sections also seem to have a wide disparity of GOR's throughout.

Q. Okay. Why don't you move on to your Exhibit 15, your frequency distribution charts, and discuss what they show for the examiner.

A. What I've set up with this exhibit is a set of histograms showing wide distributions of GOR's throughout the Delaware Pool throughout time. I took three-month intervals, basically the first quarter and the third quarter of each of the last couple of years going back to July of 1990, to take a look at what the GOR's -- the average GOR's are running and to see what kind of spread of GOR's we have throughout the field.

I've got labeled on each of the graphs the GOR along the X axis ranging from less than 1,000 to over 10,000. And then on the Y axis, the number of wells that falls within those GOR ranges. And as you can see, the height of each bar represents the number

of wells that we've got producing at a given GOR.

On the first page of this exhibit, Exhibit 15, I've got the production for July through September of 1990. And as you can see the peak bar or the high bar there is in the 1,000 to 1,999 range.

As you move on through each page of this exhibit, they're in chronological order, so you're moving through time, and you can see that that shift in that curve, the peak GOR is shifting to the right, indicating an increase over time with GOR.

Q. What is Exhibit 16?

A. Exhibit 16 is just basically a summary of what I had on the previous exhibit. I'm putting actual numbers to the histograms that I've drawn up. Again, under the dates column, I've got the quarterly data that I collected throughout the field. The production for gas and oil is the production during those months. And the producing GOR is simply the GOR of the production at that time. So it's the gas divided by the oil multiplied by 1,000.

I arrived at the median GOR simply by sorting all of the wells' GOR's and taking the middle number. As you can see, the producing and the median GOR's are fairly close to each other.

The point of all of this is that the GOR's

have increased over time. As you can see, going from 1990 through the third quarter of '92, you've got quite an increase in GOR's. That is, they've gone from around, I guess, around 18,000:1 up to 5,000 or so to 1.

Q. What does the increasing GOR imply?

A. It implies a couple of things. We've got, one, a solution gas-drive reservoir where the GOR's increase quickly. We're not at the point yet where we have enough production where the GOR's will begin to kick over and start to decrease on a fieldwide basis.

The second thing it shows is that throughout the Delaware Pool here we've got wells that produce just at naturally high GOR's.

Q. What is Exhibit 17?

A. Exhibit 17 is an excerpt from a textbook, Fundamentals of Reservoir Engineering by John C. Calhoun. The purpose of this exhibit is to show that the cumulative gas production is a function of the producing GOR and cumulative oil production. That is, the cumulative production is independent of the rate at which the wells are produced.

As you can see on the second page of this exhibit, it's textbook page No. 228, down at equation No. 156, cumulative gas equal to the integral of R,

which is the producing GOR, times D delta N, delta N being the cumulative oil production. As you can see from that equation, rate doesn't enter into this equation at all.

If you refer to the next page, that's textbook page No. 229, Figure 142, you can see the graphical result of that integral. The integral is simply the area under the curve, and you're integrating over that time period or that cumulative production to get the cumulative gas.

One thing to note here is the shape of the curve. As you produce and your cumulative oil production increases, your GOR is also increasing up to a certain point where the GOR's begin to decrease in the later stages of the depletion of the reservoir.

(Thereupon, a discussion was held off the record.)

EXAMINER STOGNER: Mr. Bruce.

Q. (BY MR. BRUCE) Are you done with this exhibit?

A. No.

Q. Go ahead.

A. I guess just -- I just want to reiterate again the points that we're trying to make here with this exhibit. And that is, one, to show via the

equation that the cumulative gas production is going to be independent of the rate at which we produce. And another thing is to note the shape of the curve that we've got. I've got a couple of exhibits that are following that will show that we've got wells that have this same type curve, if you will. That's the point I wanted to make.

Q. Is Calhoun a standard engineering text?

A. Yes, it is.

Q. What is Exhibit 18?

A. Okay. Exhibit 18 is an exhibit that I prepared actually to go along with the next exhibit. These two exhibits will show again that the Delaware wells are solution gas-drive wells, and that it doesn't matter where you're at on structure, high or low, it's consistent. We feel that we've got a solution gas-drive reservoir out here.

I took the exhibit that Charles presented earlier, his structure map, and I've put six dots on it. I've got two wells in fairly high structural positions, two wells in fairly low structural positions, and two wells in mid-structural positions.

Q. Okay. Please move on to Exhibit 19 and describe what it shows.

A. The purpose of this exhibit, again, is to

show that wells are solution gas-drive wells, and these are graphs of the wells that I've plotted on the previous exhibit.

Q. On Exhibit 18?

A. On Exhibit 18. For each of these graphs, I've plotted on the X axis the cumulative oil production, and on the Y axis I've plotted the GOR for the wells as they have produced over time.

The first page of this exhibit are the two structurally high wells, the Burkham #1 and the Siebert #1, and as you can see, they've got a gradually or actually a fairly quickly increasing GOR. They seem to reach a peak and begin to kick over. Siebert #1, the same story.

The second page of this exhibit are the mid-structure wells, the RGA #1 and the RGA #3, again showing the same sort of characteristics.

And then, finally, the third page of the exhibit, I've got the two structurally low wells, the Brantley Com #1 and the Culebra Bluff 23 (South) #7, showing the same sort of production pattern.

So as you can see, we've got the solution gas-drive reservoir here, and it doesn't matter if we're structurally high or structurally low, it seems to be consistent for the wells here that we've got.

Q. The well behavior is consistent regardless of structural position?

A. That's correct.

Q. Are you saying that GOR is a function of cumulative production rather than producing rate?

A. That's correct. It really doesn't matter how you get from one cumulative production point to another. Your GOR is going to change by a certain amount, and that's kind of a fixed number that's independent of rate.

Q. What does this say about the type of drive mechanism in this pool?

A. It says that we've got a solution gas-drive mechanism.

Q. Have you seen any indication of any other drive mechanism in the pool such as water-drive?

A. No, I haven't.

Q. Is your Exhibit 19 consistent with the excerpt from Calhoun?

A. Yes, it is. As you can see, the shapes of the curves on that particular exhibit are consistent with the Calhoun exhibit.

Q. Okay. Finally, Exhibit 20, first, just very briefly identify what Exhibit 20 is and what you're going to use it to show.

A. Okay. What I wanted to do is take a look at what kind of impact we'd have on the wells in the field if we were to change the GOR allowable from 2,000:1 to 8,000:1. I wanted to see what kind of impact it would have on the fieldwide GOR, as well as what kind of impact it might have on the producing rate for the field as a whole.

And basically the conclusions of all of this are, it doesn't have a significant effect on GOR, and we are able to increase our production rates in the field.

Q. On this exhibit there's four main columns. What is the first column?

A. The first column identifies the wells within the East Loving-Delaware Pool and also their location within the pool.

Q. And the second column?

A. The second column is production that I obtained from the State of New Mexico reports for October and November of 1992. I've got listed oil and gas production.

Q. And this is actual production data for that two-month period?

A. That's actual production data for those two months as was stated on the report. That's the total

production for the two months.

Q. Okay. Column 3 is headed Calculations, but it's kind of broken down into two subcolumns. On the left it says there's some daily production data. What is that daily data?

A. I calculated out daily rates based on the production for October and November of '92, basically taking the total production for those two months and dividing by 60 to come up with the average daily rate.

Q. And then you have a column headed Adjusted Daily Rates. What is that?

A. That column is the predicted daily rate that we would get assuming that we could increase our GOR allowable to 8,000:1.

Q. It's your estimate of what the wells in the pool will produce if GOR is increased?

A. That's correct.

Q. Why don't you go into a little more detail and tell what you did in column 4 and then briefly what the results were -- I mean in column 3, and then what that portends as far as monthly production from wells in the pool?

A. Okay. What I did is I assumed that any wells, looking at the daily production, if any wells were producing within 90 percent of their current

allowable, the current allowables being 142 barrels a day and 284 Mcf per day, I assumed that if they were producing within 10 percent of their current gas allowable, that we would be able to double the production rate on that well under an 8,000:1 GOR allowable.

And I think based on well tests that I've seen on our wells, on some wells operated by Bird Creek and some wells operated by RB, I think that that's a reasonable assumption that we can get our production rate up, maybe on average twice what they're producing right now.

Q. In that fourth column where it shows Monthly Increase, what does that indicate?

A. What I did is I took our predicted daily number, which is under the Adjusted Daily column, I subtracted off the daily rate under the previous column and multiplied that number by 30 to get it up to a monthly rate to show the change in production attributable to the change in the GOR allowable over a month's time.

Q. Based on your work, how many wells are having their production cut back in the pool?

A. Assuming the 10 percent down time that I've built into this spreadsheet, I'm counting 16 wells out

of the 90 or so wells on the entire spreadsheet. If you make an assumption of 20 percent down time, that number I believe jumps up to 24.

Again, under the predicted column, I counted for those wells producing 90 percent of their maximum allowable. I added 10 percent down time into that down time also so that we're not producing them at the full maximum rate.

Q. What do you expect the poolwide GOR to do if this application is granted?

A. I'll direct your attention to the third page. If you go all the way down to the totals row, go over to the production column where I've got GOR, and the totals row which is the last row on the page, the fieldwide GOR for October and November of 1992 was 5426:1. And with my calculations, my estimation is under the Adjusted Daily column under Calculations, if you look under the GOR column all the way to the bottom, the number is 5548:1.

Basically what we would be looking at is an increase of somewhere around 2 percent on the fieldwide GOR of 5426:1 to 5548:1. So basically the impact is insignificant.

Q. What effect do you anticipate an increased GOR will have on ultimate recovery?

A. Well, based on the fact that we don't see a significant increase in GOR's, I would say that we're not going to see a significant impact again on the ultimate recovery. It's going to be the same regardless of what rate we produce the wells at.

Q. Would you expect an increase in production?

A. Yes, I would.

Q. Is that basically column 4 at the bottom?

A. Yes, that's correct. Again, I'll direct your attention to the third page under the Monthly Increase column, go all the way down to the bottom, there are the totals. I've added them up, and I'm seeing about 120 million per month gas increase, Mcf per month gas increase, and somewhere in the neighborhood of 20,000 barrels per month increase in going from the 2,000 to 8,000:1 GOR allowable.

Q. Why are you requesting an 8,000:1 GOR? I mean, your charts show that that is not the current GOR poolwide. Why are you requesting that level?

A. Well, based on the histograms that I presented earlier and the work that I've done here, one, we're showing that it's not -- we're not going to have an effect on the ultimate recovery. We're not affecting the fieldwide GOR.

And the other reason is, in looking at the

change in GOR's over time from 1990 to present, we've seen them jump from around 1800:1 to over 5,000:1. As of the third quarter last year, right now I would suspect that the GOR is somewhere in the range of 6,000:1.

We're asking for an 8,000:1 allowable in anticipation of the GOR's continuing to increase slightly before they begin to kick over and drop off as seen in the Calhoun exhibit.

Q. In other words, you want some flexibility based upon your anticipated maximum GOR?

A. That's correct, yes.

Q. Were Exhibits 14 through 20 prepared by you or under your direction, Mr. Foshag?

A. Yes, that's correct.

Q. In your opinion, is the granting of this application in the interest of conservation, the prevention of waste, and the protection of correlative rights?

A. Yes, it is.

MR. BRUCE: Mr. Examiner, I move the admission of Exhibits 14 through 20.

EXAMINER STOGNER: Exhibits 14 through 20 will be admitted into evidence.

EXAMINER STOGNER: Mr. Geran?

MR. GERAN: No, sir.

EXAMINER STOGNER: Okay, I won't pass the exhibits then to you.

Mr. Stovall.

MR. STOVALL: Nothing at the moment. I guess I will. I'll ask you the question that we didn't get the answer to before.

EXAMINATION

BY MR. STOVALL:

Q. Do you know whether there are any wells producing from any other members of the Delaware Formation?

A. No, I don't. The wells that I've seen and that I worked with on my part of the study, I believe those were all Brushy Canyon wells, as far as I know. I obtained production information from Dwight's. I went down and reviewed the perforated intervals. They all seem to be fairly much within the same range. So as far as the accuracy of Dwight's data is, that's what I'm aware of.

Q. You did look at Dwight's for all the wells and at least observed what the wells perforated interval depths were?

A. Right. I reviewed those.

Q. Are you familiar enough with the structure

that you can make a guess that they're probably, at least in the Brushy Canyon, if not in the Middle and Lower?

A. That's correct, that's what I'd have to say, yes.

Q. Do you know how thick the Delaware is through here?

A. I couldn't say. I don't really know. I haven't looked at a type log on that, or we didn't bring one today.

Q. Does Pogo operate in any other Delaware pools to any great extent?

A. Yes. One of the fields I look after is the Livingston Ridge Field, and we've got a number of wells we operate there. Texaco and Yates I believe also operate in Livingston Ridge fields, the Brushy Canyon wells. Other fields that we are currently actively operating in, in Delaware sands, are Red Tank and Sand Dunes.

Q. Do you know the formations which of the members are producing from?

A. Sand Dunes and Red Tank, I'm not the engineer responsible for those fields, but I believe they are Brushy Canyon wells.

EXAMINATION

BY EXAMINER STOGNER:

Q. You got your degree in geological engineering; is that correct?

A. That's correct.

Q. Geological engineering requires quite a bit of geology, especially from the School of Mines up in Colorado, if I recall; is that correct?

A. Well, yeah, there's geology and a lot of engineering, a little bit of both.

Q. Do you know if the Delaware in this particular area -- or let me make it a little bit wider scope, out here in southeastern New Mexico, if the different groups are distinguishable enough that you can draw a conclusion and perhaps map, especially throughout this area, where the Brushy Canyon and the Bell Canyon and the Cherry Canyon are?

A. I think you can take a look at the logs and pick out where all of these different sands are. I guess that's what you're asking, and I guess you can map them. The production that we have in this field, as far as I know, is all Brushy Canyon. We don't have any production out of the Bell Canyon or Cherry Canyon.

Q. The reason I say I'm stepping out a little bit, one important ingredient that I feel is a little

bit lacking in this particular application is the overall geology. Following my questions, you probably can guess that I'd like to see a complete picture of what is going on out here. I think the best thing that I would like to see is a fencepost cross-section of all wells in here showing where the Bell Canyon, the Cherry, Canyon and the Brushy Canyon is and where perforations are. That's quite a bit of extensive work --

A. Yes.

Q. -- but of the idyllic world, that would be a great exhibit. And are they distinguishable in this area?

Mr. Bruce?

MR. BRUCE: I was going to say, if we could leave the record open maybe until the next hearing, maybe we could present some data to you, if that would be acceptable.

MR. STOVALL: Yeah. I guess one of the things I would like to raise, and obviously in this case, Pogo has some desire to get the rates up and get some higher production levels and hopefully a little more money out of this pool at this time. As I pointed out earlier, this is part of what is the subject of the study of a recently formed committee.

Were you aware of that before today?

THE WITNESS: Yes, we had gotten a notification, I think Jim sent us a notification of that, and that was just about a week along.

MR. STOVALL: Probably when you got the docket, I would guess.

THE WITNESS: Yeah, about the same time.

MR. STOVALL: That's when it went out, I guess. I guess the question would be, is this something -- what we are trying to avoid doing and the reason for the study committee is to look at the total Delaware picture, and that's kind of what the examiners are looking at, and see if there's some -- up to this point the Division has treated the Delaware as a single pool within each geographic area, but it is a large one, as we've talked about today, vertically, and there are some different characteristics among the different members, among which the drive mechanism may be one significant one.

I wonder if we ought to leave the record open even for a little longer to let Pogo become aware of what the bigger scope of the study is and see what these records can contribute to that and vice versa.

I don't know what kind of time frame we're talking about.

THE WITNESS: Yes.

MR. STOVALL: I know Mr. Collins, who is the chairman of the committee, has pretty much cranked into high gear and is working on it. I wonder if it would be wise, rather than try to enter an order in isolation, to get a little more information --

THE WITNESS: Okay.

MR. STOVALL: -- if what direction we're going is a more broad-based approach to dealing with the Delaware situation from the Division's standpoint.

Are you in the position where you could express an opinion on behalf of Pogo as to how Pogo would feel about that approach?

THE WITNESS: I guess what I could say is obviously we'd like to see the GOR increased for the wells out there as soon as we could get the order on it. I understand -- I realize that the study is going on, and I didn't know that a study was going to be started until about a week ago. We're all in favor of having the study done and possibly breaking the Delaware out into different units. As far as anything else I could say, I think that's probably about it.

MR. STOVALL: By the way, you're not behind the curve because the whole idea has only been started

within the last month or so.

THE WITNESS: Right.

MR. STOVALL: You got the first notice that has gone out publicly on it.

THE WITNESS: Obviously, from our standpoint, we'd like to get the GOR changed so that we can get our rates on our wells up. That's going to benefit the state also.

MR. STOVALL: The question would be is, do you do it in just the Brushy Canyon, or do you leave this pool the entire interval, what effect does that have on the other zone.

THE WITNESS: Right, I understand.

MR. STOVALL: My inclination is to say -- maybe what we ought to do procedurally, Mr. Bruce, since this has kind of been thrust into Pogo's lap, since they prepared this case, is go ahead and leave it open until the next hearing. That's three weeks. Give you a chance to go back and talk to management because I understand -- I suspect you may not be high enough up the chain to make that policy decision, or I wouldn't want to ask it of you to at this time now that I think about it.

THE WITNESS: That's right.

MR. STOVALL: And then decide whether to

close the record at that time or leave it open or do what with it. Since we need to get some specific information here anyway, let's take advantage of that to give Pogo a chance to do what they need to do, you know, in terms of the bigger picture.

THE WITNESS: Okay.

MR. STOVALL: If that works, and we'll just come back next time and decide what to do.

EXAMINER STOGNER: That's agreeable with you, Mr. Bruce?

MR. BRUCE: Yes.

EXAMINER STOGNER: And before that, I guess the April 8th date, you will be in contact with us either to tell us if you've got a geologist you would like to present and additional information.

MR. BRUCE: And some data as you requested on the perforations.

EXAMINER STOGNER: Can you think of anything else, Mr. Stovall?

MR. STOVALL: I think that pretty well covers it as far as this application. Obviously, you wouldn't have been here, and that's why the committee has formed.

EXAMINER STOGNER: With that, I have no other questions of witness.

MR. BRUCE: If I could, could I present one witness, not as an expert, but maybe give you some information on some of the operating in the area.

EXAMINER STOGNER: Sure.

MR. BRUCE: I'd like to swear Mr. Goodeau as a witness.

TIM GOODEAU,

the witness herein, after having been first duly sworn upon his oath, was examined and testified as follows:

EXAMINATION

BY MR. BRUCE:

Q. Would you please state your name and city of residence for the record.

A. My name is Tim Goodeau. I live in Midland Texas.

Q. Who do you work for?

A. I am the region manager for RB Operating Company.

Q. As part of that, do you oversee the operation of the wells in this pool?

A. Yes, I do.

Q. Operated by RB, that is?

A. Right.

Q. You've listened in on the testimony today at this hearing?

A. Um-hm.

Q. And there's been some questions about the Bell Canyon and Cherry Canyon, Brushy Canyon. As far as RB's wells, to the best of your knowledge, are they completed in the Brushy Canyon?

A. Yes, they are all completed in the Brushy Canyon. As far as the tops on the Delaware, the tops that I've seen quoted on most of the logs, etc., are around 2,000 to 2,500 feet. So you've got around 4,000 feet of Delaware that you're looking at here.

The Cherry Canyon interval -- of course, every company has a different line for where Cherry Canyon runs into Bell -- or Bell Canyon runs into Cherry and Cherry runs into Brushy Canyon because they're basically all sand lenses separated by shales, etc., etc. But there's water being injected into the Cherry Canyon in the 4,000-foot range on the periphery of the field by Parker and Parsley, Bird Creek, BTA, and RB applied for an injection well in the SCB6, which is located in the field there, and it was approved. We haven't done any injection in the well, but I think most of the operators based on that consider the Cherry Canyon probably noneconomically productive.

As far as the Bell Canyon, our mud logs,

etc., logs indicate that there's probably nothing productive up there, but there could possibly be some tests sometime in the future. As we're concerned now with the Brushy Canyon and its productive status, it's a long time in the future.

As far as this committee, etc., being formed, that's all good and fine. Over the years that I've been in the oil industry, I've looked over several Delaware pools, and what I found in the Delaware pools just from pressure work, etc., that these are zones that are separated by pressure, etc., and they probably don't need to be treated as one pool. But as you form a committee and work on it, etc., it may be two and three years down the road that this may come by.

We have a field right next to us with a 10,000:1 GOR that's producing basically in the correlative intervals, that are on federal fee acreage, too, where we have federal acreage right next to it. So as far as any problems with other Delaware mountain groups, we don't see them yet or now. All the data that Pogo presented was on wells, no matter what their perforated interval, showing that solution gas well drive.

I feel strongly that all the wells are in

the Brushy Canyon. I haven't reviewed, all -- everybody's, but I know that ours are, and the wells that we have interest in and Bird Creek's are.

MR. BRUCE: Thank you, Mr. Goodeau.

MR. STOVALL: Again, two comments on that. One, I would suggest that you may want to get in touch with Mr. Collins.

THE WITNESS: Yeah, I know Ted real well.

MR. STOVALL: The second thing is, we've had some pretty effective industry committees out there that come up with some pretty good information in six months. Again, you may have some things that you want to get with Pogo and come back in three weeks. The position that the examiner is in at this point is that he didn't find out about the committee much before you did.

THE WITNESS: I just found out about it today when I saw it on the list.

MR. STOVALL: Well, okay, he's got ten days on you. So we within the Division have not had a chance to talk about how you deal with individual cases and on an overall basis. We need that three weeks here to get that done. We'll come back then and decide what to do next.

Appreciate your input.

THE WITNESS: You bet.

MR. STOVALL: It always helps to have a little operator, real-world experience in there to support it.

EXAMINER STOGNER: With that, Mr. Bruce, is there anything further at this time?

MR. BRUCE: No, sir.

EXAMINER STOGNER: With that, this case will be continued for April 8th.

I would also suggest, Mr. Bruce, as far as I know I will be here on April 8, and if I am here, I will come in and hear this out instead of passing it on to Mr. Catanach, but there may be other circumstances come up between now and then.

MR. BRUCE: We understand.

EXAMINER STOGNER: We'll just have to deal with it.

Anything further at this time?

Let's take a ten-minute recess to prepare for the final matter.

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 10692, heard by me on 18 March 1993.

, Examiner
Oil Conservation Division

CERTIFICATE OF REPORTER

STATE OF NEW MEXICO)
) ss.
COUNTY OF SANTA FE)

I, Deborah O'Bine, Certified Shorthand Reporter and Notary Public, HEREBY CERTIFY that I caused my notes to be transcribed under my personal supervision, and that the foregoing transcript is a true and accurate record of the proceedings of said hearing.

I FURTHER CERTIFY that I am not a relative or employee of any of the parties or attorneys involved in this matter and that I have no personal interest in the final disposition of this matter.

WITNESS MY HAND AND SEAL, March 30, 1993.

Deborah O'Bine

DEBORAH O'BINE
CCR No. 63

OFFICIAL SEAL
DEBORAH O'BINE
NOTARY PUBLIC - STATE OF NEW MEXICO
My Commission Expires Sept. 19, 1994