

BEFORE THE  
NEW MEXICO OIL CONSERVATION COMMISSION  
Santa Fe, New Mexico

July 28, 1965

EXAMINER      HEARING

-----  
IN THE MATTER OF: )

Case No. 3073 being reopened pursuant to )  
the provisions of Order No. R-2758, )  
which order, as amended by Orders Nos. )  
R-2758-A and R-2758-B, established )  
160-acre oil well spacing and 320-acre )  
gas well spacing for the Tocito Dome- )  
Pennsylvanian "D" Oil Pool, San Juan )  
County, New Mexico, for a period of one )  
year. )

Case No. 3073

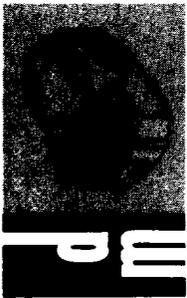
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BEFORE:      Daniel S. Nutter, Examiner.

TRANSCRIPT OF HEARING

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MR. NUTTER: The hearing will come to order, please.

The first case this morning will be Case 3073.

MR. DURRETT: In the matter of Case No. 3073

being reopened pursuant to the provisions of Order No. R-2758, which order, as amended by Orders Nos. R-2758-A and R-2758-B, established 160-acre oil well spacing and 320-acre gas well spacing for the Tocito Dome-Pennsylvanian "D" Oil Pool, San Juan County, New Mexico, for a period of one year.

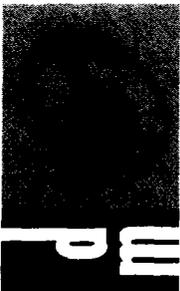
If the Examiner please, we have a letter from Mr. Booker Kelley, who is the attorney for the applicant, requesting that this case be continued until August 11, 1965.

MR. NUTTER: Case No. 3073 will be continued to 9:00 o'clock A.M., this same place, on August 11th, 1965.

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NEW MEXICO OIL CONSERVATION COMMISSION

EXAMINER HEARING

SANTA FE, NEW MEXICO

REGISTER

HEARING DATE JULY 28, 1965 TIME: 9 A.M.

NAME:	REPRESENTING:	LOCATION:
V. T. Lyon	CONTINENTAL OIL CO	Hobbs, N. M.
Ned R. Daniels	Marathon Oil Co.	Midland, Tex
CHAS MALONE	ATWOOD & MALONE	ROSWELL, NM
Jason Kellah	Kellah & Fox	Santa Fe
Paul Hull	Std. Oil Co. of Texas	Houston, Texas
Jack O. Cross	" " " " " "	Roswell, NM
J.M. Gill	" " " " " "	Midland, Tex
R.E. Cribb	Std. oil of Texas	Snyder, Texas
Nina Dinkame	R.W. Byram	Austin + Santa Fe
James D. Jennings		Roswell
Paul C. Bee	Paul Bee	Midland, Texas
T.F. Thagard	SECO PROD. CO.	MIDLAND, TEX
John L. Longford		Houston Tex
Wm. L. Edgar	Seco	Midland
Robert D. Pennington	Leonard Oil Company	Roswell, N. Mex

## NEW MEXICO OIL CONSERVATION COMMISSION

EXAMINER HEARINGSANTA FE, NEW MEXICOREGISTERHEARING DATE JULY 28, 1965 TIME: 9 A.M.

NAME:	REPRESENTING:	LOCATION:
Robert L. Monahan A. L. Porter, Jr. A. R. Kendrick P. J. McCreath	Cal-Mon Oil Co OCC OCC U.S.G.S.	Midland, Texas Santa Fe Ayte Farmington

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BEFORE THE  
NEW MEXICO OIL CONSERVATION COMMISSION  
Santa Fe, New Mexico  
August 11, 1965

EXAMINER HEARING

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IN THE MATTER OF: )

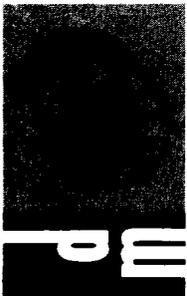
Case No. 3073 being reopened pursuant to )  
the provisions of Order No. R-2758, which )  
order, as amended by Orders Nos. R-2758-A )  
and R-2758-B, established 160-acre oil well )  
spacing and 320-acre gas well spacing for )  
the Tocito Dome Pennsylvanian "D" Oil Pool, )  
San Juan County, New Mexico, for a period of )  
one year. )

Case No. 3073

-----  
BEFORE:

ELVIS A. UTZ

TRANSCRIPT OF HEARING



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MR. UTZ: The Hearing will come to order. Case Number 3073.

MR. DURRETT: In the matter of Case No. 3073 being reopened pursuant to the provisions of Order No. R-2758, which order, as amended by Orders Nos. R-2758-A and R-2758-B, established 160-acre oil well spacing and 320-acre gas well spacing for the Tocito Dome Pennsylvanian "D" Oil Pool, San Juan County, New Mexico, for a period of one year.

MR. BUELL: For Pan American Petroleum Corporation, Guy Buell. We have one witness, Mr. Eaton.

MR. KELLY: Booker Kelly on behalf of Texaco; we have one witness.

(Witnesses sworn.)

MR. UTZ: Any other appearances?

(Whereupon, Exhibits 1 through 5, Pan American, marked for identification.)

G E O R G E W. E A T O N, a witness called to testify, having been first duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. BUELL:

Q Mr. Eaton, would you state your complete name, by whom you are employed and what capacity, and in what location,



please?

A George W. Eaton, Junior; area engineer for Pan American Petroleum Corporation, Farmington, New Mexico.

Q Mr. Eaton, you've testified at many previous Commission Hearings and your qualifications as a petroleum engineer are a matter of public record, are they not?

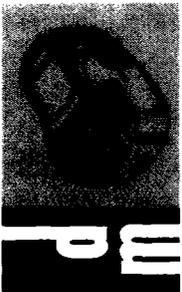
A Yes, they are. In fact, I testified in the two previous Hearings on this particular pool.

MR. BUELL: Any questions, Mr. Examiner, with regard to this witness?

MR. UTZ: I think he's a qualified witness and will remain qualified for some time.

Q (By Mr. Buell) Mr. Eaton, the original Hearing in this Case was heard back in July of 1964, and as a result of that Hearing, the Commission adopted certain temporary rules which are currently in force. I wish you would, for the record, briefly review not each and every one of the rules but what, in your opinion, are the most important of the current rules now applicable in this field?

A The rules which were adopted as a result of that Hearing are contained in Order R-2758 issued August 3rd, 1964. They provide for 160-acre oil proration units, 320-acre gas proration units; under that particular order, the oil wells were limited to that allowable which would accrue to



an 80-acre proration unit. The reservoir was recognized as an associated reservoir and appropriate rules adopted relating the gas allowable to the oil allowable so as to approximate equivalent volumetric withdrawals.

Q Order R-2758 has been amended twice, I believe, by A and B Orders, has it not?

A Yes, sir, that is correct.

Q Now, the purpose of the temporary rules, Mr. Eaton, was to give the operators an opportunity to obtain data in this interim period to see whether or not the current rules were the proper rules, or whether they should be changed. What have the data that has been accumulated in this interim period revealed to you with respect to the pool rules?

A The data which have been collected subsequent to the July, 1964 Hearing conclusively prove to me that an oil well will drain in excess of 160-acres and that a gas well will drain in excess of 320-acres.

Q In order that the Examiner may have your recommendation before him so that he can evaluate your evidence and your testimony, I wish you would state right now what your recommendation to this Commission will be.

A It is my recommendation that the temporary rules in effect for the Tocito Dome Pennsylvanian "D" Pool be made permanent.



Q In that connection, Mr. Eaton, I wish you would look now, at what has been marked as our Exhibit Number 1 and is on the wall to the left of the Examiner. What is that Exhibit?

A Exhibit 1 is a map of the Tocito Dome Pennsylvanian "D" area. The map shows the location of the wells in the pool, the oil wells are colored green on Tocito Dome area map, Exhibit 1. There are 11 oil wells in the pool. The gas wells are colored red on Tocito Dome area map, Exhibit 1, there are five gas wells, a total of 16 wells in the pool. At the time of the Hearing in July, 1964, the pool consisted of one gas well, one oil well, one well which was in the process of being completed as an oil well and a drilling well. In addition to what I've already described, Exhibit Number 1 also shows the pool outline in green. The green line includes all of the area included in the nomenclature Orders, plus some additional area which has been proven productive since the most recent nomenclature order.

Q Mr. Eaton, what is the significance of the red line that trends through this field in the northwest-southeasterly direction?

A That line which has been labeled A-A Prime is the trace of a cross-section which is our Exhibit Number 2.

Q Are you ready to go to that Exhibit, now?



A Yes.

Q It's on the opposite wall, it's marked Exhibit 2.  
What does it reflect?

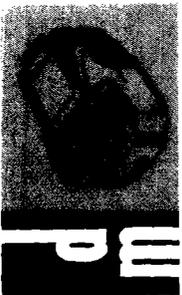
A Exhibit Number 2 shows a cross-section drawn through the pool from the north to south direction generally commencing on the left-hand side, which is the north end of the cross-section with the Pan American Navajo P Number 2 Well, and terminating on the right end, which is the south end of the cross-section with the Texaco Navajo A L Number 2 Well. On this cross-section, I have delineated the upper and lower limits of the Pennsylvanian "D" porosity zone and have colored that zone with various colors depicting whether or not water, oil or gas is contained in the porosity interval. On Exhibit Number 2, the blue color depicts that portion of the porosity which lies below the oil-water contact. This contact is at a datum of approximately minus 550 feet. The green depicts that portion of the porosity which is filled with oil. That portion that is colored red depicts that part of the porosity which lies above the gas-oil contact. In this pool, the gas-oil contact is at approximately minus 510 feet. The logs which have been used to prepare the cross-section or have colored on them the perforated interval in each of the wells. In all cases except the Texaco A L Number 2, the well on the extreme



right-hand end of this cross-section, the wells are completed or were found to be nonproductive in the Pennsylvanian "D" main porosity zone. That particular well found that zone to be water productive and was completed in a small porosity stringer immediately above the main porosity zone.

Q Mr. Eaton, from the standpoint of the purpose of this Hearing, and that is adopting permanent pool rules, what is one of the significant factors revealed by this cross-section?

A The cross-section actually is intended to depict two things. One is that the Pennsylvanian "D" porosity member is a readily correlatable and continuous member that exists from one end of the pool to the other. In addition it also shows that while the oil-water contact has been established, it underlies only a small portion of the reservoir. As a matter of fact, when considering the wells on Exhibit Number Two, only one well which produces from the main Pennsylvanian "D" porosity member is actually underlain by water in that member, that's the Pan American Navajo P Number 2 Well, on this extreme north end of the cross-section which actually cut the oil-water contact within the Pennsylvanian "D" porosity zone. This well was completed making 56 barrels of water per day and it currently makes about a hundred barrels of water per day, not surprisingly since it



actually found the oil-water contact within the well bore.

Q That's certainly not an alarming or abnormal increase in water production for the conditions that exist in that well?

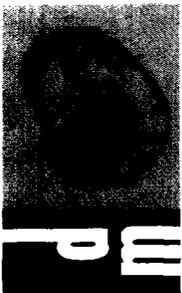
A No, sir.

Q Mr. Eaton, I wish you would look now, at what has been marked as Exhibit Number 3. What does that Exhibit reflect?

A Exhibit Number 3 is a tabulation showing certain basic reservoir data for the Tocito Dome Pennsylvanian "D" Pool.

Q Most of these data seem to be self-explanatory, but are there any of the properties that you would like to comment on that might be significant from the standpoint of the purpose of this Hearing?

A With regard to rock properties, I have listed only two as being pertinent. The porosity based on approximately 125 rock samples averaged 9.2 per cent and the permeability 148 millidarcies. I have good reason to believe that the actual porosity of this reservoir and the actual permeability of this reservoir is in excess of these two values. This rock is so soft that a good part of it is always ground up during the coring operation and it's quite possible that the very best portion of the rock has never been recovered in



any of the cores. In addition to that, in attempting to perform special research development work on selected samples of the core from one well, it was found the drilling mud had completely penetrated to the center portion of the core and could not be removed; so therefore, when the porosity and permeability measurements were made on the core, that part of the core that was saturated with drilling mud, although it contained porosity and permeability, is not reflected in the measurements.

I consider the porosity of 9.2 per cent and the permeability of 148 millidarcies to be minimum values for this particular reservoir.

Q Do you wish to comment on any other items or properties contained on Exhibit Number 3, Mr. Eaton?

A I believe I might point out that the original bottom hole pressure in this pool was 3213 psia. After about 343,000 barrels of oil production and approximately 400,000,000 cubic feet of gas well, gas production, the bottom hole pressure in June, 1965 had declined to 3005 psia.

Q Mr. Eaton, let me ask you this, how would you as a reservoir engineer, grade the reservoir that we're dealing with here?

A This Tocito Dome Pennsylvanian "D" Reservoir is an excellent reservoir, both the oil and gas wells have high

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productivity index.

Q Are you familiar with any other pool in Northwest New Mexico that is of the quality of this one?

A No, sir, I am not.

Q All right. I wish you would look now at what has been marked as Exhibit Number 4 and briefly state what that exhibit reflects.

A Exhibit Number 4 is a plot of the pressure, cumulative performance for Pan American leases in this pool. The heavy blue line connects points of cumulative production and pressure behavior with the pressures having been obtained either from new wells early in the life of the pool, or from pressure surveys of which the Exhibit shows two. The large circle, the first large circle depicts a pressure survey which was conducted in March, 1965 and that point represents the average pressure of six wells at that time. It is approximately 3115 psi. The second large circle represents the average pressure of six wells taken on June 1st, 1965. It is approximately 2995 psi. In addition to these surveys, initial pressures were obtained on new wells as shown. In each case, the initial pressure on these new wells was found to be substantially below the original value or virgin reservoir pressure of 3200 psi. In the case of Navajo Tribal U Number 3, the initial pressure is approximately

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3115. This is well below the virgin pressure of 3200 and in line with the existing average reservoir pressure at the time that well was completed. That is a gas well in this pool. A little bit later on, the Navajo Tribal U Number 4 Well was completed with an initial pressure of approximately 3,050 psi. It also is well below the virgin pressure and in line with the average reservoir pressure as of the time that well was completed. That well also is a gas well in this pool.

About the same time Navajo Tribal U Number 5 was completed, and its initial reservoir pressure was about 3,020 psi. This is an oil well and again, well below the original virgin pressure and in line with the actual average reservoir pressure at the time that well was completed.

Q Mr. Eaton, when you, as a reservoir engineer, see pressure, the initial pressure on a new well considerably below virgin pressure and at, or then at the average reservoir pressure, what does that mean to you?

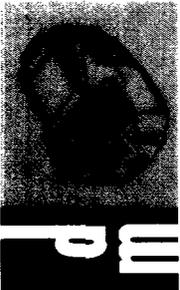
A It means that interference has occurred and that well has been in pressure communication with the other wells in the reservoir and its pressure has been partly depleted despite the fact that it has never produced anything itself.

Q Before we leave this Exhibit, Mr. Eaton, let me ask

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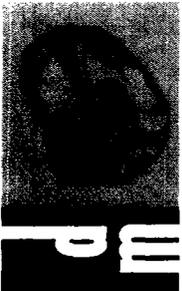


you whether or not these data contained on this Exhibit are from Pan American wells and leases?

A They are from Pan American leases only.

Q Would you look now at what has been marked as Exhibit Number 5? It's on the wall to the left of the Examiner, what is that Exhibit?

A Exhibit 5 again, is a map of the Tocito Dome Pennsylvanian "D" Pool area. It's the same map that is depicted over in Exhibit 1 and again, the oil wells in the pool are colored green and the gas wells are colored red. In addition, I have plotted on Exhibit 5 the actual bottom hole pressures that were measured during the June 1st, 1965 bottom hole pressure survey. These are these numbers which are listed beside the appropriate well and underlined in red. The significance of these pressures is that they are so near uniform, the highest pressure that was measured during that survey was 3,009 psi on the Navajo Tribal N Number 2 and the lowest pressure that was measured was 2982 psi on Navajo Tribal N Number 4. This is a difference of only 27 psi between the various wells in the pool, gets back to the fact that some of the pressures are on oil wells, some are on gas wells, some are on old wells and some are on wells that just have recently been completed. This means that the entire reservoir is being completed at approximately



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the same rate. Whatever the producing mechanism, it is an efficient one.

Q Mr. Eaton, let me ask you this again, these pressures that you have plotted on Exhibit 5 are on Pan American wells, are they not?

A Yes, they are.

Q Do you have any comparable pressures on the Texaco wells to the south, either at the time of this last survey in '65 or an earlier survey?

A Texaco did not run a survey on their wells in June, however, they did survey two of their wells during the March period at the same time that pressures were run on Pan American wells. At that time, the reservoir pressures were approximately 100 psi higher than are depicted on the June survey but again, there was very little difference between the level of pressures throughout the entire reservoir.

Q So from one end to the other in March of '65 when you had that more or less area-wide survey, for all practical purposes, they were all identical?

A Again, they were very close.

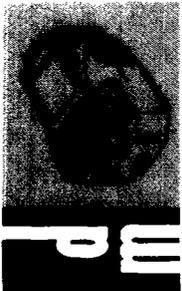
Q Mr. Eaton, I notice that you have two circled areas on Exhibit 5, one colored red and one colored green. What is the significance of those areas?

A These show the areas that have been influenced by interference as depicted by pressures obtained on new wells as they came in lower than the virgin pressure. I have colored the one area in red and one area in green. The one colored in red has a number inside it underlined in red saying 415 acres. This is the minimum area that is shown by these pressure data as being drained by a gas well. I might describe just how this area was arrived at.

The initial pressure on Navajo Tribal U Number 3 as shown by our Exhibit Number 4 came in, in line with the average reservoir pressure existing at the time that well was completed and well below the virgin pressure. I simply took an arc and struck it through the nearest well which had been producing, assuming that that well would certainly be the minimum distance over which this pressure communication had been effective. The 415 acres is the area inscribed by the circle using the radius from the new well to the nearest existing well. I could have -- I say it's a minimum area because I could have drawn one from the Navajo Tribal U Number 4 well through the nearest producing well which for it, would have been the Navajo Tribal U Number 3. That length is greater than the radius that I chose so that the area of this circle would have been greater. Again, Navajo Tribal U Number 4 showed very definite evidence of interference so 415

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acres I consider to be the absolute minimum area that has been demonstrated as being capable of having been drained by a gas well.

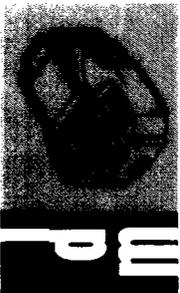
With respect to the green area, it has a number in it saying 246 acres and underlined in green, that circle colored in green is drawn around the Navajo Tribal U Number 5 Well. This is an oil well. The initial pressure on that well was very much removed from the virgin pressure and in line with the existing average reservoir pressure at the time of its completion. The radius again was struck through the nearest completed well. In this particular case, the arc was struck between Navajo Tribal U 5 and Navajo Tribal U Number 4. The area contained in that circle turned out to be 246 acres. I say this is the minimum area over which oil is effectively being drained. The actual area I feel is considerably greater for, although I chose to draw this circle through the new well with an arc the length to the nearest completed well, as a matter of fact, the nearest completed well had not ever been produced on the pipeline at the time Number 5 was completed, the actual nearest production was from the Navajo Tribal U 3, a considerable further distance away.

Q Mr. Eaton, is it your opinion that these interference data conclusively prove that an oil well will

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effectively and efficiently drain in excess of 160-acres and a gas well effectively and efficiently drain in excess of 320?

A This is what the data tell me. Yes, sir.

Q In your opinion, should the Commission make the current temporary rules permanent rules, do you feel that would serve conservation as well as protect correlative rights of all of the owners of interest?

A I do.

Q Do you have anything else that you would care to add at this time?

A I don't believe so.

MR. BUELL: Mr. Examiner, that concludes all that we have by way of direct testimony. I would like to formally offer Pan American Exhibits 1 through 5 inclusive.

MR. UTZ: Without objection, they will be entered into the record in this Case.

(Whereupon, Pan American Exhibits 1 through 5 offered and admitted into evidence.)

#### CROSS EXAMINATION

BY MR. UTZ:

Q Is Pan American currently flaring any gas out of this pool?

A The compressor that we have down there now is a



little bit overloaded and a little bit of gas is being flared.

Q Do you have an estimate of how much is being flared?

A Approximately 150 mcf, I believe.

Q Per day?

A Per day.

Q Is this situation going to persist?

A No, sir. We have a new compressor on order that has been promised for shipment today. It should be in Farmington sometime this weekend and be on the line sometime the middle of next week.

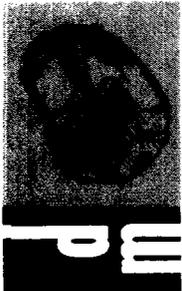
Q How do the -- How does the gas cap compare now in your opinion with what you showed on your last testimony in this case?

A Mr. Utz, I don't believe I ever did try to estimate the size of the gas cap in previous testimony. At the present time, or is this what you were asking, the size of the gas cap?

Q Well, what I asked you, how does it compare now with what you showed on your first exhibit in this case? I believe you estimated the color, as I recall, the size of the gas cap?

A No, sir. That was, I believe that was Texaco's Exhibit.

MR. UTZ: Was that Texaco's?



MR. WALSH: Yes.

Q (By Mr. Utz) How do the tops of your other four gas wells compare in relation to the third one from the right, which I can't read from here. What number is that?

A That's the Navajo Tribal N Number 3.

MR. BUELL: As shown on Pan American's Exhibit Number 2.

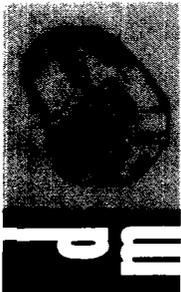
A Actually, as you will notice from that Exhibit Number 2, the structure is fairly gentle in its dip. It doesn't have steep dips in this north-south direction, we found that it does have steep dips along this western edge here. As far as how these tops compare, Navajo Tribal N 3 is this well right here in the southeast of 17. The Navajo Tribal U 3 is higher than that well. All of the others are lower than that well.

Q (By Mr. Utz) I assume the Number 5, U 5 is lower than the Number 3?

A Yes, sir, and U 6 which is this well in the northwest of Section 22 was very low, as a matter of fact it's a dry hole. It's below the oil-water contact.

Q What kind of GOR do you have in the Number 5, does it produce much gas?

A It's approximately solution ratio of 1100 cubic feet per barrel.



Q So you assume from that it's definitely not in the gas cap?

A Yes, sir.

Q In your opinion, has this pool been delineated?

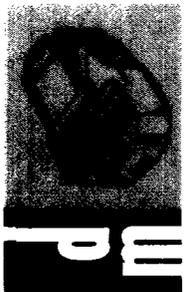
A There's only one other possible location, I think, and that might be in the northern part of Section 16. I believe that it has been delineated in the other directions. I'll just point out if I can where these dry holes are.

Navajo Tribal N Number 5 in the southeast quarter of Section 20, pretty well delineates the pool in this direction to the southwest. More recently, and actually the well has been completed as a dry hole since this map was drawn, Navajo Tribal N 7 in the southeast quarter of Section 18, pretty well delineates the pool to the west. On the northeast flank of the pool Navajo Tribal P Number 1 is a dry hole in the southwest quarter of Section 8, and then, Navajo Tribal U Number 6 in the northwest quarter of Section 22, defines the pool to the easterly direction.

Q Was that a dry hole?

A Yes, sir, it was.

But there was the one possibility of another location in the north half of Section 16, or possibly another one in Section 9 but with those exceptions, I believe that this pool is pretty well defined.



Q I believe we went into this at the last Hearing. I might refresh your memory on it. This U 2, did you pick the top of the water bearing zone from the log? Is that the way you determined the top of the water there?

A No, sir, the top of the water was picked on this well both from the log and from production tests.

Q It's perforated in the bottom of the water, isn't it?

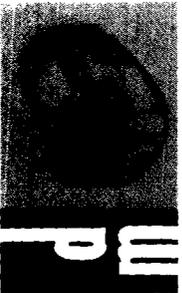
A Yes, sir. It's perforated at this point right here but it also had drill stem test, is not shown across the upper part.

Q So the entire zone was, the DST recovered no oil?

A Yes, sir, or very little, not enough to make a completion out of.

Q Do you think there's communication through that area there?

A It's my opinion that it is pressure communication, Mr. Utz, both from a standpoint of the initial level of pressures that were found on this side of this well, as compared to those to the north and also from the level of pressures that were obtained during the March survey which showed that approximately the same level of pressure existed in the south end of the pool as compared to the north end. It would be fortuitous that the same level of



pressures would exist and there not be any communication.

Q You didn't actually run any interference tests as such?

A The interference tests that we ran were confined to measurement of the initial pressure values on new wells. We did not choose a well and shut it in and produce others around it and measure the pressure performance of that shut in well. However, the pressure data obtained on brand new wells, in my opinion, are in effect interference data.

Q You are assuming that the pressure in the reservoir of those wells was virtually the same as the initial pressures in the old wells?

A Yes, sir.

MR. UTZ: Are there any questions of the witness?

MR. PORTER: What's the oil allowable, Mr. Eaton?

A The oil allowable is 334 barrels per day per well.

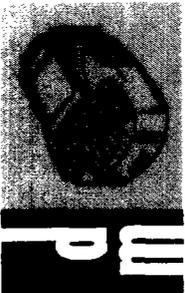
MR. PORTER: Do you know how many marginal wells you have in the pool?

A Pan American has one. Texaco has three. This Navajo Tribe P Number 2 Well, Pan American's, that is, the oil-water contact in its completion interval is currently capable of approximately 60 barrels per day. These three wells of Texaco's which are the one in the southwest quarter, one in the southeast quarter of Section 28 and one in the

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northwest quarter of Section 34, are three wells which found the main porosity member below the oil-water contact and each were completed in this little porosity stringer right above and none of those wells are top allowable.

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

MR. UTZ: Are there any other questions? The witness may be excused. (Witness excused.)

\*\*\*

A. G. WALSH, a witness called to testify, having been first duly sworn, was examined and testified as follows:

(Whereupon, Exhibits A, B, and C were marked for identification.)

DIRECT EXAMINATION

BY MR. KELLY:

Q Would you state your name, position and employer, please?

A I'm A. G. Walsh. I work for Texaco, Inc. in Farmington, New Mexico as District Engineer.

Q You have previously testified before the New Mexico Oil Conservation Commission?

A That is correct. I testified at both of the two previous Tocito Hearings.

MR. KELLY: Are the witness' qualifications a matter of record?



MR. UTZ: Yes, they are.

Q (By Mr. Kelly) Could you tell the Examiner the change, as far as the amount of drilling and production that has occurred since the initial Hearing in this Case on Texaco's properties?

A As far as Texaco's leases are concerned, at the first Hearing Texaco had one well complete and was in the completion process of one more. Since that time, we have completed five oil wells in the Tocito Dome Field.

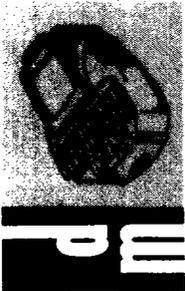
Q Referring to what we have marked as Exhibit A, would you point out those wells?

A Texaco Navajo Tribe A L Number 1 located in the northeast quarter of Section 28 was completed at the time of the last Hearing. This well is a top allowable oil well. Texaco Navajo Tribe A L 2 in the southeast quarter of Section 28 was in the completion process at that time. It is now a limited capacity, pumping oil well producing approximately 50 barrels of oil per day. Texaco Navajo Tribe A L Number 3 in the southwest quarter of Section 28 has been completed since the last Hearing. It's a limited capacity pumping well producing approximately 25 barrels of oil per day. Texaco Navajo Tribe A R Number 1 is located in the southwest quarter of Section 27, it's a top allowable flowing oil well producing 334 barrels per day, and the

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Texaco Navajo Tribe A U Number 1, located in the northwest quarter of Section 24 is a pumping oil well producing approximately 150 barrels of oil per day.

Q So your two wells capable of producing allowable are your A R 1 and A L 1, is that correct?

A That is correct.

Q What was your initial bottom hole pressure on both of those wells?

A The initial bottom hole pressure on the Texaco Navajo Tribe A L Number 1 was determined to be 3206 psi at a datum of 525 feet below the sea level. After a production of 719 barrels of oil, the initial bottom hole pressure on the Navajo Tribe A R Number 1 was determined to be 3170 psi at the datum of 525 feet below sea level after it had produced 819 barrels of oil.

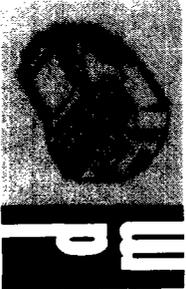
Q Would these comparative bottom hole pressures lead you to a conclusion as to the ability of these wells to drain acreage in excess of 160-acres?

A Yes. That is my opinion. To digress a little further, I would like to explain the significance of Exhibit A. Noted beside each of the wells is the cumulative production from that well at the time that the Navajo Tribe A R Number 1 was completed. If you notice the A R Number 1 has no production beside it so this indicates that no production

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had been taken from that location. The Navajo Tribe A L Number 1 had produced 21,425 barrels and this well is located 1866 feet from the A R Number 1. Going further to the northwest the Navajo Tribe U Number 1 of Pan American had produced 19,785 barrels, this well is located 1.4 miles from the Texaco A R Number 1. Pan American's Navajo N Number 2 had produced 25,476 barrels, located two miles away; and the Pan American P Number 4 had produced 5694 barrels and this well is 3.3 miles away.

The significance of this Exhibit is that this indicates that the pressure in the Navajo Tribe A R Number 1 had been decreased some 36 psi as a result of production from the Navajo Tribe A L Number 1 and other wells in the field over a seven month period. This is evidence of the fact that one well is capable of draining an area in excess of 160-acres.

Q Would you refer to what you have marked as Texaco's Exhibits B and C and explain those to the Examiner?

A Exhibit B is a plot of bottom hole pressure versus time for the Texaco Navajo Tribe's A L Number 1 and A R Number 1. Exhibit C is a plot of the bottom hole pressure in these two wells versus the cumulative production from these two wells. Coming back to Exhibit B, you will note that the pressure in the Navajo Tribe A R Number 1 in

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December of 1964, at which time it was completed is essentially equivalent to the bottom hole pressure in the Navajo Tribe A L Number 1 at that time. This is evidence that the pressures were essentially equal in these two wells at this time, which means that the entire area was drained by the production from Navajo Tribe A L Number 1. Reference to Exhibit C, you will notice that the bottom hole pressures in each well appear to be a function of the cumulative production from both of the wells. This indicates that the wells are in excellent pressure communication.

Q Do you have any opinion as to whether the limits of this pool have been pretty well defined?

A I would hesitate to say that the field is completely developed but at the present time I know of no other future drilling which we contemplate.

Q You were present when Mr. Eaton testified on behalf of Pan American?

A That is correct.

Q Would you, in your professional opinion, agree with the statements he made as far as the recommendations on making these rules permanent?

A Yes. I agree wholeheartedly with Mr. Eaton.

Q Do you feel in your professional opinion, that this pool can be effectively drained as far as oil on 160-acre

spacing and gas on 320-acre spacing?

A That is correct.

MR. KELLY: We have no further questions on direct but I would like to move for the introduction of Exhibits A, B, and C. They were prepared by you or under your direction?

A That is correct.

MR. UTZ: Exhibits A, B and C, without objection, will be entered into the record of this Case.

(Whereupon, Exhibits A, B, and C, offered and admitted.)

#### CROSS EXAMINATION

BY MR. UTZ:

Q Are these wells producing any gas?

A They're producing solution gas, not free gas.

Q What is their GOR?

A Approximately 1300.

Q Is that gas being flared?

A No, sir.

Q When you took these pressures, did you take them with a bottom hole pressure gauge?

A Yes, sir.

Q How does the top of the pay -- Well, I guess we got it, I will ask it anyway. How does the top of the pay compare in these wells as compared to the gas wells up in the northern end of the pool?



A Well, the top of pay in our well, or all our wells, is considerably lower than those wells in the north part of the field which are gas wells. You may recall at the first Hearing, that Texaco's Navajo Tribe A L Number 1 was a high gas-oil ratio well. Since that time we have performed remedial work on this well, squeezed off the upper perforations and reperforated the lower portion of it and shut off the gas so this well apparently did have the remnants of a gas cap.

Q You don't feel you have a gas cap now?

A Yes, sir. The gas cap is still there. We just -- We're not perforated in it, we are not producing gas cap gas.

Q You perforated below?

A Yes.

Q You are not producing any of the gas cap gas?

A That's correct.

MR. UTZ: Are there any other questions? The witness may be excused.

(Witness excused.)

I would like to call Mr. Eaton for another question or two.

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G. W. E A T O N, having previously been sworn, was recalled and testified further as follows:

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## CROSS EXAMINATION

BY MR. UTZ:

Q In regards to the gas cap situation, Mr. Eaton, have you detected in the gas production of any of your gas wells any increase in oil production?

A Not that I know of, Mr. Utz. We are experimenting out in this pool with several varieties of separation equipment and we have just recently moved -- Well, let me say this first, not all of the wells have exactly the same gas condensate ratio. Now, we are experimenting with different kinds of separation equipment and we just recently made a switch with some of this equipment to see if the difference in gas-oil ratio is due to the separation equipment, or if it is due to a difference in the reservoir fluids at that particular location. I don't expect that there will be significant changes between wells. The point I am trying to make is that there may be some changes due to this moving about of equipment.

Q Well, the quality and type of liquids produced from the gas wells is different than the oil produced from the oil wells?

A Oh, yes, sir. The average gravity of the condensate is about 64 to 65 degrees. The average gravity of the oil which is a black oil, is about 46 degrees, so there's a

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substantial difference between the liquids produced from the gas wells in comparison to those produced from the oil wells.

Q At this time you see no evidence of your gas allowables being high enough to pull the oil up into the gas cap?

A No, sir. We certainly don't want that to happen and if it does begin to happen, you can rest assured that we will take steps to prevent it. We certainly do not want this oil to move up into that gas cap, and with the present rules, I believe that the situation is well taken care of.

Q You think that the gor is about right, then?

A Yes, sir.

MR. UTZ: That's all I have.

A I might add one more thing, since I'm on recross, with regard to this flare gas situation I want to make it plain that it is only this new, last completed well that has overloaded our existing compressor and under the pool rules there is a certain time limit that is given for new wells to make beneficial use of the gas.

MR. UTZ: Is that 60 days?

A 60 days.

MR. UTZ: It hasn't been producing 60 days?

A Well, it's right at it right now. We are taking immediate steps and have taken immediate steps to get another



compressor in there to take care of the situation.

MR. PORTER: You'd rather sell the gas?

A Much rather, yes, sir. And you see, we have two levels of separation in this, the high pressure separator on our oil wells is operated at high enough pressure that that gas can go directly into the sale line so that the only gas that is processed into the compressor is the tail gas off the low pressure separator, that's the reason the volume that I described is nominal, because it's only the low pressure separator gas that's being compressed to put into the sale line anyway. In order to get a gas market out of this pool, we had to lay a line ten miles long from this pool eastward to tie into El Paso's main line that goes from Shiprock down to Gallup and we had to be able to deliver gas to El Paso at the end of that ten mile line at 850 psi. In order to do that, then, we have to operate our end of that line at about a thousand pounds and if it weren't for the fact that these are such good wells that they will produce with high enough flowing pressure to permit that high pressure separator to be operated in excess of a thousand pounds, then we would have a real compressor problem but the flowing pressure on these oil wells is 1400 psi or in this range, and for that reason we can operate our high pressure separator at a pressure high enough to put that gas into this high pressure



sales line and then, we must compress this 200 pound separator gas.

MR. UTZ: As the pool depletes, you'll have more acute compressor problems?

A Possibly, yes.

MR. UTZ: Unless it's a water drive?

A Yes, sir.

MR. UTZ: Any other questions? The witness may be excused again. Any statements in this Case?

The Case will be taken under advisement and the Hearing adjourned.

(Whereupon, the Hearing was adjourned at 3:20 o'clock P.M.)

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E X H I B I T S

EXHIBIT	MARKED FOR IDENTIFICATION	OFFERED	ADMITTED
Pan American Nos. 1 through 5	2	16	16
Texaco Nos. A, B, and C	22	27	27

