STATE OF NEW MEXICO

ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT

OIL CONSERVATION DIVISION

CASE 10,541

EXAMINER HEARING

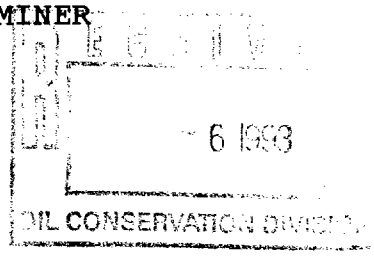
IN THE MATTER OF:

In the matter of Case 10,541 being reopened pursuant to the provisions of Division Order No. R-9773, which order promulgated special pool rules and regulations for the East Herradura Bend-Delaware Pool in Eddy County, New Mexico

ORIGINAL

TRANSCRIPT OF PROCEEDINGS

BEFORE: DAVID R. CATANACH, EXAMINER



STATE LAND OFFICE BUILDING

SANTA FE, NEW MEXICO

July 15, 1993

A P P E A R A N C E S

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I N D E X

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E X H I B I T S

APPLICANT'S EXHIBITS:

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WHEREUPON, the following proceedings were had at 10:11 a.m.:

EXAMINER CATANACH: At this time we'll call the hearing back to order and call Case 10,541.

MR. STOVALL: In the matter of Case 10,541 being reopened pursuant to the provisions of Division Order No. R-9773, which order promulgated special pool rules and regulations for the East Herradura Bend-Delaware Pool in Eddy County, New Mexico.

EXAMINER CATANACH: Are there appearances in this case?

MR. CARR: May it please the Examiner, my name is William F. Carr with the Santa Fe law firm, Campbell, Carr, Berge and Sheridan.

I represent the original Applicants in this case, and I have one witness.

EXAMINER CATANACH: The original Applicants being who?

MR. CARR: Being Ray Westall, Bird Creek Resources.

I'm also today representing Collins and Ware. They are the largest working interest owner in the field.

EXAMINER CATANACH: Additional appearances?

MR. KELLAHIN: Mr. Examiner, I'm Tom Kellahin

of the Santa Fe law firm of Kellahin and Kellahin, appearing today on behalf of Fortson Oil Company, Bass Enterprises, and Hanley Production Company.

MR. CARR: Mr. Examiner, I would also like to enter my appearance for Chevron USA Production Company.

EXAMINER CATANACH: Mr. Bruce?

MR. BRUCE: Mr. Examiner, Jim Bruce from the Hinkle Law Firm representing Pogo Producing Company. I have no witnesses.

EXAMINER CATANACH: Any additional appearances?

Okay, how many witnesses do we have in this case?

MR. CARR: I have one witness.

EXAMINER CATANACH: Any witnesses, Mr. Kellahin?

MR. KELLAHIN: No, sir.

EXAMINER CATANACH: Or Mr. Bruce? Okay.

Will the witness please stand to be sworn in?

REX G. HOWELL,

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

DIRECT EXAMINATION

BY MR. CARR:

Q. Will you state your name for the record,

please?

A. My name is Rex G. Howell.

Q. Mr. Howell, where do you reside?

A. Houston, Texas.

Q. By whom are you employed?

A. Currently I'm a consulting petroleum engineer employed by Ray Westall, Bird Creek Resources and Collins and Ware in this case.

Q. And in what capacity are you employed?

A. I'm employed as a consulting petroleum engineer.

Q. Have you previously testified before this Division?

A. Yes, sir, I have.

Q. And at the time of that prior testimony were your credentials as a petroleum engineer accepted and made a matter of record?

A. Yes, sir, they were.

Q. In fact, you were the engineering witness who testified in October of 1992 on the hearing on the original Application for these pool rules; is that correct?

A. That's correct, sir.

Q. Are you familiar with the East Herradura Bend-Delaware Pool?

A. Yes, sir, I am.

Q. And are you familiar with the efforts that are being made by the operators in this pool to develop data to support permanent pool rules for the pool?

A. Yes, sir, I am.

MR. CARR: Are the witness's qualifications acceptable?

EXAMINER CATANACH: They are.

Q. (By Mr. Carr) Mr. Howell, could -- In October, 1992, when you testified, could you just state what was being sought at that time?

A. Yes, sir, what we were requesting at the time was special pool rules, including a 10,000-to-one gas/oil ratio limit, for a one-year period.

Q. And what was approved by the Division?

A. The Division approved special pool rules for a 10,000 gas/oil ratio limit for a six-month period.

Q. Have you prepared certain exhibits for presentation here today?

A. Yes, sir, I have.

Q. Would you refer to what has been marked as Applicant's Exhibit Number 1?

A. Yes, sir. Exhibit Number 1 is a map showing the latest well test data for all the wells completed in the Herradura Bend-East Delaware field. There's a

total of 27 Delaware completions in this field. They're color-coded red.

Also shown by each one of the wells is the production data from the May C-115's showing the daily barrels of oil per day, daily barrels of water per day and the gas/oil ratio.

Also shown on the cross-section is a -- on the map, is a trace of the cross-section, going from the well in Section 26 down to Ray Westall's well in Section 35, finally over to his well number 3 in 35, over to Fortson Oil Company Pinnacle State well in Section 36, and finally down to the State GO Bird Creek well in Section 2.

That well in Section 2, Unit E, was the discovery well for the Herradura Bend East field, and it was completed in 1985.

The operators shown in the field, of course Bird Creek Resources has operations in Section 26 and in Section 2.

Ray Westall has eight producing wells, all located in the east half of Section 35.

Hanley Petroleum has two wells producing in the west half of Section 35.

Another large operator is Fortson Oil Company, who has all ten wells producing in Section 36.

Harvey E. Yates Company has one well producing in Section 2.

And Santa Fe Operating -- or Santa Fe Energy has three producing wells in Section 2.

Shown with open circles on this map are permitted locations. There are some 28 additional wells that have been permitted and could be drilled to this formation.

Q. If we look at the gas/oil ratio information shown on this exhibit, is there any clear pattern that emerges?

A. No, sir, the gas/oil ratios, which is the bottom number posted by each one of the wells, varies from a low, I guess, of about 2200 cubic feet per barrel, to Fortson's Pinnacle State Well Number 10 in Section 36, to a high of 56,500 cubic feet per barrel, to Hanley Petroleum's Well Number 2 located in Section 35.

However, generally the higher gas/oil ratios are centered around an area in the southeast quarter of Section 35. You can see the gas/oil ratios for wells in that area are 28,000, 27,000, 22,000.

Generally, the gas/oil ratios are high throughout the field, but generally higher in that southeast quarter of 35 area.

Q. Let's move, Mr. Howell, to Exhibit Number 2. Would you identify and review that for Mr. Catanach?

A. Yes, sir, Exhibit Number 2 is a north-south cross-section that was shown on Exhibit Number 1. What this is is a copy of the original exhibit used in the original hearing.

Starting on the left-hand side is the well shown up in Section 26, coming down to Ray Westall's well in Santa Fe Federal Number 1, his Number 3 well, Fortson's Pinnacle State Well Number 1, and finally down to Bird Creek Well in Section 2, which was the discovery well of the field.

I've shown -- Starting at the top here, this is Delaware sands, which are Lower Brushy Canyon, a gross interval of about 350 feet of these sands.

Now the nomenclature that we have here, the Collins sand, the Westall sand and the Brantley sand, are not universal nomenclature; it's just what the operators in this area designate these sands when talking about them.

But generally the Collins sand is the upper sand there. It's the thickest sand, has most of the original oil in place and most of the reserves, probably.

Shown next is the Westall sand there, and

it's in the middle of it.

Finally is the Brantley sand, and all of the wells in the East Herradura Bend field have been completed in either the Collins, the Westall or the Brantley sand.

An inspection of this cross-section will show that really these are three vertically separated zones by dense intervals and by shale breaks.

However, it appears that the Collins sand and the Brantley sand are predominantly gas -- I mean oil -- zones, with casing-head gas.

Now, this is a fairly volatile crude in here. The gravity is about 43 degrees API, the solution GOR was about 1500 cubic feet per barrel, and the original reservoir volume factor was about 1.65 to one. So this is a pretty volatile crude, and will have a high producing gas/oil ratio just due the characteristics of the crude in the formation.

The main thing that's really causing the high gas/oil ratios is a gas zone that occurs in the Westall sand.

Now, this zone is difficult to determine by log analysis, almost impossible to determine by log analysis. But production characteristics have shown that this zone indicated in red on this cross-section

is essentially all gas.

Now, when -- Even though the wells are geologically vertically separated, when you perforate either the Brantley zone, which is below this zone, or the Collins zone, which is above this Westall zone, and stimulate it, regardless of what type of stimulation, how low you keep the rates and everything, you communicate with this Westall gas zone.

And this is confirmed by not only production testing but by production logging and temperature logging.

And examples of those are shown by the Ray Westall's data on the Santa Fe Federal Number 1 and the Number 3 well. These wells are originally perforated in the Brantley sand and then fracture-stimulated with small volumes and low rates.

And then with high gas production being experienced, both production logs and temperature logs showed that the gas was channeling from the Westall sand.

These are just two examples. There's numerous other examples to show that regardless of how careful you are, that you are going to get into communication with this gas zone. It is not a gas cap; it is truly a gas zone.

Q. So what you're dealing with here is an extremely complex reservoir?

A. Extremely complex, yes, sir.

Q. Let's move to your structure map which has been marked Exhibit Number 3. Would you review that for Mr. Catanach?

A. Yes, sir, Exhibit Number 3 is a structure map prepared on top of the Westall zone, which is the predominant gas zone in the area.

And on this, again, I have colored in red the Herradura Bend Delaware completions.

In green are other Delaware producers in the area.

And then in yellow are the 28 proposed locations.

And generally you can see the high of the Westall zone is in the southeast quarter of Section 35, and then the northeast quarter of Section 2. And even though there's no control over Section 1, we're contouring it to go over there. It doesn't confirm 100 percent, but generally the higher gas/oil ratios are associated with the high in the Westall gas zone in this area.

Q. Mr. Howell, could you identify Applicant's Exhibit Number 4?

A. Yes, sir. Exhibit Number 4 is a plot of the production history on Ray Westall's Santa Fe Federal lease.

Shown in red is the gas/oil ratio on a lease basis, since the lease went on production in August of 1992.

Shown in blue is the daily water production.

And in green is the daily oil production.

And you can see that the gas/oil ratio peaked out at about 25,000 cubic feet per barrel in October of 1992, and you can see it's on a decline down to about 19,000 cubic feet per barrel in May of 1993, which is the latest available data.

And generally I think what this is showing is that as this Westall gas zone is being depleted, that the total producing gas/oil ratio from the lease and from the individual wells will go down.

Q. Anything else on Exhibit Number 4?

A. No, sir.

Q. Let's go now to Exhibit Number 5. Would you identify and review that for Mr. Catanach?

A. Yes, sir. Exhibit Number 5 is the same type of data plotted for the Fortson lease, which is the offset to the Westall Santa Fe Federal lease.

Again, the gas/oil ratio here is shown in

red, and you can see this lease gas/oil ratio peaked out at about 5000 cubic feet per barrel and has been in the 4000- to 5000-cubic-foot range.

And I think what this shows is that very little of the Fortson lease has this Westall gas zone exposed to it, and -- But the gas/oil ratio is still fairly high, just because of the solution gas/oil ratio from the formation.

Q. Now, Mr. Howell, are you prepared to make a recommendation to the Examiner concerning the establishment of permanent rules for this pool?

A. No, sir, not at this time on permanent rules.

Q. And why not?

A. Well, sir, there's -- The production history out here has been fairly recent.

In other words, we had a delay in getting our gas line out here. We've had delays in getting saltwater disposal facilities. This is a very complicated reservoir. We're trying to get additional data, to run additional studies, to determine drainage areas, to -- and you can see there's 28 more locations of wells to be drilled out here.

I believe by -- There will be a lot more data that can be collected and that can be analyzed and determine what are the proper rules for the production

of this field.

Q. What is it that you are recommending at this time?

A. A continuation of the temporary rules, including a 10,000-to-one gas/oil ratio limit for another one-year period.

Q. What do you anticipate will occur during that one-year period of time?

A. I think a lot of data will be collected, there will be some more wells drilled, more studies done, additional lift equipment installed and just a better handle known on how this reservoir and field is truly going to produce.

Q. You previously indicated there were how many wells currently permitted and proposed in the field?

A. There are currently 27 producing and another 28 permitted.

Q. Is any effort being made at this time to model the reservoir?

A. Yes, sir, there is, there's another -- Mr. Fortson is attempting to model the reservoir right now.

Q. Would, in your opinion, promulgation or a request for the promulgation of permanent pool rules be premature at this time?

A. Yes, sir, it would.

Q. In your opinion, would a one-year extension of the temporary pool rules for the East Herradura Bend-Delaware Pool, an extension for one year, be in the best interest of conservation, the prevention of waste, and the protection of correlative rights?

A. Yes, sir, it would.

Q. Were Exhibits 1 through 5 prepared by you or compiled under your direction?

A. Yes, sir, they were.

MR. CARR: At this time, Mr. Catanach, we would move the admission of Exhibits 1 through 5.

EXAMINER CATANACH: Exhibits 1 through 5 will be admitted as evidence.

MR. CARR: And that concludes my direct examination of Mr. Howell.

EXAMINER CATANACH: Mr. Kellahin? Mr. Bruce?

MR. KELLAHIN: No, sir.

EXAMINATION

BY EXAMINER CATANACH:

Q. Mr. Howell, in the original case for a 10,000-to-one GOR, did you present evidence as to the existence of this sand, this Westall sand?

A. Yes, sir.

Q. Okay, that was the basis for the 10,000-to-one GOR request?

A. Yes, sir.

Q. Has there been any profile logging or anything of that similar type nature to actually prove that you're getting sand -- I mean gas -- out of this zone?

A. Yes, sir, this Exhibit Number 2 here had the profile log on the two wells, the Santa Fe 1 and the 3.

The second trace shows both the production log and the temperature log. And kind of the summary is shown down at the bottom of -- on the Black Warrior Production Evaluation Log: Gas production from the Westall sand, 6064 behind the pipe, behind the perforation 6139 to -49 [*sic*].

And then right below it is the nomenclature for the cross-flow, when it was shut in showed cross-flow from 6064, which was the Westall sand, up to the Brantley sand.

And then the same type of data over on the Santa Fe Federal Number 3.

Of course, the interpretation of temperature logs and profile logs is kind of an art, but I definitely believe that the interpretation of these logs and other logs that we've collected out here shows that the gas, the majority of the gas is coming from this zone.

Q. And even if a well is completed in, say, the Brantley sand, you're still going to probably get communication into that?

A. Yes, sir, it appears, and I don't know why that is, but it appears that any type of stimulation -- and I don't know if these are naturally occurring fractures that are closed and then any pressure differential allows you to frac right up into this sand, but you do get into communication either coming from the bottom up or from the top down.

Q. Is it your opinion that this is -- Does the Westall sand contain oil in it?

A. It -- Well, let me tell you, sir, I believe it contains some oil. I know it contains gas, and I know it contains water, but I do believe it contains oil.

It does contain water, moveable water.

But being located between the Brantley and the Collins, which has oil in it, I believe that it has some oil in it. But there are zones that does have only gas and zones that have only water in it.

Q. So you don't think it's a gas cap?

A. No, sir, I do not think it's a gas cap.

Q. Is this sand, the gas-bearing sand, is it correlatable across the whole field?

A. No, sir, just in a certain area. There just -- almost looking at -- I guess the Exhibit 3, which is the structure map, you can correlate the sand there, but the gas on the zone predominantly is in the southeast quarter of 35 and then the northeast of 2 in there.

The sands -- The markers above and below it, you can correlate, but this gas sand appears to only exist right in that area.

Q. Are your high-GOR wells predominantly found in the southeast quarter of 35?

A. Yes sir, I think if you could look at the Exhibit 1 and Exhibit 3 kind of together there, you can see that the highest gas/oil ratios are in the southeast quarter there. The Number 6 well is 22,000. The Number 7 well is 21,000. Right above it is a 28,000, a 27,000.

And then going over to the Hanley well, which is the 56,000 one, coming down to the Pinnacle State well in Section 36 is a 12,000, and then finally coming down to Section 2 there, the Santa Fe wells, what you can see are higher structurally, have a 25,000, a 10,000 and then a 16,000.

It generally conforms to this structure, but not in all cases.

Q. Have you seen up to this point any decrease in the general GOR in the pool?

A. Yes, sir, I think overall, I think the Exhibit Number 4 there, on Westall's gas production curve shows a general decrease in the lease thing. In the sense this lease is a large portion of the field, then you could say that the field gas/oil ratio was probably declining some.

Q. Do you believe that production at this current GOR is not in any way harming any of these oil reservoirs?

A. No, sir, I do not believe it is. I think that the gas zone is completely independent of the oil zone.

Q. What additional evidence will you be able to bring us in a year that will help us finally decide?

A. I think we'll have -- Well, I think performance will be the main thing. In other words, what's going to happen to anything here?

And if the predominant gas production is from this Westall zone and then it continues to decline, as it has indications to, then I think this would conclusively prove that the majority of the high gas production was from this gas zone.

As I said before here, with this being a

fairly volatile crude, I expect the gas/oil ratio will stay fairly high throughout the life of the reservoir.

Again, as we get more data, get more pressure history, having relative permeability data run, I think we can make some predictions to show what this gas/oil ratio would be expected to do. And then with a year's production history I think we can calibrate those predictions better.

Q. You said that there was an attempt to model the reservoirs?

A. Yes, sir. Well, it's really modeling in the way of running predictions on drainage areas, ultimate recoveries and so forth.

Q. To your knowledge, does any operator in the pool have any problem with the current GOR?

A. No, sir, not to my knowledge.

EXAMINER CATANACH: That's all I have.

MR. CARR: Mr. Catanach, I have no additional testimony to provide.

Chevron has requested that I read a statement into the record.

EXAMINER CATANACH: Okay.

MR. CARR: I have nothing further with Mr. Howell.

EXAMINER CATANACH: Okay, you may do so.

MR. CARR: Mr. Examiner, Chevron USA Production Company currently has 12 wells staked in Section 1, Township 23 South, Range 28 East, Eddy County, New Mexico, which lies on the southern margin of the East Herradura Bend-Delaware field with a drilling program slated to begin in July, 1993.

The economics of this drilling program were developed based upon a continuation of the current temporary GOR allowable of 10,000 to one. The negative economic impact of a substantially lower GOR would jeopardize this drilling program. Therefore, Chevron requests that the OCD adopt the existing temporary pool rules as permanent rules for the field.

That's the statement they submitted.

With that, I have nothing further in this case.

EXAMINER CATANACH: Anything from Mr. Kellahin?

MR. KELLAHIN: Mr. Examiner, on behalf of Fortson Oil Company and Hanley Petroleum, Inc., we support the Applicant's request that the gas/oil ratio of 10,000 to one be continued for a temporary period of

an additional one year.

EXAMINER CATANACH: Anything from Mr. Bruce?

MR. BRUCE: No, sir.

EXAMINER CATANACH: Okay, anything further in this case?

MR. CARR: Nothing further.

EXAMINER CATANACH: There being nothing further, Case 10,541 will be taken under advisement.

(Thereupon, these proceedings were concluded at 10:36 a.m.)

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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 July 19, 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. 10547, heard by me on July 15 1993.

David R. Catanach, Examiner
Oil Conservation Division

STATE OF NEW MEXICO

ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT

OIL CONSERVATION DIVISION

CASE 10,541

EXAMINER HEARING

IN THE MATTER OF:

The consolidated Application of Bird Creek Resources, Fortson Oil Company and Ray Westall Operating, Inc., for special pool rules, Eddy County, New Mexico

ORIGINAL

TRANSCRIPT OF PROCEEDINGS

BEFORE: MICHAEL E. STOGNER, EXAMINER

STATE LAND OFFICE BUILDING

SANTA FE, NEW MEXICO

October 1, 1992

A P P E A R A N C E S

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I N D E X

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E X H I B I T S

APPLICANT'S EXHIBITS:

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WHEREUPON, the following proceedings were had at 10:35 a.m.:

EXAMINER STOGNER: Call the next case, Number 10,541.

MR. STOVALL: The consolidated Application of Bird Creek Resources, Fortson Oil Company and Ray Westall Operating, Inc., for special pool rules, Eddy County, New Mexico.

EXAMINER STOGNER: Call for appearances.

MR. CARR: May it please the Examiner, my name is William F. Carr, with the Santa Fe Law firm Campbell, Carr, Berge and Sheridan. I would like to enter my appearance in this case for Applicants Bird Creek Resources and Ray Westall Operating, Inc.

Initially, I would like to request that Fortson Oil Company be dismissed as an applicant. I would like to withdraw my appearance for Fortson so that Mr. Kellahin can substitute his appearance for Fortson Oil Company.

EXAMINER STOGNER: Fortson Oil Company will be dismissed from -- as being an applicant but not a

participant in this particular proceeding.

MR. CARR: That is correct.

EXAMINER STOGNER: Any other appearances?

MR. KELLAHIN: Mr. Examiner, I'm Tom Kellahin of the Santa Fe law firm of Kellahin and Kellahin, appearing on behalf of Fortson Oil Company, Bass Enterprises Production Company, and Hanley Petroleum, Inc.

EXAMINER STOGNER: Any other appearances?

MR. BRUCE: Mr. Examiner, my name is Jim Bruce from the Hinkle law firm in Santa Fe. I'm representing Santa Fe Energy Operating Partners, L.P. I have no witnesses.

MR. CARR: And Mr. Stogner, I would also like to enter my appearance for Harvey E. Yates Company.

MR. STOVALL: But they're not an applicant.

MR. CARR: They're not an applicant.

EXAMINER STOGNER: Are there any other appearances, interested parties, working-interest owners, land owners that would like to be a part of the record?

If not, would the witnesses please stand to be sworn?

(Thereupon, the witnesses were sworn.)

EXAMINER STOGNER: Mr. Carr?

RANDALL L. HARRIS,

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

DIRECT EXAMINATION

BY MR. CARR:

Q. Would you state your name and place of residence?

A. Yes, my name is Randall Harris. I reside at Lake Arthur, New Mexico.

Q. Mr. Harris by whom are you employed and in what capacity?

A. I'm employed by Ray Westall Operating, Incorporated, as geologist and exploration manager.

Q. Have you previously testified before the Oil Conservation Division and had your credentials as a geologist accepted and made a matter of record?

A. Yes.

Q. Are you familiar with the Application filed in this case on behalf of Ray Westall and Bird Creek Resources?

A. Yes, I am.

Q. What is the relationship of Ray Westall and Bird Creek in this area?

A. We're both operators within the East Herradura Bend-Delaware field.

Q. And what is the interest of Fortson Oil Company in the area?

A. Fortson is also an operator within the East Herradura Bend-Delaware.

Q. Have you made a geologic study of this pool?

A. Yes, I have.

MR. CARR: Are the witness's qualifications acceptable?

EXAMINER STOGNER: Any objections?

MR. KELLAHIN: No.

EXAMINER STOGNER: Mr. Harris is so qualified.

Q. (By Mr. Carr) Mr. Harris could you state what Bird Creek and Westall seek with this Application?

A. We ask for special pool rules for the Herradura Bend East Delaware Pool, for a special gas/oil ratio of 10,000 to 1, temporarily for six months.

Q. Will this tenth-month period permit you and other operators to develop data which you can bring back to the Commission at that time and at that time have a better handle on the characteristics of this field?

A. Yeah, six months should be adequate time to gather the additional data, drill a few more wells, and

at that time we should review the producing characteristics of the wells.

Q. Have you prepared exhibits for presentation here today?

A. Yes, I have.

Q. Would you refer to what has been marked as Applicant's Exhibit Number 1, identify that and review it for the Examiner?

A. Exhibit Number 1 is a land plat that shows the current pool boundaries. It also indicates the discovery well. That is triangle in the northwest corner of Section 2, discovered -- drilled by Amoco, called the GO State Number 1. It's currently operated by Bird Creek.

Q. When was this pool created?

A. The pool was designated 3-14-86, by R Order 8179 and subsequently extended by R Order 9709.

Q. Mr. Harris, I think initially it would be helpful if you would refer to this exhibit and review for the Examiner the interest positions of the various parties who have appeared in this case.

A. Ray Westall's interest is in Section 35, the east half, which we currently have drilled and completed the Santa Fe's 1 through 4. We have drilled the Santa Fe 5, and we're waiting on completion, and

are currently drilling Santa Fe Number 6.

Bird Creek has the Section 26 -- that's to the north -- and in that they have one well producing, the RML Number 1. They also have other parts of Section 2 to the south, including the discovery well, the GO.

Fortson Oil Company has Section 36, of which they have drilled five wells to date. The first well has been completed, 2 and 3 are in the process of completion, and 4 and 5 are waiting on completion.

Bass Enterprises has Section 25, would be to the northeast of the map. Section 25 is also within the Big Eddy Unit. They operate no Delaware wells in that section as of yet. I believe they have staked some locations, but as far as I know they have not been approved.

Santa Fe Energy owns selected tracts in Section 2, and they have no drilling wells at this point. I believe they have staked a location. I'm not aware if it's approved yet either.

Heyco also has acreage in Section 2 with no wells, and Hanley Petroleum has the west half of Section 5 with no producing Delaware wells.

Q. Now, this pool, you indicated, was approved in 1986. There has, however, been recently a flurry of

development that is really outside of the current designated pool boundary but within a mile of that pool; is that right?

A. That is correct, yes.

Q. Why are you seeking an increase in the gas/oil ratios for the pool?

A. Our wells are currently curtailed due to the GOR under statewide rules of 2000 to 1. We need 10,000 to 1 just to be able to produce liquids out of the formations.

Q. And what are the current allowable limitations for the wells in this pool?

A. Pool designations below 6000 feet, oil allowable of 142 barrels of oil a day per well, and 284,000 MCF at 2000 to 1.

Q. Mr. Harris, I'd like you to refer now to your Exhibits 2 and 3. I think we should refer to these together, the structure map and the cross-section.

If you would start with your structure map, identify the -- basically what it shows in the trace and then go into the cross-section.

A. Exhibit 2 is a structure map on top of the Westall sand. I'll explain the name in a moment. It also shows the Delaware completions, proposed well locations, and a trace, A to A prime, of the cross-

section of Exhibit 3.

Q. Okay, let's go at this point to the cross-section.

A. Exhibit 3 is a cross-section, A to A prime, which incorporates the Bird Creek RML Federal Number 1, Section 26, through the Ray Westall Santa Fe 1, to the Ray Westall Santa Fe 3, Fortson Oil Pinnacle State Number 1, and then back to the discovery well of Bird Creek Resources State GO Number 1.

The names that have been given these formations, being the Collins, the Westall, the Brantley and the Bird Creek Sands, are not official names. They're strictly localized. I believe it was Collins and Ware who have designated these names, but other than that they have no significance.

All sands are within the Brushy Canyon of the Delaware formation.

Q. Okay, let's start with the well on the left, and if you could just move across to this cross-section for the Examiner.

A. Most of the wells have been completed. In fact, all of the wells to date have been shot, acidized and frac'd in the Brantley sand. And most of the wells, being the Santa Fe's Number 2 and 4, and the Pinnacle State Number 1 of Fortson, has also been

completed in the Collins sand.

To date, no well has been actually perforated within the Westall sand.

On physical examination of samples and log calculations, we determined that the Westall sand was probably very gassy, and we were not at this point willing to have a high gas content.

After we perforated and completed the Well Number 1 and Well Number 3, we experienced extremely high GOR's, ranging from 10,000, 20,000 to 1. We ran production logs, and those are the logs beside the Santa Fe Number 1 and beside the Santa Fe Number 3. These production logs include a flowing temperature survey, a shut-in temperature survey, and an ohm-impedance log.

What these indicate to us, on the flowing temperature, we have a cooling effect from the Westall sand behind pipe to the Brantley perforation, which simply means we've communicated on frac or acid and completed into that sand inadvertently.

The ohm-impedance log shows that the top three or four perforations in each of these wells are producing 100 percent of the gas. From that we can deduce that gas is actually coming from the Westall sand, behind the pipe and into the bore hole of the

perforations of the Brantley sand.

Additionally, the shut-in temperature survey shows a cross-flow. The cross-flow is occurring from the Westall sand to the Brantley sand on the wells being shut in.

This leads us to believe that the Westall sand itself is a higher pressure, it is isolated from the Brantley. It is not a gas cap, for if it was a gas cap the pressures would be the same and you would not have any cross-flow.

We have another indication that it is a totally separate sand and that is our shale barriers above the Westall sand and below the Westall sand. Above it, it's very consistent, 10 to 15 feet. And below, between it and the Brantley, a consistent 8 to 10 feet thick. So it is an isolated individual gas sand.

Q. So what you have is a gas sand between two oil zones?

A. Yes, we have a gas sand between two oil zones.

Q. How do you actually complete and fracture these wells?

A. We completed these, what we consider a very typical low-rate, low-volume frac: eight barrels a

minute, 18,000 gallons total.

Q. So there was nothing unusual about the way you actually completed the wells that caused you to communicate into what you have designated the Westall sand?

A. That's correct.

Q. If we look at the structure map, does structure play any real role in explaining the gas/oil ratios that you're experiencing in these wells?

A. No, sir, the structure plays very little, if any, role at all.

If a gas cap was to truly exist in the Brantley or the Collins sand, we should see evidence of it as we go updip. Our two highest updip wells are the discovery well, the GO, and the Bird Creek RML, and they are both low GOR's.

Q. And so basically what you have -- Your structure map is simply a map showing the limited extent of the Westall sand?

A. Yes, you can infer a limited extent to the Westall sand itself.

Q. Could you identify for Mr. Stogner what has been marked as Applicant's Exhibit Number 4?

A. Exhibit Number 4 are flow-rate data sheets, field reports performed by Celtic Services on Ray

Westall Santa Fe's 1 through 4.

Q. And is Exhibit Number 5 that data, just presented in tabular and graphic format?

A. Yes, it's the field data that has been extrapolated to hourly and daily rates.

Q. All right. Let's go to Exhibit Number 5, and I would ask you to review first the tabular information on the Santa Fe Federal Number 1, and then explain to Mr. Stogner what you believe they show.

A. The information that we have gathered -- Actually, what this chart is, is the incremental flow rate in time and the volumes of oil and gas and water produced during that incremental flow, and it's been extrapolated out into per hour per day and eventually to our GOR per MCF barrel. Choke sizes are all in 64ths through 10 through 32.

What we see is, we -- typically what we see -- find out where I am here -- is that the smaller the choke size, the higher the GOR.

In fact, as you choke these wells back, you can produce zero oil -- zero fluids total, and just gas.

Q. So eventually you can lose, by choking it back, the potential to produce any oil from the formation?

A. Yes, by choking it back you produce no oil from the formation at all.

Q. Okay. Well, let's go to the graph for the Santa Fe Number 1, the next page on Exhibit Number 5, and could you review for Mr. Stogner what this shows?

A. Yes, this is a chart based on barrels of oil, barrels of water and MCF gas per daily rate.

The gas is stabilized. It apparently does not have any -- It produces independently of the oil and gas -- or oil and water in the formations.

As you can see the gas chart, it's irrelevant. If you're producing on a 32/64 or an 18/64, you'll produce approximately 800,000 MCF per day.

However, oil varies widely from 180 down to 20 or 30 barrels per day. Exactly the same with the water: a high of 600 barrels a day down to a low of 70 barrels a day.

So gas is being produced independently of the oil and water in the formations.

Q. Now, behind this graph you also have tabular and graphic presentations for the other Santa Fe wells?

A. Yes, the Santa Fe's 2, 3 and 4.

Q. Now, the Number 4 doesn't perform quite like the first three, does it?

A. No, the Number 2 does not perform.

Q. And why is that?

A. This test data on the Number 2 was performed approximately two days after completion, and I think the well was just too new to get a stabilized performance.

Q. Mr. Harris, based on your field and geologic study, do you have an opinion on whether the gas/oil ratios that you're experiencing could be related to the existence of a gas cap in the reservoir?

A. Based on field data and geologic information, the GOR cannot be related to a gas cap.

Typically in a gas cap, the GOR will not change with the varying size of the choke. Ratios of oil and gas will remain the same; only the volumes will change.

Q. In your opinion, what will happen to the ability of the operators to produce the reserves in this field if you are required to produce under current statewide rules?

A. Under the current rules, our rates would definitely be curtailed, and ultimately I believe that reserves would be left in the ground as you're not being able to produce the oil until you have depleted some of the -- perhaps the oil in place in the Collins

and Brantley sands.

Q. Would that result in waste, in your opinion?

A. That would -- definitely in waste.

Q. What would be the impact of approval of this Application on the correlative rights of interest owners in the pool?

A. There will be no impact if approved.

If not approved, and without the higher GOR, we'll actually be denied an opportunity to produce our share of the oil reserves in the Brantley and Collins sand zones.

Q. Is Exhibit Number 6 a copy of an affidavit of mailing confirming that notice of today's hearing has been provided to those individuals identified on Exhibit A?

A. Yes, sir.

Q. And to whom was notice sent?

A. Notice was sent to all operators in the pool and all operators of wells in the Delaware formation within a mile of the pool.

Q. Are there any unleased mineral owners within the pool boundary?

A. No.

Q. If this Application is approved, when would you request that the rules become effective?

A. Well, we are currently shut in on wells 1, 3 and 4. We'll be finished drilling well number 6 pretty rapidly, and completion of number 5.

So we would request a ruling as expeditiously as possible.

Q. Would an effective date of those Rules of October 1 be satisfactory for your purposes?

A. Yes, sir.

Q. Will the Applicants in this case also be calling an engineering witness to review that portion of the case?

A. Yes.

Q. Were Exhibits 1 through 6 either prepared by you or compiled under your direction?

A. Yes, sir.

MR. CARR: At this time, Mr. Stogner, we would move the admission of Applicant's Exhibits 1 through 6.

EXAMINER STOGNER: Exhibits 1 through 6 will be admitted into evidence.

MR. CARR: And that concludes my direct examination of this witness.

EXAMINER STOGNER: Thank you, Mr. Carr.

Mr. Kellahin, your witness.

MR. KELLAHIN: Thank you, Mr. Examiner.

CROSS-EXAMINATION

BY MR. KELLAHIN:

Q. Mr. Harris, let me find out from you the data that you had available to you from which to reach your conclusions about the source of the gas being produced in the well.

Let's start with the Santa Fe Federal 1.

A. Yes, sir.

Q. Second well on the cross-section. Perforated only in the Brantley sand?

A. Yes, sir.

Q. What type of logs did you have for that well?

A. We ran a CNL FDC dual micro.

Q. Any other logs?

A. A cement bond log, case log.

Q. The production evaluation logs shown in the left margin?

A. Yes, sir.

Q. What type of log was this?

A. This was a temperature -- flowing temperature, shut-in temperature, and ohm impedance.

Q. Do you develop data from this log with a spinner survey, or is that a different procedure?

A. It's a different procedure.

Q. Did you run a spinner survey on this well --

A. No, sir.

Q. -- to determine the source of production?

A. The ohm impedance determines the source of production. It is the same basic type log.

Q. Is the relevant portion of the production log what I see next to the density log shown on the display for that log?

A. Yes.

Q. Did you run any frac height logs or frac height information to determine how far you may have propagated fractures out of the Brantley sand?

A. No, but this survey gives you the same end result. It does show you from where production is coming from. So you can assume that if your production is coming from up the hole, that you have actually treated -- fractured into that zone, yes.

Q. We haven't actually perforated the Westall sand in any of the Ray Westall wells in the east yet?

A. No.

Q. The information available for the Federal 1 well tells you the likely source of the gas is going to be the Westall sand?

A. Yes, sir.

Q. When you look at the other three wells, 2, 3 and 4, have you the same type of data for each of those

wells?

A. Yes, we performed the temperature -- flowing temperature/shut-in temperature logs on the Number 2 and the Number 4.

And yes, the results are basically the same, although we have completed also in the Collins sand, so we have direction-of-flow difference. The Number 4 flows up through the Collins sand, and the Number 2 flows down to the Brantley sand. That's the only significant difference.

Q. The Number 4 well is the only one that is also perforated in the Collins sand?

A. No, the Number 2 is also.

Q. Number 2?

A. Yes, Number 2 and 4.

Q. 2 and 4 in the Collins sand, as well as the Brantley sand?

A. Yes.

Q. And the 1 and 3 are only in the Brantley sand?

A. That's correct.

Q. What do your cement bond logs tell you about the adequacy of the cement?

A. Our cement bond logs are showing virtually a hundred percent bond through this entire section. We

do not lose bonding till we get approximately 100 feet above the Collins.

We have tried everything to date to stay out of the Westall sand.

Q. Have you taken any fluid samples and submitted them for PBT analysis --

A. Not, sir.

Q. -- on any of the production?

A. No.

Q. You don't have any PBT data to work with?

A. No.

Q. Your conclusion of the data thus far is that we're not seeing a gas cap in either the Brantley sand or the Collins sand?

A. That's true.

Q. That the likely source of the gas is going to be the inadvertent communication into the Westall sand?

A. That's correct.

Q. Do you have sufficient production data on any of your wells to project ultimate recoveries for any of these wells?

A. No, sir. We have production of the 1 and 3, which are the first two wells, for approximately six weeks before we shut them in.

Well Number 4, we have approximately three

weeks of production. That is not adequate enough time to come to any conclusion on ultimate recoveries at all.

Q. In looking at the tabulation of data on Exhibit Number 5, have you and your technical people formulated an opinion about the optimum choke setting at which to most efficiently produce any of these wells?

A. Oh, yes.

Q. Okay, what is the choke setting that you would recommend?

A. It varies per well. For optimum, we have -- Since this, we have gone out there and played a little more than this actual test data.

Q. Let's just take a for instance. Take the Number 1 well and find for me the optimum choke setting that maximizes the oil production and, conversely, minimizes the gas production.

A. That would be a choke setting of 22/64, a gas flow rate of 864,000 a day, 156 barrels of oil. That would be optimum.

Q. And there's some flexibility in that, you can go to 24?

A. That's true, yes, 22, 24. However, that would be overproducing under the 142 barrels a day

allowable for the depth bracket, so --

Q. At that choke setting?

A. At that choke setting.

Q. Are you limited by the oil rate or the gas/oil ratio?

A. Both. We are limited to 142 barrels of oil a day in the depth bracket of the pool. So no, you could not produce that at 156 barrels a day on the 22/64. You would have to be somewhere between 20 and 22 to get stabilized production.

Q. Under the current 2000-to-1 gas/oil ratio, what's the maximum oil rate you can achieve for this well?

A. Very little. About 18 barrels a day, if I remember correctly.

However it's almost physically impossible on every well except our Number 1 to produce oil at a GOR of 2000 to 1.

Q. What is the 10,000-to-1 ratio justification? What's the reason for seeking that level of gas/oil ratio?

A. That is the level of which we determined on these tests that we're able to produce a sustained amount of liquid and keeping the gas at a minimum.

As we increase the choke size, of course, the

gas does not increase, but the oil volume does, and thus overproduction would occur.

Q. For instance --

A. Plus water will also come in. We have to protect the formation from the invasion of water. The more we open the chokes up, the more water you produce. That's not good.

Q. Using your most efficient choke setting and using a 10,000-to-1 gas/oil ratio, what is your equivalent oil rate?

A. Our equivalent oil rate on all four wells combined is approximately 100 barrels of oil per day.

Q. Per well?

A. Per well, at 10,000 to 1. We will be underproducing the 142, but the choke settings are so touchy that if we were to try for more oil we also -- It's not uniform. In other words, we don't go from 100 barrels a day to 110 to 120. We jump from 100 up to 200 barrels a day in one choke setting.

So it becomes a matter of playing with the wells individually to establish their optimum rate.

Q. What happens if you use a 5000-to-1 gas/oil ratio? What do you see?

A. At 5000 to 1, as you can see on every well but Number 1, you're physically -- Again, you're

physically limited that you cannot even produce the wells at 5000 to 1. Or you are able to produce them, but you're overproducing at an extremely high rate. Such as the Number 1, at 5000 to 1, which you could establish, you would be producing 168 barrels of oil per day.

On the Number 2, the lowest you can get is 6.9 -- or 6900 to 1, but you're producing 456 barrels of oil a day, definitely overproducing.

Q. Do you have data from which you are able to conclude what the bubble point of the reservoir is?

A. I would have to defer that to our engineer.

Q. As well as the solution gas/oil temperature?

A. Yes, yes.

MR. KELLAHIN: Thank you, Mr. Examiner.

EXAMINER STOGNER: Thank you, Mr. Kellahin. Mr. Bruce?

CROSS-EXAMINATION

BY MR. BRUCE:

Q. Mr. Harris, do you have any pressure data, bottom-hole pressure data?

A. Bottom-hole pressure data just from our shut-in surface pressures.

Q. And what is that?

A. Our shut-in surface pressures --

Q. Yes.

A. -- vary from 2000 to 2400 pounds.

Q. And I think you said that the 1 through 4 wells are producing, right? Or capable of producing?

A. They're capable of production, yes.

Q. And each -- What are they producing at, each well?

A. Each well?

Q. Yes.

A. We have -- Each well is averaging approximately 100 barrels of oil per day, and anywhere from one -- the low side is the Number 1 well, producing 800,000 a day in gas, to the high side of our Number 3, 1.4 million.

Q. So the GOR has varied pretty much from well to well?

A. No, as a matter of fact the GOR is pretty well stable at about 11,000 to 1, except for the Number 1 well, and that is somewhat lower, 9000 to 1.

Q. Which well was that? The Number --

A. The Number 1.

MR. BRUCE: That's all I have, Mr. Examiner.

EXAMINER STOGNER: Thank you, Mr. Bruce.

Mr. Carr, any redirect?

MR. CARR: Nothing further, Mr. Stogner, on

redirect.

EXAMINATION

BY EXAMINER STOGNER:

Q. In referring to your Exhibit Number 3, the Brantley sand, let me make sure I'm understanding this right. What is the reservoir mechanics and the reservoir energy, just the Brantley sand alone?

A. We're assuming that the Brantley sand is combination solution gas and water drive.

Q. If we run from this Westall sand, what would the -- would the 2000-to-1 limit be satisfactory to produce just the Brantley sand, without the induction of this Westall sand gas coming in?

A. That is up to speculation at this point. I would assume probably not, sir. Most Delaware Brushy Canyon fields do exhibit a higher GOR than 2000 to 1.

What we have seen, East Loving, which is to the south of us, it apparently is approximately 5000 to 1. The Avalon field to the north is 4000 or 5000 to 1. So I think that's generally what we see in the Brushy Canyon formation.

Q. Do you know where the oil/water contact is out here?

A. No, sir.

Q. It's foreseeable that there's some wells out

here without the influence of the Westall sand, I would assume?

A. Yes.

Q. And increasing the GOR limit for those wells, which would go along with increased GOR, is there a possibility that we may see a more premature water influx into the oil zone?

A. I don't believe so. We have two updip wells currently, both Bird Creek, and on full production -- and on pump, they do not exhibit any abnormally high GOR.

Q. What is the medium between the Westall sand and that Brantley sand? What are we looking at?

A. We're looking at shale, shale and tight sands.

Q. So we have the channeling down of the sand through -- I believe you said perforations and then through -- Well, how about the cement behind the pipe? Is that also an influence?

A. Probably not. We have excellent bond from the Westall through the Brantley, so we have communicated probably between the cement and the formation.

Q. And that was done after fracturing?

A. Yes. Well, we assume after fracturing or

after acidizing. There would not have been a communication before we acidized or frac'd, no.

Q. Do you know what the extent this Westall sand -- On the cross-section you show it to be somewhat limited.

A. To the north and south, yes, it is limited.

Q. How about to the east and west?

A. To the east it does not occur in the west half of Section 35, in the Hanley well. And to the west it has not been -- or -- yeah, to the -- east, it has not been determined yet.

Q. What's the characteristic of that Westall sand gas production? Is it high volume, low pressure? High pressure, low volume?

A. High pressure. We see the high pressure from two factors: the shut-in of the wells, which is definitely abnormal for Brushy Canyon Delaware, and from our shut-in temperature survey we do see cross-flowing from that zone to the lower Brantley sand.

So we can assume there's fairly high pressure. You're not able to put a particular amount on it because you are cross-flowing.

We assume this dries gas, with very little liquid in it.

Q. What would -- well -- You think one well

could drain if it was perforated in that Westall sand, just to drain that sand off, since it is of some -- appears to be of somewhat limited extent? Alleviate the problem instead of --

A. It's possible. Drainage pattern on a Delaware gas sand, as far as I know, has never been written where I could have read any results of it.

I don't know what the extent of drainage would be.

Q. Well, you have some indication that it's coming in out of these fractures.

Okay, you have some of the Collins sand, I believe, in that Pinnacle State Number 1?

A. Yes.

Q. At least on the cross-section. That is perforated.

What's the driving mechanism for that particular sand interval?

A. We believe that is also solution gas.

Q. No water drive?

A. We could assume a water drive. Most Delaware sands do have a water drive.

However, we have not found the downdip limit of this sand as of yet.

Q. So it's my understanding that without the

induction of the Westall sand gas and -- either into the Brantley sand or the Collins sand, that the 10,000-to-1 GOR ratio will not affect the overall production on these two reservoirs?

A. No. We believe that, hopefully in six months, that the Westall sand pressure will have come down enough to be equivalent to the Brantley or the Collins or both, to where the GOR will come down.

Q. What would be the danger during the six-month period of putting a perf into the Westall sand directly?

A. There would be no danger at all.

Q. Other than the additional cost?

A. That would be correct, yeah, other than the additional cost.

Q. At the end of the six-month period, if the Westall sand appeared to be losing its pressure and volume to a sufficient amount, do you think a lower GOR would -- could be given to this pool?

A. Yes, sir.

EXAMINER STOGNER: Any other questions of this witness?

MR. STOVALL: Just one other.

EXAMINATION

BY MR. STOVALL:

Q. As far as, you know, if you were to take the option of perforating and producing the gas out of the Westall sand to eliminate the source of gas, given the realities of costs and everything else, what would be the best way to do it? To take one well and set a packer or something and perforate it and produce it, or --

A. Well, we have communicated on all four of the Westall wells already. We are communicated to the Westall sand.

Q. Uh-huh.

A. So you're going to deplete that zone whether you've perforated it or not on our four wells.

Perforated, sure, your gas will come into the bore hole directly opposite the sand.

I don't see what difference it would make if we did perforate it or just leave it alone. I am not opposed to perforating it.

EXAMINER STOGNER: I'm sorry, sir, you just told me you didn't know what the reservoir characteristics was in the Westall sand.

Now you're saying without perforating that you can alleviate it.

I'm sorry, I'm confused here. You just confused me altogether. You contradicted yourself.

THE WITNESS: No, I --

EXAMINER STOGNER: You need to straighten me out here.

THE WITNESS: Okay, I'm not -- I didn't -- I don't know where I --

Q. (By Mr. Stovall) Well, let me back you up and try this again.

If I understand what you just said, the answer to my question was that regardless of whether you perforate the Westall sand or continue to produce through your existing perfs, the Westall gas is going to be drained off?

A. Yes.

Q. It's either going to flow through that shale member and get down to the Brantley and be produced, or if you perforate directly it will perforate -- you'll produce it out of that sand?

A. Yes.

Q. Now, I think what Examiner Stogner was referring to before was, you had indicated that you didn't know if you were to perforate, say, one well in that Westall, how much area you would effectively drain just of the Westall, with the Westall well?

A. Oh, that's correct, that's correct.

No, I don't know how much we would drain off

of --

Q. Was that what you meant before when you said you didn't know the characteristics of that particular sand?

A. I don't know the drainage pattern off the sand.

Q. Does the problem appear to be primarily on your -- I'm sorry, is that the Santa Fe lease?

Is that what that east half of 35 is? Is that what you're calling that?

A. Yes, sir.

Q. And that's where the problem primarily seems to be --

A. That's where --

Q. -- at least as far as you can tell?

A. Yes.

Q. Now, back to my question again.

If there were some concern about raising a GOR and its broader effect in the pool, would it be possible to take, say, the -- it wouldn't matter which well -- one of those six or seven wells in that east half of 35, set a packer below the Westall, perforate the Westall, get the gas out, would you expect to see, then, that you'd have a pressure drop in the Westall and that it would therefore -- you would have less

cross-flow down to the Brantley, and therefore you would lower the GOR in the oil wells in the Brantley?

A. Yes, if you could --

Q. Is that too much of a --

A. If you could effectively drain more than that 140 acres, yes, you would see a pressure drop in that sand.

Q. Do you have any -- Looking at your logs, can you tell from the permeability whether you would expect to --

A. The logs indicate fairly good relative permeability.

Of course, that's not even calculatable. It's just assumed by the amount of distance between the micro -- the shallow and the deep ladder logs.

Q. And that's a sand formation, right?

A. Yes, sir.

Q. Given you have kind of a general geologic presumption that gas is going to drain a larger radius than oil, then conceivably you could put -- take one of these wells right in this -- Look at the 2 or 3 for example, or the --

A. Conceivably, yes, you could drain the gas off with one well.

Q. And I guess given the amount of gas that

you're seeing, it really could be economically viable to go ahead and produce that gas for a short time and move it out and --

A. Oh, yes.

Q. -- kind of protect the Brantley portion of the formation, right?

A. Yes.

Q. The bottom line is, is that is a viable option?

A. Yes.

Q. Given the -- It wouldn't necessitate expensive drilling of another well or anything else. It could be done as a...

A. (Nods)

Q. Bottom line, in your opinion, either -- The Westall sand is going to be drained of gas either through the cross-flow to the Brantley, or if another perforation in that sand were required -- That gas is coming one way or the other.

A. That gas is overriding everything else in the other two oil zones, yes.

MR. STOVALL: I don't think I have any more questions.

EXAMINER STOGNER: Any other questions of this witness?

MR. KELLAHIN: One follow-up, Mr. Examiner.

EXAMINER STOGNER: Mr. Kellahin?

FURTHER EXAMINATION

BY MR. KELLAHIN:

Q. Is there any direct measurement of the composition of the hydrocarbons in the Westall sand?

A. Yes.

Q. Show me which well has been perforated --

A. No, no, no, no --

Q. -- exclusively in the Westall sand.

A. No, no, not exclusively, no, no.

We do have analyses of the gas itself at the higher rates, and our engineer will --

Q. But that's gas that we cannot specifically quantify --

A. That's correct.

Q. -- as being produced only out of the Westall sand?

A. No, we cannot quantify that, no.

Q. So we don't know if the Westall sand will classify itself as a gas sand or not.

The presumption at this point is that it should?

A. Yes. From all evidence with the ohm impedance, with all the gas coming in the top two or

three perforations, yes, it's a pretty good assumption.

Q. And the way you've mapped the Westall sand, it's going to extend beyond the Westall leases, and it should be present in the Fortson Oil Company's Pinnacle State Number 1?

A. Yes, sir.

MR. KELLAHIN: No further questions.

FURTHER EXAMINATION

BY MR. STOVALL:

Q. And in response to that, follow-up question to that is that Fortson could then perforate a Westall -- one of its wells in the Westall and get its share of that gas, correct?

A. That's correct.

MR. STOVALL: I have nothing further.

EXAMINER STOGNER: Anything further of this witness?

MR. CARR: Nothing further.

EXAMINER STOGNER: You may be excused at this time.

Mr. Carr?

MR. CARR: At this time we call Rex Howell.

REX HOWELL,

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

DIRECT EXAMINATION

BY MR. CARR:

Q. Will you state your name and place of residence?

A. My name is Rex G. Howell. I reside in Houston, Texas.

Q. Mr. Howell, by whom are you employed and in what capacity?

A. I'm an independent petroleum engineering consultant being retained by Collins and Ware at this time.

Q. Could you briefly review your educational background and work experience?

A. Yes, sir. I graduated with a bachelor of science in petroleum engineering from the University of Texas in 1958. I went to work for Amoco as a junior petroleum engineer in Levelland, Texas, and then worked through many offices and many different engineering positions for about 17 year with Amoco. At that time it was Pan American Petroleum.

I left Amoco in 1974. I was division reservoir engineer and supervisor in charge of all the reservoir engineering operations in Texas, New Mexico, and the mid-continent.

Joined the Energy Reserves Group as the

division production manager responsible for all production activities in the southern half of the US.

And then in 1982 I joined H & G Oil Company in Midland, Texas, as the executive vice president, served in that capacity until about 1985 when Inter North and Houston Natural Gas merged, and was named the executive vice president of the merged companies, Enron Oil and Gas Company, served in that capacity until early 1989 and then took early retirement from Enron and have been an independent petroleum consultant since that time.

Q. What interest does Collins and Ware have in this pool?

A. Collins and Ware has interest in both the Westall-operated wells in Section 35, and also the 14 wells operated in Section 36.

Q. When were you actually contacted about this particular question in this pool?

A. This particular question came up in mid to late August. Mr. Collins called me and wanted me to update and do a reserve analysis for all of his properties, and then particularly look at this field because it was a recent, new discovery, and attempt to assign reserves to these wells.

Q. And you've reviewed this pool as part of that

effort?

A. Yes, sir, I have.

Q. When did you become aware of the potential for a separate gas zone in this pool?

A. When I first got to Midland in late August out there, they had all the logs hung up, and a map, on the wall, and were telling me that they had a high -- or high gas/oil-ratio wells in the Delaware, and they thought it was coming from a gas sand between two oil zones.

Q. And then what have you done since that time to evaluate these properties and, in particular, determine whether or not there is a gas -- separate gas sand in this area?

A. All right, sir, I've looked -- attempted to look at all the available data to Collins and Ware, including looking at the well logs and all the production history in attempting to make reserve estimates.

Q. Have you reached certain engineering conclusions that you're prepared to present to the Examiner today as a result of this study and review of the pool?

A. Yes, sir, I have.

MR. CARR: We tender Mr. Howell as an expert

witness in petroleum engineering.

EXAMINER STOGNER: Any objections?

MR. KELLAHIN: No, sir.

EXAMINER STOGNER: Mr. Howell is so qualified.

Q. (By Mr. Carr) Mr. Howell, I think it would be helpful if you would now in detail review exactly what you studied and what processes you went through with the limited data available to you to determine whether or not you did have a separate gas sand.

A. All right, sir. At the time I started my study on the Westall lease in Section 35, I had well log data on five logs, the logs on Santa Fe wells number 1 through 5. I also had log data on three of the Fortson wells, wells number 1, 2 and 3. So I had logs -- complete electric logs and porosity logs on eight wells in the field.

We also had production history from Mr. Westall's four wells -- at the time wells number 1, 2, 3 and 4 -- and a short production history on the Pinnacle Federal Number 1 well.

Taking that data, then what I did in using the geological nomenclature that this reservoir has been divided into, the three sands, the Collins sand, the Westall sand and the Brantley sand, I then made a

log analysis foot by foot for each zone there, determined the porosity, the water saturation, and then from that developed a hydrocarbon pore volume for each zone.

That would allow me to determine the original oil in place and the original gas in place for each one of the wells and for each one of the zones.

Once knowing the original oil in place, derived by log calculations, I had to go in and make several assumptions. That was really about the end of my real hard data.

But I made the assumption that a Delaware well could drain 40 acres.

I further made the assumption that a well completed in the Collins sand would have a primary recovery factor of 15 percent of the original oil in place.

I made the further assumption that a well completed in the Brantley sand would only have a ten-percent recovery factor of primary oil.

Q. And what were you basing that on?

A. Well, it's just really looking at the log characteristics here.

The average porosity in the Collins sand was higher than it was in the Brantley sand. The Collins

sand is a lot more uniform, you can correlate it from well to well better.

The Brantley sand is, as I say, lower porosity and seemed to be more heterogeneous than the Collins sand there.

So I assumed a lower recovery factor. It was an assumption to try to take into account either lower drainage or lack of good pack.

And for the Westall sand, what I did was use the -- calculate bottom-hole pressure from surface shut-in pressures. I assumed an abandonment pressure of 500 p.s.i. and then calculated the original gas in place, and using a 500-pound abandonment pressure you would come up with a recovery of 85 percent of the gas in place for the Westall zones.

Q. Now, what other information did you have available to you?

A. Well, we don't have a fluid sample on this thing and it's really unfortunate, because it's really key to some of the conclusions that we've drawn on this thing.

We know that the oil gravity is 43 degrees API. We do know that.

On one of the Fortson wells, they had an early test out of the Brantley sand with a producing

gas/oil ratio of 1500. Now, I assumed that the solution gas/oil ratio for this reservoir, then, was 1500 cubic feet per square barrel.

Knowing the oil gravity of 43 degrees, assuming a solution gas/oil ratio of 1500, and knowing the bottom-hole temperature of the gas gravity, then I could calculate a reservoir volume factor of 1.65.

Now, that's a pretty high reservoir volume factor, and -- almost indicating a volatile oil. But what it indicates to me is that this is a real high-quality hydrocarbon being produced out of here, a light crude, and it's with a lot of gas in just the Collins and just the Brantley sands, in addition to probably being essentially all gas out of the Westall sand.

Q. Now, admittedly you're working with limited information?

A. Yes, sir, very limited information. And like I say, we don't have a bottom-hole sample. You would like to have a -- say, a recombination sample on that thing.

But to really get meaningful fluid properties out of it, you've got to know what proportion to combine the gas back with the oil. And with all the evidence out here of communication with the gas zone, it's really difficult. And about the only way I would

know to get a valid fluid sample out of this thing, a bottomhole sample -- and I think the operations people would not look on this kindly -- is maybe to drill stem test just the Collins sand there, and then you might could get a true fluid sample and do it.

I'm not advocating that, but I don't know how to get a good bottom-hole sample or a -- or what proportions to recombine the gas and oil to come up with the correct fluid properties.

Q. With the information available, and based on the assumptions that you've had to make, have you been able to reach conclusions concerning the producing gas/oil ratios for this pool?

A. Yes, sir, just taking -- on these assumptions, and there are many assumptions in here -- for just the Collins sands and the Brantley sands, which are the oil sands in here, and based on these assumptions that I've outlined, I think the average producing gas/oil ratio of those wells, of the wells completed in just those sands, with no communication, will be in the vicinity of 7700 cubic feet per barrel, over the life of the properties.

Q. And this is just from the solution gas only?

A. Yes, sir, that's just from production of solution gas in those two oil sands.

Q. Have you attempted to factor in what you understand to be the Westall sand?

A. Yes, sir, again taking into account an 85-percent recovery factor, which is assuming a 500-pound abandonment pressure, then I calculate in just the eight wells that I analyzed, assuming they'll drain 40 acres, that there's about 2.6 BCF of gas in the Westall sand.

So when you add that to the 2.6 BCF to the gas, solution gas that's going to be produced, you're going to come up with about an average gas/oil ratio of 9700 cubic feet per barrel over the life of these properties.

Q. Do you have an opinion as to whether or not it would be prudent to independently produce the Westall sands?

A. Well, sir, I -- I don't think it would be -- I don't think you can independently produce the Westall sand, just as I don't believe you can independently produce the Brantley and the Collins.

I know that the Westall sand has good productivity, following stimulation by a frac from the lower zone. But just because a well has good initial bottomhole pressure and initial deliverability doesn't indicate it's going to be a big well and drain a large

area there.

But your question, specifically, I don't know how you would do that, because in my belief, by looking at the log characteristics of that well -- we don't have any cores and no permeability measurements there -- I think the Westall sand is going to have to be stimulated.

So if you stimulate the Westall sand, you go into the Brantley sand and the Collins sand. So I don't think you can independently produce the Westall sand.

Q. Based on your understanding of this reservoir, do you see evidence of a gas cap?

A. No, sir, I do not see any evidence. And when we first -- when I first went to Midland and they told me about a gas zone between two oil zones, it didn't seem right to me. And I thought, Well there's a zone that's got a gas cap in it; that's their a problem there.

But after reviewing -- And this is a sample log from a cross-section there. But reviewing all of the logs available out there, you can see that there is a good shale barrier between the Westall interval and the Brantley sand. And in my opinion, that is a good geologic barrier there.

Right above the Westall sand there is another good shale barrier. In fact, it's thicker than the one between the Brantley. Again, it exists in all the wells over there, and so I think that's the thing there.

Now, why there's just gas in the Westall zone, I can't answer that.

But -- And then I further looked at the -- Based on log analysis only, I cannot calculate or locate a gas/oil contact in either the Brantley or the Collins zones. Consequently, I can't locate an oil/water contact.

Now, I can locate zones that have high water saturation scattered through there, much higher than I would suspect connate water or irreducible water, and I suspect some water production in here.

But I cannot locate, in these wells that I've seen, I cannot locate either a gas/oil contact nor an oil/water contact in either of the zones.

Q. In your opinion, would approval for six months of a gas/oil ratio on a temporary basis of 10,000 to 1 dissipate reservoir energy?

A. No, sir.

Q. In your opinion, would denial of this Application ultimately result in oil being left in the

ground?

A. Yes, sir.

Q. In working with this information, did you come across any other data or information that would support the existence of a separate gas zone in the reservoir?

A. Yes, sir, we did. We looked at some gas analysis that was available.

One, the first one here, what I've got is produced gas analysis from three wells. All three of these wells produce from the Brushy Creek section of the Delaware here.

The first one, what I've looked at is the heating values and the liquid content of the gas.

And you can see on the Ray Westall well the heating value in BTU's per MCF is about 1167, where the other two wells, again out of the Delaware, are 1571 and 1431.

In other words, a much dryer gas reflected by the heating value.

This is also reflected and shown by the liquid content of the gas. Five gallons per million for the FM pluses in the Ray Westall well, 13 gallons per million in the Bird Creek well, and in excess of 10 gallons per million in the Myrtle Meyer Number 2 well.

So to me -- And this is only three samples. But to me, this indicates that the Ray Westall well is a much dryer gas and is really not representative of what you would expect casinghead gas to be in a normal Delaware reservoir.

Q. Could you just summarize for Mr. Stogner the conclusions you've reached from your work with this pool?

A. Yes, sir. What I've concluded from looking at the data -- and I admit that it's limited here -- that we really have three geologically separate zones out here, two of them being oil and the third one being in the middle of the two oil zones, being a predominantly gas zone.

That when you try to stimulate either the upper oil sand or the bottom oil sand, you're going to get communication with it, and that, consequently, the gas contributed by that zone is going to contribute to a higher gas/oil ratio in this field.

And that I do not believe that the well can be -- that the field can be efficiently depleted at a gas/oil ratio limit of 2000 to 1.

Q. Is 10,000 to 1 needed to do this efficiently?

A. Yes, sir, in my opinion a period of six months here will allow us to collect other data and see

if this is the optimum gas/oil ratio to produce this field at.

Q. Admittedly, there's a lot of activity in the area right now?

A. Yes, sir, there's many wells, as you heard, being drilled.

Q. And it's your recommendation that if this Application is approved it should be re-opened and reviewed again in six months?

A. Yes.

Q. Was Exhibit Number 7 prepared by you?

A. Yes, it was.

MR. CARR: At this time, Mr. Stogner, I would move the admission of Applicant's Exhibit Number 7.

EXAMINER STOGNER: Are there any objections?

MR. KELLAHIN: No objection.

EXAMINER STOGNER: Exhibit Number 7 will be admitted into evidence.

MR. CARR: And that concludes my direct examination of Mr. Howell.

EXAMINER STOGNER: Thank you, Mr. Carr.

Mr. Kellahin, your witness.

CROSS-EXAMINATION

BY MR. KELLAHIN:

Q. Mr. Howell, give me a checklist, if you will,

sir, of what type of data you would propose the operators gather from their wells so that in six months when we come back to the Examiner we will now have sufficient data to satisfy the issue of the appropriate gas/oil ratio for the reservoir.

A. You know, let me think of the things that would be ideal from a reservoir engineering standpoint.

From an operator's from an operator's standpoint, looking at costs --

Q. No, sir, my question was for the reservoir engineer, what do you see?

A. I think a complete core analysis of the whole -- of all three sands out here would be quite helpful in determining permeability, porosity and hopefully coming at some answer of what drainage areas might be.

Q. We don't have any core data yet for the reservoir?

A. Not to my knowledge. Now, I think maybe one of the Fortune wells has had the upper sand cored. I have not seen that analysis yet.

But I would like to see core analyses on all three sands, a full core analysis.

Q. All right, sir. What else?

A. I'd like to see relative permeability data obtained from those things so we can make not only some

primary recovery calculations, I believe that these sands really have a -- quite a potential for waterflood and even tertiary. So I'd like to see some oil/water relative permeability rates.

So I'd like to see relative permeability, gas/oil and oil/water.

Q. All right, sir. What else?

A. I'd like to see a bottomhole flood analysis. Now, I think that's going to have to be some thought of how we're going to collect that. Is anybody willing to drill stem test?

Once you get through the Collins sand or penetrate that shale below the Collins sand, I'm not sure you can get a representative sample of just the oil.

Q. When you're looking at a fluid analysis, do we have to take them for multiple wells in the reservoir in order to have an accurate reflection of the reservoir?

A. Well, the more you have, the better. The more data points you have. I would think if you could get one good -- one good -- I guess if we could get one sample that kind of fit what we thought it should be, I would be kind of comfortable with that.

If it doesn't fit what I want, then I would

want to take a couple. But the more you have, the better. But a fluid sample would really be helpful.

Q. All right, sir. What else?

A. I think, of course, daily production histories on all the wells of the choke sizes and the -- as the operators normally get. All rates, all gas/water, the pressures and the choke sizes, and I think that could help on that thing.

Pressure data would also be helpful too.

Q. What kind of pressure data would you propose to gather, over what intervals?

A. Well, on the flowing wells, if you could run bottoms in there, you know, I think that would be appropriate, to run bottoms, if the operators, you know, would consent to running bottoms on the wells. There's always a chance of losing the bottom, and you don't like to do that.

But, you know, if you could take pressures fairly early -- and I think what we're seeing here, they're going to be pretty representative over there. But if you could get, say, a well every 80 acres, every other well, like that, pressures over the history here -- You know, in six months and if this reservoirs are as good as I expect it to be -- I don't like -- I don't expect to see a lot of pressure drawdown in these

wells out here. But I think we do need to get some pressure data on as many wells as are feasible.

Q. Let me ask you to respond to a question that Mr. Stovall introduced into the topic a while ago, and that is whether one of these operators could simply selectively perforate the Westall sand, get all the gas out of that sand and not somehow disrupt the reservoir. Is that a solution for us?

A. Well, in my opinion it's not. And as I told Mr. Carr, I don't think you can find your withdrawal point to just the Westall sand.

And further, just because you have good initial productivity doesn't indicate you're going to drain the world on that, and so I think you could get gas out of a well by perforating it there.

But I think if you had to stimulate it, in my opinion, if you have to stimulate you're going to get, also, some oil out of the Collins and the Brantley zone. And just because you get the well at this 40 acres, I don't think you lose the problem from the other 40 acres, in my opinion.

Q. You introduced the topic just now of potential future pressure maintenance for the reservoir?

A. Yes, sir, I think this really has a lot of

potential for secondary by waterflooding and tertiary by CO_2. And that's based on -- When I joined H & G Oil Company, we were operating the Delaware Field in Loving County, Texas, and we bought the field from Mobile after it had been successfully waterflooded. Not a great waterflood, but a successful waterflood.

And we picked up CO_2 and compressed it and carried it 26 miles there. And when I left, we had already recovered 4 million barrels of tertiary oil from that field.

And looking at the quality of sand, particularly the Collins sand is much better than that one. So if this field responds under primary, as I suspect it will, I think secondary by waterflooding would be quite feasible and followed by CO_2. So I think this is a very valuable reservoir, yes, sir.

Q. Part of a scheme for pressure maintenance would be control of pressure by limiting the gas withdrawals from the reservoir, would it not?

A. Under primary, I think you could -- I don't think you'll want to ever -- You can slow the rate of pressure decline, but you will stretch the life.

In other words, if this zone, on the solution gas drive reservoir, which I think is the predominant producing mechanism, and you deplete it down to the

balance pressure, the economic limit, under a 2000-to-1 gas/oil ratio, you can do this.

I think it's going to take 25 to 35 years to do it. You're going to get to the same point and essentially the same ultimate recovery as under a 10,000-to-1 gas/oil ratio, but you can shorten the life by roughly a fivefold increase to do that.

So I don't think you're going to conserve energy by not producing the gas/oil ratio.

Now, I think everyone realizes or believes -- the reservoir engineers do -- that the quicker you start a waterflood and less the shrinkage of crude, the better your ultimate recovery.

Q. Let me ask you this: Does it impair the opportunity for success of the pressure maintenance project by increasing the gas/oil ratio to the 10,000-to-1 rate for a six-month period?

A. No, sir, not in my opinion.

Q. If this is truly a solution gas/oil reservoir and we were not going to develop a gas cap or make an existing gas cap larger in any of these zones, then it's not rate-relative?

A. That's correct, sir.

Q. So at a solution gas/oil ratio reservoir, we're not going to leave oil in the ground by

manipulating the gas/oil ratio?

A. No, you can stretch the life out a lot.

Q. Anything else on data-gathering for the reservoir in order to come back in six months and have an answer to the issue?

A. There's probably other things, but that's all I can think of right now, sir.

MR. KELLAHIN: Thank you. No further questions.

EXAMINER STOGNER: Thank you, Mr. Kellahin.

Mr. Bruce?

CROSS-EXAMINATION

BY MR. BRUCE:

Q. Mr. Howell, you said you did look at log data on Fortson wells 1 through 3?

A. Yes, sir.

Q. Did the Westall zone extend eastward to the number 3 well?

A. Yes, sir, it did.

Q. And what kind of production history data did you have? What kind of production data did you have when you did your study?

A. I had -- On the Westall wells I had the four tests that were submitted there, and then on the Fortson Pinnacle Number 1 I had one test that had been

submitted to Mr. Collins, who's a working interest owner under that unit, one test only, and it was a fairly short-term test.

Q. Okay. Do you recall what the Fortson test showed?

A. No, sir, I do not recall. I'm sure we could find it.

Q. Okay. And there wasn't any pressure data on the Fortson wells?

A. No, sir.

MR. BRUCE: I don't have anything further, Mr. Examiner.

EXAMINER STOGNER: Mr. Carr, any redirect?

MR. CARR: No redirect.

EXAMINER STOGNER: Mr. Carr, I have a few questions for Mr. Howell, and then I would like to come back to Mr. Harris.

EXAMINATION

BY EXAMINER STOGNER:

Q. Mr. Howell, this -- In answering Mr. Kellahin's questions, I jotted down what he had asked you. I call it a sort of a reservoir engineer's wish list --

A. Yes, sir.

Q. -- core data and such as that.

In your opinion, is that type of information and data feasible on a lease basis for -- in this area?

A. You mean can it be collected? Yes, sir, I believe it can. Now, Mr. Westall, I don't know -- I know he's drilled well 6. I don't know if 7 and 8 are available to be drilled. But, you know, at that time they could be cored.

Q. Let me -- Can it be collected by one operator on his lease?

A. Yes, sir. Yes, sir.

Q. It could. Would it be better if a conglomeration of operators collected this data?

A. Yes, sir. The more data points you have scattered out across the field, the more better it would be.

Q. So this would be information that perhaps you would like for unitization, say?

A. Oh, I think ultimate unitization and secondary recovery, yes, sir. Just proper maintenance of the field, operation of the field to develop a real optimum plan of depletion, the more data you get, the better that you can do the design work.

EXAMINER STOGNER: I have no other questions of Mr. Howell. Are there any questions of this witness?

MR. CARR: No.

EXAMINER STOGNER: I'd like to recall Mr. Harris at this time.

MR. CARR: Mr. Harris?

RANDALL L. HARRIS (Recalled), the witness herein, after having been previously duly sworn upon his oath, was examined and testified as follows:

EXAMINATION

BY EXAMINER STOGNER:

Q. Mr. Harris, you are employed by which company?

A. Ray Westall Operating.

Q. Before proposing this today, was there a meeting with the operators in this particular pool about what was going on, about your proposal, about what you have presented today?

A. Yes, sir. We've had several meetings. One was just a joint operating meeting between Fortson Oil and Great West Oil and Collins and Ware. That was, I believe, September the 1st or 2nd.

Q. And that was just of the three original Applicants?

A. That's correct.

Q. Has there been any communications with -- Let

me go back. How many operators are out in the pool? How many operators have wells that are -- have production from this pool or dedicated to this pool?

A. Just Bird Creek, Ray Westall and Fortson.

Q. Okay.

A. We have shown the data, however, to Bass and to Hanley and to Heyco as a matter of courtesy before this hearing. We've basically presented our case to them for their nod of approval or not object before we appeared here today.

EXAMINER STOGNER: So gentlemen, and Mr. Kellahin, Mr. Bruce, Santa Fe, Hanley and Bass, and Mr. Carr, Harvey Yates is appearing here today as a working interest in this pool?

MR. KELLAHIN: Yes sir.

MR. CARR: Correct.

EXAMINER STOGNER: I just wanted to make sure I was clear on everything.

MR. BRUCE: I'm not sure where Santa Fe's interests are. I think they're within a mile of the pool.

EXAMINER STOGNER: But they're not -- Your client is not an operator?

MR. BRUCE: I believe not at this time.

Q. (By Examiner Stogner) Has there ever been

any talk that you're aware of, of unitizing this area?

A. Yes, in our first initial meeting with Collins and Ware and Fortson, it was discussed that the quality of the reservoir, especially the Collins sand, did appear to have the characteristics of secondary recovery, so it was touched on that ground, yes.

As far as unitization, you would just assume unitization if you were going to go into a joint waterflood project at some time in the future.

Q. Getting away from that line of questioning, the wells -- I don't want to use the word "caused" -- well, yeah, I will -- that causes communication with the Westall sand, you have narrowed it down to which four wells, in your opinion?

A. The Santa Fe Federals 1, 2, 3 and 4.

Q. And when I look at Exhibit Number 2, which is a map, it's those four wells marked 1, 2, 3 and 4 in the east half of Section 35?

A. Yes, sir.

Q. Wells 6 and 7 are proposed locations?

A. Number 6 is currently -- I just got a late report. We are running casing on it as -- right at the moment.

Q. Okay. Now, when I look up north, there's a well number 5.

A. Yes.

Q. That wasn't on the cross-section.

A. No, that is a new well that we were in the process of still completing.

Q. A geological question: We have used and we have continually used your nomenclature. I'll say the Collins sand, the Westall sand, Brantley sand and Bird Creek sand.

Are these -- You've mentioned already that these names are not recognized but only localized for today's case. Do they correspond with any other known sand intervals that have been named or designated out there as such?

A. No, sir.

Q. Okay. So any reference to these names today in an order subsequent to this is just for that particular purpose; it is not, nor do we -- nor is the Division advocating naming any pools, parts of or sands, intervals or producing sands?

A. No, sir. Every company has their own designation, generally of their pay sands within the Delaware.

EXAMINER STOGNER: Okay, I want that clear that if these -- we recognize these names today, we've utilized them but nor are we in any way advocating the

designation of any pools or parts of, other than the normal accepted procedures of naming after formations such as geographical area.

I have no other questions of Mr. Harris. Are there any other questions while he is on the stand?

MR. KELLAHIN: No, sir.

MR. CARR: No, sir.

EXAMINER STOGNER: Mr. Carr, do you have anything further?

MR. CARR: I have nothing further in this case.

EXAMINER STOGNER: Mr. Kellahin?

MR. KELLAHIN: No, sir.

EXAMINER STOGNER: Mr. Bruce?

MR. BRUCE: No, sir.

EXAMINER STOGNER: Is there any need for closing statements at this time?

MR. CARR: No, sir.

MR. KELLAHIN: No, sir.

EXAMINER STOGNER: Does anybody else have anything further in Case Number 10,541? If not, this case will be taken under advisement.

(Thereupon, these proceedings were concluded at 11:55 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 October 10th, 1992.

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. 10541, heard by me on October 1992.

, Examiner
Oil Conservation Division