STATE OF NEW MEXICO

ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT

OIL CONSERVATION DIVISION

IN THE MATTER OF THE HEARING CALLED BY THE OIL CONSERVATION DIVISION FOR THE PURPOSE OF CONSIDERING:

APPLICATION OF FASKEN OIL AND RANCH, LTD., FOR CREATION OF A NEW OIL POOL WITH SPECIAL RULES, LEA COUNTY, NEW MEXICO

CASE NO. 11,612

ORIGINAL

REPORTER'S TRANSCRIPT OF PROCEEDINGS

EXAMINER HEARING

BEFORE: DAVID R. CATANACH, Hearing Examiner

September 26th, 1996

Santa Fe, New Mexico

This matter came on for hearing before the New Mexico Oil Conservation Division, DAVID R. CATANACH, Hearing Examiner, on Thursday, September 26th, 1996, at the New Mexico Energy, Minerals and Natural Resources Department, Porter Hall, 2040 South Pacheco, Santa Fe, New Mexico, Steven T. Brenner, Certified Court Reporter No. 7 for the State of New Mexico.

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I N D E X

September 26th, 1996
Examiner Hearing
CASE NO. 11,612

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E X H I B I T S

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A P P E A R A N C E S

FOR THE DIVISION:

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FOR THE APPLICANT:

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By: W. THOMAS KELLAHIN

FOR KARL RESTINE, JAMES FIELDS and SHIRLEY WRIGHT:

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By: TANYA M. TRUJILLO

* * *

WHEREUPON, the following proceedings were had at 8:16 a.m.:

EXAMINER CATANACH: At this time we'll call Case 11,612.

MR. CARROLL: Application of Fasken Oil and Ranch, Limited, for creation of a new oil pool with special rules, Lea County, New Mexico.

EXAMINER CATANACH: Are there appearances in this case?

MR. KELLAHIN: Mr. Examiner, I'm Tom Kellahin of the Santa Fe law firm of Kellahin and Kellahin, appearing on behalf of the Applicant, and I have two witnesses to be sworn.

EXAMINER CATANACH: Are there any additional appearances in this case?

MS. TRUJILLO: Mr. Examiner, I'm Tanya Trujillo from Campbell, Carr, Berge and Sheridan, entering an appearance today on behalf of Karl Restine, James Fields and Shirley Wright.

We will not be presenting any witnesses today.

EXAMINER CATANACH: Any other appearances?

Okay, can I get the witnesses to stand to be sworn in at this time?

(Thereupon, the witnesses were sworn.)

MR. KELLAHIN: Mr. Examiner, Fasken is seeking to

have the Division create a new Devonian oil pool and to adopt special rules and regulations.

We have two witnesses to present. Mr. David Brown is a petroleum geologist, Mr. Carl Brown is a petroleum engineer.

We're requesting 80-acre oil spacing. You'll see from the evidence that the discovery well, the Grande Well Number 1, is at an unorthodox location if you adopt the rules we're proposing, and we would ask that you grandfather in the discovery well.

The proposal is to ask you to create a Devonian pool consisting of the west half of the southwest quarter of Section 3. The evidence will be that 80-acre spacing is an appropriate initial starting point for the pool. We would ask you that you also enter an order that precludes the drilling and production of more than one well in an 80-acre spacing unit.

In addition, we propose to follow the normal convention for 80-acre oil pools, and that is, all well locations would be within 150 feet of the center of either of the 40-acre tracts in the spacing unit and that the gas-oil ratio would be the statewide 2000 to 1. At this depth, our special oil allowable would be 490 barrels a day under the depth bracket rule. We do not propose any adjustment in that.

In addition, we would ask that any well drilled, completed and produced -- or recompleted to the Devonian Pool within a mile of this boundary would be subject to these rules.

You'll see from the evidence that the closest Devonian pool is to the east of us. It in fact has a boundary that is within a mile of the discovery well. It's the Bronco-Siluro (Devonian) Pool. The pool to the east is on statewide 40-acre spacing.

Our evidence will demonstrate that both from a geologic perspective and based upon engineering conclusions, in fact, the discovery well is separate and distinct from any other Devonian pool. That's what we're asking you to do.

DAVID H. BROWN,

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

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q. Mr. Brown, for the record, sir, would you please state your name and occupation?

A. My name is David Brown. I'm a geological engineer.

Q. Mr. Brown, on prior occasions have you qualified and testified as a geologic expert before the Oil

Conservation Division?

A. Yes, I have.

Q. Have you been involved as a geologist with regards to Fasken's Grande Well Number 1, located in Section 3 of 13 South, 38 East, Lea County, New Mexico?

A. Yes, I have.

Q. What has been your involvement?

A. I worked up the -- part of the seismic data -- this was shot with a 3-D seismic survey -- and took the seismic data into a structure map.

Q. You were involved, then, in the location of the discovery well?

A. Yes, sir, I was.

Q. And you now have data from the discovery well, including log information, to analyze?

A. That's correct.

MR. KELLAHIN: We tender Mr. Brown as an expert petroleum geologist.

EXAMINER CATANACH: Mr. Brown is so qualified.

Q. (By Mr. Kellahin) Mr. Brown, let's turn to the first display, which is your Devonian structure map.

Before I ask you some conclusions and opinions that you now hold, let's take a moment and simply have you describe for us the coding and the indexing of the map so we understand what we're looking at.

A. Exhibit 1 is a structure map, subsurface structure map, on the top of the Devonian formation. The contours are in a 25-foot contour interval, and the color codes are subsea depths, with the hotter colors, red, being high, and the deep blues being structurally lower than the surrounding areas.

Q. When we look at the black dots, the symbols for wells, are they confined to wells that have penetrated the Devonian?

A. In general, the wells that have penetrated the Devonian have a subsea number under them of Devonian subsea. There are some Wolfcamp wells, especially off the flanks, that don't have subsea numbers.

Q. So the well symbols in here are not exclusively Devonian tests?

A. That's correct.

Q. And to distinguish a Devonian test, then, we look at the subsea number next to the well symbol?

A. That's right. There may be one or two that are missing, that didn't have information on them. But for the most part, all the information I had available is represented by the subsea numbers, and those are Devonian penetrations.

Q. When we look over in the center of the display, you have outlined an area where we're seeing sections, are

we not?

A. That's correct.

Q. When I look in Section 3, in the southwest quarter of Section 3, there's an area identified as being the beginning point of a cross-section. It says A, and there's a well symbol.

A. That's correct.

Q. What does that represent, sir?

A. That is a cross-section, A-A', that begins at the letter A, at the discovery well, the Fasken Grande Number 1.

Q. Give us a summary of how you as a geologist interpret the Devonian feature from which the discovery well produces.

A. This Devonian feature was discovered from a 3-D seismic shoot, the outline of which is detailed in this blue outline. It covers about two and a half, nearly three sections.

We looked at the seismic and mapped the top of the Devonian and noticed that this structure popped up at this location very distinct from the Bronco field and, in fact, distinct from any other place in the survey. It was bounded, especially to the south and the east, by some very steeply dipping rock that dipped very steeply to the east and to the south, down into the deeper part, which is

colored blue.

We have -- This map was created by integrating the seismic data all the way to the edge of the blue outline where our 3-D seismic stopped, and then from there we picked up the rest of the data from subsurface well logs.

Q. When we look at the display and move west of the discovery well, there's a dryhole symbol in the southeast quarter of Section 4. What does that represent?

A. That represents a dryhole that was not drilled deep enough. That's the reason it does not have a top on it. It did not penetrate the Devonian.

Q. Okay, let's move to the eastern portion of the display and look in the area where we have the hot red color. Generally in that area, what particular pool are we identifying when we look at the Devonian production?

A. That's the Bronco-Siluro (Devonian) Pool, and it's -- generally the wells that produce are in this red area. You start going off into the yellows, and especially in the greens, and Devonian wells that were drilled that deep were wet.

Q. What's the general vintage of the wells in the Bronco-Siluro (Devonian) Pool?

A. Generally in the Fifties to early Sixties. It's a very old pool.

Q. Describe for us how you as a geologist have concluded that your discovery well, in fact, is in a separate reservoir from any of the other Devonian wells producing in this vicinity.

A. We have two main pieces of information that point to that. One is the structural elevations that occur through here. This north-south-trending low that goes between the two fields is supported both by seismic and by a well in Section 10 where the cross-section takes a bend. That was a dry hole that did penetrate the Devonian, which is significantly lower than either field, either discovery well. So it establishes by subsurface control, and actually a wellbore, where that deep ravine is between the two fields.

Q. When we look at the well in the southeast quarter of 10, did that well actually encounter the Devonian reservoir?

A. That well did encounter the Devonian reservoir. It was tested 100-percent water, formation water.

Q. What then causes the separation between your discovery pool and the Bronco-Siluro (Devonian) Pool?

A. The main separation is because of structure. There's a deep structural ravine between the two.

Q. Is there a water component to the reservoir?

A. There appears to be a water component. If you

drill too deep and it's too deep structurally, it will be wet.

One interesting thing to note is, in the Bronco Pool, if you were to drill in the green-shaded contour elevation, you would have been wet. Our discovery is in the green contour, and it DST'd 100-percent oil.

Q. Take a moment and illustrate that point for me. If I'm in the Bronco-Siluro (Devonian) Pool and I'm moving to the west, how deep can I go before I am into the water?

A. Basically, as soon as you start losing the red, at about 8000 feet, thereabouts, you start getting into some -- into water.

Q. And so over at your discovery, you're an additional 356 feet deeper than that elevation, and you were successful in obtaining oil production?

A. That's correct.

Q. What does that tell you?

A. That tells me it's a different pool. If it was a connected pool, the oil would seek the equivalent level and we would be -- we would have encountered 100-percent water.

Q. When we look over at the Fasken discovery pool, describe for us the character of the reservoir. What are we looking at?

A. The reservoir is steeply bounded on the sides, and the rock itself is a dolomite. It's vuggy in nature

and very well connected vugs. We have a slight limestone cap, a dirty limestone cap, of 20 to 30 feet, and then we go into good quality dolomite, which is the reservoir.

Q. Where is the porosity within the dolomite, then, for the discovery reservoir?

A. If you turn to your cross-section, Exhibit 2, the discovery well is on the left-hand side and the perforations are marked in red. The top of the Devonian is that bold line.

And about -- It's about 28 feet, 27 feet into the Devonian before you get to the good dolomite reservoir. And in the Bronco field that varies anywhere from, at the very top, to 50, sometimes even 75 to 100 feet into it, before you get to the dolomite. So there is a limestone cap that goes through there before you get the good, vuggy dolomite.

Q. Continue to illustrate the other points on Exhibit Number 2, then, as you move from left to right.

A. As you move from the discovery well, which is a small closure, you move off to the east into that subsea ravine that was tested by Midwest Oil Corp., the Townsend Number 1 in Section 10.

Q. There's a drill stem test noted on that --

A. That's right, on the right-hand side of the log, it may be difficult to read, but there was a drill stem

test. They penetrated the top five or ten feet of Devonian, which was kind of a traditional completion practice back then, and they ran a DST and got over 1000 feet of salt water, which -- They encountered good quality reservoir, but it was entirely wet, with no show of oil.

Q. In your opinion, was that an appropriate test of the reservoir at this location?

A. That was a very appropriate test at this location.

Q. The failure to produce is not attributable to some problem in the wellbore?

A. No, sir, it was a good mechanical test, and the failure to produce was simply because they were too low structurally out of the oil column.

Q. Let's move over to the Ward 3, which is the Amerada Petroleum Corporation well on the right.

A. As you go off to Section 10, you go back up into a major structural element that runs pretty much the length of the State Line Bronco, and then up to the northern part of Section 2. The Ward Number 3, there's nothing special about that well. It's just a type log to illustrate the Bronco-Siluro (Devonian) field. Its Devonian top, as illustrated by that bold line, Devonian formation, is significantly higher than the discovery well, and it has a very thick oil column, you know, well over 200 feet in some

places.

Q. All right, sir. Let's turn your attention to the type log, which is Exhibit Number 3.

A. This is the well of the discovery, the Grande Number 1, drilled by Fasken. It's a large-scale log of just the Devonian section. The top of the Devonian is marked just underneath the base of the Woodford there. This shows a little bit better the dirty limestone cap up above that is not porous.

We drilled through that cap, and as soon as we saw a drilling break indicating porosity, we drilled about -- oh, ten feet, 12 feet of it, and called a DST.

Q. Describe the relationship between the test interval on the DST and the perforated interval.

A. We tested on log depth down to about 12,226. After the DST, which recovered oil, we drilled on down to see if there were any other zones of interest. We set pipe and then we ended up perforating from 12,210 to 12,228, which is two feet below the DST interval.

Q. Based upon your geologic interpretation, Mr. Brown, are you able to conclude as an expert witness that in fact this well constitutes a new discovery separate and distinct from any known producing Devonian pool in the vicinity?

A. Yes, I am.

Q. Now, let's turn your attention and have you identify for the record Exhibit Number 4.

A. Exhibit Number 4 was a -- is a land map outlining Fasken's land holding that was given to me by our land department.

MR. KELLAHIN: Mr. Examiner, you'll find in your package of exhibits that at the end of the exhibit package, the last one is marked Exhibit 12. That is our certificate of notification.

Pursuant to Division rules, we sent notice to all interest owners within the 80-acre proposed spacing unit for the new pool.

In addition, there were no operators within a mile, but we chose to notify all those 40-acre offsets to our 80-acre spacing unit, and there were some unleased mineral owners involved. So Ms. Trujillo's clients are among the group, then, of mineral owners that are adjacent to this boundary. So we went ahead and notified all those people.

I am not aware of any objection from any of the parties notified.

That concludes my examination of Mr. Brown, Mr. Examiner.

We would move the introduction of Exhibits 1 through 4.

EXAMINER CATANACH: Exhibits 1 through 4 will be admitted as evidence.

Ms. Trujillo, do you have any questions?

MS. TRUJILLO: I don't have any questions.

EXAMINATION

BY EXAMINER CATANACH:

Q. Mr. Brown, do you know what the extent of this reservoir might be?

A. I believe the extent can be demonstrated close to where this -- the green turns to blue. That seems to be where the structural closure is, and production is controlled by the structural closure.

So our best estimate is, it's the boundary, probably illustrated best by the green, although we're not exactly sure where the oil-water contact is. If it's no more than 30 or 40 feet, it would not be that extensive.

Q. Do you believe that this -- Well, I don't know if you want to get into drainage, but does Fasken plan on drilling another well in this structure?

A. Fasken does not plan on drilling another well. We believe we can drain the structure with one well economically.

Q. Is the well in the southeast quarter of 10, that's the only test between your well and the Bronco field?

A. That's correct. There are some wells off in Section 15 to the south, on the Bronco, where they came off the structure, that were recompleted in the Wolfcamp, I believe, but they were not productive in the Bronco field itself.

But the main separation is that well in the southeast of Section 10.

Q. Okay. And the Bronco field goes up north into Section 2 and then north from there?

A. I believe the northern extent is into the north part of Section 2, and then a little bit into the next section to the north, and that's probably the farthest northern extent.

MR. KELLAHIN: Mr. Examiner, if it will help you, I have the *Byram's* printout of that acreage, and I have sketched it on a plat so that you could see the boundary.

EXAMINER CATANACH: Okay.

MR. KELLAHIN: The check marks represent the Bronco field.

EXAMINER CATANACH: Okay, thanks Tom.

Q. (By Examiner Catanach) The Bronco Pool, you said, is Fifties and Sixties vintage. Is that pool pretty well depleted by now?

A. Yes, sir.

Q. Are there still any wells producing from there?

A. Yes, there are. I think at the very top the wells are still producing.

Q. Did you guys look at pressure information?

A. In the Bronco Pool?

Q. And in the new -- in your new pool?

A. In the DST analysis, Mr. Brown, can speak to that more further, but we did compare pressures, mostly initial pressures, of the Bronco. We don't have any modern data of the Bronco field.

EXAMINER CATANACH: Okay, I have nothing further of the witness. You may be excused.

MR. KELLAHIN: Carl?

CARL BROWN,

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

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q. Will you please state your name and occupation?

A. My name is Carl Brown. I'm a petroleum engineer for Fasken Oil and Ranch, Limited, Midland, Texas.

Q. On prior occasions, Mr. Brown, have you qualified as an expert petroleum engineer before the Division?

A. No, not --

Q. All right, summarize for us your education.

A. I earned a bachelor in science degree in

petroleum engineering from Texas Tech University in December, 1977.

Q. Summarize for us your employment experience.

A. I began my initial employment with Sun Oil Company and then an independent oil company in Midland with Mabee Petroleum, and I've been eight years now with Fasken Oil.

Q. Were you involved with Mr. David Brown in this discovery well?

A. Yes.

Q. What was your involvement?

A. My main involvement was log analysis, getting the logs run and analyzing the drill stem test data.

Q. So you've been involved in this well from its inception?

A. Yes.

MR. KELLAHIN: We tender Mr. Brown as an expert petroleum engineer.

EXAMINER CATANACH: Mr. Brown is so qualified.

Q. (By Mr. Kellahin) Let's start with the production data and see where we go from there, Mr. Brown. If you'll start with Exhibit 5, describe for us what we're looking at.

A. Exhibit 5 is a tabulation of our production history, beginning August 29th, through September 24th, and

I have there daily oil rates, water rates and flowing tubing pressures.

And you can see that the first 11 or 12 days we flowed water-free, and we started cutting a little bit of water, starting our flowing tubing pressure reducing. We initially started the well flowing around 200 barrels a day, a conservative rate, knowing that this is a fractured reservoir, and we weren't sure whether we'd have a sufficient barrier between water below us. We just wanted to start slow.

Q. Do you have enough data at this point to have an engineering opinion concerning the drive mechanism of this reservoir?

A. Yes, I believe it's a water drive, strong water drive, similar to the Bronco (Devonian).

Q. Would that be unique for Devonian reservoirs, to be water-drive reservoirs?

A. I think it would be typical of Devonian reservoirs.

Q. Okay. With this production information, did you attempt to investigate the rate at which this well would respond to drawdown and recover its ability to produce oil?

A. Yes, based on the drill stem tests, basically we got a high rate, and I will go into that.

Q. Were you able to utilize drill stem tests and

engineering methodology to come to some opinion with regards to the area affected by this well?

A. Yes, drill stem test analysis showed that the radius of investigation of the test was in excess of 1400 feet, and --

Q. When you do the math using that radius, what kind of area are you affecting with this discovery well?

A. Well, that calculates out to 143 acres. Whether there's a boundary that -- It didn't seem to indicate a boundary on the drill stem test data, but --

Q. At least initial data has caused you to conclude that 40-acre spacing would be much too dense?

A. Yes.

Q. All right. And are you proposing, based upon your conclusions, that the Division approve 80-acre spacing for the pool?

A. Yes, I am.

Q. Do you have a recommendation concerning the number of wells to be drilled within an 80-acre-spaced unit?

A. I recommend one well per 80-acre spacing unit.

Q. Okay, let's turn to Exhibit 6, and describe for us what you've done with the drill stem test data.

A. Exhibit 6 is a plot of our drill stem test data. It's like the drill stem test chart that you would get out

of the test tool. And we have pressure on the left and time in hours on the X axis, and it's your typical drill stem test chart.

Q. Are you satisfied that the hours for the test were adequate in order to derive sufficient data from which you could conduct your analysis?

A. Yes, that's sufficient time for buildup analysis, yes.

Q. Did you find any problems or mistakes with regards to the actual test?

A. No, it was a good mechanical test.

Q. All right. Describe for us what you've done here.

A. Just plotted the pressure data from the electronic gauge that we had in the hole.

Q. In the fifth hour, then, what's occurring here?

A. In the fifth hour was our initial flowing period for a five-minute flow period. Then we shut in for an hour, for the initial shut-in pressure.

Q. And your initial shut-in pressure is what? The 4500 pounds?

A. About 4500, 4513.

Q. And you've shut it in for -- it looks like an hour or so?

A. Yes.

Q. And then what happens?

A. Then we opened for the final flow period, about 3.6 hours, and --

Q. And the plot goes --

A. -- increases in pressure as the oil was filling in the drill pipe.

Q. All right. So we have an inclining slope in about the seventh hour up to the tenth hour?

A. Yes.

Q. And what does that indicate to you?

A. We were getting recovery in the pipe of reservoir fluid.

Q. After the drawdown, then, the reservoir is giving up fluids to the wellbore and it continues to build up towards the pressure it had at the 4500 pounds when it was shut in?

A. After we shut it in, yes, it built very quickly to the 4500 pounds, and -- indicating no depletion from the initial flow to the final flow.

Q. All right. In the tenth hour, approximately in the tenth hour, then, you're shutting in the well?

A. Yes.

Q. And it almost instantaneously goes back up to the pressure you had in the original shut-in period?

A. Yes, very quickly.

Q. What does that tell you?

A. That tells me that there's a very good permeability in the formation.

Q. Okay, what happens then after the tenth hour of the test, all the way up through about -- what, the 17th hour?

A. Well, generally the rule of thumb is to leave the well shut in for at least twice as long as your flow period, to ensure that you can analyze the data properly.

Q. What happens if that's not a flat line after the tenth hour? Does that give you a problem?

A. Well the -- In analyzing the final pressures, if it's substantially less than the initial pressure, you've got a problem of depletion, possibly, in a small reservoir. But we did not see that.

Q. Okay. What then did you do, Mr. Brown?

A. Then we took this information, the buildup data, and applied a pressure transient analysis to it.

Q. Let's look at Exhibit Number 7 and see what you have analyzed.

A. This is a Horner plot of our final buildup pressure data, and --

Q. Help us interpret the plot.

A. Okay. The -- Of course, pressure transient analysis is a study of the relationships between the

pressure rate and reservoir rock and fluid properties, and after a flow-rate change in a reservoir, like the DST we did, a plot of the pressure buildup versus a logarithm of time will yield a straight line before any boundary effects influence the pressure data.

And that slope of that straight line is indirectly proportional to the permeability of the reservoir.

Q. Once you've analyzed the buildup -- the DST test information, constructed your Horner plot, then you're able to use that as one of your points of information, if you will, in the subsequent calculation, to come up with the permeability, and then you can further calculate and determine how far out into this reservoir you have investigated with this test?

A. That's right.

Q. Okay. What you're doing is to see where you find the nearest potential boundary in the reservoir?

A. Yes.

Q. All right. Let's see what you've done, then, with Exhibit Number 8.

A. Back on Exhibit 7, I wanted to indicate that the dashed blue line is our straight line, and that is the line that we use to calculate the slope for the Horner analysis.

Extrapolating that blue line, dashed blue line,

would be our reservoir pressure. Extrapolating to the far right where a Horner time of one -- that's infinite time, basically -- we have a reservoir pressure of 4513 p.s.i.

Q. So we're getting two values off the Horner plot, are we not? You're getting your extrapolated pressure, the 4513, and then you're getting your Horner slope?

A. And the slope, yes.

Q. All right. Now, let's go to Exhibit 8, and show me the other components of the calculation.

A. Okay, the flow rate is calculated from the recovery from the drill stem test, and it was 100 percent oil at a rate of 534 barrels a day. That was a flow time of 3.6 hours.

The oil was a 47-degree gravity with a GOR of 150 to 1 or less. And using that as -- for standings correlations, we got a formation volume factor of 1.17, a viscosity of about .6 centipoise, and log analysis showed a porosity of 5 percent, and then total compressibility there of 12 times 10^{-6}, and the drill stem test tested an interval of formation thickness of 16 feet.

And applying those parameters to the equation for permeability from the Horner analysis, I've calculated 236 millidarcies for average perm.

Q. Give us a sense of what that value means when you look at permeability. What does 263 millidarcies mean?

A. 236.

Q. I'm sorry, 236.

A. That's an excellent permeability. Typically in the Permian Basin, we work with reservoirs, you know, less than 10 millidarcies on a regular basis. So this is excellent deliverability.

Q. It's a huge number, isn't it?

A. Yes.

Q. All right. Once you have your permeability value, finish the rest of the calculation for us.

A. Well, you can calculate, then, a radius of investigation from the wellbore using that permeability, the producing time, porosity, viscosity and the compressibility. And that calculates to 1409 feet of distance away. So in 3.6 hours the pressure disturbance that we caused from our test reached out that far.

Q. And you know that it has -- not only does it have great permeability, the reservoir has the capacity in a very short period of time to give up large volumes of fluids?

A. Yes.

Q. Have you -- For an 80-acre pool, what would be the radius of a circle that contains 80 acres?

A. Eighty acres would be 1053 feet. So the investigation was beyond the 80-acre drainage radius.

Q. Okay. And your calculation shows slightly over 1400 feet?

A. Yes.

Q. Let's turn to Exhibit Number 9, Mr. Brown, and have you identify and describe what this display shows.

A. This is a Vogel curve of inflow performance relationship. It's a plot of productivity index.

I'd like to direct your attention to the right side. We have oil rate from zero to 1000 on the scale, and on the X axis we have drawdown pressure. It's backwards, actually, from -- It goes from the far right, zero, to 4500 p.s.i. drawdown.

The triangle point is the DST rate, and it was -- the drawdown pressure during the test was around 1900 p.s.i., indicating some possible skin damage or flow restriction. I believe it was more a mechanical downhole choke restriction.

Q. What's the purpose of a Vogel curve? What do you use this for?

A. Okay, this is a -- It's just a productivity index plot, barrels per day per p.s.i. drawdown. And then it's an estimate of the total deliverability, ultimate deliverability of a well.

Q. It would appear for a small drawdown in the reservoir, you're able to be successful in producing large

volumes of fluid?

A. Yes, after we set pipe, did perforations, added a little bit of -- 200 gallons of acid, I have there the -- the round -- they're circled to the far right, at about 190 barrels a day and a drawdown of less than 100 p.s.i. is a calculated point, calculated to bottomhole pressure from the surface flowing pressure. And the well will deliver a high rate with a very small change in reservoir -- or drawdown. So it's got a very good deliverability.

Q. Have you operated the well long enough now to have a sense of whether or not the depth bracket oil allowable of 490 barrels a day gives you adequate operational flexibility to produce this well at its most efficient rate?

A. Yes, the well will deliver a 490-barrel-a-day rate.

Q. You as an operator may choose not to produce it that fast, but --

A. That's right.

Q. -- you don't need any extra allowable at this point?

A. That's correct.

Q. All right. Let's look at your analysis of what you anticipate to be the recoverable oil to be produced by this well.

If you'll direct your attention to Exhibit 10, let's look at your analysis. You've chosen to use a volumetric methodology to determine the recoverable oil from this well?

A. Yes, I've -- from the log analysis, I've calculated then a volumetric estimated ultimate recovery. The log analysis gave me data of 5-percent porosity, a perforated formation thickness of 18 feet, water saturation of 40 percent, a formation volume factor once again at 1.17, and a recovery factor of 35 percent.

Q. Describe for me why you've chosen 35 percent as your recovery factor.

A. Typically, we see in strong water drive reservoirs a recovery in the range of 25 to 45 percent, of oil in place, and a 35-percent recovery factor is a reasonable estimate of potential recovery from a water-drive reservoir.

Q. All right, finish the calculation, if you use those parameters.

A. Okay, I've applied and calculated the recovery per acre to be 1250 barrels, stock tank barrels per acre. And then applying that to either 40 acres or 80 acres, I have an estimated ultimate recovery on 40 acres of 50,000 barrels, and on 80 acres of 100,000 barrels.

Q. Now, you as a reservoir engineer are going to

have to make some engineering judgments about a decline rate for your discovery well, are you not?

A. That's correct.

Q. In order to come up with the recoverable gas -- the recoverable oil for 40 acres, you're going to have to presume a slope of decline for the well, because we don't have one yet?

A. That's right, it's early in the life of the well.

Q. What did you presume to be the slope of decline?

A. Well, given a 50,000-barrel recovery, at a rate of around 120 barrels a day, declining to a 10-barrel-a-day economic limit, that's about a 60-percent-per-year decline rate. And on 80-acre spacing, or the 100,000 barrels, that decline rate would be less. It would be about 35 percent.

In other words, if you have two wells in the reservoir competing against one another, they would decline at a steeper rate than one well by itself draining a larger area.

Q. In your opinion, are both those values reasonable and probable with regards to this pool and this well?

A. I think they're -- Yes, I think they're reasonable decline rates. Thirty-five percent decline rate is probably a steep estimate, and it may do better than that or shallower than that.

Q. All right. Now that you've got your recoverable

oil, have you compared that to the cost of obtaining this level of recovery?

A. Yes, I've done an economic comparison.

Q. All right, let's look at Exhibit 11, and turn your attention to the economic comparison.

A. Okay, I've scheduled future oil production, based on the previous decline rates that we talked about, and applied the investment of $842,500, which is our AFE amount, estimated some revenue, future revenue and expenses.

And for 40-acre spacing at 50,000 barrels of ultimate recovery I have an uneconomic well.

And on 80-acre spacing for 100,000-barrel recovery, I do show at the end of the life a profit.

Q. In your opinion, would it be wasteful to attempt to develop this pool on 40-acre spacing?

A. Yes, I think we'd have uneconomic production.

Q. And at least at 80-acre spacing you could make the investment and show a cumulative profit over time?

A. That's correct.

Q. So you would not recommend spacing less than one well per 80 acres?

A. That's correct.

Q. How does your engineering analysis compare to our conflict with Mr. David Brown's geology?

A. I think it agrees very well with the geology, as far as the potential reservoir area that's there. It's small and can be drained sufficiently and economically with one well.

Q. His seismic and log data from the discovery well infers a certain size to the reservoir which, based upon your analysis, appears to be probable? In other words, you've shown a radius of investigation of 1400 feet, give or take, and that is sufficient to be contained within the container he's described geologically?

A. That's correct.

Q. So you're not inconsistent? In fact, you're in agreement?

A. Yeah, I think we're in agreement, yes.

MR. KELLAHIN: All right.

That concludes my examination of Mr. Brown.

We move the introduction of his Exhibits 5 through 11, and then our final exhibit is the certificate of notice, which is Exhibit 12.

We would seek to introduce all those exhibits at this time.

EXAMINER CATANACH: Exhibits 5 through 11 and Exhibit 12 will be admitted as evidence.

Any questions?

MS. TRUJILLO: I have no questions.

EXAMINATION

BY EXAMINER CATANACH:

Q. Mr. Brown, what -- You say the well is capable of production in excess of 490 barrels per day at this point?

A. Drill stem tests recovered 534-barrel-a-day rate. We have not produced it at that. We've chose to produce at 200-barrel-a-day rate initially, flowing.

I believe that the Vogel curve, the inflow performance relationship, currently shows a very high productivity index. In other words, a small change in drawdown is a very large change in rate.

And it -- Before it started making water, it probably could produce in excess of 500 barrels a day, but we didn't want to cause some water production that we might could avoid.

Q. So you've been producing the well at -- you've been producing it choked back so it's not --

A. Yes, we did choke it back quite a lot to keep it at 200 barrels a day initially.

We did run a production log to try to see where the water's coming from, and it may be from below us. Whether it's through the fractures around and up into the bottom perforations, we're not -- or behind the cement, we're not positive at this time.

But when we put it on the -- We can put it on rod

pump, artificial lift, and it will provide in excess of a 500-barrel-a-day total fluid rate. That would be water and oil.

Q. Do you know when that might be?

A. It looks like it's going to be pretty soon. We're dropping our flowing tubing pressure rapidly, because our water is building up and the well can't sustain that water gradient and still flow.

Q. So is it your opinion that your radius of investigation -- would that correspond to an area that you think the well would drain?

A. Assuming that 16 feet of high reservoir thickness and that permeability extends that far, to 1400 feet, yes, it could drain that, very easily and economically.

Q. So it's your opinion this well will drain or will recover in excess of 100,000 barrels?

A. Yes, to the extent of the data I have at this point, yes.

Q. To really get a feel for it, you would have to have some production history and a decline curve to --

A. Exactly, we'll need to see how it does on artificial lift, basically.

Q. What is the recovery factor in the Bronco field? Do you know?

A. I did not do a calculation on that. I do know of

similar fields and testimony in 1993, the North Jenkins-Devonian field, there was some work presented, four different -- or three different fields in that area were calculated to be in excess of 40-percent recovery factors. So I think 35 percent is a reasonable estimate at this time.

Q. Mr. Brown, do you know the status of the 80-acre -- The proposed 80-acre proration unit is going to be the west half of the southwest quarter; is that correct?

A. That's correct.

Q. Is that a single lease, a common ownership?

A. Yes, the southwest quarter is a common lease.

Q. The whole southwest quarter?

A. That's right.

Q. Okay. Over in the southeast quarter of Section 4, that's a different lease, though, isn't it?

A. Yes, it is.

Q. Those are all fee leases, or --

A. Yeah, I believe they are, yes.

Q. Do you think that the Grande Well Number 1 will drain a portion of that southeast quarter?

A. Of Section 4?

Q. Yes, sir.

A. If the reservoir is not below water over there on that side. The drill stem test didn't indicate possible

boundary, but -- If there is some reservoir over there, it will drain it, yes.

Q. And this is the only well that Fasken proposed to drill on this structure?

A. At this time.

Q. Is the discovery allowable, is that something that -- you're asking for; is that something that you need?

A. Right now it's just a yardstick allowable. The well could --

Q. Okay.

A. -- is capable of producing that amount of production.

Q. Okay. The -- I guess I'm a little confused. You're not asking for like a bonus-type discovery allowable?

MR. KELLAHIN: It may be in the Application, Mr. Examiner, because I always ask for it, and I don't presume to know how Mr. Brown is going to produce the well. If he believes that in the foreseeable future he will not need the bonus from the discovery allowable, then it's probably not necessary.

EXAMINER CATANACH: Okay.

Q. (By Examiner Catanach) Mr. Brown, we generally promulgate rules for a temporary period. Are you guys prepared to come back in with some more evidence when you

have that?

A. Yes, we could.

Q. Would you recommend 18 months to be a sufficient time period?

A. I think 18 months would be sufficient to determine how it will produce, yes.

EXAMINER CATANACH: Okay, I have nothing further of the witness, Mr. Kellahin.

MR. KELLAHIN: That completes our case, Mr. Examiner.

EXAMINER CATANACH: All right, there being nothing further in this case, Case 11,612 will be taken under advisement.

(Thereupon, these proceedings were concluded at 9:13 a.m.)

* * *

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 11612, heard by me on Sept 26 1996.

David R. Catanach, Examiner
Oil Conservation Division

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 5th, 1996.

STEVEN T. BRENNER
CCR No. 7

My commission expires: October 14, 1998