STATE OF NEW MEXICO

ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT

OIL CONSERVATION DIVISION

CASE 9916

EXAMINER HEARING

IN THE MATTER OF:

Application of Exxon Corporation for an Unorthodox Oil Well Location and Simultaneous Dedication, Eddy County, New Mexico

TRANSCRIPT OF PROCEEDINGS

BEFORE: MICHAEL E. STOGNER, EXAMINER

STATE LAND OFFICE BUILDING

SANTA FE, NEW MEXICO

April 18, 1990

ORIGINAL

A P P E A R A N C E S

FOR THE APPLICANT:

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WHEREUPON, the following proceedings were had at 1:25 p.m.:

EXAMINER STOGNER: This hearing will come to order.

I'll call the next case, Number 9916, which is the Application of Exxon Corporation for an unorthodox oil well location and simultaneous dedication, Eddy County, New Mexico.

I'll call for appearances.

MR. BRUCE: Mr. Examiner, my name is Jim Bruce from the Hinkle Law Firm in Albuquerque, representing the Applicant. I have three witnesses to be sworn.

EXAMINER STOGNER: Are there any other appearances?

Will the witnesses please stand to be sworn?

(Thereupon, the witnesses were sworn.)

EXAMINER STOGNER: You may be seated.

Mr. Bruce?

WILLIAM T. DUNCAN, JR.,

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

EXAMINATION

BY MR. BRUCE:

Q. Would you please state your full name and

city of residence?

A. William T. Duncan, Jr., Midland, Texas.

Q. And who is your employer and in what capacity are you employed?

A. Exxon Corporation, I'm employed as a senior engineer.

Q. And have you previously testified before the Division as an engineer and had your credentials accepted?

A. Yes, I have.

Q. And are you familiar with the matters involved in Case 9916?

A. Yes, I am.

MR. BRUCE: Mr. Examiner, is the witness acceptable?

EXAMINER STOGNER: Mr. Duncan's qualifications are so accepted.

Q. (By Mr. Bruce) Mr. Duncan, would you please refer to Exhibits 1 and 2 and describe the proposed location of this well?

Back up. First, Mr. Duncan, would you briefly describe what exactly Exxon seeks in this case?

A. Exxon seeks approval of an unorthodox oil well location for our Yates "C" Federal Well Number 36 to be drilled 1305 feet from the north and east lines

of Section 31, Township 20 South, Range 28 East, in the Avalon (Delaware) pool.

We ask that the well be simultaneously dedicated with the Yates "C" Federal Well Number 4 to the existing standard 40-acre oil spacing and proration unit comprising the northeast quarter of the northeast quarter of Section 31.

Well Number 4 is located at a standard oil well location, 660 feet from the north and east lines of Section 31.

Q. Okay, now would you move on to Exhibits 1 and 2, please?

A. Exhibit 1 is a map showing the approximate location of the Avalon (Delaware) Field north of the City of Carlsbad in Eddy County, New Mexico.

Exhibit 2 is a map centered around Exxon's proposed location for the Yates "C" Federal Well Number 36, which is 1305 feet from the north and east lines of Section 31. It's indicated on this map by a red dot. Section 31 is in 20 South, 28 East, Eddy County.

This location spots in the northeast quarter of the northeast quarter 16.7 feet and 27.5 feet from the south and west quarter-quarter section lines, respectively.

The well symbols used in this map are shown

in the legend in the upper right-hand portion of the exhibit. The large symbols as shown in the legend are actual size for the Delaware completions, but smaller symbols on the map reflect deeper completions.

Completions shallower than Delaware are not shown.

This map includes much of the Avalon (Delaware) Pool, which currently contains 26 producing wells producing about 650 barrels of oil per day, and has produced over 2.2 million barrels of oil to date since its discovery in January of 1979.

The field is in the middle primary stage of depletion. The lessee or operator of each tract is shown on the map in the upper portion of each tract, and the lease name is shown in the lower portion of each tract. Exxon's Yates "C" Federal Lease is shown in yellow. This lease is a 100-percent Exxon working-interest lease.

Exxon proposes to drill the captioned well at an unorthodox well location in the Avalon (Delaware) pool and to simultaneously dedicate Unit A to this well into the existing Well Number 4, sharing the 40-acre allowable of 80 barrels of oil per day.

Currently wells 3 and 7 are capable of producing about -- approximately the 80-barrel-per-day

40-acre allowable, while both wells 4 and 9 are capable of 40 to 50 barrels of oil per day.

We've requested this location almost equidistant from existing wells in the northeast corner of Section 31 in an effort to encounter reserves which the existing wells cannot produce.

In addition, we're planning an aggressive coring, logging and testing program for the well, and we anticipate this location will provide significant amounts of information.

Thirdly, the proposed location could be utilized in any future post-primary recovery projects requiring increased well density.

Subsequent witnesses will go into more detail on these reasons for our Application today.

Q. Were the offset operators notified of this Application? I refer you to Exhibits 3-A and 3-B.

A. Yes, they were. Exhibit 3-A is the list of those notified by a copy of Exxon's March 26th, 1990, Letter of Application. On the left we have shown the certified mail article number, and on the right of each address we have shown the disposition of each of those items, either received based on proof of delivery, or undeliverable with specific comments or notified via another address.

This list contains not only offset operators but also lessees and mineral-interest owners. We over-notified in this way because at the time of our filing our land information for the offsetting tracts did not differentiate between operators, lessees and unleased mineral-interest owners. To avoid additional delay, we chose to over-notify.

Q. And were Exhibits 1 --

A. Exhibit 3-B is copies of all return receipts received by Exxon to date. For those not yet received, we have included copies of the certified proof of mailing. These are the last pages of Exhibit 3-B.

Q. Were the exhibits you referred to -- 1, 2, 3-A and 3-B compiled from company records or prepared under your direction?

A. Yes, they were.

Q. And in your opinion, is the granting of this Application in the interests of conservation, the prevention of waste and the protection of correlative rights?

A. Yes, it is.

MR. BRUCE: Mr. Examiner, I move the admission of Exhibits 1 through 3-B.

EXAMINER STOGNER: Exhibits 1 through 3-B will be admitted into evidence at this time.

EXAMINATION

BY MR. STOGNER:

Q. Mr. Duncan, you said that this lease was in the middle of its primary stage of completion or development. When did this lease and pool begin production?

A. It began production in January of 1979, and the discovery well was located on this lease. I don't recall which well it was. I could find out.

Q. Do you know if it was either the 4 or 9 or 3 or 7?

A. I don't know.

Q. You don't know, okay.

A. I can find out just by asking.

(Off the record)

MR. MAXWELL: The well you refer to in January of 1979 is actually not on the colored lease. It's north of the map area.

EXAMINER STOGNER: Okay.

MR. MAXWELL: Well Number 3 was the first well in our lease to produce.

THE WITNESS: Okay, misunderstood.

Q. (By Examiner Stogner) Anyway, it was 1979?

A. Right. The field itself has produced about 2.2 million barrels to date.

Q. Now, when you say the field, do you mean the pool or your particular lease?

A. I mean the pool.

Q. The pool? Now, the yellow markings on your Exhibit Number 2, is that the full extent of the Yates "C" Federal Lease?

A. That is not the full extent. It extends further to the south off of the mapped area. It includes all of Section 5, I believe, and the entire west half of Section 4.

Q. So essentially what this Application is is an in-field proposal, essentially, where you would have a well within the middle of four other producing wells?

A. That's correct.

Q. And more than likely it would probably utilize secondary recovery at some future date?

A. Drilling this well is an integral part of planning for a future secondary recovery project.

Q. How would you classify this reservoir? What type of a trapping mechanism?

A. I don't know. I would have to refer you to Tim Maxwell, our geologist.

EXAMINER STOGNER: Okay, I'll wait till he gets up, then.

I have no other questions of Mr. Duncan at

this time. He may be excused.

Did we admit Exhibits 1, 2 and 3, Mr. Bruce?

MR. BRUCE: I moved that they be admitted. I believe they were.

EXAMINER STOGNER: I think we did. But if not, well, we'll admit them again.

TIMOTHY C. MAXWELL,

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

EXAMINATION

BY MR. BRUCE:

Q. Mr. Maxwell, would you please state your full name and city of residence?

A. My name is Timothy C. Maxwell, and I reside in Midland, Texas.

Q. And who are you employed by and in what capacity?

A. Exxon Corporation, I'm currently a senior geologist.

Q. And have you previously testified before the Division?

A. No, I have not.

Q. Would you please outline your education and your work experience for the Examiner?

A. I have a bachelor of science in geology in

1980 from Guilford College in Greensboro, North Carolina, and I have a master of science in geology in 1985 from West Virginia University in Morgantown, West Virginia.

As far as my experience goes, I have two years' experience as a mudlogger, wellsite geologist in the American Rocky Mountains and in several Australian basins, and I have five years' experience as a production geologist in the Permian Basin.

Assignments have included both carbonate and clastic depositional settings in the Delaware Basin of southeastern New Mexico and the Midland Basin of west Texas, and I contributed the geological work on both the original and the follow-up field studies for the Avalon (Delaware) Field, and I'm currently the geologist in charge of all the operational activities for the field.

Q. And since you've obtained your master's degree in 1985, have you been employed by Exxon?

A. Yes, I have.

MR. BRUCE: Mr. Examiner, are the witness's credentials acceptable?

EXAMINER STOGNER: They are.

Q. (By Mr. Bruce) Mr. Maxwell, would you please refer to Exhibit Number 4 and describe the pool

involved in this Application?

A. Exhibit Number 4 is a type log for the Delaware Mountain Group, stratigraphic section. The well log shown is from the Yates "C" Federal Number 13, a well on the Yates "C" Federal Lease located in the northwest quarter of the southwest quarter in Section 31. The scale shown on this log is a hundred feet to the inch.

And this exhibit shows the two formations that Exxon is interested in: The Cherry Canyon Formation and the Brushy Canyon Formation.

Three log curves are shown. On the left in red is the gamma-ray curve, in the middle in blue is the dual lateral log resistivity curve, and on the right in green is the neutron porosity curve.

The Cherry Canyon and Brush Canyon are bounded by the overlying Goat Seep Reef.

EXAMINER STOGNER: I'm sorry, the what?

THE WITNESS: The Goat Seep Reef.

EXAMINER STOGNER: Goat Seep?

THE WITNESS: S-e-e-p.

EXAMINER STOGNER: Okay.

THE WITNESS: It's a dense, impermeable dolomite. And it's underlain by the Bone Spring Formation.

Looking at the upper formation, now, the Cherry Canyon Formation, it occurs at a measured depth of approximately 2500 feet and is approximately 1000 feet thick across the field area, and it's composed of fine-grained quartz sandstones with interbedded shales.

Hydrocarbon production is from the upper portion of the Cherry Canyon, which is shown bounded by a thick blue line and a thinner blue line, and it's annotated out to the right. And this zone is between 200 and 250 feet thick across the field area.

The net porosity greater than 12 percent, which is what we used as a cutoff in this field, is approximately 88 feet on average for that zone.

Looking at the lower formation, the Brushy Canyon, it occurs at a measured depth of approximately 3500 feet and extends down to around 4800 to 4900 feet, giving it an approximate thickness of 1300 to 1400 feet. It's composed of very fine-grained quartz siltstones. It's a much finer-grained formation than the Cherry Canyon, but it does have some sands and interbedded shales as well.

Likewise, hydrocarbon production is from the upper portion of this formation, shown again bounded by a thick blue line and a thinner blue line and annotated out to the right there in the blue text.

This zone is approximately 200 feet thick across the field area and has a net porosity greater than 12 percent of approximately 170 feet.

There are a couple of other productive zones within this section, but they're relatively minor and I'm not going to go into them at this time.

Q. (By Mr. Bruce) Thank you. Would you please move on to Exhibit Number 5 and describe its contents.

A. Exhibit Number 5 is a structural cross-section, showing the Cherry Canyon Formation and the upper portion of the Brushy Canyon Formation. This is a strike section. That is, it's oriented parallel to the shelf margin or perpendicular to a depositional dip. The scale on these four logs shown is the same as on the previous exhibit. It's a hundred feet to the inch.

The location of the cross-section is shown in the index map, in the right-hand corner there, with a red line. It starts at the Yates "C" Federal Number 6, goes through the "C" 7, through the proposed location, through the "C" Number 4 and then out to the Hondo "A" State Number 1.

This cross-section illustrates the stratigraphic discontinuity in the Delaware section. What I've shown highlighted in orange is all that

porosity that's greater than 12 percent that's present within both productive zones: the upper Brushy Canyon and the Upper Cherry Canyon zones. And this porosity has been stratigraphically correlated, consistent with the depositional model that we've used out of this field.

The porosity distribution in the two zones is quite different. In the Brushy Canyon Formation, the lower of the two, the porosity is fairly uniformly distributed, both vertically through the zone as well as horizontally within each separate stratigraphic unit. Whereas up in the Cherry Canyon the porosity tends to be a lot more variable through the zone vertically, and the porosity within the individual stratigraphic units is much more discontinuous laterally across the field. That is, there are pinchouts of these units evident.

This porosity variation between the two zones is related to a difference in depositional origin for these rocks. In the Brushy Canyon, which again is composed of very fine-grained laminated siltstones, we were dealing with a suspension deposition, and with suspension you tend to get very uniform, blanketlike deposition of a unit across a very broad area, and internally you have very homogeneous reservoir

characteristics. Whereas up in the Cherry Canyon Formation, again composed of fine-grain sands, we're dealing there with a system of braided channels. And with this type of deposition, your porosity and permeability is going to be restricted to the channel bodies themselves, with the inner-channel rock faces tending to be much lower in porosity. So that the resulting stratigraphic picture, which is depicted quite nicely on this cross-section is, you'll tend to get stacked and slightly shingled porous lenses or porous stringers, which internally have pretty good continuity but are very limited extent, limited width, laterally. And so on a field-wide scale you actually have quite a bit of discontinuity.

The proposed location is shown between the Yates "C" Federal Number 7 and the Yates "C" Federal Number 4 where lateral discontinuity of at least three separate channels in the Cherry Canyon zone is evident. And we believe that a well in this location will not only give us significant incremental oil due to the increased continuity that we will attain, but it also will be draining oil that cannot be drained by existing wellbores.

Q. Would you please now refer to Exhibits 6 and 7 and describe how they relate to the proposed

location?

A. Exhibits 6 and 7 are a structure map and an average oil saturation map for the upper Cherry Canyon Formation, respectively.

Exhibit Number 6, the structure map, the contours are shown in feet subsea. The contour interval is 25 feet. This map shows with the red dot there the proposed location is situated high on the Cherry Canyon structure, and as structure is a controlling element of production in both these zones we feel that it's in a very favorable location structurally.

On Exhibit Number 7, the average oil saturation map, the units are -- It's contoured in a fraction. The contour interval is .05, and again the red dot shows the proposed location, shows that it's situated within the productive area of the Upper Cherry Canyon Reservoir. It has been empirically determined by well tests that oil saturations must be greater than approximately 50 percent to bring on an economic well, and it is within that area.

Q. Would you please now refer to Exhibits 8 and 9 and discuss them also?

A. Eight and 9 are a structure map and an average oil saturation map for the Upper Brushy Canyon

Formation, respectively. As with the previous two maps -- Or I should say the units in the contour interval are the same as on the two previous maps. And as was the case in the Upper Cherry Canyon zone, these two maps show that the proposed location is in a very favorable location structurally. That's evident on Exhibit Number 8, and it's well within the productive area of the Upper Brushy Canyon Reservoir shown on Exhibit Number 9.

The economic productive cutoff for oil saturation in the Upper Brushy Canyon Formation is approximately 35 percent, somewhat lower than in the Cherry Canyon Formation.

Q. Would you please now move on to Exhibit 10 and discuss its significance?

A. Exhibit Number 10 is a productive limits map. It kind of summarizes the previous four maps. It illustrates the approximate areal economic productive limits of both zones.

Below the title box is a key showing the hachuring that is oriented in a northwest-southeast direction is for the Upper Cherry Canyon Formation productive area, and the hachuring that runs the opposite direction is for the Upper Brushy Canyon Formation, so that the overlap gives you -- the cross-

hatched pattern shows you the overlap of those two zones.

I should point also that there's five wells down to the southwest and towards the west. The five large black dots that are not shown within the productive area are five wells that produce from a Lower Brushy Canyon zone, one of the zones I talked about earlier but did not go into.

This Exhibit shows that essentially the northern half of the section within which we proposed our location would be productive in both zones. It also shows, with the red dot, our proposed location, which is situated in the northeast quarter of that section.

Q. Okay. Let's move on to Exhibit 11.

A. Exhibit 11 is a cumulative oil production map. The units are in thousands of barrels, and the contour interval is 50,000 barrels. And this exhibit shows that the proposed location is located between the four best producers in the field, or in the so-called sweet spot of the field.

Q. Okay, would you please now summarize the reasons Exxon desires to drill a well at your proposed location?

A. We want to drill this well for essentially

three reasons.

The first one is for the incremental oil that we will obtain that's not otherwise producible with existing wellbores.

Secondly, for data acquisition. As was mentioned earlier, we have planned a very aggressive coring, logging and testing program, and we anticipate getting a lot of good geological and engineering data from this well.

And finally, the well would conform to a possible future post-primary recovery project, should we decide to pursue such a project.

As far as the particular location we've chosen, I've shown with the foregoing exhibits, the structure and oil saturation maps and the productive limits map, that the entire north half of Section 31 would be prospective in both zones. We believe that drilling in the northeast quarter, between the four best producers in the field will give us a good producing well.

But secondly, and very importantly from a data-acquisition perspective, we chose this location to allow for more optimal areal core coverage. And I refer you back to the previous exhibit, Number 11. We already have core in Well Number 17, which is located

in the northeast quarter of the northwest quarter, and we have core in Well Number 6, the well directly south of it, and we have core in Well Number 18 which is in the northwest quarter of the southeast quarter.

So we felt like a location up in the northeast quarter there, would be optimizing or spreading out our coverage of core as best as possible.

Q. Were Exhibits 4 through 11 prepared by you or under your direction?

A. Yes, they were.

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

A. Yes, it is.

MR. BRUCE: Mr. Examiner, I move the admission of Exhibits 4 through 11.

EXAMINER STOGNER: Exhibits 4 through 11 will be admitted into evidence.

MR. BRUCE: No further questions at this time.

EXAMINATION

BY EXAMINER STOGNER:

Q. Mr. Maxwell, do you know what the -- if there's a stimulation program for these wells?

A. The wells that have already been drilled?
Q. Yes.
A. Yes, there is.
Q. And what is that type?
A. We generally acidize them with 15 percent HCl and then generally put a foam frac on.
Q. And is this both in the Cherry Canyon and the Brushy Canyon zones?
A. Yes, the completion programs are very similar in the two zones.
Q. Do you propose that this well have the same type of stimulation?
A. Yes, I would.
Q. Even with the stimulation which you just outlined, the four wells that are presently there cannot drain this particular portion of -- or cannot adequately drain the 40 acres?
A. We don't believe that they can. We believe that there's enough discontinuity to warrant an infield well.
Q. Are the 3, 4, 7 and 9 wells -- Are they presently on pump?
A. Yes, they are.
Q. They are? What kind of initial reservoir pressure did we have in these two zones, the Cherry

Canyon and the Brushy Canyon?

A. I really don't recall.

EXAMINER STOGNER: Mr. Duncan, do you know?

MR. DUNCAN: I think Mr. Beuhler probably does.

EXAMINER STOGNER: And he's going to be our next witness?

MR. DUNCAN: Yes, sir.

EXAMINER STOGNER: Okay, then we'll just wait and cover that at that point.

I don't have any other questions of this witness at this time. Maybe later.

So, Mr. Bruce?

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

GILBERT G. BEUHLER,

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

EXAMINATION

BY MR. BRUCE:

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

A. Gilbert G. Beuhler, of Midland, Texas.

Q. And who are you employed by and in what capacity?

A. I'm a senior engineer with Exxon Corporation

in Midland.

Q. And have you previously testified before the Division?

A. No, I haven't.

Q. Would you please summarize your educational and work background?

A. I graduated from the University of Kansas with a degree in petroleum engineering in 1983. I hired on with Exxon that same year.

In 1983 through 1985 I was in Exxon's Field Studies Group in Midland, which is a long-term projects reservoir study group. In that group I did reservoir studies for infield drilling and waterflood implementation projects.

From 1985 through 1986 I was in our operations group in Andrews, Texas. I was a reservoir engineer on the Exxon-operated Fullerton Clearfork Unit.

EXAMINER STOGNER: The which one?

THE WITNESS: The Fullerton Clearfork Unit, just outside of Andrews.

EXAMINER STOGNER: Clearfork?

THE WITNESS: Yes.

EXAMINER STOGNER: Okay.

THE WITNESS: I assisted in the day-to-day

operations of the field and also did analysis and development of a large infield drilling program on that field.

From 1986 through 1989 I was in our acquisitions group in Midland and worked many, many different fields, doing reserve determination and economic analysis of the potential acquisitions.

From 1989 through the present I've been in our Reservoir Technology Group, which is pretty much the Field Studies Group which I started out with, doing reservoir studies once again for infield drilling and waterflood implementation projects.

I have testified on three separate occasions as an expert witness with the Texas Railroad Commission.

Q. (By Mr. Bruce) And are you familiar with the engineering matters involved in Case 9916?

A. Yes, I am.

MR. BRUCE: Mr. Examiner, is the witness considered acceptable?

EXAMINER STOGNER: Mr. Beuhler is so qualified.

Q. (By Mr. Bruce) Mr. Beuhler, would you please refer to Exhibit Number 12 and discuss the incremental recovery Exxon anticipates obtaining from the proposed

well.

A. In Exhibit Number 12, reserve potential from the proposed location is calculated by estimating the amount of net pay contacted at the current well density in order to calculate the additional reservoir that has been contacted by the drilling -- that will be contacted by the drilling at the proposed location.

The X axis, if you note, was the well density in acres. The Y axis is the percent of total reservoir pay contacted at a particular well density. This is also called reservoir continuity and is a measure of the reservoir volume that is contacted by wellbores in the field.

It is usually calculated by estimating net pay in each well and correlating this pay to the next well using cross-sections. The volumetric percentage of pay that is continuous to the next well is the reservoir continuity at that spacing.

At zero-acre spacing -- in other words, with no distance between wellbores -- a hundred percent of the pay is contacted. As the spacing gets larger, less pay is contacted, as shown by the downward-sloping line on this graph.

A description of reservoir continuity and how it applies to primary and secondary recovery, plus the

technique for calculating it from cross-sections, is discussed in SB Papers Number 6198 and Number 6739.

Noted with the vertical arrows is the current well density of 40 acres per well, and the 20-acre proposed location.

The black dots are the percentage pay contacted at zero-acre and 40-acre density. As noted before, the zero-acre density contacted pay is always 100 percent.

The contacted pay at 40-acre density was calculated from cross-sections to be 75 percent. This means that 75 percent of the Avalon (Delaware) Field is being drained on the current density of 40 acres per well.

The shape of the curve becomes important in calculating the additional pay that will be contacted by the drilling at the proposed location. This slightly curved shape was determined by additional points on the curve at larger well densities, which are off this graph, and industry experience in fields on denser well spacing, which indicate continuity tends to follow roughly an exponential curve.

Using this curve, the proposed location spacing of 20 acres would contact 86 percent of the pay. In other words, 11 percent more pay would be

contacted and drained.

The reserves in this additional pay would never be recovered on the current well density.

Because no 20-acre infield sells have been drilled in this field, no actual measurements of contacted pay on 20-acre well density can be made. Therefore some uncertainty exists in the shape of this curve between zero and 40 acres and the interpolation to 20 acres. The bracket at 20-acre density indicates this uncertainty, giving a range from 83 to 89 percent.

Calculation of reserves from this contacted pay is shown in the insert.

The estimated ultimate recovery on current density is 300,000 barrels of oil per 40-acre well. This is the average EUR of the four offset 40's from decline-curve analysis.

As noted before, the contacted pay on this current density is 75 percent. This means the maximum potential recovery from a 40-acre tract would be 400,000 barrels. This assumes that 100 percent of the pay is contacted.

The pay contacted at the proposed location would be 86 percent, and this means the incremental pay contacted would be 11 percent.

The estimated ultimate recovery incrementally

of the proposed location would be 11 percent of the maximum potential: in other words, 44,000 barrels of oil.

As noted before, we have some uncertainty in the shape of this curve, and that uncertainty is noted in the branch from 32,000 barrels of oil to 56,000 barrels of oil.

Q. Thank you. Now, it's been previously mentioned that Exxon desires to drill this well for a potential future secondary recovery program. Would you please refer to Exhibit Number 13 and describe Exxon's thoughts on secondary recovery in this pool.

A. Yes. Exhibit 13 shows a possible implementation plan for a future secondary recovery project that would encompass most of the Avalon (Delaware) Field.

The black and red larger solid dots represent future producing wells that would be part of this project. Including the currently proposed location, 18 future 20-acre infield producers would be drilled to form a secondary pattern.

The present producers would be converted to injection as shown by the injector symbol in the legend. The secondary patterns are delineated with the green line. The infields and conversions would form a

20-acre well spacing five-spot pattern.

Because of the substantial remaining oil in place in the field after primary recovery, we feel that this field offers a significant secondary recovery target, and a future secondary recovery project is very likely.

Twenty-acre infields are a very probable part of this future development because of the thick section, approximately 250 feet of combined net pay, and because of the reservoir discontinuity noted before.

Under secondary recovery this pay discontinuity becomes even more critical, since an individual reservoir stringer needs only one well completed in it to be drained for primary recovery, but both a producer and an injector to be flooded by secondary recovery.

In addition to 20-acre infields being needed to form an effective secondary pattern, the production data from the proposed well, plus other data gathered from the well such as conventional core analysis, special core analysis and selective zone testing, would help to better define the secondary recovery potential and improve the project design.

To optimize secondary recovery from the

field, the project scope would encompass several leases. Therefore, unitization of the Avalon (Delaware) field would be required.

The other major operator in the field, Yates Petroleum, has been contacted about possible unitization, and Exxon plans to begin formal discussions with potential working-interest owners later this year.

Q. Thank you. Were Exhibits 12 and 13 prepared by you or under your direction?

A. Yes, they were.

Q. And in your opinion, is the granting of this Application in the interests of conservation and prevention of waste and the protection of correlative rights?

A. Yes, it is.

MR. BRUCE: Mr. Examiner, I move the admission of Exhibits 12 and 13.

EXAMINER STOGNER: Exhibits 12 and 13 will be admitted into evidence.

EXAMINATION

BY EXAMINER STOGNER:

Q. Mr. Beuhler, on Exhibit Number 12, how are the points establishing the curve? I missed that. How was that established?

A. Okay, the point at zero-acre density is by definition 100 percent. All your wellbores are touching so you would be able to contact 100 percent of your pay.

The 40-acre point, the 75 percent, was calculated from cross-sections done in the field. What you do is determine the net pay zonally -- in other words, go down the well vertically by zone -- in a given well, and then through cross-sections correlate that to the next well and see what percentage of that pay continues to the next well.

This total percentage is your percentage of pay that's continuous, and therefore your reservoir continuity.

Q. Does this line ever reach a plateau or flattens out to a near horizontal? And at what point?

A. It comes very close to that. We have additional points way out, like at approximately section-type densities.

Q. So that would be the maximum when you would take it out, would be a 640?

A. Well, whether it actually flattens out we really don't know. Because it's an exponential decline, it definitely levels out to the greatest extent.

Q. Now, you give a range at that 86 percent of being between 83 and 90.

A. Yes.

Q. Does that also hold true for 40 acres?

A. Well, the range at 83 to 89 is because there's uncertainty in the actual defining of the curvature of the line. The point at 40 acres is an actual point, because we are drilled up on 40, so we can actually calculate that number.

So at 20, it's an estimated point, because we have no 20-acre wells, and at 40 it's an actual point done from cross-sections on 40-acre wells.

Q. Now, the points in which you got to make the curve, was this both from the Cherry Canyon and the Brushy Canyon zones, both? Did you treat them as one, or average, or how did you take into account the two different zones?

A. Actually, I believe they were combined but I'm not sure on that point. One check that we do have on this point --

(Off the record)

THE WITNESS: Okay, sorry. I need to rephrase that, let me correct that. The point at 40 acres was just the Cherry.

One of the -- There's a couple things that

happened here. One, we have a very good check on the 40-acre density point. In this field we happen to have calculated the -- Well, we calculated the original oil in place two different ways: one volumetrically, in other words the total oil in place of the entire field, both zones; and then a material balance original oil in place, once again from production from both zones.

And the -- This material balance original in place was calculated, of course, at the current density of 40 acres. So it only includes 40-acre production from both the Cherry and the Brushy. So it automatically weights the Cherry and Brushy together.

And the -- taking the material balance original in place and dividing by the volumetric original in place should be another great indication of your reservoir continuity on 40-acre spacing, and in this case it is also 75 percent.

So we have a very good check on that cross-section determined 40-acre space continuity.

Q. Now, you've gone on in Exhibit Number 13 and expanded into the future possible waterflood.

A. Yes.

Q. Now, would this water flood both -- there again, the Cherry and the Brushy Canyons?

A. Yes.

Q. Okay. How would you classify this reservoir?

A. In terms of what?

Q. Trapping mechanism, energy?

A. The Brushy Canyon would be a relatively low-energy reservoir. In other words, it's like Mr. Maxwell discussed before. It's a suspension deposit and therefore has more lateral continuity because of this low-energy environment, whereas the Cherry Canyon has these channels of deposits which increase the discontinuity in the Cherry Canyon.

As far as the actual trapping mechanisms and things, I would need to refer you back to Mr. Maxwell.

EXAMINER STOGNER: Mr. Maxwell, what is the trapping mechanism?

MR. MAXWELL: In the Brushy Canyon Reservoir, it's a structural trapping mechanism. And in the Cherry Canyon Reservoir it's kind of a combination structural and stratigraphic, because you have the channel pinching out updip into the base of that impermeable Goat Seep Reef dolomite.

Q. (By Examiner Stogner) Mr. Beuhler, do you have a feel of -- at this point, of how much longer primary production would be in this particular field before waterflood would be initiated?

A. Okay, as far as before waterflood would be

initiated, we currently feel that this is a significant enough of a secondary target to proceed soon. In other words, we are currently looking at unitization at least beginning negotiations later this year, and therefore secondary could possibly happen within the next three or four years.

Q. And this would be a water-injection mechanism, right?

A. Yes.

Q. So this would probably be classified more as a pressure-maintenance project than a waterflood, I would assume, since --

A. Because it would be done before it's depleted, it would be, I guess, classified as pressure maintenance.

EXAMINER STOGNER: Okay. I have no other questions of this witness. Is there anything else, Mr. Bruce?

MR. BRUCE: No, Mr. Examiner, that's all we have in this case.

EXAMINER STOGNER: Okay, does anybody else have anything further in Case Number 9916? If not, this case will be taken under advisement.

(Thereupon, these proceedings were concluded at 2:11 p.m.)

CERTIFICATE OF REPORTER

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

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

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

WITNESS MY HAND AND SEAL April 26, 1990.

STEVEN T. BRENNER
CSR No. 106

My commission expires: October 14, 1990

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 9916, heard by me on 18 April 1990.

, Examiner
Oil Conservation Division