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 CONOCO INC.

CASE NO. 10220

REPORTER'S TRANSCRIPT OF PROCEEDINGS

EXAMINER HEARING

BEFORE: JAMES MORROW, Hearing Examiner

January 24, 1991

Santa Fe, New Mexico

This matter came on for hearing before the Oil Conservation Division on January 24, 1991, at 8:19 a.m. at Oil Conservation Division Conference Room, State Land Office Building, 310 Old Santa Fe Trail, Santa Fe, New Mexico, before Freda Donica, RPR, Certified Court Reporter No. 417, for the State of New Mexico.

FOR: OIL CONSERVATION DIVISION

BY: FREDA DONICA, RPR
Certified Court Reporter
CCR No. 417

(ORIGINAL)

I N D E X

January 24, 1991
Examiner Hearing
CASE NO. 10220

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E X H I B I T S

A P P E A R A N C E S

FOR THE DIVISION: ROBERT G. STOVALL, ESQ.
General Counsel
Oil Conservation Commission
State Land Office Building
310 Old Santa Fe Trail
Santa Fe, New Mexico 87501

FOR THE APPLICANT: KELLAHIN, KELLAHIN & AUBREY
117 N. Guadalupe
Santa Fe, New Mexico
BY: W. THOMAS KELLAHIN

HEARING EXAMINER: Call case 10220.

MR. STOVALL: Application of Conoco Inc. to amend division order number R-6906 by expanding, contracting and redesignating the Conoco-Southland Blinebry Cooperative Waterflood Project, extend the vertical limits and to include additional injection wells into said project, Lea County, New Mexico.

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

HEARING EXAMINER: Will the witnesses stand and be sworn?

(Witnesses sworn.)

HEARING EXAMINER: Go ahead, Tom.

MR. KELLAHIN: We are seeking in this particular case the expansion of a pilot waterflood project that initially determined the feasibility of the Blinebry and Tubb to be flooded for enhanced secondary oil recovery. That project has been successful, and so we're seeking your approval to expand the existing project to include the approval of additional injectors, to modify the vertical limits of the pools affected within the project area and the appropriate nomenclature changes with regards to the affected pools.

The case you have before you dockets many of the

aspects of the presentation. At the time we filed this case, we concurrently filed a request for the creation of a new pool specifically allocated to the boundaries of the project with the corresponding adjustments in adjacent pools. Mr. Stogner, in preparing the advertisement for that case, brought to our attention the need for further amendments to our request and, therefore, we were unable to appear on the docket today with the pool creation case. It is now scheduled for the February 21st docket.

In order to hopefully avoid the necessity of presenting this case twice, with your indulgence, I'll have the engineering witnesses also describe what, in their opinion, is the justification for the pool changes so that in the absence of opposition on the 21st of February we might ask you to incorporate this record for purposes of deciding that subsequent case.

With that explanation, I'd like to introduce to you Mr. Jerry Hoover. Mr. Hoover is an engineer and the regulatory coordinator for his company who will make the first presentation concerning the project.

JERRY HOOVER

the witness herein, having been sworn to testify the truth, the whole truth, and nothing but the truth, testified as follows:

DIRECT EXAMINATION

BY MR. KELLAHIN:

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

A. I'm Jerry Hoover. My position is regulatory coordinator with Conoco in the Midland, Texas, office.

Q. On prior occasions have you testified before the division as a petroleum engineer?

A. Yes, I have.

Q. As part of your experience with Conoco were you involved in any of the exploration and development of the Warren project?

A. Yes, I was.

Q. And currently have you made yourself familiar and knowledgeable concerning the various details and engineering aspects of the application that Conoco seeks to have approved?

A. I have.

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

HEARING EXAMINER: I'll accept him as such.

Q. (By Mr. Kellahin) Mr. Hoover, let me direct your attention, sir, to what has been marked as Exhibit Number 1. Before we talk about the specific details, take a moment and identify the display and help us understand how to read it.

A. Yes. If you'll notice, in the central part of this map there is a bold, dotted black line. This outlines the Warren Unit which Conoco operates. And all of the operations and expansion that we're talking about is within that unit. In the lower part of that unit, the dark blue solid line, outlines the current Blinebry waterflood pilot area. The dashed blue line outlines the proposed expansion of that waterflood.

Below our Warren Unit you'll see the area outlined by the yellow-orange line. That is Shell's northeast Drinkard Unit, which offsets us. Then the red curved line outlines the one-half mile radius of review for this project, the larger aqua, lighter blue line is the two mile radius. If you'll look carefully in Section 34, kind of central -- lower central part of the map, you'll see a small red circle. If you'll look up to your right, up in Section 24, you'll find another red circle. Those are the locations of the only two active fresh water wells which we found in this area.

Q. Before we talk about the project itself and what you're seeking to accomplish, I think it might be useful, Mr. Hoover, if you identified for us what is marked as Exhibit 1-A.

A. Exhibit 1-A is a map of the Warren Unit area, specifically. You'll notice three colored outlines. The

red outline is the current boundary of the Blinebry oil and gas pool in this area. The green outline is the Warren-Tubb gas pool outline, and the pink line outlines our proposed project area for which we'd like to create the new comingled pool.

Q. Using the two displays for illustration purposes, describe for us the type of reservoir involved, and give us a general idea of the plan of operation for an effort to successfully flood the expansion area.

A. Yes. Looking at -- yes, you're looking at 1-A. Let me give you just a very quick synopsis of the development of this area, looking at the 1-A map, the small one.

Section 28 was the original development area. Several original wells were drilled, oh, probably about between 20 and 30 years ago. And they were all -- came in as gas wells. And so development ceased in that area, assuming that this was strictly a gas pool in the Warren-Tubb. And, therefore, the Warren-Tubb gas pool was established. But in the mid-70s, all these wells you see over in Sections 27 and 26 and extending down into 34 were drilled. We discovered that although there was a small gas cap over the Section 28, that the remainder of this area in the Tubb formation was not gas. They were oil wells. We do not have a gas cap over Sections 26, 27 or 34 in the Tubb,

only up in Section 28. That's the way the development began. And even though the Warren-Tubb pool is still called the Warren-Tubb gas pool, by far the majority of these wells are not gas wells.

Q. When we look at the vertical intervals to be included within the flood project, we're dealing with a Blinebry interval, and below that we have a Tubb interval. Would you describe within the original project area what is the relationship between those two formations?

A. Initially, these wells were dualed and produced from the Tubb in Blinebry. But at this point, the field is fairly mature and all but four of the wells in the proposed project area have been down-hole comingled and produced with the Tubb and the Blinebry together.

Q. Compare and contrast your particular project to the Shell operation that's shown on Exhibit Number 1, outlined partially in the orange line. The Examiner may recall that's a statutory unit in which there was a component that dealt with the Blinebry production and additional provisions to deal with the Tubb zone. Summarize for us the differences and the similarities, if any, between the two project areas.

A. The Northeast Drinkard Unit in the Tubb formation is in a different pool. That is, the main Tubb pool bears only the name Tubb Oil and Gas Pool up in the Warren Unit.

There's a break between these pools in the Warren Unit. We have established a much smaller pool called the Warren-Tubb Pool. We did not feel like we've got the same type of pool at all up in the Warren Unit. Down in the Northeast Drinkard Unit, there was a somewhat continuous though perhaps thin gas cap showing up pretty much throughout that area. But up in our Warren Unit, that's not the case. We have the one gas cap over in Section 28; the remainder of the area is strictly oil production.

Q. Let me direct your attention now to Exhibit Number 1-B. Identify and describe that exhibit for us, Mr. Hoover.

A. 1-B is an application for creation of a new pool for the project area which you see outlined in pink on 1-A. You might want to keep 1-A handy; we're going to refer to that since it identifies the areas we'll be discussing. But the pink outlined area is the project area. And this application was to create a Warren Blinebry dash -- pardon me, a Warren Blinebry dash Tubb pool. The first part of this application gives the description, the aerial description, of this new area.

Q. That area will correspond to the boundaries of the pilot project in the expansion area?

A. That is correct.

Q. Vertically then, what was your request in the

pool creation case?

A. Vertically, our request was to include the entire Blinebry and Tubb Pool vertical sections in the new pool.

Q. Do you anticipate having any difficulty with regards to the Tubb zone and the potential for having wells classified as gas wells within the project area and the unitized interval?

A. No, we do not.

Q. If the division creates this new pool for you, how do you propose to handle that in terms of adjustments in the nomenclatures for the various pools?

A. We would suggest that the areas underlying the proposed new pool which are currently in the Blinebry Oil and Gas Pool and which are currently in the Warren-Tubb Gas Pool be deleted from the current pools.

Q. Have you coordinated with the Hobbs office of the Oil Conservation Division in order to determine whether or not the suggested changes and modifications in the pool rules and the acreage dedicated to those pools meets their approval?

A. Yes, we have.

Q. And that is the language contained on the second page of the application, starting on the bottom of page one and continuing to the second page?

A. That's correct.

Q. Do you see any necessity for the Examiner to create any special rules with regards to a gas-oil ratio or a limiting GOR, or any type of allowable restrictions for the new pool?

A. Since this is a secondary project, we do not see the need for an allowable and, therefore, no particular need for a limiting gas-oil ratio.

Q. Sir, let me have you turn your attention now to what is marked as Exhibit Number 2. Identify and describe that for us.

A. Exhibit 2 is a copy of the original order which was issued for our Blinebry Waterflood Project. That was order number R-6906. This was originally established as a cooperative flood between Conoco and Southland Royalty.

Q. Have you taken action, Mr. Hoover, to have any offsetting operators notified with regards to your applications?

A. Yes, we have.

Q. What did you do to compile a list of the offset operators?

A. We prepared on the Exhibit 1 from our land maps a notation of the operators, offset operators, within a half mile radius. Then we searched through oil and gas producing directories that we had, looking for addresses of these parties. And we subsequently then sent them a copy of the

application by certified mail.

Q. Is that information shown on Exhibit 3-A?

A. Yes. Number 3-A is the mailing list for those to whom we sent applications by certified mail. There are two exceptions noted on that list. You'll notice at the bottom of the operators' list Stevens & Tull and Vista Verde, we did not find addresses for.

Q. After preparing the initial mailing, did you discover that there were any additional offsetting operators to whom you desired to give notice?

A. Yes. We discovered that we had inadvertently missed Elk Oil. And we contacted them, faxed them the application, and they have sent us a waiver which you should have received a copy of also.

Q. And that waiver from Elk Oil is identified as 3-C?

A. That is correct.

Q. What is Exhibit 3-B?

A. Exhibit 3-B is a copy of the returned certified mail cards.

Q. Now, how did you handle the preparation of the notices for the surface ownership?

A. We gave them the same notice. They were listed at the bottom of the list on 3-A. They were all given certified mail notice also, and they're included in the

green card copies, 3-B.

Q. To your knowledge, are these the owners of the surface at each of the injector locations that you propose to add to the project?

A. That's correct.

Q. With regards to any of these potential parties, have you received any notice, objection or complaint from any of them?

A. No, we have not.

Q. And, in fact, you've received a substantial number of the waivers?

A. Several, yes.

Q. And those are shown as attachments to Exhibit 3?

A. That's correct.

Q. And it runs from Exhibit 3-C all the way through 3-H?

A. H.

Q. Anything further with regards to your testimony, Mr. Hoover?

A. No, sir, I believe that covers it.

MR. KELLAHIN: At this time, Mr. Examiner, we move the introduction of Exhibits 1 through 3.

HEARING EXAMINER: Exhibits 1 through 3 are accepted into evidence.

MR. KELLAHIN: That concludes my examination of Mr.

Hoover. I've got another witness. If you don't have any questions for Mr. Hoover, I'll call the next witness.

HEARING EXAMINER: What information do you have on the fresh water wells?

THE WITNESS: We have specific information that we received from the state engineer's office in Roswell. The next witness will present you with some exhibits on that.

HEARING EXAMINER: All right. The well in the southwest corner of Section 26 looks like it's identified as a gas well. What about that well?

THE WITNESS: Southwest corner?

MR. KELLAHIN: 27, I think it is.

HEARING EXAMINER: 27.

MR. KELLAHIN: It's well number 26.

THE WITNESS: That well is a gas well in the Blinebry --

MR. McCAFFERTY: It was a triple Blinebry Tubb Drinkard.

THE WITNESS: We do not plan any injection into that well.

HEARING EXAMINER: Is it open to production now?

MR. KELLAHIN: If it's all right with the Examiner, I'll have Mr. McCafferty testify with regards to the specifics of the individual wells.

HEARING EXAMINER: What more do you plan to present on

the nomenclature request on February the 21st?

THE WITNESS: I believe that all of it is included in this application, unless you have further questions about it.

HEARING EXAMINER: I believe, Tom, you indicated that you did. What did you say about the --

MR. KELLAHIN: After the conclusion of the presentation today, Mr. Examiner, with these two witnesses, we believe we will have sufficiently given you substantial evidence not only on this application but on the application for February 21st so that when that hearing examiner has that case to deal with, he can look at this record and these exhibits and make the necessary changes in nomenclature. The technical justification for the change will be presented by Mr. McCafferty.

HEARING EXAMINER: All right. The Blinebry Pool, it -- I guess the question I have: Does it include all that you plan to expand into and more to the south? Is that the Blinebry?

THE WITNESS: Yes. This is only the small upper end of it. It includes all except up in Section 22, the south half of the southwest quarter, is not currently in the Blinebry.

HEARING EXAMINER: And there's no completions there at this time?

THE WITNESS: Not at this point.

HEARING EXAMINER: So the Blinebry, that's where your flood has been to date; is that correct?

THE WITNESS: That's correct.

HEARING EXAMINER: And what you're proposing to do today is include some Tubb in that waterflood.

THE WITNESS: That's correct.

HEARING EXAMINER: As well as to expand the area.

THE WITNESS: The next witness will show you some detailed information on that.

HEARING EXAMINER: Has there been any injection into the Tubb at this point?

THE WITNESS: Not to this point.

HEARING EXAMINER: There has been -- I believe you indicated there are some Tubb completions that are open to production.

THE WITNESS: Yes.

HEARING EXAMINER: On the -- what did you say about the limiting GOR? I believe you said there was no need for a limiting GOR.

THE WITNESS: Since it was a secondary recovery project, we don't anticipate a specific oil allowable. Our assumption is that we would not need a limiting GOR. There would be nothing to apply it to.

HEARING EXAMINER: You indicated leaving it at 2,001 or just leave it off?

THE WITNESS: I would just leave it off. You can't create a volume because you don't have an oil allowable to apply it to.

HEARING EXAMINER: That's all the questions I have.

MR. STOVALL: No questions.

JOHN McCAFFERTY

the witness herein, having been sworn to testify the truth, the whole truth, and nothing but the truth, testified as follows:

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q. Would you please state your name and occupation?

A. My name is John McCafferty. I'm a senior production engineer with Conoco in the Midland division.

Q. Mr. McCafferty, on prior occasions have you testified before the division?

A. No, I have not.

Q. Would you take a moment and summarize your educational background for the Examiner?

A. I've got a mechanical engineering degree from Cal State Northridge, and I received my degree in 1985. I've been with Conoco for 18 years.

Q. Summarize your employment experience with Conoco. What have you done?

A. I began my employment with Conoco as a

roustabout, and within two years I became an engineering technician. And during the period while I worked on my degree, I worked in the engineering office monitoring waterfloods and other production operations. Within the last five years I've been involved with waterflooding.

Q. Have you familiarized yourself of the North Blinebry Waterflood Project, this Warren Unit?

A. Yes, I have.

Q. Are you knowledgeable about the Tubb and the Blinebry formations in this specific area?

A. Yes, I am.

MR. KELLAHIN: We tender Mr. McCafferty as an expert engineering witness.

HEARING EXAMINER: He has been so qualified.

Q. (By Mr. Kellahin) Let me have you start your presentation, Mr. McCafferty, by referring to Exhibit Number 4. Identify the display for us.

A. Exhibit Number 4 is a Blinebry marker structure map. Contour intervals are on 25 foot. The area highlighted in red is Conoco's Warren Unit. The areas highlighted in yellow are the proposed waterflood expansion area.

Q. It might be helpful to look at Exhibit Number 4 in relation to Exhibit Number 1. I'll put one in front of you, Mr. McCafferty, Exhibit Number 1. What's the purpose

for you as an engineer to examine and understand the Blinebry structure in this particular area?

A. Okay. From a waterflooding standpoint, the Blinebry structure, the pilot area was located in Sections 33 and 34. And the expansion area will be located on a similar area of the structure in Sections 26 and 27. To the northwest in Section 28, as Jerry Hoover pointed out, was the gas cap area for the Blinebry and Tubb, Blinebry Zones 1, 2 and 3, and the Tubb zone. So we are skirting that gas cap area with our waterflooding.

Q. Do you see a structural justification or an explanation to the fact that you're not anticipating gas wells in the Blinebry within the project area?

A. The production to date has not -- as a mature, primary production, we have not seen a significant amount of gas wells or gas production in these sections.

Q. With regards to the Blinebry production then, have you satisfied yourself as an engineer that you're not going to have a gas component to the Blinebry that's going the create some complexity to the flood?

A. No.

Q. Describe for us the gas wells that, in fact, are shown on 27. I believe there are two of them identified -- three of them identified in Section 27 by gas well symbols. Describe to us why, in your opinion, those are not a problem

for your waterflood in the Blinebry.

A. The gas production from those wells has depleted to the point that they're approximately 100 MCF, without looking at specific production data; but they're down in a low range where we feel that it's mature enough and depleted enough to where it will not affect our flood.

HEARING EXAMINER: That's the wells in Section 28?

MR. KELLAHIN: 27.

THE WITNESS: 26 and 27. In Section 28 we -- those are still gas production.

Q. (By Mr. Kellahin) But they'll be excluded from the --

A. Yes, they are excluded from the flood area.

Q. So when we complete the expansion, we're looking at that area shaded in yellow on Exhibit Number 4.

A. Correct.

Q. And the structural position then within the unit area is such that you do not anticipate having gas wells in primary producing status in Section 34 or Section 33?

A. That is correct.

Q. Let's turn to what you have analyzed with regards to the Tubb structure. Now, the Tubb will be below the Blinebry, will it not?

A. That is correct.

Q. What's the approximate vertical difference

between the two?

A. The pipe log -- there is a pipe log that is attached as Exhibit Number 25. And if you'll refer to Exhibit Number 25, the top of the Blinebry is located at a subsea depth of minus 2307. The Blinebry marker is at 5940. The top of the Tubb is located at a subsea depth of minus 2879, and the bottom of the Tubb would be the top of the Drinkard at minus 3183. We will be waterflooding the interval from the top of the Blinebry at minus 2307 to the top of the Drinkard, which would be minus 3183.

Q. Describe for us the significance then of the Tubb structure in determining the feasibility of the waterflood insofar as it would affect the Tubb formation.

A. Okay. The Tubb structure is Exhibit Number 4, and it's basically a reflection of the Blinebry structure. The current production, the Exhibit Number 4, again highlights the Warren Unit in red and highlights the proposed waterflood expansion area in yellow.

Q. We're comparing 4 to Exhibit 5. You're discussing on Exhibit 5 then the Tubb structure?

A. Correct.

Q. Okay. Make your comparison for us with regard to the significance of the Tubb.

A. The Tubb development, as Jerry pointed out -- Jerry Hoover pointed out -- began in Section 28, and then

approximately ten years later, in the mid-'70s, we began developing Sections 26 and 27 and a few wells into 33 and 34. Conoco did not develop further into Sections 33 and 34 because of some testing that they had done in those section line wells that indicated the Tubb may not be commercial down in those sections. So we limited our Tubb development to Sections 26 and 27, primarily. We do plan on testing on this project further Tubb potential in Sections 33 and 34.

Q. While you're on that point, describe for the Examiner the operational practice that you'll utilize in those areas where you're going to penetrate the Tubb with the well and it's not previously been penetrated.

A. Okay. The new wells that we will drill in Sections 33 and 34 to explore and possibly develop the Tubb in those two sections, the Tubb zone will be tested independently. We'll obtain bottom hole pressure data and reservoir fluid quality and determine whether or not they are compatible for down hole comingling and flooding with the Blinebry.

The two zones in Sections 26 and 27, the Blinebry and Tubb zones in those sections have been down hole comingled for approximately five years now. The reservoir quality of the two zones, the porosity, both zones run about eight percent, and the permeability runs between four-and-a-half to five millidarcies. So the zones are very

similar -- they're both dolomite -- and we feel that the waterflooding of those two zones, they would be very compatible for waterflooding.

Q. If the Examiner desires a visual reference with regards to which wells penetrated both the Blinebry and Tubb, can he do that by making a comparison between Exhibits 4 and 5 and looking at which wells extend into the Tubb and which, in fact, stop at the Blinebry?

A. That is correct. And also Exhibit 6 will be cross-section A-A prime, which will be a typical cross-section through the pilot area and the expansion area.

Q. And you've shown the line of cross-section on both Exhibits 4 and 5?

A. That is correct.

Q. Why did you pick that particular orientation for the cross-section?

A. That particular orientation was selected to intersect the existing pilot as well as the proposed expansion area.

Q. In your opinion, does that give you a typical example of the characteristics for both the Tubb and the Blinebry?

A. Yes, it does.

Q. Let's turn to that cross-section and have you describe that for us.

A. Exhibit 6 is a cross-section from the southwest to the northeast. The wells, Warren Unit 16, 17 and 20, show the existing flood depth into the Blinebry. That's an existing pilot area. 34, 31, 42, 54 and 53 extend up through the expansion area.

Q. What's the significance of the different shadings of the zones?

A. Conoco identifies different layers in the Blinebry zone as porosity streaks that we have found to be commercial. We label them Blinebry 1 through 5. The Tubb zone is not shaded on this cross-section.

Q. So on the cross-section where we see on the right-hand margin of each log the reference "Tubb Marker," that represents the top of the Tubb?

A. That is correct.

Q. And you found the Tubb present in those wells shown on the cross-section starting with well 34, moving on to the right of the display?

A. That is correct. The wells in the pilot area, again, we have not penetrated the Tubb in those sections, in the lower part of those sections.

Q. Contrast this project for Conoco, Mr. McCafferty, to what has been the Shell operation to the south. They're dealing also with a Blinebry and a Tubb. How are they dissimilar?

A. Well, the Shell properties to the south, they're waterflooding actually three zones, the Blinebry, Tubb and Drinkard. And we plan on isolating our flood to the Blinebry and Tubb only. We also plan on using control measures to isolate injection into the Tubb and the Blinebry separately.

Q. Do you see any need for concern with regards to any gas cap forming in either the Tubb or the Blinebry in your project area?

A. No, I don't see that.

Q. Shell, for a number of years, had specific detailed rules that dealt with their gas wells being produced within the unitized interval in Shell's operation, did they not?

A. Yes, they did.

Q. You don't see that problem being an issue in your project area, do you?

A. No, not from the experience we've had with the primary production on these wells. Again, we feel the gas cap is off to the west in Section 28 on a structure high, and we feel that the primary production has indicated that we're to the point where we should not have a problem with gas production.

Q. Let's turn now to Exhibit Number 7. Identify and describe that display for us.

A. Okay. Exhibit Number 7 again outlines the Warren Unit in black bold dots, dashes. The existing pilot area, the north Blinebry waterflood pilot, is in the solid blue in Sections 33 and 34. The expansion, or proposed expansion, area is in the dotted blue lines. The existing -- or the proposed waterflood patterns would be in the dashed red lines. The proposed injection conversion wells would be the dashed triangles, and the existing waterflood patterns would be in the solid red lines.

Q. Identify for us on Exhibit Number 7 those producing wells in the pilot area that you utilized in making your engineering analysis on the success of the pilot project area.

A. Okay. As can be seen from the blue line around the existing pilot area, the wells on the peripheral of the pilot were not really exposed to water injection. We have several wells, 93, 91, 84, 21, 34, that are on the peripheral that did not have the benefit of water injection. The analysis for the waterflood were done on the full pattern wells, which were 12, 15 and 18, and then the three-quarter pattern wells, which were 19, 38 and 76.

Q. Let's turn now to Exhibit Number 8, Mr. McCafferty, and describe for us your conclusions with regards to your study of the performance of the pilot project area.

A. Okay. Exhibit Number 8 is a summary through August of 1990. It's a tabular presentation on the performance of the waterflood. And the reserves in the bottom right-hand section of that table, the reserves for the original oil in place, we estimated to be about six million barrels. Primary production to the flood start was 15.5 percent. The current primary and secondary recovery to date or through August of 1990 was 18.45 percent. And our EUR, estimated ultimate recovery, we predict to be 25 percent, based on a decline analysis.

Q. Separate out for us what percentage is directly attributable to the secondary recovery by waterflooding.

A. The secondary reserves recovery through this project to date are 169 MBO, or 2.8 percent.

Q. How does that compare, in your opinion, to the flooding of similar type formations in other areas?

A. I believe that this is a commercial waterflood application. I believe that these are reasonable reserves to recover from a waterflood.

Q. Based upon those conclusions and the analysis of the success of the pilot project, have you recommended to your company and to this Examiner the expansion of the project area?

A. Yes, we have.

Q. Let me have you turn to Exhibit Number 9.

Identify that display for us?

A. Exhibit Number 9 is a summary of the pilot area performance. And this exhibit illustrates each one of the producers in the pilot area, the identified pilot area. If you'll note, as I've stated earlier, the peripheral wells, 21, 34, 84, 91 and 93, all have not shown response to the waterflood. The different color-coded bars, the red bar indicates the years to first response. And, again, there was no response in those five wells just mentioned.

Q. And the absence of response is directly attributable to what fact?

A. Waterflood injection.

Q. The absence of effective waterflood patterns surrounding those wells?

A. Exactly.

Q. For those wells that were subject to effective waterflood and had adequate patterns around them, what response did you see?

A. We saw an average of two years deferred response.

Q. In terms of the increase or magnitude of increase between the initial response and the peak response, you see an increase of what?

A. The green bar indicates the peak production versus the initial production at flood start for the waterflood bump. The green bar, the average for the wells

that responded was 4.66 years.

Q. Have you analyzed the success of the pilot project in any other ways, Mr. McCafferty?

A. Basically, we've gone through a fairly detailed study of it, and these are the summaries of that study.

Q. Let's turn to Exhibit Number 10 and have you describe for us your analysis of the success of the project with regards to a decline display, if you will.

A. Okay. Exhibit Number 10 is the waterflood production from the decline analysis from the six responding wells. The primary decline was established to be 9.33 percent. We had infill drilling in the mid-'70s. And the waterflood began in January of 1983, the waterflood pilot.

By extrapolating the primary decline from that point, we were able to establish the remaining primary reserves for the flood area. The flood response, again, approximately two years to first response, four years to the peak. And as you'll notice from this decline curve, this pilot area still has not achieved its waterflood peak. It's still on a slight incline. And for the reserve extrapolations we used a 20 percent decline, which is typical for waterflooding in this area.

Q. Based upon the extrapolation on a 20 percent decline, have you forecasted the recoveries for a secondary waterflood project in the expansion area?

A. Yes, we have.

Q. How is that displayed? Is that Exhibit Number 11?

A. Yeah. Exhibit 11 shows three curves. The lower curve, the black curve with the stars, is assuming a base case if we let the existing waterflood pilot go until the year 2000 when it becomes uneconomic, and also the existing production in Sections 26 and 27 go until their economic limit. And the total reserves for that would be the -- the economic limit would be reached in 2010.

The blue curve on that line with the squares indicates some remedial work that we plan on performing on our producing wells. And we'd pick up an incremental primary production from that, the cleanout and stimulation work. However, the cost of the cleanup and stimulation would not be economic without the secondary reserves to help support the costs.

The green curve with the diamonds indicates the waterflood response in the total expanding project. And we modeled it after the existing pilot. We used two years to first response, four years to peak. Then we held the production flat for four years and assumed a 20 percent decline beyond that point. We felt that was a conservative estimate, based on the actual performance of the pilot to date.

Q. Based upon your engineering studies, have you prepared a summary of the reserves for the pilot as well as the anticipated recoverable reserves for the expansion area?

A. Yes, we have.

Q. That's Exhibit 12?

A. That would be Exhibit 12. And Exhibit 12 tabulates the reserves. The column to the left is a base case. It gives the reserves for the pilot area and the expansion area. The second column is if we implement and upgrade and expand, and implementing the waterflood upgrading and expanding the project. It gives the total reserves that we would achieve if we were to complete the project.

The last column to the right is the incremental reserves for the project. The lower two tables on this page are a breakdown of those incremental reserves. On the left side is the allocation of the incremental reserves for the pilot area, and the right side would be for the expansion area. We show some drilling wells, stimulations and conversions.

Q. If the Examiner desires to have your estimated reserves directly attributable to the success of the waterflood operation in both the pilot project area and the expansion area, what numbers would he add together in order to give him that volume?

see exhibit 12

A. The 170 for drilling one injector, 170 MBO, in the pilot area; 140 MBO by converting number 84 to injection, and the 1,349 MBO for the three new injection wells.

Q. Giving you a total volume of what for secondary reserve recovery?

A. 1,659 MBO.

Q. Let me direct your attention now, Mr. McCafferty, to the details of the division form C-108 and the aspects with regards to compliance with the underground injection control regulations of the division. Have you familiarized yourself with that information, and are you knowledgeable about the requirements of the C-108 filings?

A. Yes, I am.

Q. Without going through all the details of that submittal, Mr. McCafferty, let me direct your attention to the package of documents starting with Exhibit 13-A and continuing on through Exhibit 23. Are those the filings attributable to the C-108 application?

A. Yes, they are.

Q. Let me ask you some summary questions then. Have you, within the half-mile radius of each injector well, which is the cloud-shaped area shown within the red outline on Exhibit Number 1, within that area have you made a careful and thorough analysis of the wellbore information

for all wells that have penetrated to or through either the Blinebry or the Tubb?

A. Yes, I have.

Q. In that analysis, did you come across any plugged and abandoned wells?

A. Yes.

Q. In your opinion, as an engineer, did you find the details of that plugged and abandoned well to satisfy you that it was properly plugged and abandoned so that injection fluids in either the Blinebry or the Tubb would be isolated and not use that wellbore as a means to migrate into other zones?

A. Yes, I have.

Q. What is your conclusion?

A. I believe that it is properly abandoned and that isolation has been achieved.

Q. With regards to the producing wells in compliance with the C-108, have you either tabulated or in a schematic form supplied all the details available to you or in the public records with regards to those wells?

A. Yes.

Q. Have you analyzed that information to satisfy yourself that you have no problem-producing wells?

A. That is correct.

Q. Can you conclude as an engineer that there are no

producing wells in which you have casting exposed to either flood formations?

A. Yes.

Q. What is your conclusion?

A. That the wells, the cement tops, are above the injection intervals.

Q. Have you also analyzed as an engineer the potential deepest zone that produces fresh water in this area?

A. Yes, we have.

Q. Show us on the displays where the Examiner may find the information about the fresh water details.

A. The fresh water wells on Exhibit 18, 19 -- let's see. I'm sorry, it starts -- strike that. Exhibit 21 is where the fresh water well data starts. And this is a tabulation of the fresh water wells that we'd received from the state engineer in Roswell. We were only able to locate two of these wells, and the water analysis from two of these wells are attached, are Exhibits 22 and 23.

Q. Did you have Conoco personnel or employees or consultants subject to Conoco's control actually inspect the surface looking for fresh water wells?

A. Yes, we did.

Q. To the best of your knowledge, all the known fresh water wells are shown on Exhibit Number 21?

A. Yes.

Q. Have you satisfied yourselves that all the producing wells or the plugged and abandoned wells have surface casing strains that are cemented from the surface down to a depth sufficiently low enough to cover any potential fresh water sands?

A. Yes, I have.

Q. You're satisfied that they do so?

A. Yes.

Q. Do you see any compatibility problems with water to be utilized for injection into the waterflood project?

A. No, I don't. We have had compatibility tests run, and they are Exhibits 18, 19 and 20.

Q. What is to be the source of the water to be injected into the waterflood?

A. It's the -- the current water that's being injected into the north Blinebry waterflood pilot is the city of Hobbs sewage effluent that we increase the salinity through a salt mining well and then filter the water and inject it.

Q. And you have not experienced any kind of incompatibility problems or operational difficulties in the pilot project utilizing those injection waters?

A. No, we have not.

Q. Describe for us the approximate volumes and

ranges with regards to the injection rates used for these wells.

A. The rates that we plan on injecting, approximately on the average, 12,500 barrels of water per day, or 500 barrels of water per day per well.

Q. Utilizing those injection rates in the pilot project, did you see any problems with the division guideline concerning surface pressure limitations?

A. We initially were able to get water away. A step rate testing would be performed to determine the maximum allowable surface pressure. We would default to the .2 PSI per foot rule.

Q. So in the absence of filing the step rate justifications to increase your injection pressures, you would propose the Examiner provide you a provision that would allow you to inject up to a pressure that corresponds to .2 PSI per foot of depth to the top perforation in the flood?

A. That's correct.

Q. Will you monitor the annular space on your injection wells so that you will know what the pressure is in that space?

A. Yes, we will.

Q. How will you handle the operational details to insure yourself that you have an effective flood of water

into those formations and you're not simply cycling water within the near wellbore space of the injector?

A. We initially will run injection profiles, and we will follow those up with periodic injection profiles to monitor our injection, as well as monitoring our water injection rates and pressures.

Q. Based upon your experience with the pilot project, Mr. McCafferty, do you see any potential violation of the correlative rights of any of the offsetting interest owners?

A. No, I don't.

Q. Do you see any opportunity for the waste of hydrocarbons or other resources with the approval of this application?

A. No, I don't.

Q. Can you conclude then, based upon your studies, that the approval of this application will be in the best interests of conservation?

A. Yes.

MR. KELLAHIN: At this time, Mr. Examiner, we move the introduction of Mr. McCafferty's exhibits. I believe he started with Exhibit Number 4, and it continues on through the type log, Exhibit Number 25.

HEARING EXAMINER: Did you talk about 24?

MR. KELLAHIN: We did not talk about the specific

details of 24. Let me have Mr. McCafferty identify that for the record.

Q. (By Mr. Kellahin) Identify the package of displays shown as Exhibit 24.

A. Exhibit 24-A through Exhibit 24-N are the log sections from the wells that Conoco plans to convert to injection wells.

HEARING EXAMINER: All right. Let's see, what -- Exhibit 25, where did it start?

MR. KELLAHIN: Four through 25, Mr. Examiner.

HEARING EXAMINER: Exhibits 4 through 25 then are accepted into evidence.

MR. KELLAHIN: That concludes my examination of Mr. McCafferty. We submit him for questionings by the division.

HEARING EXAMINER: Mr. McCafferty, when was the Warren Unit formed?

THE WITNESS: The year that it was formed?

HEARING EXAMINER: Yes.

THE WITNESS: 1982, February 15th, 1982.

MR. KELLAHIN: That's the approval date of the division order that approved the waterflood project.

HEARING EXAMINER: All right. What is the current producing GOR in the area?

THE WITNESS: The down hole comingled -- the current

producing GOR is around 10,000.

HEARING EXAMINER: What now? The comingled -- you said the comingled production?

THE WITNESS: Yeah, the down hole comingled.

HEARING EXAMINER: In the others where only the Blinebry is open, what is it, the average producing GOR there?

THE WITNESS: It has declined to about 8,000 current GOR. Through the flood start, it was running about 11,000, and it's been on a decline since that point to about 8,000 to date, with repressuring.

HEARING EXAMINER: In Shell's project to the south, are the three zones that they're flooding there, are they comingled or open together?

THE WITNESS: It's my understanding they are. I'm not an expert on that flood. It's my understanding that they have the three zones and they are produced comingled.

HEARING EXAMINER: You mentioned testing the Tubb separately in new wells to be drilled. Do you plan to drill new wells or deepen existing wells or both?

THE WITNESS: Initially we plan on drilling a new producer into the Tubb -- Blinebry and Tubb in Section 35. That will be the first well that we'll drill on this project to test and evaluate the Tubb in that part of the section. And if it shows to be commercial, we will either dual that

producer or do the proper testing to apply for down hole comingling.

HEARING EXAMINER: Do what now?

THE WITNESS: We test the reservoir pressure and the compatibilities of fluid. I don't perceive the compatibilities of fluid to be a problem. They haven't been a problem in the other Tugg-Blinebry down hole comingled wells, but we would test the bottom hole pressure to insure the Tubb -- being that this section is basically undeveloped on Conoco acreage, these two sections, we don't know the reservoir pressure, and so we would be concerned with having a depleted Blinebry or the partially repressured Blinebry in a flood area being comingled with a higher pressured Tubb zone.

HEARING EXAMINER: Your applications would involve a nomenclature description and a field area that would include both the Blinebry and the Tubb, as I understood your request.

THE WITNESS: Correct.

HEARING EXAMINER: So did you indicate you'd need a further application then to down hole comingle those two? I wouldn't think you would.

THE WITNESS: From a prudent operator standpoint -- maybe I was speaking assuming we didn't have the approval -- but from a pursuant operator standpoint, we would not

automatically comingle two zones where the pressures are significantly different.

HEARING EXAMINER: On Exhibit 8, were the numbers there for the pilot only? I think they were.

THE WITNESS: This was for the waterflood pilot only, that's correct. And it includes the flooded area, the 400 acres, the six wells that were in the 400 acres that responded, as opposed to the peripheral wells. We did not include them in this table in our waterflood analysis.

HEARING EXAMINER: On Exhibit 9 there was -- the green bar indicated, I believe, a rate of production that I didn't fully understand how you're supposed to read that exhibit.

THE WITNESS: The green bar on Exhibit 9 shows the peak production versus the initial production at flood start. An example would be if the waterflood were producing 100 barrels a day at flood start, within four years it would reach its peak, and its peak production would be four times that initial, or 400. And that would be the waterflood bump.

HEARING EXAMINER: So there's no way from that exhibit to get an actual rate. It's just a --

THE WITNESS: No, this is just to show the order of magnitude by well that the -- they responded to the waterflood injection.

HEARING EXAMINER: So the green bar is just the peak

rate over the initial rate; is that right?

THE WITNESS: At flood start, that's correct.

HEARING EXAMINER: On Exhibit 12 you gave an explanation there that I didn't follow completely. Let me see if I can remember what my question was. You talked about if I wanted to determine the maximum increase in reserves or the total increase in reserves, I need to add some numbers together. That was in response to a question from Mr. Kellahin.

THE WITNESS: The secondary reserves; they're tabulated below, but they are not totaled. The allocation of incremental reserves are the bottom two tables. For example, a drill one producer, number 101 in the pilot area, we're estimating 70 MBO and 210 unit cubic feet of gas. And that would be primary production. We have each one of those tabulated whether they're primary or whether they're secondary. And if you add up the secondary production, that would be the secondary reserves for this project.

HEARING EXAMINER: So what's subtotalled down at the bottom, that's --

THE WITNESS: The subtotals at the bottom on the left column is for the pilot area only. We've broken this project into the pilot area and in the expansion into the Blinebry-Tubb area and Sections 26 and 27.

HEARING EXAMINER: But the subtotals are -- is that the

addition of all that you've got listed above it?

THE WITNESS: Yeah, the primary and the secondary.

HEARING EXAMINER: What you were saying there, if I wanted to separate out primary and secondary, you could do that by just adding up what's identified as primary and secondary?

THE WITNESS: That's correct.

HEARING EXAMINER: We didn't go through all -- I believe it was Exhibit 18 with alphabetic subscripts. Were details included there for all the plugged and abandoned wells in the area?

THE WITNESS: Yes. There was only one plugged and abandoned well within the area within the half-mile radius.

HEARING EXAMINER: And you did have --

THE WITNESS: The schematic is in the exhibit.

HEARING EXAMINER: The witness can be excused.

MR. KELLAHIN: Mr. Examiner, if you desire to make specific reference to how the division has handled the Shell project, I can give you the reference to the order numbers. They will be order number R-8539, 8541. Each one of those has an amendment. In September of last year the division entered order 8539-A and 8541-B, and those combined together will give you the regulatory approvals that have been applied by the division to the Shell project.

HEARING EXAMINER: Summarize those for me, if you

would.

MR. KELLAHIN: Essentially, they start out with a complex set of rules and regulations for the Shell operation in which they specifically dealt with the gas component in the Shell project in the Tubb. Shell originally believed and had evidence that they had primary gas production in the Tubb, as well as gas cap forming in the Blinebry. Back in August of last year they presented a detailed reservoir analysis updating that project in which they had redescribed the reservoir, concluded that there was not a material problem with regards to a gas cap in the Shell project, and that the Tubb zone had been 95 percent depleted of gas, and that the gas did not present a problem with regards to the ability to flood each zone.

The division accepted that explanation and approved then the modification of the Shell rules, in effect deleting the gas-oil ratios, deleting the classification of gas wells and allowed Shell to operate the entire property within the same corresponding vertical interval we're seeking to flood. The difference between our project and theirs is that we have never seen a gas problem within the project area and think we can successfully flood both the Blinebry and the Tubb with not having a gas cap formed within our project area.

HEARING EXAMINER: Anything else?

MR. KELLAHIN: That's all we have, Mr. Examiner.

HEARING EXAMINER: Case number 10220 will be taken under advisement.

(The foregoing hearing was adjourned at the approximate hour of 9:00 a.m.)

STATE OF NEW MEXICO)
:
COUNTY OF SANTA FE)

I, FREDA DONICA, RPR, a Certified Court Reporter, DO HEREBY CERTIFY that I stenographically reported these proceedings before the Oil Conservation Division; and that the foregoing is a true, complete and accurate transcript of the proceedings of said hearing as appears from my stenographic notes so taken and transcribed under my personal supervision.

I FURTHER CERTIFY that I am not related to nor employed by any of the parties hereto, and have no interest in the outcome hereof.

DATED at Santa Fe, New Mexico, this 19th day of February, 1991.

Freda Donica
Certified Court Reporter
CCR No. 417

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 10220, ~~heard~~ by me on Jan 24 1991.

Examiner
Oil Conservation Division