STATE OF NEW MEXICO
ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT
OIL CONSERVATION DIVISION
STATE LAND OFFICE BLDG.
SANTA FE, NEW MEXICO

24 September 1987

EXAMINER HEARING

IN THE MATTER OF:

Application of Shell Western E&P, Inc., for pool creation, special pool rules, and contraction of Blinebry, Tubb, and Drinkard Pools, Lea County, New Mexico,	CASE 9230
and	
For statutory unitization, Lea County, New Mexico,	CASE 9231
and	
For a waterflood project, Lea County, New Mexico.	CASE 9232

BEFORE: David R. Catanach, Examiner

TRANSCRIPT OF HEARING

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E X H I B I T S

EXHIBITS CONT'D

MR. CATANACH: We'll call this hearing back to order this morning on Docket No. 28-87, and we'll call first case this morning, 9230.

MR. TAYLOR: The application of Shell Western E & P, Inc., for pool creation, special pool rules, and contraction of Blinebry, Tubb, and Drinkard Pools, Lea County, New Mexico.

MR. CATANACH: Are there appearances in this case?

MR. PEARCE: May it please the Examiner, I am W. Perry Pearce of the Santa Fe law firm of Montgomery & Andrews. I appear in this matter on behalf of Shell Western E & P, Inc., and I have three witnesses who will need to be sworn.

MR. CATANACH: Okay, are there any other appearances?

MR. KELLAHIN: Mr. Examiner, I'm Tom Kellahin of Santa Fe, New Mexico, appearing on behalf of J. R. Cone.

MR. CARR: May it please the Examiner, my name is William F. Carr, with the law firm Campbell & Black, of Santa Fe. We represent Kaiser Francis Oil Company.

We do not intend to call a witness.

MR. PEARCE: At this time, Mr. Examiner, for efficiency and shortening the record to the extent we can, I would ask that Cases 9231 and 9232 be consolidated with this case because there is a great deal of overlap in the evidence in these three cases.

MR. CATANACH: Okay, at this time we'll call Case 9231.

MR. TAYLOR: The application of Shell Western E & P, Inc., for statutory unitization, Lea County, New Mexico.

MR. CATANACH: And we'll call Case 9232.

MR. TAYLOR: The application of Shell Western E & P, Inc., for a waterflood project, Lea County, New Mexico.

MR. CARR: May it please the Examiner, I would request that the record reflect the entry of our appearance for Kaiser Francis in each of the additional cases.

MR. CATANACH: Thank you, Mr. Carr.

MR. KELLAHIN: And likewise for me, too, Mr. Examiner.

MR. CATANACH: Thank you, Mr.

Kellahin.

Will the witnesses please stand and be sworn in?

(Witnesses sworn.)

MR. PEARCE: Mr. Examiner, before we begin, if I may take just a couple of moments and summarize what we're seeking today and how we intend to proceed, hopefully that will clarify what we're about.

In this matter Shell Western E & P, Inc. seeks the culmination of a three-year effort to unitize and waterflood portions of the Blinebry, Tubb, and Drinkard Pools to greatly enhance recovery of hydrocarbons.

The proposed unit area, which is one of the cases under consideration, is slightly under 5000 acres, contains 31 separate tracts with 41 separate working interest owners.

After study of this project by a technical committee of working interest owners, we believe it is reasonable to expect some 15-million barrels of incremental recovery to result from this project.

The investment that's going to be required to recovery this is somewhere in the neighborhood of $20,000,000.

After this three-year effort to unitize this area and study it technically for waterflood, the vast majority of working interest owners have agreed to the unitization. There are a few small interests outstanding, which is the reason for the statutory unitization case being brought forward.

We're going to proceed in this matter this morning with three witnesses.

Mr. John Goforth is a landman for Shell Western E & P, Inc.. He's discuss the unit agreement, the unit operating agreement, the ratifications of those instruments which have been received, and will indicate to you that preliminary approval from the BLM and the State Land Office has been received.

Mrs. Lisa Corder, who is a geologist with Shell Western E & P, Inc., will discuss the structure under their proposed pool and unit. She'll describe the unitized interval, and she will indicate the reasons that she believes these formations are -- the geological reasons these formations are suitable for water-flooding.

Finally, Mr. Doug Burbank, a reservoir engineer for Shell Western, will discuss the history of the pool, the reasons for trying to create a new pool in this area. He will also discuss the participation formula that has been agreed to by the vast majority of working interest owners and royalty interest owners in this area.

He'll discuss the development of the secondary recovery forcast. He will also present Division Form C-108, which has been filed in support of the waterflood application and the injection operations, and will describe those waterflood operations to you.

With that brief introduction, if I may, Mr. Examiner, I'd like to call at this time Mr. John Goforth to the witness stand.

JOHN GOFORTH,

being called as a witness and being duly sworn upon his oath, testified as follows, to-wit:

DIRECT EXAMINATION

BY MR. PEARCE:

Q At this time, sir, for the record would you please state your name and place of employment?

A Okay. My name is John Goforth and I work for Shell Western E & P, Inc.

Q What do you do for Shell Western, Mr. Goforth?

A I'm a landman for Shell Western.

Q Have you appeared before the Oil Conservation Division or Commission previously and had your credentials made a matter of record?

A No, I have not.

Q All right. Would you please describe for us your undergraduate education and work experience?

A Okay. I received a Bachelor's degree from Washington State University in 1981.

I started with Shell upon graduation in June of 1981 and over the past six years I have been involved with oil and gas leasing, title curative, farmout contract negotiations, as well as sales and acquisitions of producing properties and unitization.

Q And during the course of your work experience with Shell Western, have you been involved in the proposed Northeast Drinkard unitization effort?

A Yes, I have. I was assigned to the Northeast Drinkard Unit in September of 1986. My primary responsibility was to identify the working interest owners as well as the royalty and overriding royalty interest owners, and to prepare the unit agreement and unit operating agreement for the proposed Northeast Drinkard Unit.

Q All right. Mr. Goforth, at this time I'd like for you to approach what we've marked as Exhibit One and I've previously taped that up to the wall, and describe what's shown on that exhibit, and I'd also ask you to speak up a little so the court reporter doesn't have a hard time.

A Okay. This is a county map of Lea County. Highlighted in the various colors are the various units as well as study areas.

In orange here Township 21 South, Range 37 East, is Shell's proposed Northeast Drinkard Unit. As you can see, there's an Amoco North Drinkard Study Area to the west and the Chevron Central Drinkard Unit to the south-west.

The unit is located, proposed unit is located approximately two miles north of the town of Eunice.

Q At this time let's look Exhibit Number Two, which is, I believe, a plat of the proposed unit, and could you discuss that for us, please.

A Okay. This proposed unit again is in Township 21 South, Range 37 East. We have it divided up here where it shows Federal, State, and patented lands.

As you can see on the plat, Federal lands amount to roughly 708 acres, which account for 14.12 percent of the unit.

State lands account for 1,669 acres, to roughly 33.26 percent of the unit, and the remaining acreage, the patented fee lands, account of 2,640 acres, which comes ot 52.62 acres.

The circled numbers designate the tracts within our proposed unit.

Q Okay, let's turn quickly to what we've marked as Exhibit Number Three, and would you identify that for us, please?

A Exhibit Number Three is the unit agreement to the Northeast Drinkard Unit. In compiling this unit agreement we determined the ownership of the various tracts in our proposed unit by searching the federal, state, and county records.

After identifying the working interest owners we requested that they supply us division of interest sheets that would show all working, overriding royalty, and royalty interest owners with their percentages and addresses.

Q Okay. Could you turn to the portion of the unit agreement which describes the proposed unitized interval for us?

A Okay, the unitized interval is described in Section 2 (h) page 5 of the unit agreement.

Q Okay, for the record, would you briefly summarize what that unitized interval is?

A Well, the unitized interval, according to the definition here, extends from the upper limit, 75 feet above the stratigraphic Blinebry marker, to the lower limit, at the top of the Abo formation.

As see on the type log from the Shell Argo, located at 660 feet from the south line, 2310 feet from the west line, Section 15, Township 21 South, Range 37 East, and is that interval which is correlated to the interval from 5530 feet to 6680 feet below the surface, measured from the derrick floor.

The Blinebry marker has defined by the New Mexico Oil Conservation Division at a depth of 5,457 feet, elevation 3,380, subsea datum -2077 in Exxon State S No. 20, located in the southwest quarter of the northwest quarter of Section 2, Township 22 South, Range 37 East, Lea County, New Mexico.

Q All right, sir, as part of your responsibilities for Shell Western, did you cause copies of this unit agreement to be provided to working interest, royalty, and overriding royalty interest owners?

A Yes, I did. We sent out the unit agreement to all interested parties, working, overriding royalty, and royalty, on May 18th, 1987.

Q Okay, I notice, sir, that there appear to be some attachments to that unit agreement. Could you discuss those for us, please?

A Exhibit A is the unit plat that I discussed as Exhibit Two.

Q That is another -- all right, go ahead.

A And then Exhibit B-1 is the description and tract ownership divided up into fee, State and Federal, or in fee lands.

Q Okay, B-2?

A B-2 is the tract ownership, their percentage, the working owners percentage as well as their participation factors for Phase 1 oil, Phase 2 oil, gas Phase 1, and Phase 2 gas.

Q All right, for location purposes only could you point us to the portion of the unit agreement dealing with participation?

A The tract participation factor is in Section 13, page 19 of the unit agreement and will be discussed at a later time.

Q Okay, thank you. Let's look now at Exhibit Number Four and would you describe that exhibit for us, please?

A Exhibit Four is the unit operating agreement for the Northeast Drinkard Unit. It is modeled after the American Petroleum Institute's model form. This unit operating agreement has been agreed to by the majority of the working interest owners.

Q And you were largely responsible for that effort to secure voluntary participation?

A Yes, I was.

Q All right, sir. Let's look at Exhibit Number Five to this proceeding, and would you describe what that is for us, please?

A Exhibit Five is the royalty owner brochure that was sent to the royalty and overriding royalty owners in the proposed Northeast Drinkard Unit on May 18th, 1987.

The purpose of the brochure was to briefly and concisely inform the royalty and overriding royalty owners of the purpose of the Northeast Drinkard Unit and the results from such unitization.

Q Is it fair to say that that provides the most simply and straightforward explanation of what's going on out here?

A Yes, it does.

Q Okay, thank you. Let's turn to Exhibit Number Six, if you would, for us, please.

A Exhibit Number Six is the ratification process for the working and royalty interest owners by tract. It gives a summation as to each tract's percentage ratified by the working and royalty for Tracts 1 through 31.

Q How widely was the package distributed?

A We sent the royalty package to approximately 320 royalty owners and 40 working interest owners, again on May 18th, 1987.

We followed up letters after approximately a month from the time that we sent out the initial ratifications to ascertain if the various royalty and working interest owners had any questions or problems with ratifying the unit.

After such time we sent these letters we obtained phone numbers of those royalty owners that we could not contact by letter for one reason or another, and followed up with numerous phone calls to each one that we had not received ratification from at that time.

Q All right, sir. Let's look at Exhibit Number Seven and am I correct that that is a summary of the information contained in Exhibit Six?

A Yes, it is.

Q And what is that information?

A It is a tract ratification summary listing all the tracts and the working and royalty interest percentages broken down by tracts.

Q All right, sir, if I understand correctly, there are two phases to this proposed unit participation formula. There is also an oil phase and a gas phase in each. Could you indicate for the record, since we've gotten some ratifications since we put the paperwork together, our percentage participation in each of those cases as of this ratifications from the royalty owners.

Q And Exhibit Number Eleven?

A Exhibit Number Eleven are the ratifications for the working interest owners.

Q And Exhibit Number Twelve, please.

A Exhibit Number Twelve is copies of the return receipts for the hearing notification, as well as listing of all the parties that received such notification.

Q And as you've testified earlier, you compiled this list of working interest, royalty, and overrides, through the process of record search and contacting leasehold operators, is that correct?

A That is correct.

Q All right, sir. Do you have anything further at this time?

A No, I don't.

MR. PEARCE: I don't have any further questions, if the Examiner has any at this time. I expect Mr. Goforth to remain through the day in case something comes up, but he's ready now if you have questions.

CROSS EXAMINATION

BY MR. CATANACH:

Q Mr. Goforth, I'm not sure I understand your different phases. Would you go into -- explain more on that in detail, please?

A What exactly do you mean by different phases?

Q Well, the Phase 1 oil, Phase 2 oil, and Phase 1 gas.

MR. PEARCE: Mr. Examiner, if I may suggest, the petroleum engineer, our last witness of the day, we plan for him to go into explaining that formula to you in some detail, and I simply wanted Mr. Goforth to point it out. We may be a little more efficient if you can hold that question for that witness.

Q Okay, but you needed agreement for each of those phases, is that correct?

A Yes.

MR. PEARCE: By that, Mr. Examiner, I will mean to reflect that the phases are set forth in the unit agreement so that ratification of the unit agreement and unit operating agreement by interest owners is a ratification of those separate phases and the participation formula contained in the unit agreement. We -- I don't intend to indicate to you that each person got eight separate sets of ratifications to the agreement.

MR. CATANACH: I think that's probably all we have at this time.

MR. PEARCE: All right. As

I've indicated, Mr. Examiner, we will make Mr. Goforth available later if other questions come up.

MR. CATANACH: Thank you.

MR. PEARCE: Thank you, John.

At this time I would call Mrs. Lisa Corder to the stand, please.

LISA CORDER,

being called as a witness and being duly sworn upon her oath, testified as follows, to-wit:

DIRECT EXAMINATION

BY MR. PEARCE:

Q At this time for the record would you please state your name and place of employment?

A My name is Lisa Corder and I'm an associate geological engineer with Shell Western E & P in Houston.

Q Mrs. Corder, have you appeared before the New Mexico Oil Conservation Division or Commission previously and had your credentials as a geological engineer made a matter of record?

A No, I have not.

Q All right, would you please go through for us your undergraduate degree and work experience?

A I received a Bachelor of Science degree in geological engineering from Michigan Tech University in 1985.

Since then I've been employed by Shell Western in the Western Production and Geological Engineering Group.

I've been involved in both primary and development projects, waterfloods, and waterflood optimization projects.

Several of the waterflood projects I have worked on have been in the Upper and Lower Clearfork Formations in West Texas and those formations are equivalent to Blinebry and Drinkard in New Mexico.

Q Okay. Could you give us some indication of your experience with the proposed Northeast Drinkard unit?

A I was assigned in the Northeast Drinkard Unit in January, 1987, and since then I hav spent some time reviewing the past geological work that has been done on the project, including that work that was done for the Technical Committee Report and numerous in-house Shell geological studies.

I have examined two cores from the field area and I've prepared several of the exhibits to today's hearing.

MR. PEARCE: Mr. Examiner, I tender Mrs. Corder as an expert in geological engineering.

MR. CATANACH: She is so qualified.

Q All right. At this time, Mrs. Corder, I'd like for you to refer to what we've marked as Exhibit Number Thirteen to this proceeding and describe what's reflected on that exhibit for the Examiner and those in attendance.

A This is a structure map of the proposed unit area.

The proposed unit is situated on the northeast end of a north/northwest south/southeast trending anticline of the Penrose Skelly trend and parallels the western edge of the Central Basin Platform.

There is approximately 300 feet of structural relief within the proposed unit area and dips are generally in the range of 1 to 2 degrees.

This particular structure map was drawn on the top of the Blinebry but both the underlying Tubb and Drinkard formations more or less mimic the same structure.

The structurally highest point within the field is down to the southwest corner.

Q Okay, let's look at what we've marked as Exhibit Number Fourteen to this proceeding, and could you describe that for us, please?

A This is a type log for the proposed Northeast Drinkard Unit. This log is taken from the ARGO No. 8 Well, which is located in Section 15 and it's noted with the red dot on the county map.

Q Okay, that's a little far off for some folks. Could you walk over and show us in what part of the proposed unit the type log is taken from, please?

A The proposed unit is outlined in orange here, the Argo No. 8 Well, located in Section 15.

Q Could you describe the information reflected on the type log, please?

A We are proposing to waterflood three formatins, the Blinebry, the Tubb, and the Drinkard. Those three formations are equivalent to the Upper Clearfork, the Tubb, and the Lower Clearfork in West Texas.

The top of the unit is the New Mexico Oil Conservation Division top of Blinebry, which has been defined as 75 feet above the Blinebry marker.

The bottom of the unit is the top of the Abo formation.

The entire interval is 12-to-1300 feet thick and of that approximately 160 feet is considered pay. The pay is distributed in thin, porous streaks, interbedded with dense nonreservoir quality rock.

Q Okay, could you give us some indication of the thickness of expected productive zones in each of the Blinebry, Tubb, and Drinkard formations, please?

A The Blinebry we -- the average is about 72 feet of pay; the Tubb is about 34 feet of pay; and the Drinkard is about 54 feet of pay.

Q You indicated that you had examined two cores in this area. Could you briefly relate for us what that core examination revealed?

A I'll go through each one of the formations separately, starting with the Blinebry.

The Blinebry is approximately 450 feet thick and core examination revealed it consists of a tan to gray colored dolomite with various amounts of nodular replacement and pore filling anhydrite. The reservoir rock consists of a grain-supported packstone. We have six cores within the study area from which we have core data available. For those sampoles with a permeability greater than average permeability was 2.45 millidarcies.

Q Okay.

A The Tubb formation is approximately 400 feet thick. There is no core available for examination but a 1971 ARCO report described the Tubb as a gray, fine-grained, silty sandstone interbedded with brown, finely sucrosic, sandy dolomite.

Cuttings from a recently drilled Shell well confirm that same lithology.

We have three wells within the study area from which we have core data available. For those samples with a permeability greater than .1 millidarcy, the average porosity was 8.28 percent and the average permeability was 1.19 millidarcies.

Q Okay, and moving town to the Drinkard, could you describe that for us, please?

A The Drinkard is approximately 300 feet thick. Based on core examination it is a tan to dark gray limestone and dolomite. Core filling and replacement anhydrite are most common in the limestone and nodular anhydrite is most common in the dolomite.

The reservoir rock consists of a skeletal lime grainstone and lime packstone and a little bit of dolomitic packstone.

We have one core with core data available within the study area. Those samples that had a permeability greater than .1 millidarcy, the average porosity was 11 percent and the average permeability was 2.45 millidarcies.

Q At this time let's take a moment and hang what we've marked as Exhibit Number Fifteen on the wall.

A Could you describe first of all what's reflected on Exhibit Fifteen?

A Exhibit Fifteen is cross section A-A', which is an east/west cross section . It takes in every well along the east/west line noted on the index map.

Exhibit Number Sixteen is cross section B-B', which takes approximately every other well along the north/south line noted on the index map.

Both of these are structural cross sections. They've been hung of datum of -1800 feet and the horizontal scales for the two cross sections are different but they're both noted down in the righthand corner.

Q All right, what's the primry type of log reflected on these cross sections?

A Resistivity, SP logs have been the primary correlation tools throughout the history of the field and this is the type of log that we've included on the cross section. We do have one neutron log on the cross section. It's the Conoco Hawk.

Both the neutron and the resistivity logs are useful tools to determine or distinguish reservoir rock from non-reservoir rock.

Those low porosity dense zones correspond with high resistivities and the higher porosity reservoir rock -- reservoir quality rock correspond to the low resistivities.

Both the Blinebry and the Drinkard have

historically been broken up into five cycles based on the log response, and the cycles are most important in the Blinebry and the most pronounced.

Now go through each one of the formations?

Q Would you please?

A The log correlations of the Blinebry reveal five cycles of porous reservoir quality rock interbedded with zones of dense highly resistant rock.

We have core data available from five wells within the proposed unit area and the core data corresponds well with those -- both the resistivity and neutron log response. Those zones that are -- have high porosity correspond with low resistivity and vice versa.

I'll point out the five cycles that we see. This is porosity zone one, two, three, four, and five.

Q If you could just take a moment on one of the logs on that well and indicate the depths that you're indicating the five cycles occurring, the record's not going be able to tell otherwise.

A Okay. In the Cities Service State S No. 5 Well, Zone 1 for this -- for practicality starts with the New Mexico Oil Conservation Division top of Blinebry, go through a porosity zone into a dense zone and ends at about 5670 total depth.

Porosity 2 starts at that depth, goes down to approximately 5730 where it ends up in a dense zone.

Porosity 3 starts at that depth and goes down to approximately 5850.

Porosity 4 starts, goes into a dense zone and ends at about 5950.

Then you pick up the Porosity 5 zone which ends at the top of the Tubb formation and which is about 6000 feet.

Q Okay, thank you.

A If we go through and describe the type of production we have from each one of these zones, Zone 1 is primarily gas productive.

Zone 2 produces gas and 65 degree API gravity condensate.

Zones 3, 4, and 5 produce 38 to 40 degree API gravity oil and associated gas.

Available core data along with log correlation in the zones indicates that there's a fairly continuous dense zone that exists between Zones 2 and 3. This dense zone is anywhere from 20 to 40 feet thick and should act as a permeability barrier preventing any vertical communication between the oil zones and the gas zones.

And there are similar dense zones separating the other cycles, as well, but the only one that I've highlighted on the cross section is that between Zones 2 and 3.

We're planning on flooding Zones 3, 4, and 5 and producing gas reserves from Zones 1 and 2 through separate wellbores.

Log correlations in the five zones from porous reservoir quality rock and interbedded dense zones can be carried easily throughout the field. For this reason we feel that that supports the potential of the Blinebry as a floodable unit.

Q Anything else on the Blinebry?

A That's just about it.

Q Let's move down to the Tubb and would you discuss what's reflected on the exhibit with regard to the Tubb?

A Both oil and gas are productive, are produced from the Tubb but there does not appear to be common gas/oil contact across the entire field. We've seen oil production from as high as -2750 and gas as low as -3050.

A production surveillance study identified only two areas of the field as oil productive. Those were the north half of Section 10 and all of Section 2. The rest of the field is primarily gas bearing with a few scattered oil wells.

The location of those oil and gas productive areas do not correspond with the structure map. Original API gravities of liquid hydrocarbon production in those areas that are oil productive average 38 degrees API gravity. All those areas that are gas productive average 51 degrees.

Based on log correlations the oil and gas productive areas cannot be differentiated from one another, nevertheless, all of the production information that we have indicates that the pay intervals within the Tubb must be extremely discontinuous. We are only planning on flooding those areas that have been identified as oil bearing.

As a final note on the Tubb, there obviously must be vertical separation between the bottom zones of the Blinebry and the Tubb itself for Tubb gas to have remained within that formation over geologic time.

At the bottom of porosity Zone 1, porosity Zone 5 in the Blinebry, there is another tight streak. That, in combination with the fact that the Tubb formation is a silty formation, probably combined to form the permeability barrier separating those two formations.

Q All right, anything else with regard to the Tubb in these exhibits?

A No.

Q Let's look at the Drinkard, please.

A The Drinkard has historically been broken up into five cycles, also; however the cycles are less pronounced and the bottom four cycles are much thinner than they are in the Blinebry.

Zone 1 is two to three times thicker than the other cycles. The top three-quarters of Zone 1 is primarily non-reservoir quality dolomite. We have core data available on this interval and both the porosity and the permeability are very low. This is the zone I've highlighted on this cross section. Because of this we feel that this a good permeability barrier between the Drinkard zone and the Tubb formation, and it's easily carried across the entire field.

The bottom of Zones 1 -- of Zone 1 and Zones 2, 3, 4 and 5 are relatively thin and they consist of thin, porous streaks of limestone and interbedded dense zones of limestone and a few zones of porous dolomite.

Based on the description in the Drinkard formation in the Central Drinkard Unit, it appears as though the litholoy in both those areas are similar. Gross log correlation in the Drinkard is fairly continuous from well to well and we feel that all these observations support the potential of the Drinkard as a floodable unit.

Q All right, let's go back and just summarize a couple points, if we may, Mrs. Corder.

You've indicated that in the Blinebry and Tubb you have separate oil and gas zones, is that correct?

A Right.

Q You've also indicated to us that because of interbedding you do not expect any waterflooding within the oil zones in those two formations to affect gas production from other portions of those formations, is that correct?

A Correct.

Q And I believe you indicated that the proposal for operation of this unit is to have separate wellbores for gas wells and oil wells, is that correct?

A Correct. Just in summary I wanted to note that in addition to the success of the Central Drinkard Unit there are numerous successful waterfloods on the Central Basin Platform in West Texas in the Upper and Lower Clearfork formations, which are equivalent to the Blinebry and Drinkard.

Q Okay, anything further at this time?

A No.

MR. PEARCE: I have nothing further of this witness at this time, Mr. Examiner.

QUESTIONS BY MR. LYON:

Q Victor Lyon, Chief Engineer for the OCD.

Ms. Corder, you've use a couple of terms that I haven't heard before. I'm not exactly a newcomer to the business, but could you further define for me what's a packstone and what's a grainstone?

A Well, the grainstone is just a grain supported rock.

The packstone is also grain supported but it has more matrix.

So they're both grain supported rock, as opposed to like a mudstone or a waxstone.

Q Is this something that we generally characterize as a sandstone?

A Well, we use it a lot in carbonate rocks. I have not worked that much in sandstones, since the whole time that I've been in West -- working for Shell in the western division it's all been carbonates.

Q Do you consider a packstone or a grainstone to be reservoir quality rock?

A They can -- you can have pore filling grainstones. We've got anhydrite throughout most of the formations. Some of the packstones and grainstones, they're called packstones and grainstones because they are grain supported, but they may have pore filling anhydrite.

Where we see pay, we see grainstones and packstones and various amounts of pore filling anhydrite.

But that's where we see the pay. It's in the marine intervals and are primarily dolomite or in the Blinebry there are dolomite and packstones, and in the Drinkard there are dolomite and limestone grainstones and packstones.

Q I'm not sure that I understand any better than I did.

A Well, we've always used that terminology for as long as I've been working for Shell.

Q Well, Shell does have some different terms.

I think that's all.

QUESTIONS BY MR. LEMAY:

Q Ms. Corder, Bill Lemay, Director of OCD.

You studied the Texas fields as well as New Mexico fields and correlated your cross sections from Texas into New Mexico?

A No. I'm just -- just stating that there are successful waterfloods in Texas in equivalent formations.

Q How about the zoning of the Blinebry and zoning of the Drinkard formations? Can you make those five zonations (sic) in Texas in the Upper and Lower Clearfork as well as here in New Mexico?

A All of the formations that I have worked on in Texas you cannot do that. The porous streaks cannot be carried across the entire field is what we're seeing here. Now, the logs that we're using are just resistivity logs. We don't have any type of neutron logs over the entire field, but the fact that our core data appears to correspond with the resistivity log response, we feel that those low porosity -- or those low resistivity zones do correspond with pay and they can be carried easily across the field.

We haven't gone through and tried to correlate individual porosity stringers by any means, but the whole packages can be carried across the field.

Q Is there a shaley component through the carbonate so that some of the low resistivities might be reflecting a shale content to the rock?

A The core that I examined, we had discrete shale streaks but they were generally in the -- anywhere from a few inches up to six inches. You have mudstones that may have a little bit of shale in them but we don't see those showing up at low resistivity. I think the fact that they're usually packed around areas that are dense dolomite prohibits that resistivity from coming down on the logs that we've seen.

And we've broken it up into discrete

packages, as porosity and dense.

Q Are these predominantly on log analysis or as tied to the cores that you have.

A Tied to the core that we have.

Q Your examination has shown that these zones, as you've zoned them, are -- operate independent or only where you have the colored in dense streaks? In other words, the vertical communication that we're trying to find out if it exists or not, may or not be -- may or may not be present in these various zones or how do you -- how do you do the vertical communication within the Blinebry?

A Okay. Within the Blinebry I view it as five independent zones of porosity. We see the most continuous tight streaks at the top of the whole interval, those -- that's between Zones 1 and 2 and Zones 2 and 3. In some areas of the field, based on resistivity log response, when you get down to Zones 4 and 5, you don't have as high a resistivity break between those formations but all of the core data that we have shows very low porosity and permeability between all five of the zones.

We've got core data available on one well throughout the whole interval down to Zone 5, and we see those tight streaks all the way through.

So it's not just between 2 and 3. We've seen it between 1 and 2, 3 and 4, and 4 and 5 on core data, and we're carrying that across the entire field based on resistivity log response.

Q When you measured the permeability did you measure vertical or horizontal permeability?

A The ones that I quoted are horizontal permeabilities. I assume that we've measured vertical permeabilities. I don't know on how many of the ones we have. I just have the summaries. I've reviewed the summaries of the technical committee report, put in the report, and the curves that they've generated and the averages that they've generated.

Q Thank you.

MR. LYON: May I ask one more question?

MR. CATANACH: Yes, sir.

QUESTIONS BY MR. LYON:

Q You may have stated this and I may have missed it, but what do you consider to be the separation between the Blinebry -- bottom of the Blinebry and the top of the Tubb?

A Okay, there is, on the resistivity log response, there is a tight streak at the top of the Tubb. Some places in the field you cannot see it as predominantly as you do in other areas. That, in combination with the silty nature of the Tubb and the fact that we do have gas zones within the Tubb, we feel that there must be separation between the Tubb and the Blinebry for gas to remain in that formation over geologic time.

Q You're saying, as I understand it, that even though you can't see a discrete separation in there, the fact that the two fluids are in there as they are indicates that there is a complete separation.

A We see a dense zone, as you can see it on some of these logs here, but then on this log you don't see a tight zone, but again, now, we're comparing our resisitivity with some sort of porosity reading, and that, and just combination with the lithology of the Tubb, that's enough, and the fact that we've got gas with the oil, we have separation between the two.

Q And you did say that the bottom three zones of the Blinebry are oil productive and the -- I believe you said that the gas occurrence in the Tubb is not -- you're unable to correlate the -- as to zones, whether the content of the porous interval would be oil or gas.

A That's right.

Q So there probably is some horizontal separation in there.

A That's -- that's what we think and that's why we're only going ot be waterflooding those areas that are oil productive. Those are the only two areas within the field.

We think there's horizontal separation because of the fact that the oil production has been seen as high as -2750 and gas production as low as -3050. There's got to be some sort of horizontal separation.

CROSS EXAMINATION

BY MR. CATANACH:

Q Can you define the two oil bearing Tubb zones that you intend to flood, or the areas?

A Define the areas?

Q Yeah, just --

A The north half of Section 10 and Section 2.

Q Does Shell intend to use the Argo No. 8 Well as a type log for the -- for defining the vertical limits of the --

A Yes.

Q Your separation between Zones 2 and 3 in the Blinebry, is that continuous across the field?

A We've got core data in five wells and we've correlated that to resistivity log response and you can carry that tight zone across the entire field. Some areas it's, you know, quite a bit higher resistivity than it it is in other places but we're correlating that with porosity and since resistivity doesn't read porosity, it's just kind of a qualitative measurement.

But all of the core data that we have of the five wells show a 20 to 40 feet thick dense zone between those two formations, or between those two zones.

Q Did you encounter any clear gas-bearing zones in the Drinkard?

A No.

Q That's all I have.

MR. CATANACH: Are there any other questions of this witness?

MR. PEARCE: If I may briefly.

REDIRECT EXAMINATION

BY MR. PEARCE:

Q Mrs. Corder, you've presented evidence and testimony relating to Exhibits Thirteen, Fourteen, Fifteen, and Sixteen. Were those exhibits prepared under your direction and supervision or compiled under that direction and supervision?

A Yes.

MR. PEARCE: Mr. Examiner, at this time I would move the admission of Shell Western Exhibits One through Sixteen.

MR. CATANACH: Exhibits One through Sixteen will be admitted as evidence.

MR. PEARCE: Thank you.

DOUG BURBANK,

being called as a witness and being duly sworn upon his oath, testified as follows, to-wit:

DIRECT EXAMINATION

BY MR. PEARCE:

Q All right, sir, at this time for the record would you please state your name and place of employment?

A My name is Doug Burbank. I'm a reservoir engineer employed by Shell Western. My primary areas of responsibility are West Texas and New Mexico.

Q Okay, Mr. Burbank, have you appeared before the New Mexico Oil Conservation Division and had your credetials as a reservoir engineer accepted and made a matter of record?

A No, sir, I have not.

Q All right, sir, at this time I'd ask for you to go through your education beginning at undergraduate degree and your work experience, please.

A I graduated from Iowa State University in

1981. That same year I began work for Shell in Houston.

My first three and a half years I spent as a production engineer working on Shell's Denver Unit CO2 Project and the next two and a half years I worked as a reservoir engineer in various assignments in West Texas and New Mexico.

Q All right, sir, and how long have you worked on the area we're discussing today?

A I've been assigned to the Northeast Drinkard Unit fo the past year and have coordinated the activities between various groups within Shell.

Q And are you familiar with the request that Shell Western is making at the hearing today for pool creation, statutory unitization, and waterflood permission?

A Yes, sir.

MR. PEARCE: Mr. Examiner, at this time I would tender the witness as an expert in petroleum reservoir engineering.

MR CATANACH: He is so qualified.

Q All right. Mr. Burbank, at this time I'd like for you to go through a little of the history of the area under dicussion today for us.

A Okay. The field was discovered in 1944 with the drilling of the Gulf Vivian No. 1, as indicated on

Exhibit One.

Most of the drilling activity occurred between 1948 and 1958 when the field was drilled to 40-acre spacing.

Commingling of the Blinebry, Tubb, and Drinkard began in the mid-seventies and has continued to present.

The cumulative production in our unit area from the Blinebry, Tubb, and Drinkard formations, has been about 27-million barrels of oil and a little over 400 BCF of gas.

The current production from the unit area is about 550 barrels of oil a day and 16-million cubic feet of gas a day.

The -- we estimate that the field has produced about 90 percent of the primary production. There has been no significant infill drilling in the last twenty years; therefore we feel that the well spacing has been adequate to recover the primary production in our unit area.

Q All right, sir, at this time I'd refer you to what we've marked as Exhibit Number Seventeen to this proceeding and would you discuss that exhibit for the Examiner and those in attendance?

A Exhibit Seventeen summarizes the activity in the area, both past and present.

Our proposed unit area is indicated in the green shaded area. I'd like to point out that there is a tract in the southeast corner of the unit, Tract 31, --

Q Let's for simplicity refer back to what I believe we marked as Exhibit Number Two to this proceeding, and that indicates the tract we're discussing at Tract 31.

A Tract 31, when the unitization proceedings with the working interest owners was started, was owned by Mobil. It has since been purchased by Bison Petroleum. Bison Petroleum has recently indicated to us that they do not want to include Tract 31 in the unit and Shell is agreeable to that.

Q Do you -- we'll cover some more of this later, but do you believe that Tract 31 can be excluded from the proposed unitization without substantially affecting the operations of the unit as you plan them?

A Yes

Q All right. Are there other tracts owned now by Bison Petroleum which they have ratified into the unit?

A Yes. Tract 27, as indicated on Exhibit Two, is also owned by Bison Petroleum and they have agreed to leave that tract in the unit and we've agreed to unitize that tract.

Q All right, sir.

A Now if I continue with my discussion of Exhibit Seventeeen, there's a dotted outline on there of an ARCO proposed unit that was begun in the 1970's, an area which received orders but -- but was never unitized.

There is one -- two existing waterflood areas indicated on the map, the Central Drinkard Unit to the southwest, and the Warren Unit indicated to the north.

The Central Drinkard Unit, which I will discuss a little bit later, was used as an analog for predicting the secondary recovery from the proposed Northeast Drinkard Unit.

To the west Amoco has a proposed North Drinkard Unit and they are proceeding as we are to try to unitize the Blinebry, Tubb, and Drinkard formations.

To the east is a Conoco proposed East Blinebry Unit that is paralleling our efforts but has since been delayed or put on the back shelf.

Q Anything else with regard to Exhibit Seventeen?

A No.

Q All right, let's move to Exhibit Number Eighteen and could you describe for us the information reflected on that exhibit?

A Okay. About four years ago Shell began an in-house study of the secondary recovery potential in this unit area and the first thing that Shell looked at was the pressures in the Blinebry, Tubb, and Drinkard.

And, as you can see from Exhibit Eighteen, the pressures in the Blinebry, Tubb, and Drinkard on the SWEPI leases in the early 1960's, there was a significant difference in pressure but due to the commingling in the mid-seventies the pressure within those three zones has equalized.

So we believe that this constitutes, the three zones, Blinebry, Tubb, and Drinkard, constitute a common source of supply of oil and gas.

Q Okay, you mentioned that approximately four years ago SWEPI began to look at alternatives in that area. Could you now refer to Exhibit Number Nineteen and discuss some of the alternatives that were considered?

A Shell, in considering the waterflood potential of these three zones looked at different alternatives to waterflooding the Blinebry, Tubb, and Drinkard zones.

Alternative one, shown on Exhibit Nineteen, was to build a common water injection plant and have common injectors for the Blinebry and Drinkard formations but to unitize the two formations separately.

That would have required drilling an additional 52 wells and required duplicate production facilities to separate the Blinebry and Drinkard oil production, and we indicate that the profit before Federal income tax is a negative $20,000,000 for that alternative.

We also looked at another alternative that would be to unitize the Blinebry formation and put in injection facilities, production facilities just for the Blinebry formation, and use all the existing wells for Blinebry use and the profit before Federal income tax is approximately a negative $10,000,000 because you do not have the -- you lose the secondary reserves associated with the Drinkard formation in that alternative.

Alternative three was to use the existing wells to flood the Drinkard formation and that alternative nets a negative $35,000,000 profit and again you would lose the secondary potential in the Blinebry formation.

So Shell concluded that the optimum unit interval would be to include the Blinebry, Tubb, and Drinkard formations into one common injection interval.

Q All right, once you reached that initial conclusion, what steps did Shell Western take?

A Shell then called a working interest owners meeting of the owners in the unit area and that was in October of 1984.

Q Let's look at Exhibit Twenty and describe that for us, please.

A Shortly after the first working interest owners meeting was called they formulated a technical committee charge which is shown on Exhibit Twenty, and that charge included defining an optimum unit area, to define an optimum unit vertical interval, to develop unitization parameters to be used for a participation formula, and to develop a water flood plan that included an oil recovery forecast investment, and economic evaluation.

Q All right, sir, you set in the charge, or someone did, what's the next step in the story?

Let's look at Twenty-one and Twenty-two, please.

A Okay. The charge was fulfilled with the acceptance by the working interest owners of the technical committee reports.

Exhibit Twenty-one is Part I of the technical report, called Unit Area Vertical Interval to be unitized and Unitizatio Parameters by Tract for the Proposed Blinebry-Drinkard Unit, Lea County, New Mexico.

And Part I fulfilled the first three charges as defined on Exhibit Twenty, and Part II is the Waterflood Plan and Economics for the Proposed Blinebry-Drinkard Unit, Lea County, New Mexico, and that fulfilled the final item for the technical committee charge.

Q All right, sir, at this time could you discuss for us the unitization parameters, please, and I'd refer you to Exhibit Number Twenty-three.

A As I mentioned in Part I of the technical committee report unitization parameters were tabulated for each tract in the unit area and those unitization parameters are for oil and gas, the current production from June of '84 to May of '85, the cumulative production through May of 1985, the remaining primary reserves after may of 1985, and the ultimate primary recovery.

Q Would you describe for us how those unitization parameters were utilized?

A The unitization parameters were used to formulate a participation formula to be used in the unit area and in early 1987 several working interest owners meetings were called to negotiate our participation formula, adn the working interest owners felt that a 2-phase formula and the 2-phase formula -- 2-phase formula for oil and 2-phase formula for gas should be used, and Exhibit Twenty-Four details those participation formulas that were developed by the working interest owners.

I'll go through each of the phases and what each of the formulas mean.

The Phase 1 oil formula was developed by the working interest owners to try to reflect their remaining primary oil production share of the unit and also to maintain their current income, so the participation formula in Phase I oil was agreed to be 25 percent of each tract's share of current oil production plus 75 percent of each tract's share of remaining primary oil reserves, and that formula is in effect until the remaining primary oil reserves are produced from the unit area after May of 1985, and that amounts to about 2.3-million barrels of oil.

Now after 2.3-million barrels of oil had been produced from the unit area, then Phase II oil would go into effect and this Phase II formula was developed to try to reflect equal tract share of secondary recoverable -- secondary recovery potential in the area.

Now, I won't go into -- I'll go a little later into how the secondary recovery forecast was developed and the analog used, but I'll say right now that the secondary recovery potential is a ratio with the ultimate primary production from each -- from the unit area, and therefore the Phase II oil was based 100 percent on each tract's share of ultimate primary production.

Now, the gas phase I formula, the working interest owners wanted to insure that they would get their share of the remaining primary gas reserves, and therefore the Phase I formula was based on 100 percent of each tract's share of remaining primary gas reserves and the technical committee estimated that approximately 72 BCF remained of primary gas reserves; therefore the Phase I gas formula will be in effect until 72 BCF have been produced from the unit area after May of 1985.

Now, in case we underestimated the gas reserves available from the unit area there was a Phase II formula that would be in effect after the Phase I gas formula, and that is based on 100 percent of a tract's share of ultimate primary gas production.

Now, if you refer to Exhibit Twenty-five, this will more concisely how the participation formula works. I've indicated on the top the unitization parameters from Tract 5 for oil and gas, the current production of the remaining primary, and ultimate primary oil for Tract 5 and for the unit, and the remaining primary and ultimate primary gas for Tract 5 and for the unit.

The Phase I oil participation is 25 percent of that tract's share of current production, which is 20,000 barrels over 272,000 barrels plus 75 percent of that tract's share of remaining primary, which is 162 over 2285.

Adding those two fractions together, Tract 5's unit participation is 7.2 percent.

Q And that participation factor will be in effect until 2.3-million barrels have been produced from the unit area.

The Phase II oil formula is 100 percent

of that tract's share of ultimate primary and that equates to 7.9 percent, so that will be in effect after the Phase I oil.

Phase I gas is that tract's share of remaining primary, 8.8 percent, and Phase II gas is that tract's share of ultimate primary gas recovery, 7.2 percent.

Q All right, Mr. Burbank, besides, I suppose, keeping a number of accountants very busy for the next number of years as a result of this formula, do you believe -- it it your petroleum engineering opinion that this formula is a fair and equitable basis to distribute proceeds from production in this unit and has it been agreed to by the vast majority of working interest, royalty interest owners and overriding royalty interest owners in the unit area?

A Yes.

Q Thank you. All right, sir, let's turn to what we've marked as Exhibit Number Twenty-six, please, and would you describe what that is?

A Okay, Exhibit Twenty-six we refer to as the AFE package and this package was sent to all working interest owners along with the unit agreement and unit operating agreement.

And in this package it details the investment required for the unitization. It details the future operating costs associated with the unit. It gives a remaining primary forecast and a predicted secondary recovery forecast for the unit, and it also gives the facilities diagrams for flow lines and production lines for the unit area.

Q Could we take a moment and look at the production forecast contained in that exhibit, please.

A Okay, there's two production forecasts contained in Exhibit Twenty-six.

Q Excuse me, if I may, just a moment.

MR. PEARCE: For the Examiner, those are graphical representations perhaps 2/3rds of the way back into the package.

A The first graph is a graph of the remaining primary oil production from the unit area and the technical committee predicts that the remaining primary oil production for May of '85 to depletion is approximately 2.3-million barrels.

And adding that to the cumulative oil production through May of '85, gives an ultimate primary oil production of a little over 29-million barrels of oil.

Now the next page is the secondary recovery forecast developed by the technical committee and I will go into more detail on how this was formulated.

The technical committee used the Central Drinkard Unit as an analog for predicting their secondary oil recovery potential.

The Central Drinkard Unit, I'll point out, is located to the southwest of our proposed unit area on Exhibit One.

Q Do you recall how long that unit's been in operation?

A The Central Drinkard Unit started waterflooding in the mid-sixties so they have over twenty years of waterflooding experience.

They predict that they will recover a volume of secondary oil equal to half of their predicted primary production, so you have a secondary to primary ratio of 0.5, and that is what the Northeast Drinkard technical committee used to estimate the production, secondary production from the unit area, so from the first graph I showed you, 29.4-million barrels of primary production times 0.5, we estimate that the ultimate secondary oil production will be 14.7-million barrels fromour unit.

Q Let's look at the first couple of pages of the AFE and would you indicate the expected investment costs of this project, please.

A Okay, the initial investment associated with the Northeast Drinkard Unit is approximately $18.6-million.

The -- there's a summary of economics

shown on the third page, which shows the initial investment of $18.7-million, an ultimate investment of $24-million and a -- which yields a profit of 174 percent.

Q Okay, let's turn now to what we've marked as Exhibit Number Twenty-seven to this proceeding and could you describe that, please, for the Examiner and those in attendance?

A Exhibit Twenty-seven is the proposed flood plan for the Northeast Drinkard Unit. Indicated on here by blue circles are water source wells. We plan on using San Andres water for our injection needs at the Drinkard, Northeast Drinkard Unit.

The yellow circles are gas wells which are interspersed throughout the unit. There are twenty gas wells.

The red circles are oil wells and the blue triangles are our water injection wells.

The flood pattern is a 5-spot injection pattern and I'd like to point out a couple of areas on this flood map where we plan to co-op with bordering units. Around the southwest side of Section 14 we have three injection wells along the unit boundary, which we plan on co-oping with the J. R. Cone lease, and not shown on this map but on the north border Wells 109 and 114, we plan on converting to injectors and co-oping with the Warren Unit to the north of our unit.

Q All right, sir, anything further on Exhibit Twenty-seven?

A No. I'd like to introduce Exhibits Twenty-eight and Twenty-nine, which are listings of the proposed gas wells and the proposed injection wells in our unit area.

It gives the current well and lease name, the future unit well designation and a location of those particular wells.

Q Okay. And those are the dots reflected on Exhibit Twenty-seven, is that correct?

A Yes.

Q All right. Thank you. Now, sir, if you would, let's turn to what we've marked as Exhibit Number Thirty and could you describe that exhibit for the Examiner and those in attendance?

A Okay. In order to include the Blinebry, Tubb, and Drinkard into our unitized interval, we had to develop some special rules and regulations for the now named North Eunice Blinebry-Tubb-Drinkard Oil and Gas Pool, so we combined the three existing pools into a new North Eunice Blinebry-Tubb-Drinkard Oil and Gas Pool and I'd like to go through some of these particular pool rules.

I'll start with Rule No. 3, which says, that the acreage may be simultaneously dedicated to a gas well and an oil well in the North Eunice Blinebry-Tubb-Drinkard Oil and Gas Pool, thereby receiving separate oil and gas allowables.

Q All right, let me interrupt for a moment. When Mrs. Corder was on the stand I asked if the oil and the gas wells would be separate wellbores. Will that occur?

A Yes.

Q And on that basis do you believe that simultaneous dedication of acreage within a pool will not in effect simultaneously deplete the same zones in that proposed pool?

That was awful.

A I'm not sure I understand the question.

Q I'm not sure I do, Mr. Burbank. Let me try again, please.

Do you believe that a gas well in the proposed pool with 160 acres dedicated will deplete the same zones within the pool that are being depleted by oil wells on the same 160 acres?

A No.

Q Thank you, sir. On that basis do you believe that it is sound engineering principle to allow simultaneous dedication of acreage within the proposed North Eunice Blinebry-Tubb and Drinkard Oil Pool to oil wells and gas wells at the same time?

A Yes.

Q All right. Thank you, sir. Now let's look, if we could, to proposed Rule No. 4.

A Rule No. 4 states that any acreage within the North Eunice Blinebry-Tubb-Drinkard Oil and Gas Pool shall not be assigned to a gas well proration unit if the acreage is located within 1,320 feet of the North Eunice Blinebry-Tubb-Drinkard Pool boundary, and 2) such acreage is not contiguous to offset non-unit gas proration unit.

Q Okay, looking back, if you would, please, to Exhibit Number Twenty-seven, do you find yellow spots indicating proposed gas wells which do not meet the conditions set forth in proposed Rule No. 4?

A Yes, there are three gas wells shown on Exhibit Twenty-seven that do not meet the new pool rules and those particular wells are Wells 409, 510, and 201.

Q 409 is a well in Tract 11. 510 is a well in Tract 13. What was the other number? 201, and that's a well reflected as being in Tract Number 5. Is it Shell Western's proposal to return during a subsequent hearing to seek exception to these proposed pool rules and allow others to present their opinions with regard to that matter?

A Yes.

Q Okay. Anything further on proposed Rule No. 4, Mr. Burbank?

A No.

Q All right, let's look, if you would please, at proposed Rule No. 5.

A Proposed Rule No. 5 reads, any well within the North Eunice Blinebry-Tubb-Drinkard Oil and Gas Pool designated as a gas well shall be subject to the gas proration rules set forth in Commission Order No. R-8170, as amended for the Blinebry Oil and Gas Pool or Tubb Oil and Gas Pool, or both, as appropriate.

In effect what that states is that the gas produced from our unit gas wells will be prorated under the existing proration rules in the Blinebry and Tubb Oil and Gas Pools.

Q All right, sir, let's look at proposed Rule No. 7 at this time.

A The proposed Rule No. 7 reads, the limiting gas/oil ratio for oil wells in the North Eunice Blinebry-Tubb-Drinkard Oil and Gas Pool shall be 6000 cubic feet of gas per barrel of oil.

Q And 6000-to-1 is the current gas/oil ratio for the -- one of the three current pools, is that correct?

A Yes, the Drinkard --

Q All right, sir.

A -- Pool.

A There are two wells within the unit area that when this rule becomes effective will produce more gas than they are now because they are limited under current Blinebry and Tubb gas/oil ratios of 4000 and 2000. Those particular wells are the Exxon New Mexico State V No. 3 and the Shell Western State Section 15 No. 1.

With the introduction of a higher gas/oil ratio in the unit, we estimate that the gas production will increase by only 27 MCF a day by raising the casinghead gas production limit from these two wells.

Q Let's look now, if we could, please, sir, at proposed Rule No. 8.

A Rule No. 8 states that commingling in the wellbore of production from oil zones and gas zones in the North Eunice Blinebry-Tubb-Drinkard Oil and Gas Pool is prohibited.

And, finally, Rule No. 9 states that the gas volumes from our unit gas wells will be reported in the current Blinebry and Tubb oil and gas proration schedules.

Q And has Shell Western discussed these reporting requirements with the Division staff members responsible for natural gas prorationing?

A Yes.

Q Okay. Anything else with regard to Exhibit Number Thirty, the proposed special pool rules?

A No.

Q All right, sir, let's look, if we could, please, at Exhibit Number Thirty-one to this proceeding and if you could describe that exhibit for the Examiner and those in attendance.

A Okay. Exhibit Number Thirty-one is a C-108, which is the Application for Authorization to Inject, and if I may, I'll just walk through this package and describe what we've included in here.

The first several pages are a listing of the proposed injection wells in the unit and on there describes the location of those wells; the casing and depth; the sacks of cement used to cement the casing; the top of cement in each of the -- on the production strings; and our proposed tubing and packer assembly used for injection purposes.

Now along with that table the next set of papers in this packet are schematics of those particular injection wells, and the data on that first section is repeated on all of these schematic diagrams.

The next section describes some of the data required on the C-108 form.

Our proposed average injection rate is approximately 1350 barrels of water per day per well. The maximum injection rate will be approximately 2000 barrels per day.

We propose a closed injection system. The average injection pressure will be 1000 psi and the maximum injection pressure will be approximately 1200 psi, not to exceed the .2 psi per foot to top perforations limitation.

The source water that we plan on using comes from the San Andres formation and the analysis is attached later on but why don't I continue by describing this map that we have included in this package.

The map has highlighted our unit area in yellow and a blue is the area of review as required by the C-108 form.

Q Just for clarification, how did you arrive at the area of review?

A The area of review requires a one-half mile radius around each injection well and rather than drawing a circle around each injection well, we decided to take a -- a quarter mile distance around the proposed unit area as the area of review.

And because all of our injection wells are located two locations inside of our unit, that quarter mile around the unit area fulfills the requirement of a half mile within our injection .

Now, for those wells in the area of

review we have tabulated all of the locations, names, and completion schematics of those wells with the top of the cement of the production string indicated.

I'd like to point out that of those wells in the area of review there are two wells where the top of cement is below our proposed injection interval. Those two wells are the Chevron Eubank No. 8 and the Meridian Doron No. 3.

The Meridian Doron No. 3 is located in Section 10 and the Chevron Eubank No. 8 is located in Section 22.

We plan on contacting these operators and insuring that there is cement across their injection interval prior to commencing with injection in that area.

Following the table of wells in the area of review we have included schematics of all the plugged and abandoned wells in our -- in our unit area, and reviewing all the schematis we have insured safe protection of the injection water in these wells.

Following the schematics of the plugged wells we have attached a water analysis of the San Andres source water we plan on using plus an analysis of the Blinebry, Tubb, and Drinkard waters and our chemical engineers have indicated that the source water is compatible with our produced water.

Also in the unit area we have taken water samples from fresh water sources in the area. We searched the State Engineer's Office for sources of fresh water and the only sources of fresh water in the area were surface alluvium deposits and we have attached three samples from throughout the unit of that fresh water.

Q Mr. Burbank, obviously an extensive amount of work has gone into the preparation of the C-108 and attachments. In conducting the study relative to this matter the geologic and engineering data indicated in that exhibit, have you found any evidence of open faults or other hydrologic connection between the proposed injection zone and any underground source of drinking water?

A No.

Q Okay. I would ask you now, sir, to refer to what we've marked as Exhibit Number Thirty-two to this proceeding, and tell the Examiner and those in attendance what's reflected on that exhibit?

A Exhibit Thirty-two is the certified return receipts from sending out the C-108 form to all surface owners and offset operators.

That was sent out on September 8th.

Q All right, sir. In summary, sir, I would ask you to refer please to what we've marked as Exhibit Number Thirty-three to this proceeding and describe --

A This --

Q Go ahead.

A Exhibit Thirty-three are three applications. 9230, the contractino of exisitng pools, creation of new pool. 9231, statutory unitization. And 9232, the waterflood.

9230 is summarize in order to accomplish this pool creation it will be necessary to contract the present boundaries of the Blinebry Oil and gas Pool, Tubb Oil and Gas Pool, and Drinkard Pool by eliminating from those pools the acreage to be included within the North Eunice Blinebry-Tubb-Drinkard Oil and Gas Pool.

The Applicant prays that the Division enter its order creating a new pool named the North Eunice Blinebry-Tubb-Drinkard Oil and Gas Pool, contracting the present boundaries of the Blinebry Oil and Gas Pool, the Tubb Oil and Gas Pool, and the Drinkard Pool, to allow acreage presently in those pools to be included within the North Eunice Blinebry-Tubb-Drinkard Oil and Gas Pool, designating certain wells as gas wells and adopting the special pool rules attached hereto as Exhibit A as the rules governing the North Eunice Blinebry-Tubb-Drinkard Oil and Gas Pool, all for the purpose of prevention waste of natural resources and protecting the correlative rights of interest owners within the area of the proposed North Eunice Bline bry-Tubb-Drinkard Oil and Gas Pool.

Case 9231 states that the approval of the statutory unitization of the Northeast Drinkard Unit is in the best interests of conservation, the prevention of waste, and protection of correlatiave rights; wherefor, Shell Western respectfully requests that the application be set for hearing before the Division Examiner on September 24th, 1987, and after notice and hearing as required by law and the rules of the Division, the Division enter its order granting this application.

Q All right, sir, and the final application was the application reflected as Exhibit Number Thirty-one to this proceeding and what is being sought in that application, the C-108?

A The application calls for authorization to inject and conduct a secondary recovery operation.

Q All right, sir. After studying this project and devoting substantial amounts of time and energy to this project, have you formed the professional petroleum reservoir engineering opinion that approval of these three applications is in the best interest of conservation of natural resources, the prevention of waste of natural resources, and the protection of the correlative rights of various interest owners within this area?

A Yes.

Q Thank you, sir. Do you have anything further at this time?

A No.

MR. PEARCE: I have nothing further of the witness at this time, Mr. Examiner. I would move the admission of Shell Western Exhibits Seventeen through Thirty-three at this time.

MR. CATANACH: Exhibits Seventeen through Thirty-three will be admitted into evidence.

There's quite a lot of information, Mr. Pearce. Why don't you give us fifteen, twenty minutes to get our thoughts together.

MR. PEARCE: Good.

MR. CATANACH: We'll take about a fifteen, twenty minute break.

(Thereupon a recess was taken.)

MR. CATANACH: I guess we'll call this hearing back to order at this time.

CROSS EXAMINATION

BY MR. CATANACH:

Q I only have a few questions. Mr. Burbank, do you know why Tract 31 was not included or why

Bison didn't want to included in the unit?

A No, I'm not familiar with why they didn't want to be in it.

MR. PEARCE: Mr. Examiner, if it's at assistance at this time let me mark something as Exhibit Number Thirty-four to this proceeding and I may need to get it in by recalling Mr. Goforth.

It's a copy of the letter which we received from Bison requesting that that tract be excluded, and for those who did not receive copies, the concluding sentence of that brief letter is, this tract is on the edge of the productive limits and is not likely to produce any economic secondary production.

I have not made an independent investigation to determine whether or not Shell Western agrees with that analysis, but that certainly was the position of Bison and on that basis and since, as the witness testified, he did not believe he affected the operations of the unit, we agreed to exclude that acreage.

MR. CATANACH: Okay.

Q Mr. Burbank, do you have a time frame on when you think Phase II oil and gas are going to go into effect?

A Yes. If you'll refer ot Exhibit Twenty-Six, which is an AFE package, turn to the first table, wich is the fifth page, we estimate that Phase II oil participation will begin in mid-1993.

And we do not expect Phase II gas participation to ever be in effect. The reason for that is we feel we will recover the remaining primary gas but we will not get any incremental gas production and Phase I is in effect until primary gas production is depleted.

Q Do you have any knowledge of -- of any of your interest owners who -- who have had any problems with yoiur allocation formulas?

A No.

Q No one has sent any opposition to those?

A No.

Q Were those contained in the unit agreement?

A Yes.

Q You said you had -- you were planning to co-op with Conoco, I believe, and Cone, two parts of the waterflood. Do you already have agreements in place with those two parties

A No, we do not. We plan on pursuing those after unitization.

Q Okay, probably before you start waterflooding (not clearly understood)?

A Yes.

Q Referring to your Exhibit Thirty-one, the Form C-108, looking at your offset wells or wells within the area of review, I notice that you have cement tops and some are listed as temperature survey tops.

A Uh-huh.

Q Did you -- how did you determine the other cement tops on these wells?

A The cement tops were calculated using a 25 percent loss and that was based on data available from the temperature surveys.

Q All right, you further stated that the only fresh water in the area that you have found was in the surface alluvium. Do you have any depths that that fresh water is encountered in here?

A I don't have any available with me, but it is, I believe all of the water is less than 150 feet deep.

Q Does the fresh water, as far as you know, extend throughout the field?

A From a map of all of the wells that were -- had been drilled for fresh water in the unit area, most of the unit area probably has some surface alluvium water under it. But it was very difficult to find wells that were active form those records, so we -- we attempted to get as many fresh water samples as we could in the area.

Q Okay, and your proposed waterflood operations will protect that fresh water in that area.

A Yes.

Q Okay.

QUESTIONS BY MR. LYON:

Q Mr. Burbank, referring to Exhibit Nineteen, I guess that is Exhibit Nineteen, is --

MR. PEARCE: It may take us just a moment, please, Mr. Examiner -- I'm sorry, Mr. Lyon.

All right.

Q Can you explain why you state in the alternatives two and three that you would have lost primary of secondary (unclear) recovery reserves in the case of alternative two and lost Blinebry and Tubb reserves in alternative three?

A Those alternatives were looking at just separate zone floods, so alternative two was -- we use all the existing wells to flood the Blinebry and we don't flood the Drinkard, and if we just try to flood the Blinebry, we don't make any money. We have a negative profit. Therefore, you can conclude that if you had to drill another 50 wells plus in order to try to develop the Drinkard, that definitely would not be profitable.

So when you just look at the alternative of flooding the Blinebry and that's not profitable, the Drinkard will not be profitable either, and therefore you would not pursue secondary recovery operations.

Q But you're not -- are you saying that flooding one zone precludes any flooding of the other zones?

A Economically.

Q Are you looking at just a given time period or you're saying that if you elect to flood one zone individually, that you could never flood the other ones.

A Okay, within a given time frame the economics currently are not attractive to go after the secondary reserves in the Drinkard. I guess that's what we're trying to say there.

Q Okay. Now, in Exhibits Twenty-four and Twenty-five, you have separate phases for oil and gas. Now, under which one of those does casinghead gas come?

A It goes under gas, Phase I.

Q It comes under gas, so you're not dealing strictly with the gas wells as such in that parameter.

A Right.

Q If you don't ever expect to enter into Phase II in the gas phase, why do you have it?

A It was -- it was developed so that in case our estimates were low the working interest owners would have another phase based on their ultimate primary gas production.

So it was just used in case our estimates are low, and instead of based on just what is left, if we underestimated we want the Phase II to be based on their total that has been produced from each tract.

MR. PEARCE: I think the analogy may be a belt and suspenders.

Q I have a little problem with some of your nomenclature in your applications, right there on 9230. You refer to all of these things as lots and in the regular sections they're actually quarter quarter sections, and so you don't have lots within Sections 10, 15, 22, and 23, and lots that you refer to by letters are our designation of proration units (not clearly understood).

I just wanted to nitpick a little.

MR. PEARCE: We'll be happy to clean that up, Mr. Examiner.

In addition, I would point out that on the application in Case 9230 what's designated as Lots L and M, Section 24, I believe is Tract 31, which is not under consideration at this time.

So there are two things we need to clean up on that.

Q Mr. Burbank, have you looked at all the wells in the unit area?

A Yes.

Q Okay, have you looked at the wells immediately surrounding the unit area?

A Yes.

Q I wonder if it would be -- if you would be willing to supply us with a map that shows the acreage dedication in the Tubb and Blinebry Pools around the perimeter of the unit so that we can -- can see what acreage is eligible to be assiend to the wells, to the gas wells.

A That can be done.

Q And if you want a cutoff date, say, effective as of the hearing date, because I know those things change from time to time.

Are you familiar with your well which on Exhibit Twenty-Seven is designated as Well 204?

A 204? Yes.

Q Did you look a the history on that well?

A I don't recall what it is, no.

Q I wondered if you could tell me what zones it was -- it was open in, and what its production history might have been.

A I don't -- I don't have that data with me, no.

Q Well, it's been awhile since I've looked at that well but I wondered if the history on that well is consistent with the representation that the top two zones of the Blinebry are gas and that the rest of them are oil.

A I don't know. We can investigate that.

Q Okay, I wish you would. I believe that's all I have. Thank you.

QUESTIONS BY MR. LEMAY:

Q Mr. Burbank, you've indicated, I think, that -- that there was common source here, implying that there was communication between all zones, at least that's the way I interpreted your statement of common source.

Do you believe that's mechanical communication or do you believe that there is communication within these reservoirs throughout the interval you want to flood?

A I think there is communication only in the wellbores from commingling and not, not any fracture connection or anything, any such connection as that.

Q So you would adhere to the theory of your geologist, that these are horizontally segregated zones --

A Yes.

Q -- by virtue of tight streaks and they are not communicated?

A Yes.

Q How about the water, is there water being produced from these various zones?

A Yes.

Q Which ones?

A Well, we have water samples from all three zones that we've included in our C-108 application.

Q Is this down dip water? It's not an active water drive, it's gas solution, I take it.

A No, it's not an active water drive.

Q And do both the Blinebry and the Drinkard zones produce water mainly in the down dip wells, that's produced in conjunction with the oil?

A I don't know where the water is produced but it's very minimal in the unit area.

Q Minimum amounts of water being --

A Amounts of water, yes.

Q Can you give me a range at all?

A I don't know.

Q Do you know if the Ogallala carries water in this area? Fresh water?

A No, it does not.

Q It's not present in here (unclear)?

Oh, it's below the cap, okay. You're off the cap here?

A Yes.

RECROSS EXAMINATION

BY MR. CATANACH:

Q Mr. Burbank, in your proposed set of rules, pool rules for the North Eunice Blinebry-Tubb-Drinkard Oil and Gas Pool, referring to Rule 5, where it says the District Supervisor shall have authority to classify any well in the pool as a gas well or an oil well, do you have any recommendations -- recommended criteria that we could use to classify a gas well or an oil well?

A We had planned on submitting a list of wells to the Division that we wanted classified as gas wells, and those particular wells in our unit area would only be completed in the gas zones in the Blinebry and Tubb wells, but we had proposed any sort of GOR, no.

Q So the gas wells that you have listed as of now, are those the ones that you intend to keep as gas wells and you don't intend to complete any more gas wells?

A Well, at this time the initial plan is to complete those twenty wells as gas wells and I can't predict in the future what we will want to do but of those twenty wells, as I mentioned before, there's three are exceptions to these particular pool rules and we will come back to the Division for exceptions in those cases.

Q Okay, and as I understand it, all your producing wells will be open in all three zones?

They won't be separated by packers? Is that correct?

A No, not in the production wells.

Q Okay, your injection wells will be -- some of them will be segregated by packers, is that right?

A We plan to separate injection in the Blinebry and Trubb and Drinkard zones with packers and the plan at this time is to use downhole flow regulators to regulate the flow of water into each zone.

Q And how do you intend to distribute the flow into each of the zones?

A We'll prabably base it on the Phi-H of each well as to how much water goes into each -- to each injection zone.

Q Okay, of the gas wells you have listed, are those -- are the majority of those already completed and producing from the gas zone?

A No.

Q How do you intend or propose to complete these gas wells?

A We plan to go in and cement squeeze all the perforations and to go back in and re-perforate in the gas zones and produce from the Tubb and/or Blinebry, we'll have gas production.

Q On your application you're seeking sort of a blanket approval to downhole commingle the two gas zones.

A I guess we hadn't considered a commingling application at this time.

Q Okay would Shell be willing to -- to follow standard procedure and file applications for each of these gas wells when they're completed?

A Yes.

MR. CATANACH: Does anyone else have any questions of this witness?

MR. PEARCE: I have one follow-up if there are not others. Excuse me just a moment.

REDIRECT EXAMINATION

BY MR. PEARCE:

Q One follow-up question, Mr. Burbank. is the unit operator willing to provide the Division and the Hobbs District Office with annualized production numbers allocated to the Blinebry, Tubb, and Drinkard reservoirs for historically record keeping purposes in this matter?

A Yes.

Q Okay.

MR. PEARCE: Mr. Examiner, I -- at this time I'm inclined not to try to get Exhibit -- what

I marked as Exhibit Thirty-four into the record. That's the Bison letter. If you would like us to bring on another witness and demonstrate that that came from our records and was duly received, we'll do that, but --

MR. CATANACH: You don't want to enter it into the record?

MR. PEARCE: I don't think it's important. We'll be happy to do it if you would like it as an exhibit to this proceeding.

MR. CATANACH: That's fine. We don't need to enter that, Mr. Pearce.

MR. PEARCE: All right. With that, Mr. Examiner, I have nothing further of this witness.

MR. CATANACH: The witness may be excused.

MR. PEARCE: All right. In conclusion, Mr. Examiner, I would like to hand you at this time two sets of proposed orders in this matter. One is a proposed order creating the North Eunice Blinebry-Tubb-Drinkard Oil and Gas Pool, contracting the present Blinebry Oil and Gas Pool, Tubb Oil and Gas Pool, and the Drinkard Pool, and establishing special pool rules for the new pool.

One is a statutory unitization order for the Northeast Drinkard Unit and finally, an order approving a waterflood project within this area.

MR. CATNACH: You must have known I was going to ask you for these.

MR. PEARCE: And for the record, the lot designation problem has been resolved by numbering four lots in Section 4 by the numbers rather than letters and the property description substitutes quarter quarter section descriptions for the letter number -- letter designated lots down in the application.

MR. CATANACH: Okay. Is there anything further in any of these cases, Case 9230, 9231, or 9232?

If not, they will be taken under advisement.

(Hearing concluded.)

C E R T I F I C A T E

I, SALLY W. BOYD, C.S.R., DO HEREBY CERTIFY that the foregoing Transcript of Hearing before the Oil Conservation Division (Commission) was reported by me; that the said transcript is a full, true, and correct record of the hearing, prepared by me to the best of my ability.

Sally W. Boyd CSR

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. ______ heard by me on ______ 19____

______, Examiner
Oil Conservation Division