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

Hearing Held in Farmington

6 July 1988

EXAMINER HEARING

IN THE MATTER OF:

In the matter of the hearing called by the Oil Conservation Division on its own motion for pool creation and Special Pool Rules, San Juan, Rio Arriba, McKinley and Sandoval Counties, New Mexico, and — CASE 9420

In the matter of the hearing called by the Oil Conservation Division on its own motion for an order contracting the vertical limits of certain pools in San Juan and Rio Arriba Counties, New Mexico. — 9421

BEFORE: David R. Catanach, Examiner

TRANSCRIPT OF HEARING

A P P E A R A N C E S

In attendance:
William J. Lemay, Director
Oil Conservation Division
State of New Mexico

William R. Smith, Director
Oil and Gas Conservation
Commission
State of Colorado

For the Division:
Robert G. Stovall
Attorney at Law
Legal Counsel to the Division
State Land Office Bldg.
Santa Fe, New Mexico 87504

BEFORE EXAMINER CATANACH
OIL CONSERVATION DIVISION
M/W EXHIBIT NO. 7
CASE NO. 11996

7/6/88 hearing

A P P E A R A N C E S Cont'd

For Amoco:	Kent Lund Attorney at Law Amoco Production Company P. O. Box 800 Denver, Colorado 80201
For Dugan Production Corp.; Merrion Oil & Gas Corp.; Hixon Development; Robert L. Bayless; and Jerome P. McHugh & Associates:	Tommy Roberts Attorney at Law P.O. Box 1020 Farmington, New Mexico 87499
For Arco and Blackwood & Nichols:	William F. Carr Attorney at Law CAMPBELL and BLACK P. O. Box 2208 Santa Fe, New Mexico 87501
For Meridian Oil:	W. Thomas Kellahin Attorney at Law KELLAHIN, KELLAHIN & AUBREY P. O. Box 2265 Santa Fe, New Mexico 87504
For El Paso Natural Gas:	Dennis J. Dwyer Senior Attorney El Paso Natural Gas Company P. O. Box 1492 El Paso, Texas 79978 (In association with Montgomery & Andrews, Santa Fe, New Mexico.)
For Pennzoil:	James Bruce Attorney at Law HINKLE LAW FIRM P. O. Box 2068 Santa Fe, New Mexico 87504

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MR. CATANACH: Okay, we'll call Case Number 9420, in the matter of the hearing called by the Oil Conservation Division on is own motion for pool creation and special pool rules, San Juan, Rio Arriba, McKinley, and Sandoval Counties, New Mexico.

Are there appearances in this case?

MR. STOVALL: Yes. Mr. Examiner, before we take appearances in this case, I'd like to ask that this case be consolidated with the following Case 9421.

MR. CATANACH: At this time we'll call Case 9421, in the matter of the hearing called by the Oil Conservation Division on its own motion for an order contracting the vertical limits of certain pools in San Juan and Rio Arriba Counties.

Are there appearances in either one of these cases?

MR. STOVALL: Robert G. Stovall, appearing on behalf of the Oil Conservation Division.

MR. LUND: Kent Lund, appearing on behalf of Amoco Production Company and also (unclear).

MR. ROBERTS: Mr. Examiner, my

name is Tommy Roberts. I'm an attorney in Farmington. I'm appearing on behalf of Dugan Production Corporation, Merrion Oil & Gas Corporation, Hixon Development Company, Robert L. Bayless, and Jerome P. McHugh and Associates.

MR. CARR: May it please the Examiner, my name is William F. Carr of the law firm Campbell & Black, P. A., in Santa Fe.

We represent ARCO Oil & Gas Company and Blackwood & Nichols.

MR. KELLAHIN: Mr. Examiner, I'm Tom Kellahin of the Santa Fe law firm of Kellahin, Kellahin & Aubrey, appearing on behalf of Meridian Oil, Inc..

MR. DWYER: Mr. Examiner, I'm Dennis Dwyer, appearing on behalf of El Paso Natural Gas Company, and in association with the firm of Montgomery & Andrews in Santa Fe.

MR. CATANACH: Are there any individuals who will be presenting statements without an attorney here today?

MR. STOVALL: Mr. Examiner, I'd like to note for the record entry of appearance by James Bruce of the Hinkle, Cox law firm in Santa Fe, New Mexico, on behalf of Pennzoil Company. It's a written entry of appearance by letter dated June 30th, 1988.

MR. CATANACH: Could I get all the witnesses to stand at this time to be sworn in?

(Witnesses sworn.)

MR. STOVALL: Mr. Examiner, I've entered my appearance in this matter on behalf of the Oil Conservation Division.

I'm actually presenting a witness on behalf of the committee which was set up to study, evaluate, and propose a set of rules for the production of gas from the Fruitland coal formation.

This committee is not an official, existing entity and therefore had not actually an appearance but the recommendations in this case are being presented by the committee.

There will be four witnesses who will testify and present evidence on behalf of the committee. Mr. Ernie Busch in the Aztec OCD office who served as Co-chairman of the committee throughout its working period, will present the initial opening evidence covering the broad scope of what the application in this case requests and will propose an order to be entered in this case.

Mr. Dana Craney of Meridian

Oil will be presenting the committee's geological evidence in support of the application.

Mr. Alan Wood of Amoco will be presenting the committee's engineering evidence in support of the application.

Mr. Alan Alexander of Meridian Oil will be presenting the committee's evidence with respect to the proposed spacing requirements in this -- in this proposed application and proposed order.

Mr. Craney and Mr. Alexander from Meridian will be examined by Mr. Tom Kellahin. Mr. Wood will be examined by Mr. Kent Lund. They will all be presenting, in this capacity initially, evidence in support of the application as representatives of the committee. This will not preclude them at a later time from presenting evidence in support of their own company's position, should there be any additional evidence they wish to offer in that respect.

Having said that, I would now call Mr. Ernie Busch to the stand.

Before Mr. Busch gets started, I believe that there are copies of Mr. Busch's exhibit over in the box in the corner, is that not correct, Ernie?

MR. BUSCH: That's correct.

MR. STOVALL: If anybody did

not receive one, I think there are some --

MR. BUSCH: I'm sorry, Mr. Stovall, they're up on --

MR. STOVALL: Oh, on the top, I'm sorry, on the upper corner up here.

ERNIE BUSCH,

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

DIRECT EXAMINATION

BY MR. STOVALL:

Q Mr. Busch, would you please state your name and place of residence?

A Yes. My name is Ernie Busch and I'm with the New Mexico Oil Conservation Division in District III, Aztec.

Q And in what capacity do you serve in the Oil Conservation Division?

A I am the geologist for that district.

Q Have you previously testified before this Division and had your credentials accepted as a petroleum geologist?

A Yes, I have.

Q Are you familiar with the applications

which have been filed in this case?

A Yes, I am.

Q Would you please briefly for the Examiner summarize the broad purpose of the application in the Case 9420

A Yes. Case 9420 is to recognize the Fruitland Coal as a separate reservoir from other formations in the San Juan Basin by declaring it a separate pool and to enact special rules that will address the unique character of this resource.

Q And what is the purpose of the application in Case 9421?

A Case 9421 is an application to contract the vertical limits of all of the Fruitland pools in this -- in the San Juan Basin to include only the sandstone formations.

Q To take the coal formations from -- from those pools in order that they might be in a coal pool rather than in the -- in the sandstone pool.

A That's correct. Today we're going to -- we're going to show to the satisfaction of the Examiner that the coal is a separate source of supply from -- from the sand.

MR. STOVALL: Mr. Examiner, I'd like to offer Mr. Busch as an expert witness in this

case.

MR. CATANACH: He is so qualified.

Q Mr. Busch, would you please describe the history of what has gone on before these applications were filed and why these applications were filed?

A Yes. In the fall of 1986 the Aztec Office of the NMOCD saw that the Fruitland Coal development, gas development, was increasing and that because of the unique nature of this resource existing rules might not be adequate.

So we contacted Mr. Bill Smith of the Colorado Oil and Gas Conservation Commission to see if he would be interested in joining with us in calling together an industry committee to advise us on what type of regulation would be necessary to allow for the best development of this resource.

Q Mr. Busch, may I interrupt you here for just a moment, please, and ask you, why -- why did you contact Mr. Smith in Colorado? What was the reason for that?

A The resource extends into both states and --

Q So it was an effort to come up with a common set of rules, or common understanding of the formation in both states?

A That's correct; to try to establish some rules that would apply in New Mexico as well as in Colorado.

Q All right, would you continue, please, then with what happened?

A Yes. We held our first meeting in November of 1986 and today we are presenting the fruits of our labors of the 1-1/2 years of work that the Committee has undertaken.

And we would like to thank the Committee members for the tremendous input that they have given us and the cooperation of all the companies, the company representatives that served on the Committee, and at this time I'd like to briefly give a list of those -- of those companies that did serve on the Committee.

Meridian Oil Company, Amoco Production, Mesa Limited, NCRA, ARCO Oil and Gas, the BLM, Southern Ute Tribe, Northwest Pipeline, El Paso Natural Gas, Tenneco Oil Company, Blackwood & Nichols, Resource Enterprises, Union Texas Petroleum Corporation, Dugan Production Corporation, Merrion Oil and Gas Corporation, and that -- that would conclude the list of those participating on the (unclear).

Q Now you've identified the Southern Ute Tribe as being one of the participants.

A That's correct.

Q In what capacity did the Southern Ute Tribe appear and participate in the hearings -- or the meetings?

A They -- they participated as an active voting member of the -- of the Committee.

Q And to your knowledge, does the Southern Ute Tribe exercise any jurisdictional authority over and regulate oil and gas production in the interest of conservation and protection of correlative rights?

A Yes, it's my understanding that they do.

Q So in addition to the State of Colorado and the State of New Mexico, we also have the Southern Ute Tribe as a regulatory authority participating in an effort to come up with a unified plan, is that correct?

A That's correct.

Q Let me ask you, Mr. Busch, you've identified a broad number of companies. How did you seek or solicit participation in this Committee effort?

A We issued a memorandum addressed to all the gas operators in the San Juan Basin to join us in discussing formation of a committee.

Q And how did you identify those operators?

A All gas operators in the San Juan Basin.

Q From the records of the New Mexico Oil

Conservation Division?

A That's correct.

Q And did you also go to the Colorado Commission's to identify additional operators?

A Yes, we did.

Q You invited participation by each and every operator that you identified in this committee's effort, is that correct?

A That's correct.

Q What was the role of the Aztec office of the New Mexico Oil Conservation Division in this work?

A I was asked to be chairman initially and later became co-chairman with Katy Templeton Buell of the Colorado Oil and Gas Conservation Commission, but our role, Katy and my roles were as non-voting members of the committee, and although I am District Geologist for the New Mexico Oil Conservation Division, District III, I am here today as Co-Chairman of the Fruitland Coalbed Methane Committee presenting the recommendations that the Committee came up with.

Q Do you know if the State of Colorado has conducted any hearings with respect to these proposed rules for production from the Fruitland coal seams?

A Yes, they have and I'm in this morning of an order that they have issued on the recommendations of

the committee, although it is not signed yet.

Q And are those -- is that proposed order generally consistent with the application in this case, the proposed order in this case?

A Yes, it is, Mr. Stovall.

Q In your capacity, you've indicated that you are here testifying as the Chairman of the committee rather than as the District Geologist for the Oil Conservation Division.

Are you representing the perspective or point of view of any individual companies in this case?

A No, I am not. I'm representing the recommendations of the entire committee as to this.

Q Mr. Busch, let's now turn to your exhibit and discuss that.

Would you describe for us, please, what the proposed vertical and horizontal limits of the pool are?

A Yes, Mr. Stovall. I'd like to -- before we do that, I'd like to indicate that there may be some exhibits out there that the first two pages are in reverse order. The map should be first and then the log should be second.

Q Are they both behind Tab A?

A They are both with Tab A.

Q All right.

A That's correct.

Q All right.

A I'd like to start with part one of Tab A, which is a map showing the proposed pool boundary.

This boundary follows the Fruitland Coal outcrop around the San Juan Basin.

The second page of Tab A is a log referred to in the proposed order which is under Tab B, of the Schneider Gas Com B No. 1 Well, which illustrates the top of the Fruitland formation at 2450 feet to 2880 feet, which is the vertical interval that we're looking at today.

Q And the proposed order proposes that the vertical limits of the pool be correlated to this low as well, is that correct?

A This is a typical log from the coal producing wells, not a type log. It's merely to indicate where the top of the Fruitland formation is and the bottom but, yes, the purpose of the application is to examine the entire Fruitland interval.

Q Now, I'm looking at the contour map under Tab A. The boundary of the pool is shown in a dark outline, is that correct?

A That's correct.

Q And the boundaries for the pool as it

affects this case are, the northern boundary is the Colorado/New Mexico state line, is that correct?

A That's correct.

Q And then the Colorado case would encompass the remainder of that formation as it appears north of that boundary in the State of Colorado. Correct? To the best of your knowledge?

A That's correct.

Q Turn now to the proposed rules, if you would, Mr. Busch, and just -- what I would like you to do is briefly go through them part by part and summarize the rules and the reasons for those rules.

A Before we do that, Mr. Stovall, I would like to refer you -- refer the Examiner to -- to Tab, the back of Tab B, where we do have a list of criteria that will in our opinion classify a well as a Fruitland Coal Well.

Now on to -- on to the recommended rules for the pool.

Rule 1 is the general rule, which states that any well drilled, operated and produced will be in accordance with the rules set forth.

Rule 2, the pool establishment, indicates that the Director may require the operator to produce to the satisfaction -- to his satisfaction, that existing

wells are producing and the proposed wells will produce from the appropriate common source of supply.

Rule 3 (a) is Well Spacing and Location. This matter will be taken up by a later witness.

Rule 3 (b), Unorthodox Well Location, will also be covered by a later witness.

Rule 4, Increased Well Density, will be addressed by a later witness.

Rule 5, Horizontally Drilled Wells, will again be covered by a witness later.

Rule 6 (a), Testing, the 24-hour shut-in period that we recommend is because of a concern that longer shut-in may cause damage to -- to a Fruitland well, to the Fruitland coal well.

Q And the normal shut-in testing period for the Oil Conservation Division is greater than 24 hours, is that correct?

A That's correct. It is a 7-day shut in period.

Q So you're proposing to change due to the unique characteristics of the wells in this pool.

A That's correct.

Rule 6 (b), the venting and flaring portion, is an adoption by the Committee of the BLM paying well determination provision which allows a volume greater

-- well, New Mexico Oil Conservation Division rules, the Rule 404 allows no venting of gas for gas wells, so the Committee wants to adopt, wants the Commission to adopt this particular provision of the BLM to give it flexibility in producing these unique wells.

Q If I understand you correctly, what you're saying is that under existing general OCD rules venting of the gas well gas is not allowed for any purpose, is that correct?

A That's correct.

Q The -- because of the -- again, because of the nature of these particular wells and the production therefrom, it may be necessary to vent a well in order to -- vent it or flare it -- in order to test the well's productivity to determine whether in fact it is a productive well, is that correct?

A That's right.

Q And the numbers you have chosen, you've not chosen necessarily because of any standard for testing purposes, but rather because it is consistent with BLM rules and regulations regarding the flaring of gas from Federal leases and really these -- these numbers are for the purpose just being consistent with those rules, is that correct?

A For a paying well determination, that's

-- that's correct.

I would like to state that in regard to venting gas in New Mexico, C-129 Form is an application by the operator to vent greater amounts of gas subject to pipeline hookup. So there is a provision that does exist for the venting of 30 MCF a day prior to pipeline hookup under hardship conditions.

Q Okay. Will you now turn to Rule 7 and just briefly summarize the purpose of that rule?

A Yes. Rule 7 is not a recommendation made by the Committee, however, the committee that we -- the subcommittee that we set up that was -- that was chaired by Mr. Paul Burchell, felt that it was necessary to make a provision to those operators who have existing Fruitland, Pictured Cliff, or commingled Fruitland-Pictured Cliff wells which would fall in conformance with Paragraphs A and B of this recommended order, such that they could have their well reclassified as a Fruitland Coalbed Methane Well and have given them a period of 90 days effective at the date of the order, to submit the C-102's and C-104's that are appropriate for that reclassification.

Q Is that proposal in recognition of the fact that this is a rather unique case for the creation of a new pool, given that it is not really based upon the existence of a discovery well but rather it's actually

forming a new pool into which many wells have already been drilled and are already operating. Is that correct?

A Well, that's correct.

Q So you're trying to accommodate the existing wells which may penetrate or be producing from these -- the coal seams.

A That's right.

Q Now, Mr. Busch, in order for the Examiner to understand the necessity for coming up with a special set of rules for production from the Fruitland Coal seams, would you please describe the geological history of the Fruitland Coal?

A Yes. The Fruitland Coal formation was deposited approximately 75-million years ago during the Cretaceous period.

Part C of Exhibit One is a map illustrating the position of the San Juan Basin on the edge of a large sea that existed during that time.

On the lower two-thirds of Part D there's a sketch showing how the southwestern shoreline of this sea transgressed and regressed creating and covering those coastal swamps.

And at the top of this exhibit is a stratigraphic cross section from southwest to northeast across the midsection of the San Juan Basin showing the

resultant Fruitland Coal Beds and the underlying Pictured Cliff sandstone.

If we turn to Part E it shows how the tectonic movement during the Laramide orogeny created the current San Juan Basin structure. The Fruitland Coal has been mined along its outcrop for many years and is in fact fuel for the electric generating plants just west of here.

Q Would you please describe the lithological nature of the Fruitland formation and particularly the coal seams?

A Yes. The Fruitland formation is a coastal plain deposit of (unclear) carbonaceous shales, siltstones, sandstones, and coals. It ranges from a thickness of from 100 to 600 feet.

Part F is a typical lithologic column combined with an induction electric log showing how the Fruitland formation is underlain by the Pictured Cliff formation, a regressive coastal barrier sandstone, and overlain by the lower member of the Fruitland -- Kirtland Shale formation.

The depositional and preservational environments for the individual coalbeds vary and therefore correlating the individual lenticular beds is difficult over large distances; however, the major coalbeds have an areal extent of several miles, square miles, and therefore

it's necessary to include all coals as a common source.

The coal is generally considered to be low volatile bituminous to sub-bituminous.

Q Why couldn't Fruitland Coal be considered as a separate source of supply than the gas pool?

A It has a unique character, unique signature in the -- in the gas analysis.

Part G is a paper by Mr. J. R. Levine describing how coal quality influences the generation of methane gas during coalification. I can't fully explain the complex chemical nature of the processes described in this paper but I do want to point out that this paper shows that methane, carbon dioxide and water are the results of coalification.

This means that the coal itself becomes a source bed for natural gas.

If you'll note, looking through the paper, there is no reference to heavier hydrocarbons than methane and we have yet to find heavier hydrocarbons within the -- within the coal wells.

Q Has the OCD ever heard cases before and are you familiar with any cases in which the distinct nature of gas produced coal seams has been identified?

A Yes.

Q (Not understood).

A Yes, Mr. Stovall. Amoco Production Company presented some evidence for NGPA Section 107 Pricing, to -- and in these cases, there were -- there were eight of them, and in these cases they showed the unique character of the -- of the gas composition from the Fruitland Coal.

Q Is coal actually source rock for any other horizons?

A No. At one time it was generally accepted that the coals were the source rock of gas found in the Pictured Cliff formation, but this idea is being less accepted for several reasons.

First, in the area of better Pictured Cliff production, the southwest part of the Basin, the Fruitland Coals and the Pictured Cliff formation are greatly separated.

Second, in the area where they are closest to the north, there's little PC production.

Finally, and most obvious, given the geometry of these formations, it's difficult to imagine (unclear) large amounts of gas.

Q Now would you go into a little more detail and describe for the Examiner how you differentiate the coal gas production from sandstone production in the area?

A Yes. Yes, we can show that two ways; one by gas analysis and produced water analysis and pressure.

Part H shows a typical gas analysis for -- for a coal well, or for some coal wells, and it also shows some sandstone gas analyses.

The, as you'll note, the coal gas shows significant carbon dioxide and low BTU as compared to the Pictured Cliff sands and Pictured Cliff gas, excuse me.

Part I is a Piper diagram of a water analysis, the produced water analysis from PC and Fruitland coals, and this shows that the bicarbonate and chloride levels can be used to differentiate producing intervals.

And finally, it's been long know that drillers in the San Juan Basin have had to take precautions when driling through the Fruitland Coal because of the danger of blowouts from over-pressured coals.

Part J is a paper written by A. D. Decker describing his analysis of the -- of the over-pressured situation.

I will quote from the second paragraph of what is marked at page -- at the bottom of page 55.

"To date, overpressured coal reservoirs in the San Juan Basin are water saturated and highly permeable. These reservoir conditions may be related to coal

water generative cycle under shale bounded conditions."

If you will again refer to Part F, this becomes clear, not all the Fruitland coal is over-pressure, but this over-pressure is excellent to show separation.

Q Would you just please summarize the geological conclusions?

A Yes, the Fruitland Coal extends throughout the area of this application and although they are lenticular, the individual coalbeds are large enough to extend over several miles each.

The coalification process has produced gas which is confined within the coals and can be produced through coals -- through wells drilled to the coalbeds.

Therefore the Fruitland Coal should be designated as a common source of supply apart from the sandstone intervals within the Fruitland formation and apart from the Pictured Cliff formation.

Q Why is it important that the coal be a separate pool?

A Well, there are two reasons. First, production of coal gas requires a different technology and science than the conventional oil and gas production and because of that it needs to be regulated differently to assure the efficient and orderly development of the resource to prevent waste and protect correlative rights.

Secondly, we are now beginning to realize the value of this resource.

Part K is a paper written by Mr. Bruce Kelso. I will quote from the third paragraph of what is marked as page 119.

"The regional geologic analysis concluded that the Fruitland formation coals have an estimated in place methane resource of 56-trillion cubic feet (TCF), nearly double the previous estimate of 31 TCF."

This is quite significant in that to date we've only produced approximately 14-trillion cubic feet from all formations in the San Juan Basin and have proven reserves left of about that much.

Also it's significant in relationship to another giant gas pool, the Prudhoe Bay, which has an estimate of only approximately 29 TCF gas in place.

So declaring the coal as a separate pool is a recognition of these facts.

Q Do you have anything further you wish to add with respect to Exhibit One?

A Not at this time.

MR. STOVALL: Mr. Examiner, I'd like to offer Exhibit One into evidence at this time.

MR. CATANACH: Exhibit One will be admitted into evidence.

Q One question, when the Committee was doing its work, in the course of doing its work, were there any problems that it identified which have not been included in the proposed order in this application?

A Yes, Mr. Stovall. The Committee made a recommendation that the -- that serious consideration should be given to the following issues:

Number one, establish a new priority under R-8441, which is the -- the gas priority schedule for the Fruitland Coalbeds Wells while they're in the dewatering phase and additionally recommended that this issue should be addressed by the Gas Advisory Committee and that they would be charged with developing guidelines to determine and define the dewatering phasé and where coalbed wells should be placed in that -- in that schedule.

Secondly, the Water Disposal Subcommittee made the recommendation to the Committee and the Committee adopted it, that a joint department be set up in New Mexico and Colorado to take care of the applications coming in from the operators to take -- to handle the disposal of these produced waters from the Fruitland Coalbeds.

Q Why is that particularly a concern? Would you just briefly touch on that?

A These wells make a tremendous amount of water initially and water disposal is a very vital concern

to the operator and has a very economic - big economic impact on him, on the lifting costs for the operator on these wells.

Q Are there any other concerns that the Committee addressed that are actually part of this application?

A Yes. Upon completion of the other Fruitland Coalbed gas well and having been classified, that Colorado and New Mexico represented -- approve or recognize a determination for NGPA category 107 be made regardless of whether it's an open hole or a cased hole completion.

Q Do you have anything further you'd like to add with respect to your testimony today?

A No, I don't think so.

Q To you believe that granting this application would be in the interest of conservation, the prevention of waste, and the protection of correlative rights?

A Very definitely.

MR. STOVALL: Thank you. I have no other questions, Mr. Examiner.

MR. CATANACH: Any cross examination at this time? I'll start out with Mr. Lund?

MR. LUND: No questions, Mr. Examiner.

MR. CATANACH: Mr. Roberts.

MR. ROBERTS: No questions.

MR. CATANACH; Mr. Carr?

MR. CARR: No questions.

MR. CATANACH: Mr. Kellahin?

MR. KELLAHIN: No questions.

MR. CATANACH: Mr. McGuire?

MR. DWYER: No questions.

CROSS EXAMINATION

BY MR. CATANACH:

Q Mr. Busch, how was the -- actually was the horizontal boundary of the pool determined?

A Mr. Examiner, it was determined by following the Fruitland outcrop around the Basin.

Q That goes all the way around the Basin?

A Yes. That's illustrated in Exhibit One under Tab A.

Q I have a question on the -- the criteria for classification.

A Yes, sir.

Q Would a well have to demonstrate, what, two of those criteria at least, or --

A Well, a preponderance. We thought that a preponderance would be a good yardstick for that. An

operator may not run electric logs, for instance. Some of the other, he certainly should have a gas analysis. That would be after the fact. Of course a water analysis would be after the fact; reservoir performance would be after the fact; have completion data, mud logs, drill cuttings, log cores, and that type of thing would probably be sufficient, and we wanted to leave that, really, to the discretion of the -- of the regulatory bodies to make a determination as to what would qualify, but these are some recommendations from -- as to what could be used.

Q In your Rule Number 1 you don't have the -- the 1-mile limit normally in a pool. Is that on purpose that you left that out?

A Well, yes, because the pool boundary is the entire -- the entire coal occurrence.

Q It takes in everything, though.

A Takes in everything.

Q So it probably won't be extended any time.

A That's -- that's right.

Q I'm a little curious about the recommendation for the joint department with Colorado and you can go into a little bit more detail on that, as to why?

A Yes. The operator has historically encountered a lot of problems with clearing various regula-

tory agencies and bodies, such as in Colorado, not only does the operator have to go through the Colorado Oil and Gas Conservation Commission, but they need to go through the county health departments and -- and various other -- other departments of that nature.

In New Mexico it's -- it's a lot easier to do. We do have the Environmental Bureau in Santa Fe and so we recognize that in New Mexico it's a fairly simple process but -- or easier, I'm not going to say simple, but you know, a little easier process than it would be in Colorado and so the operators wanted to see if there was any way that Colorado and New Mexico could get together and create a department to facilitate speedier application approval.

When an operator drills one of these coal wells he has an immediate problem with disposal of these large volumes of water and so an expedient approval would certainly be in the best interest of economic considerations.

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

If not, he may be excused.

MR. KELLAHIN: Mr. Examiner, for the record my name is Tom Kellahin. I'm an attorney appearing on behalf of Meridian Oil, Inc. As part of the

work study presentation we'd like to call at this time Mr. Dana Craney. He spells his last name C-R-A-N-E-Y. Mr. Craney is a petroleum geologist with Meridian Oil, Inc. He's already been sworn in.

We have, Mr. Examiner, marked as Meridian exhibits, Mr. Craney's presentation, and as we go through them we will number them as Meridian Exhibits One, Two, consequently.

I have for the Examiner and staff copies of Mr. Craney's exhibit books. I believe we've distributed to some counsel who have made entries of appearances, copies of the exhibit book.

Mr. Craney will use an overhead viewer, Mr. Catanach, which displays all of this exhibits in a format where I think the audience can see it. I'd like to spend a few minutes, if that's all right, to qualify Mr. Craney as an expert geologist.

DANA CRANEY,

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

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q For the record, sir, would you please

state your name and occupation?

A My name is Dana Craney. I'm a (unclear) Staff Geologist with Meridian Oil.

Q Mr. Craney, would you describe your educational background for us?

A I received a Bachelor of Science degree from the University of Southern Colorado, Master of Science degree from the University of Oklahoma.

Q In what years, sir?

A '74 and '78.

Q Subsequent to graduation and obtaining your degrees, would you summarize your work experience as a petroleum geologist?

A I worked for El Paso Natural Gas as a Development Geologist for three years.

I worked with El Paso Exploration as a Development Geologist and Development Coordinator for four years.

And presently work for Meridian Oil, which Meridian (unclear) El Paso Exploration and they -- sort of a project coordinator for the Fruitland Coal.

Q Let's talk specifically about your personal involvement as a petroleum geologist in the study of the coal seam gas production out of the Fruitland formation. What has been your personal experience?

A I've been involved in Fruitland Coalbed Methane development and exploitation since about 1982 and have been actively involved in Meridian's drilling and development program in the San Juan Basin.

Q Have you participated on behalf of your company as an expert geologist with regards to the work study program that Mr. Busch described here earlier this morning?

A Yes, I have.

Q And what has been your particular involvement?

A I was involved in the commingling subcommittee.

Q Did you participate on that subcommittee in terms of voting and discussing issues before that committee?

A Yes, sir, I did.

Q And pursuant to the work of that subcommittee have you prepared for us a package of exhibits to illustrate your conclusions and recommendations on behalf of that subcommittee?

A Yes, I have.

MR. KELLAHIN: Mr. Examiner, at this time we tender Mr. Craney as an expert petroleum geologist.

MR. CATANACH: He is so qualified.

Q Approximately when did your efforts and the efforts of the subcommittee on commingling begin?

A I believe we started the subcommittee back in February of 1988.

Q Would you identify for us, sir, what were the major issues of concern that directed the attention of the subcommittee and their work?

A Okay. Our subcommittee addressed four main issues and the results of these were that we adopted the current definitions of the Pictured Cliff Fruitland formation that are already established in the San Juan Basin.

The Pictured Cliff sandstone is the stratigraphically highest sandstone in the San Juan Basin and on wireline (unclear) contact between Pictured Cliff and Fruitland formations we picked the top of the massive marine sandstone.

The contact between the Fruitland and Kirtland formations is placed at the top of the highest carbonaceous shale or the highest coalbed, and (not clearly understood) combination of logs. If you could use this log in conjunction with the induction SP log, you would see a decrease in resistivity as you got above the carbonaceous

bed and got in the lower resistivity for the Lower Kirtland Shale.

First of all, I'm talking on a type log here and --

Q We'll come back and identify the display and we'll talk in detail about each of the four issues.

A Okay.

Q Give us an outline, though, and tell us what the four issues were.

A Okay, the four issues were that we defined the Pictured Cliff and the Fruitland formation. We established the Fruitland Coal as a separate pool. We left the currently defined Pictured Cliff Sandstone and Fruitland Sandstone Pools as they are; that is, commingled in Colorado and separate in New Mexico, and then we adopted coalbed methane criteria from the Bureau of Land Management which Ernie Busch talked to earlier in his exhibit.

Q In addressing the first issue, which is to identify the vertical limits of the proposed pool, you have noted what is identified as a type log? This is Meridian Exhibit Number One?

A Yes, sir.

Q What is the source of that type log? Identify the log for us.

A Okay, this is a type log of the Amoco Schneider Gas Com "B" No. 1 Well. It's drilled in the southwest of Section 28, 32, 10, San Juan County, New Mexico.

This is a gamma ray (unclear) density log.

MR. KELLAHIN: Mr. Examiner, this is the type log used by the Division when they adopted special rules for the creation of the Cedar Hills Basal Coal Pool. It's Order No. R-7588 and I have a copy of that order for you, which refers to the type log.

Q Tell us about the selection of a type log for the Basin coal gas pool that we're discussing today, Mr. Craney.

A The Rules Committee selected this type log first of all because it was already used in the Cedar Hill Pool and what the type log will show is the recognition of the Fruitland Coal primarily, which is the (not clearly understood) new coal pool. It would also show the recognition of the Picture Cliff Sandstone and the top of the Fruitland formation.

Q When we look at the blue shading on each side of that log, what is identified by that area?

A Okay, on the right side, the right column, identifies the three formations defined in -- by

the log, and on the left side it identifies the boundary, vertical limits of the Fruitland Coalbed Methane Pool.

Q What's shown with the green lines in the center portion of the display?

A The green in the depth track shows the coal as identified primarily from the bulk energy volume.

Q When we look at that interval that was identified as the Basin coal for the Cedar Hills Pool, what are we looking at on the type log?

A On the type log the Basal Coal Zone is this coal zone right here, from about 2832 to 2880.

Q Was there a general consensus among the geologists working on the subcommittee that you participated in as to whether or not this type log would be characteristic of a type log to be used throughout the Basin for identifying the coal gas seam production?

A No, sir, it wasn't and the reason is that the type log was picked after the Committee submitted their recommendations. It was picked by the rules writing committee but we have no problem with the type log.

Q Describe for us the Committee's conclusions and recommendations with regards to the vertical definition and limits for the Basin gas coal seam pool.

A The vertical limits of the Fruitland Coalbed Methane Pool established that it encompasses the

entire Fruitland formation and on the type log it's positioned at the top of the Pictured Cliffs formation, which is picked on the top of the sandstones at 2880, to the top of the highest carbonaceous shale for a coalbed, which on the type log is at 2450 (not clearly understood) through the Kirtland Shale and the type log is used to show that the Coalbed Methane Pool can be identified anywhere in the San Juan Basin as encompassing any and all coalbeds within the entire Fruitland formation.

Q Am I correct in understanding that above the top line there on the display that they are not going to find in the Basin coal seam gas production in commercial quantities?

A That's correct.

Q Anything further about the type log?

A No, sir.

Q All right, after having gone through the process of identifying the vertical limits for the pool, what then did you do as a study group?

A Okay. The -- we defined the vertical limits -- well, to reach the point of defining the vertical limits, we had to define the Pictured Cliff- Fruitland formation, which I jumped into right off the bat.

Q Okay.

A And we adopted the current definitions

as they already are in the San Juan Basin.

To reiterate, (not clearly understood) encompasses the carbonaceous sediments of the Continental deposit immediately overlying the Pictured Cliff formation.

The second step the Committee took was to -- we agreed and therefore recommended that the Fruitland coal represents a common source of supply within themselves and that the coal also represents a distinct and separate source of supply from the sandstones.

Q What was the basis of information that led you to that conclusion?

A The basis of that information is widely published data which the operators had access to and this information, as well as published information from the hearing information which was talked about earlier in Amoco establishing the Basal Fruitland Coal as a separate source of supply from the sandstones in the Cedar Hill area.

Q I know Mr. Busch touched on some of that discussion, but let's have you go through that discussion and lead us towards, then, your conclusions with regards to the horizontal boundaries of the Basin pool.

A Okay. Just by way of a brief review of how we -- I'll present this very quickly because Ernie presented this very well -- just a brief review of the

geology and how we made our conclusion --

Q You've displayed Exhibit Number Two, Meridian Exhibit Number 2?

A Exhibit Number Two.

Q All right, sir.

A This shows a rough diagrammatic Paleo-geographic map of the depositional environment during the time of (not clearly understood) deposit.

The Fruitland formation was deposited in the coastal plains exhibited, marine swamps, marshes, and rivers, and it was deposited out westward of the receding Pictured Cliffs shoreline, where the Pictured Cliffs sands were deposited and northeast of that was the Pictured Cliffs Sea, where the marine Lewis Shale was being deposit-ed.

Exhibit Three is an exhibit which Ernie showed. It shows the southwest to northeast cross section taken through time of this interval.

This cross section show how the pools were evolved on a coastal plain and it shows that after the coals were deposited that this relatively small strati-graphic interval of a few hundred feet would then be sub-jected to the pressure and increasing temperature due to (not understood) and tertiary sediments after that.

The response of these coals to the in-

creasing temperature and pressures is for them to metamorphose (sic) from peat to lignite to various ranks of coal, potentially all the way to anthracite. In the San Juan Basin they metamorphosed to low volatile bituminous.

The process of this coalification caused the coal to become its own source and trap. The gas generated within the coal seams did not migrate out of the coal but remained trapped in the coal seams.

Conversely, the current sandstone reservoirs have gas that was generated from the adjacent shales of the overlying Kirtland, Fruitland, and underlying Lewis formations, and gas and water from these shales has migrated into the sandstone.

So thus today we see the distinct gas and water differences in analysis between the Fruitland and the sandstones that Ernie Busch already talked about.

Q Identify for us, Mr. Craney, what is the source of the information displayed on Exhibit Number Three.

A The source of information on Exhibits Two and Three is from articles (unclear) by James E. Fassett, the U.S.G.S. geologist, noted authority on the Cretaceous in the San Juan Basin.

Q All right, sir. Exhibit Number Four?

A Exhibit Number Four is a rank map of the

Fruitland formation and ranks are determined based on vitrinite reflectance and volatile property of the coal, which changes as the coal matures.

And this map shows two things. One is that coal is present almost everywhere within the San Juan Basin and the net coal isopach map behind Tom Kellahin on the white board over there also shows the coal present almost everywhere in the San Juan Basin.

Q Let's take a moment and bring this display over there to you, sir.

A Shall I continue?

Q Let's -- We've marked the vitrinite reflectance value map as Exhibit Number Four. Let's do the thickness map as Exhibit Number Five so that you have them.

All right, you were making reference to Exhibit Number Five. Take a moment and identify it for us.

A Exhibit Number Five is a net coal thickness map of the Fruitland formation. This was published in the Southern (unclear) Association's Symposium by Mr. Kelso, and what -- what this map primarily shows is that the coal is present almost everywhere in the San Juan Basin. It shows the outcrop of the Fruitland formation and places upon the eastern side of the San Juan Basin where you can see the only -- where the zero contour line is, it shows the where the Fruitland Coal was either not deposited

or more than likely eroded off.

That zero line, this zero contour line for the Fruitland Coal is not present today.

Q When you -- stay a moment at the display there, Mr. Craney, when you look at that zero contour line around the outer boundary of the shaded area --

A Yes.

Q -- how does that conform to the proposed boundary for the -- horizontal boundary of the pool?

A The horizontal boundary was established outside of the zero line in this side of the San Juan Basin and then follows the outcrop of the Fruitland formation around the southern and western sides of the San Juan Basin and then follows the Colorado border to the eastern side of the San Juan Basin.

Q Within that boundary was the Committee satisfied that they encompassed and contained all of the potential coal that would be productive of gas --

A Yes.

Q -- in the Basin?

A Yes.

Q In looking at the different shades, is it reasonable or possible to separate out the different thicknesses of the coal seams and, say, create multiple different pools for the coal gas?

A Based upon a thickness map it's not; that some of the best coal wells that are producing from 18 feet of coal to 19 feet of coal, and this it showed that in other parts of the Basin we have as much as 80 feet of coal, so there is not a relationship between thickness and production.

Q Help us understand, for those of us that deal more commonly in gas produced out of marine sand as opposed to gas produced out of coal, what the relationship is, if any, that you can draw between a typical or characteristic isopach thickness map and the kind of coal thickness map you're seeing before you on Exhibit Five.

A The primary relationship that we could establish from the -- from the thickness map would be to calculate a volumetric type gas in place calculation. But to take a -- to take that and relate it to a rate is more dependent upon the permeability, the relative permeability, the pressures, an absorption/desorption isotherm; it's primarily permeability of the reservoir where that well is, and that primarily has been influenced by fracturing, natural fracturing.

Q Was the Committee satisfied taking the area encompassed with the dark outer boundary that you were containing an area of gas production out of coal that ought to be treated by the same rules and regulations?

A Yes, sir.

Q Let's go back for a moment to Exhibit Number Four and look at the coal quality map, the vitrinite reflectance values?

A Yes, sir.

Q Describe for us again what we're seeing when we look at that display.

A What we see in this display is that the coals range from a high volatile C bituminous in the southern part of the Basin to a low volatile bituminous in the northern part of the Basin.

This is an increase in rank or an increase in coal maturity and this is due to the greater depth of burial in the northern part of Basin, influence from a heat source, heat source to the north of the San Juan volcanic intrusive activity.

Q With regards to this information was there any consensus by the Committee as to whether or not using this data you should have any other boundary than the outer boundary proposed for the pool?

A No, there wasn't.

Q Did you consider whether or not you ought to shrink the boundary based upon the quality of the coal encountered in the area?

A In the Commingling Committee we did not.

Q Do you as a geologist consider that outer boundary as proposed to be a reasonable, logical geologic boundary for the pool?

A Yes, sir, I do.

Q Based upon that information you've seen on Exhibit Number Four, do you see any reason to treat any different area of that pool under rules and regulations that are any different from any other part of the pool?

A No.

Q All right. Let's go on to your next exhibit, Mr. Craney.

A The next exhibit is a series of three slides with data which Meridian recently collected on the Vanderslice No. 100 Well in the Cedar Hill Pool in -- well, the well is located in the northeast of 18, 32, 10, San Juan County, New Mexico.

Q Give us a preface, Mr. Craney, as to what four issues does this -- these three exhibits address themselves?

A The primary issue that these will address themselves to is that the coal, all the coals within the Fruitland formation represent a common source of supply and they are indeed separate and distinct from the Fruitland sandstone, the Pictured Cliffs sandstone, and when Amoco established the Cedar Hill Pool it was for the

Basal Coal only and that the vertical limits encompassed only the Basal Coal.

Q Did you find in your studies that the upper coal gas production had a similar gas composition signature as the Basal coal gas analysis?

A Yes, sir, we did.

Q And you were able to distinguish also the gas production composition from coal versus the sandstone within the Fruitland formation.

A Yes, sir.

Q Tell us how you did it.

A Okay. We -- this is a well which Meridian cored. We took a sample of the core from approximately 2968 feet in the upper coal.

We took a sample of the core from 29 -- 3042, 70 feet below that, which is the base of the Fruitland Coal.

We put these cores into canisters and had gas analyses run of these canisters.

Q Take a moment and using Exhibit Number Five there, on the bulletin board, show us approximately where this well is located.

A This well is located in about the very northwest of 32 North, 10 West.

Q Please continue.

A The solid blue denotes the upper coal and the cross hatched blue shows the gas schematic data on the lower coal.

As you can see, the carbon dioxide -- well, the molecular percent is on the lefthand side of the graph. The breakdown of the gas constituents is on the bottom. As you can see, the carbon dioxide, methane, ethane, and hexane+, that these gases are similar, and the next two slides show a comparison of the gases to the average gas composition of the Fruitland formation -- or the Fruitland coal, Fruitland sand, and Pictured Cliffs sandstone in this area.

Q This one is -- the current exhibit is Number Six and you're going to Exhibit Number Seven?

A Yes.

Q All right, let's look at that exhibit.

A The exhibit again shows the solid blue is the Upper Fruitland Coal. The cross hachured blue is is the Basal Fruitland Coal. And then the next blue hachured line is the Average Fruitland Coal, (unclear) data Cedar Hill Area. The red line shows the average Fruitland Sandstone gas analysis and the green cross hachured shows the average Pictured Cliffs Sandstone gas in the area.

The key characteristics of coalbed

methane gas, or coalbed gas, is high methane content and high carbon dioxide content.

The key factors of the sandstone gas is high methane content and a high ethane content or other heavies in the gas.

In this slide the two main characteristics which you want to look at would be the carbon dioxide and the ethane. So we've magnified those two curves.

We again show the Upper Fruitland Coal, Basal Fruitland Coal, Average Fruitland Coal, gas analysis in the Cedar Hill Area. This contrasts with the carbon dioxide of the Average Fruitland Sandstone and the Average Pictured Cliff Sandstone in the area.

In addition, the upper, basal, and average ethane contents of the Fruitland Coal is greatly lower than the Average Fruitland sandstone and the Average Pictured Cliff Sandstone in the Cedar Hill Area.

These slides show that the, based upon fluid analysis that the coals are a common source of supply.

Q I don't know if you have a copy of it but it's Mr. Busch's exhibit book and it is the characteristics or the set of criteria shown on page two just before you get to the proposed rules, and they show a set of criteria or data to help establish whether you're dealing

with a well that produces gas from the coal seam or produces gas from the Fruitland Sandstones.

You're familiar with the criteria, are you?

A Yes, sir.

Q Would you care to comment on the criteria and whether or not it serves as a useful, realistic basis by which you can, using various combinations of this data source, distinguish between gas produced from the coal and gas produced from the sandstone?

A The -- start at the top and go through each criteria to --

Q No, sir, just tell me, generally, though, what the -- what you, as a geologist, feel about using this data source to help you develop then a basis upon making comparisons by which you can distinguish, then, wells that produce coal gas versus sandstone gas.

A We would feel comfortable using the entire group as a data source and that -- we feel that coalbed methane can be identified, again from the fluid analysis that we just showed, gas analysis, likewise water analysis also shows characteristics of the two different reservoirs after the fact. These are after the wells are produced.

However, the other data sources which

are listed on here also provide the operator a preponderance of evidence to justify a coalbed methane well.

Q Did you have any comments or responses or criticisms by any operator or participant in the work study that this was simply too difficult a way to distinguish between the two types of gas?

A There was some discussion but it was generally accepted that these were very acceptable criteria to identify the coal gas.

Q Have you reviewed Amoco's presentation in the Cedar Hill Pool where they requested the establishment of 320-acre spacing in the Cedar Hill Pool?

A Yes, sir, I have.

Q And that transcript includes a discussion of gas analysis comparison about certain values in the gas composition, that would be signatures of gas produced from the coal seam, does it not?

A Yes, sir, it does.

Q How does that relate to the type of information you've seen in your display here?

A Well, the data which Amoco presented is incorporated in the Average Fruitland Sandstone data and the Average Pictured Cliffs Sandstone data (not clearly understood) as well as the average Fruitland Coal data. That date is this data presented in graphic form.

Q Are you satisfied as a geologist that this is methodolgy by which we can separate out gas produced from coal versus gas produced from the Fruitland Sandstone in an accurate, reliable way?

A Yes, sir, I am.

Q Do you have anything else to add to your presentation?

A No, sir.

Q Let me ask you, sir, what your opinion is with regards to the implementation of the proposed rules as outlined by Mr. Busch, and whether or not in your opinion those rules will in fact protect correlative rights?

A I feel that they will.

Q And do you have an opinion, sir, as to whether or not the adoption of those rules will also prevent waste?

A Yes, sir.

Q Has the Committee completed its work with regards to this project, Mr. Craney?

A I believe that there is -- as far as the recommendations, yes, sir.

Q Have we covered all those geologic points that you desire to discuss with regards to adoption of these rules?

A Yes, sir, I have.

MR. KELLAHIN: Thank you, Mr. Examiner. We move the introduction of Meridian Exhibits One through Eight at this time, Mr. Examiner.

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

MR. KELLAHIN: Pass the witness.

MR. CATANACH; Mr. Lund.

CROSS EXAMINATION

BY MR. LUND:

Q Mr. Craney, I wanted to ask you a little bit about the geologic phenomenon of intertonguing caused by the transgression and regression in the sea. Would you explain what that is and how it's effective in the area that we're talking about today?

A Okay. Referring back to this exhibit, what -- what you're referring to is that during the deposition of the Fruitland formation there have been regressions or transgressions of Pictured Cliffs shoreline over parts of the Fruitland formation due to (not clearly understood_.

The result of that is that the Pictured Cliff Sandstone has been deposited on parts of the Fruitland Coal and thus you have an intertonguing that you've

referred to because where you have Fruitland formation overlying Pictured Cliff Sandstone underlain by Fruitland formation, and again underlain by Pictured Cliffs Sandstone.

Q So simplistically the sea moved in and out --

A Yes, sir.

Q -- and then it left kind of fingers of coal throughout the area, is that correct?

A That is correct.

Q And the intent of the Committee as far as the geologic testimony that you've given, is to include all the coals, you know, not just intertongue the coal within the Pictured Cliff but also the coal within the Fruitland Sand as part of the pool we're talking about.

A That's correct.

Q That is, we're including all the sands.

A That's right.

Q And the last question I have, looking at your Exhibit Exhibits Four and Five that show differences or variances in the coals throughout this area, is it your opinion that it's proper to uniformly space the entire area on 320's despite that variance?

A Yes, sir.

Q Why?

A At this point in time we don't -- we have not seen data from other parts of the Basin changing any spacing the Commission recommended.

Q In particular, as a geologist, are you comfortable to space even (unclear) in the area to 320?

A At this time we are.

Q And again all for the same reason.

A Same reason.

Q Okay, thank you.

MR. LUND: Nothing further.

Oh, I have to have one more.

Q When you're referring to the common source of supply, you're actually referring to all coals available for production not necessarily a single coal seam, is that right?

A That is correct.

Q Okay. Thank you.

MR. CATANACH: Mr. Roberts?

MR. ROBERTS: No questions.

MR. CATANACH: No questions? Any other questions from anybody?

MR. LYON: May I ask one question?

MR. CATANACH: Mr. Lyon.

QUESTIONS BY MR. LYON:

Q I'm not sure whether it was Exhibit Four or Exhibit Five but it was the projection of the volatile -- the various grades of coal expressed in volatility.

A I think that's Exhibit Number Five.

Q Right. Since this is quite different from what we normally encounter in our Division, I'd like to ask you if there is some relationship between the likelihood or quantity of gas that you would encounter in these various grades, is this a various grade of the coal or are you more likely to encounter significant gas in the high volatile coal as opposed to low volatile coal?

A You are more likely to encounter -- in the San Juan Basin you are more likely to encounter high gas in place in the northern part of the San Juan Basin due to the more (unclear) gas that is generated in the coal in the northern part of the San Juan Basin, and (not clearly understood), that build pressure.

Q So the light yellow or ecru color in the south is less likely to have gas, significant gas, than the -- than the darker green shade to the north, is that right?

A There has been some gas present all the way to the southern part of the lighter shades of green,

and you (not clearly understood) in part of the San Juan Basin there is less gas in place in the southern part of the (unclear) and it appears there's gas, there's gas everywhere in the Fruitland Coal in the San Juan Basin.

Q I guess I'm just having problems evaluating what that tells me about gas in the Basin.

What I'm wondering is the different colors, you'd think --

A You could -- you can say that the darker the color the more gas in place (not clearly understood).

Q So a low volatile bituminous would be likely to produce more gas than a high volatile C bituminous --

A Yes. The conclusion was that a foot of low volatile bituminous coal would produce more gas than a foot of high volatile C bituminous and the answer is yes.

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

MR. KELLAHIN: Let me pursue that a little bit.

REDIRECT EXAMINATION

BY MR. KELLAHIN:

Q I want to pursue with you, Mr. Craney, Mr. Lyon's line of questioning with regards to an attempt

to quantify the volume of gas in place within the Basin by looking at the different shades of green on the display when you look at Exhibit Number Four.

Other than saying in a general way as we move north we find more gas in place in a given acre as the color gets darker. Can we quantify it any more specifically?

A Not off the display. You have to take that in conjunction with other types of data.

Q That display alone, then, cannot tell us how to establish whether or not we should treat the darker green areas with different rules, including different spacing patterns for wells, than the southern portion.

A That's correct.

Q In addition, in the southern portion while the quality of the coal is less than the northern portion, you also have certain areas in the southern portion that have thicker coal seams.

A That's correct.

Q Then you would have to integrate that to determine how much gas in place you have in the coal seams. And having integrated the thickness map, Exhibit Number Five, with the value map on the quality, Exhibit Number Four, those two pieces of the puzzle still are not going to tell you anything about drainage, are they?

A That's correct.

MR. KELLAHIN: Nothing further.

MR. CATANACH: Any other questions of this witness?

If not, you may be excused.

And let's go ahead and take about a 20 - 25 minute break at this time.

(Thereupon a recess was taken.)

MR. CATANACH: The hearing will come to order at this time.

C. ALAN WOOD,

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

DIRECT EXAMINATION

BY MR. LUND:

Q Would you please state your name, your business address, and by whom you are employed and in what capacity?

A C. Alan Wood, with Amoco Production Company. I have worked in regulatory practices for appro-

ximately seven years. I've participated in excess of 150 different hearings involving the establishment of field rules as well as general rules and have also participated in legislative matters.

Q Your expertise is in the field of petroleum engineering?

A My degree is in mechanical engineering. I went to work for Amoco in 1977 and have been with them since that time.

Q You have testified before this Commission before, isn't that right?

A Yes, I have.

Q And your qualifications have been accepted?

A Yes, they have.

Q And you're testifying in this part of the hearing on the spacing issues that may have recommendations presented today?

A That's correct.

MR. LUND: I would offer Mr. Wood as an expert in petroleum engineering and unitization.

MR. CATANACH: He is so qualified.

Q Mr. Wood would you tell the Examiner what committees and subcommittees you served on and what

you did?

A Okay, I was one of two Amoco employees to serve on the committee.

I participated on the Spacing Subcommitee as well as the Drafting Committee.

Q Please tell us the methods the Spacing Subcommittee went through to formulate its recommendations that it's presenting today.

A The Spacing Committee had a live conservation approach to handle this properly and to prevent waste of this natural resource. There was a live discussion concerning the data available from the Cedar Hill Field, since that was the only data that was at that time public record with regard to coal wells' ability to drain.

Q And was the concern of the Spacing Subcommittee the possibility of drilling unnecessary wells?

A Yes, it was one of the concerns.

Q And what generally was that discussion about?

A I think part of the discussion dealt with the fact that we had recognized that the coals underlying (unclear) and we had relatively little data in order to determine appropriate spacing, and certainly it concerned prevention of waste. We Could have seen the drilling of unnecessary wells, which would have been waste.

Q And ultimately the Committee decided to recommend 320-acre spacing?

A That's the recommendation the Subcommittee made to the General Committee and subsequently approved by the General Committee. It has to be recognized that that was one of a couple very significant recommendations with regard to spacing.

Another recommendation developed by the Spacing Subcommittee was administrative approval for an increased density well, which I believe recognized some concern that we only had, or have, limited data in order to make the spacing determination.

Q And so for purposes of this part of your testimony, Mr. Busch asked you to (unclear) and you are advocating the 320-acre spacing as was discussed by the Methane Committee?

A Yes.

Q And now you've prepared three exhibits for this committee?

A Yes, I have.

Q Let's turn, then, to Exhibit Number One. Will you identify it and explain its significance?

A Exhibit Number One is a 12-section plat showing the relative location of coal gas wells and also pressure observation wells in the Cedar Hill Field.

That field is located in portions of Townships 31 North and 32 North of Range 10 West.

Q And this shows the wells as of approximately what date?

A Late 1983, I believe, and it has been updated. It has been updated to show some --

Q Additional wells?

A Yes.

Q It shows both pressure observation wells and producers and how are those designated on the exhibit?

A The producing coal wells are designated with a gas well symbol. The pressure observation wells, there are three of them in the area, or were three of them in the area, are indicated by a gas well symbol highlighted by a small, black arrow.

Q And the distances among those wells?

A Yes, sir, that's correct.

Q Anything else about Exhibit Number One?

A We'll refer to it a little bit later when we start talking about Exhibit Number Three.

Q Will you go to Exhibit Number Two and explain the significance of this exhibit?

A Amoco's Cahn No. 1 Well, located in Section 33, of Township 32 North, Range 10 West, was the dis-

covery well for the Cedar Hill Pool.

The production plot, as indicated on Exhibit Number Two, shows in a solid black line the average in a daily rate. It shows in a dashed line the barrels of water per day, and in the lower portion of the exhibit shows the days produced.

Q What is -- excuse me. Why is this unique or significant?

A Why this is significant is that the Cahn No. 1 exhibited a production trend which is unique to coal well gas production, and that being our initial production period, which was the first part of 1979, late 1978, was basically 100 percent water with no gas production.

In 1979 we actually started seeing some commercial quantities of gas and through a period of '79 through 1984 this gas actually exhibited an incline in its production rate, which is certainly different from what you would anticipate with a traditional sand reservoir.

Q Now what does this information show you about whether you can apply traditional reservoir engineering calculations in matters such as spacing and drainage?

A This particular producing characteristic is relied upon to determine appropriate spacing and you have to appreciate what is typically done when an engineer

develops spacing recommendations.

You basically perform two calculations. What gas is available in the reservoir to produced and what an individual well is capable of producing, and from those two calculations you can determine appropriate spacing.

The problem exhibited on the Cahn No. 1 Well is that we had no method. If we apply traditional decline curve analysis to the Cahn No. 1, we would actually calculate infinite reserves; therefore, infinite drainage, which I think is inappropriate.

Q Will you go now to the last exhibit, identify it and explain it?

A Exhibit Three is a graph showing the pressure measurements taken in the three pressure observation wells located on Exhibit Number One versus time. This is the data that was available in 1984 that we presented to the New Mexico Oil Conservation Division in support of our application to adopt 320-acre spacing for the Basal Coal Seam in Cedar Hill.

Now we have to at this point go back to Exhibit Number One and start taking a look at some of the inter-well distances and equate those to what might be an effective drainage radius.

On Exhibit Number One I've indicated the Cahn Well and that's the well located, a producing coal

well located in the northwest quarter of Section 33. It was the discovery well. That well actually produced by itself until mid-1981.

The distances from the Cahn Well are very important to know.

The three observation wells are the Cahn No. 2, located to the southwest of the Cahn No. 1, which is our gas producing well. That inter-well distance was 933 feet. That equates to a little bit less than an 80-acre drainage radius.

The well to the north of the Cahn No. 1, which is our pressure observation well, was the the Schneider B No. 1. That's located in the southwest quarter of Section 28. The inter-well distance was 2,180 feet. That equates to approximately a 320-acre drainage radius.

The third pressure observation well is located to the east of the Cahn No. 1 and it's located in the northwest quarter of Section 34. That well was the Leeper B No. 1. The inter-well distance between the Cahn and the Leeper was 5,131 feet, which is in excess of a 640-acre drainage radius.

Q Again, those three pressure observation wells are designated on Exhibit One with an arrow.

A They are highlighted with the black arrow, that's correct.

Returning to Exhibit Number Three, we can actually see the pressure history of these pressure observation wells over a period of time. The initial reservoir pressure that's been estimated from data from the Cahn No. 1, is 1562, 1,562 psi.

The first thing I would like to point out is the pressure history of the Cahn No. 2. That is the well that's located some 933 feet away from the Cahn No. 1 and would amount to an 80-acre drainage radius.

We see the first pressure test run in the Cahn No. 2 was taken in mid-1979 and that's indicated by the solid black line. That particular pressure point was already below the original reservoir pressure as determined by the Cahn No. 1. Over the next twelve months that pressure continued to decline until mid-1980 it reached a point of some 1350 psi. That would indicate, given the understanding that during this time the only well producing in the reservoir was the Cahn No. 1, that we were seeing pressure response from the Cahn No. 2; better said, we were seeing pressure response at an 80-acre drainage radius.

The second curve that I would like to discuss, is for the Schneider pressure observation well. That's indicated by the solid or, excuse me, the dashed line.

The initial pressure observed in the

Schneider Well was very close to the estimated initial reservoir pressures but over a period of some two years, from mid-1979 through mid-1981, the pressure declined to approximately 1485 psi.

Now this particular well was located 2180 away from the Cahn No. 1, which would be the 80-acre drainage radius, and during this period of time, once again the Cahn No. 1 was the only well producing from Cedar Hill.

Beginning in mid-1981 we brought some additional wells on line. Those are indicated on Exhibit Number Three. The wells that were brought on line are the Schneider B-1S and the State BW No. 1. Those are also indicated on Amoco's Exhibit Number One.

The Schneider B-1S is located some 327 feet from the Schneider B No. 1, which is the pressure observation well, and if you look at the pressure response of the Schneider Well during that period of time you see a very rapid decline in measured pressure. I believe that indicates the response of that well to the Schneider B-1S coming on production.

The third pressure observation well was the Leeper, which is, as I indicated earlier, located in the northwest quarter of Section 34.

The first measured pressure data is in 1983. At that point in time we had three wells on produc-

tion, those being the Cahn No. 1, the Schneider B-1S, and the State BW No. 1. The closest well to the Leeper Well was in fact the Cahn No. 1, some 5100 feet away. The initial pressure indicated in the Leeper Well was 15 -- approximately 1525 psi, which was a relatively small difference from the initial reservoir pressure as determined in the Cahn No. 1.

It was that data point that indicated to us that 320-acre spacing appeared to be appropriate for the Cedar Hill Pool.

Q Let's try to sum up what you've set forth on those exhibits.

What are your conclusions about pressure response on a 40-acre offset here.

A The well that we equate to a 40-to-80 acre offset shows very rapid pressure response to offset productions.

Q What about on an 80-acre offset?

A It would be basically the same well and it would show -- and it did show a fairly rapid pressure response.

Q How about on 320 acres?

A 320 acres we did see a somewhat less pressure response although we did define that there was a significant pressure response in that 320-acre well.

Q And then finally, from the Cahn to the Leeper Well is just about 5131. What about that?

A Basically insignificant pressure difference between the two points.

Q All right. When you -- when you received this data, what actions did Amoco take then with respect to the Cedar Hill Area?

A Amoco filed an application with the New Mexico Oil Conservation Division requesting a hearing to adopt 320-acre spacing for the Basal Coal Seam in the Cedar Hill Pool.

Q What then did the Division do?

A The Division issued an order adopting 320-acre spacing. That was adopted as a temporary order. It was subsequently heard again, I believe, in March of 1986 and was adopted as a permanent order. Both orders reflect the 320-acre spacing.

Q Were Exhibits One through Three prepared by you or under your supervision and control?

A Yes, they were.

MR. LUND: I would offer Exhibits One through -- Amoco Exhibits One through Three in evidence.

MR. CATANACH: Exhibits One through Three will be admitted into evidence.

Q Just a couple final questions, Mr. Wood. Number one, do you think that the Cedar Hill information can be properly applied for purposes of this hearing in a little broader fashion with respect to spacing?

A I think it must be applied in a broader fashion. I've tried to indicate the unique producing characteristics of coal wells preclude the application of traditional engineering calculations to determine spacing.

One of the concerns that must be recognized is the potential for drilling what can be proved to be unnecessary wells, which would be waste.

I think the adoption of a 320-acre spacing order based upon the only technical data that I'm familiar with is appropriate. I think that if one looks through the recommendations made by the Methane Committee, there is ample flexibility given, not only to the operators but also to the State to hear on an individual merit basis future requests from either 160-acre spacing or even something greater than 320.

Q And do you have an opinion about whether it would be more prudent to start on a 320-acre basis as opposed to a smaller spacing basis?

A Yes, I do. It's my opinion that it's always better to start wide because you can never undrill a

well and if you start wide and you're proven to be wrong, you would still have the option to go back in and allow additional wells to be drilled within the reservoir.

Q Do you want to talk about the increased density situation as part of this testimony or would that be later?

A That would be fine.

Q Why don't we talk about Rule Number 4 that they proposed?

A Rule Number 4 in my opinion reflects the concern that the Spacing Subcommittee had with the limited data that was available to justify trends when you're spacing. I believe that the parties recognize that there may very well be areas within the Basin that would justify 160-acre drilling.

What we came up with is an administrative procedure by which the New Mexico Oil Conservation Division, and also the Colorado Oil and Gas Conservation Commission, could allow an operator to drill that additional well.

The operator of the well was obligated to provide notice to the offset owners and those offset owners had a 20 working day period in order to enter an objection.

We thought that this complimented the

320-acre spacing recommendation and we believed it gave ample latitude for an operator to address specific needs within specific portions of the Basin and gave the offset operators who could have been affected by that act ample opportunity to protect their interest.

Q And you think Rule 4 as composed is fair in large part because of the notice requirements?

A Yes, I do.

Q Let's just summarize. Is the bottom line there your conclusion that the best data available indicates that 320 is an appropriate spacing pattern in the (unclear)?

A Yes, sir, that's correct.

Q Do you have anything further?

A No, sir.

MR. LUND: I have nothing further and would tender the witness for cross examination.

MR. CATANACH: Any questions of this witness?

CROSS EXAMINATION

BY MR. CATANACH:

Q Mr. Wood, are there any other wells outside the Basal Coal Area that are producing from the coal formations?

A One of the first actions that the Methane Committee took was an attempt to identify where the producing coal wells were. Amoco certainly supplied the requested information to the Committee. I think it might be more appropriate to address that particular question to one of our Co-Chairs and they might have the map that actually showed that.

It's my understanding that there is some other established coal production and certainly Amoco operates some coal wells in the Colorado portion of the Basin.

Q Okay, but you're not aware of any other test data that exists at this time?

A Not -- no, sir, I'm not.

Q You talked about Rule 4 there, would an operator have to demonstrate the need for a second well or not?

A The operator really has two options.

One, he could request the administrative approval route if in fact the offset operators did not have an objection to the request; and he also has the option to pursue notice -- or pursue relief through notice and hearing, and at that time I think we'd be obligated to demonstrate to the satisfaction of this agency that they were entitled to relief that they were seeking.

MR. CATANACH: Any other questions?

If not, this witness may be excused.

MR. KELLAHIN: Mr. Examiner, we'd like to proceed with the testimony of Alan Alexander. He's a landman with Meridian Oil Company, Inc..

ALAN E. ALEXANDER,

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

DIRECT EXAMINATION

BY MR. KELLAHIN:

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

A My name is Alan Alexander. I'm currently employed as the Area Land Manager for Meridian Oil here in the Farmington Office.

Q Have you previously testified before the Oil Conservation Division of New Mexico as a petroleum landman?

A No, I have not.

Q Would you take a moment and describe what has been your educational and employment experience as

a petroleum landman?

A I received a Bachelor of Business Administration degree from West Texas State University in 1970.

I received a Master's of Business Administration from the same institution in 1971.

I started work for El Paso Natural Gas Company in their Land Department in 1972. I was in El Paso, Texas, from 1972 through 1974.

I was transferred to the Field Office in Amarillo, Texas, for El Paso; worked the Anadarko Basin from 1974 through 1984.

I was then transferred under Meridian Oil, Inc. to the Farmington Office in 1984 up to the present time and I have -- in the present capacity of Area Land Manager.

Q As Area Land Manager for Meridian Oil, Inc., did you participate in any of the committees that were involved in the study of the Fruitland Coal Methane?

A Yes, I did. I was the Chairman of the Spacing Committee and participated in the Committee in that capacity.

A In that capacity do you have recommendations and opinions to express with regards to the spacing matters that were addressed by that Committee?

A Yes, I do.

MR. KELLAHIN: At this time, Mr. Examiner, we tender Mr. Alexander as an expert petroleum landman.

MR. CATANACH: He is so qualified.

Q Mr. Alexander, would you identify for us those particular issues that the subcommittee on spacing dealt with that you would like to report to the Examiner?

A Yes, I would.

The Spacing Committee was charged with the responsibility of developing a spacing pattern for this new resource, the Fruitland Coalbed Methane Pool.

We considered the area to be spaced, the footage requirements and setback requirements of that spaced area. We also considered unorthodox well locations. We considered increased density wells that Mr. Wood has spoken to. We have also considered the application of a horizontal well for this unique pool.

Q Let's start with the well spacing in terms of the acreage to be dedicated to a given well. The recommendation of the Subcommittee was 320 acres?

A That's correct.

Q Was -- how was the ballot and vote taken on that particular item?

A The vote was initially taken, of course, by the Subcommittee. It was a majority consensus that we do -- that we did recommend to the full committee the 320-acres with the increased density provisions be adopted and be recommended to the full committee.

The full committee then voted upon the very same recommendation and it again was approved by a majority of the Committee votes.

Q Do you recall, Mr. Alexander, the particular vote count by the Committee as a whole on the spacing unit?

A I believe I have some information here that would indicate that.

The initial vote in the -- once the Subcommittee recommended to the full Committee, that was the first time that we tabulated the actual votes, the vote at that time, and the record was left open by the Co-Chairmen for some people that were not present or that needed additional time to consider the votes, it looks like that we had at the initial voting stage 12 affirmative votes adopting the Committee's recommendation, 1 no vote, and 1 abstaining vote.

Mr. Busch took some votes later on, tabulated those votes. I do not have my copy of that voting available, however, I believe that there was one

additional no vote and one additional abstaining vote.

Q Approximately what length of time or period of time was involved by the Subcommittee in discussing and addressing the spacing issue?

A I believe that the Subcommittee performed in January.

Q Of this year?

A Of 1988.

Q And when were the final votes taken on that topic?

A I believe the final votes were taken approximately on the 27th of April, 1988, and the remaining votes to be called in to Ernie were shortly thereafter.

Q Let's go now, sir, to the question of unorthodox well locations. It's in Mr. Busch's exhibit package where he sets forth the proposed rules. It's under Rule 3(b).

What was the Committee's action and recommendation with regards to unorthodox well locations?

A The Subcommittee recommended and the full Committee approved again by a majority vote that the Director should have the authority to grant an exception to well locations stated in Rule 3(a) any time without notice and approve those administratively any time that the location was based upon topographic conditions; for the

proposed well or if the operator desired to plug back an existing well, that approval could also be made administratively if that well was drilled at an orthodox or if that well was drilled at an unorthodox -- previously approved unorthodox location.

Q Was there a consensus among the committee members voting -- in principle on this topic was there any dissenting votes among the committee members on questions of unorthodox well location?

A I do not believe that there was any dissenting votes on unorthodox well location.

Q Let's turn now to the increased well density. That's set forth in Rule 4. Was that part of the Spacing Committee action?

A Yes, it was.

Q And what action did you recommend?

A We recommended that the Commission have the right to approve administratively, again, an increased density well on the 320-acre drilling block upon proper notice by the operator that was proposing the well, and if there were no objections received, it could be approved administratively. If there were objections received, the hearing could be -- it could be set for hearing, or that the Commission would have the right to set the cause for hearing if it deemed that that was proper to do that.

Q We're characterized this rule as an infill well provision?

A Yes.

Q In taking the committee action, did you ultimately after discussion have any dissenting votes as of now?

A Not during the phase of the Subcommittee, we did not have a dissenting vote. There was a great deal of discussion about the rule, the procedures to be employed. There were a great many variations discussed, possibilities discussed. There were, of course, some dissenting votes on spacing in general at the time that they were voted before the full Commission.

Q Turn now, sir, to the question of the horizontally drilled wells under Rule 5. Summarize for us what the Committee action was with regards to this proposed rule.

A The Committee discussed the possibility and the probability that an operator would in fact like to drill a horizontal well in the Fruitland Coalbed Methane Pool. This is a fairly new technology. We have seen it employed in the coal and we expect that it probably will be employed in the future.

The Committee did not feel that the current Rule 111, which basically addresses deviated holes,

was sufficient and did not give the flexibility to address the horizontal well in this particular reservoir.

Q Summarize specifically for us, Mr. Alexander, why the Committee felt that the current Rule 111 for directionally drilled wells was not inclusive enough to include what the operators proposed for these horizontally drilled wells in the coal seams.

A A deviated well generally means a well that is deviated from a surface location in order to encounter at the bottom hole the formation that they are exploring for.

Of course, a horizontal well, of course, is deviated, but the intent there is to have the lateral borehole transverse the formation or be drilled through the formation and not just cut it or just intersect it at the bottom of the hole. There is enough difference there that we felt that it would be prudent to recommend that the Commission adopt specific rules for horizontal wells that would allow them to address this specific problem.

Q And was there a consensus reached by the Subcommittee on this topic?

A Yes, there was.

Q And how did -- what action did the full committee take on this issue?

A The full committee also voted by the majority to adopt the position and to have incorporated in the rule making -- by the rule making body into these final rules that are being proposed.

Q Did the Subcommittee discuss and debate the issue of well locations internally within the spacing unit (not understood)?

A Would you restate that, please?

Q Yes, sir. When you look at a 320-acre spacing pattern, did you come to any consensus with regards to where a well could be drilled within the drilling window for that 320-acre pattern?

A Yes, we did.

Q And have you set forth that as a diagram in the last page of the Meridian exhibit book?

A Yes, I did. I have a visual representation of that, also, that I could --

Q Well, that might be helpful. Let's get it and put it on the overhead and have you show us what you've got there.

A As I stated, this is a visual representation of the --

Q Excuse me, Alan, turn this way so that you're talking this way.

A It is a visual representation of the

spacing rule that is being recommended to the Commission.

This particular view graph is set up to describe what would happen if a person drilled a well on a 320-acre drill block with standup drill blocks.

Q The total display shows us a single section.

A Yes, it does.

Q And what is the orientation of the 320 spacing unit? Is it a standup or a laydown?

A Yes, they would be standup 320-acre units.

Q Let's look at the west half standup 320 and and show us what the drilling window is that is proposed.

A The drilling window as described by the proposed rule would include all the area within this black outline here.

Q Within that drilling window is there an internal setback from the quarter quarter lines proposed?

A There is no interval from the quarter quarter. The setback distance of 790 feet from a quarter -- from the outer boundary of a quarter section. The only internal setback requirement that we have proposed to the Commission is 130 feet, and that would be the internal quarter section setback.

Q Within that drilling window why have you proposed a no setback requirements from the internal quarter quarter lines?

A Since we do not have all the information that we need at this point in time to fully address this unique reservoir, we did want the Commission to give us the flexibility to move within this drilling window. There are many concerns, such as topographic conditions and conditions well previously drilled in the areas, pipelines, and other facilities that are already there, since we are dealing basically with areas that are currently held by production from existing wells.

This approach was also developed to give consideration to the horizontally drilled wells. The horizontally drilled well, as we have proposed it, could be located anywhere within -- in this instance, and keep in mind we're talking about a 320-acre drilling unit, but the first well as the rule reads, would, of course, be located in a particular quarter section, and for a horizontal well that's basically true, also. Now a horizontal well, the surface location of that well could be located anywhere within the quarter section. We do not have the requirement as proposed to the Commission that would establish that as being inside the drilling window; however, the borehole cannot cut the Fruitland Coal formation; cannot enter it

nor exit it outside of the drilling window that we've described here.

And this also again gives us the flexibility to try to develop this particular resource.

Q Do the proposed rules require a particular orientation in a given section as to whether it's a standup or a laydown 320?

A No, they do not. The Committee felt -- it was discussed whether to possibly dedicate a location such as we had in the Cedar Hill Pool or just to leave that dedication open and to leave the laydown and standup aspect of the decision open to the operator also.

When the first well is drilled in there the operator would determine whether it would be a standup or a laydown 320-acre configuration. He could also determine which quarter section that he would want to drill in.

Again this was done for reasons of flexibility, topographic, plugback of existing wells that may not conform to dedicated spacing or to the drilling windows as they are proposed in other gas pools.

Q Is there a requirement in the proposed rule with regards to the location of the infill well in relation to the original wellbore?

A Yes. We have recommended to the Commission that the infill well would of course be located in

a quarter section that does not already have a well drilled to this formation or to this pool.

Q And it would be confined to a similar drilling window as you see displayed in the northwest quarter of that section?

A That's correct, for an increased density well.

Q Does that conclude the recommendations and the issues addressed by your subcommittee, Mr. Alexander?

A I believe it does.

MR. KELLAHIN: Mr. Examiner, we've marked this display that Mr. Alexander has just referred to as Meridian Exhibit Number Nine. We would at this time move its introduction.

MR. CATANACH; Exhibit Number Nine will be admitted into evidence.

MR. KELLAHIN: Pass the witness.

MR. CATANACH: Any questions of this witness?

Mr. Lund?

CROSS EXAMINATION

BY MR. LUND:

Q Just one question, Mr. Alexander. I believe you indicated that no orientation was recommended by the Committee, is that correct?

A That's correct.

Q Although your exhibit indicates a northwest/southeast orientation.

A That is purely for purposes of this exhibit and I did not attempt to show any particular trend or 320-acre spacing unit. It just so happened that I chose that spacing pattern for this exhibit.

Q In fact Amoco is of the opinion that it ought to be northeast/southwest orientation like the Cedar Hill, is that right?

A I understand that to be correct.

Q Thank you.

MR. CATANACH: Any other questions?

MR. STOVALL: Mr. Examiner, I have a couple of questions with respect to Rule 3(B), if we could take a look at that for a moment.

CROSS EXAMINATION

BY MR. STOVALL:

Q In the first sentence, second line of Rule 3(B), you're proposing to have -- to give the Director

authority to grant an exception to the well location requirements without notice and hearing.

Would it not be more accurate to say what you're proposing is without hearing but that notice would be required to the offset operators or owners of interest, in the -- particularly in the circumstances described in the third paragraph of that rule, where you're talking about notice if it's closer to the outer boundary of the drilling unit?

A Yes. That's correct. That would provide notice to the offset operator under that circumstance.

Q Would you object or do you think that the Committee would object, I realize you're not taking a formal vote, but just speaking for yourself, would you object to deleting the words -- the word "notice" out of that second line, just "without hearing", providing for notice to the offset operators?

A Well, we do have a differentiation here, I believe, that we -- we were specific that if the unorthodox location was closer to the outer boundary. Now we do have some -- we do have an internal boundary that is the 130 foot from the quarter section line. I think it probably would be changing the rules as proposed somewhat. It was contemplated that probably -- or that we would not request notice to the offset operators unless we were en-

croaching upon the outer boundaries. There is a little bit of a difference there.

Q So in other words, what you're saying is if within the proration unit that well was less than 130 feet from the quarter section line, you would think that notice would not be -- be necessary?

A That's correct. We are internal to the drilling unit and we do not see a breach of correlative rights in that instance, and that was the reason the rule was written as it was written.

Q One other question with respect to that rule. In the third paragraph, moving over Mr Busch's exhibit to page three, second line, you're providing for notice to the operator of any spacing unit, and I assume that you use the term "spacing unit" you're talking about a developed spacing unit, is that correct?

A Where are we located exactly here?

Q Page three, first line, let's look at the first line of page three.

A All right.

Q It's talking about notice if a -- when the proposed unorthodox location is closer to the outer boundary of the spacing unit, you're talking about notice to the operator of a spacing unit, and then you go on to say the "owner of an undrilled lease".

A Yes.

Q A spacing unit, does that mean a spacing unit on which there is an existing well, a producing spacing unit?

A To this pool, that's correct, it would be a developed spacing unit.

Q And going on in that sentence you go to "or owner of an undrilled lease". Would you object to changing that language to the -- to read "owner of any undrilled acreage", recognizing that there may be unleased, undrilled acreage there?

Do you understand what I'm saying?

A Yes, I do. I do understand what you're saying, and I do not believe that I would object to include the unleased mineral owner in that language.

Q I think -- it's my opinion that the language "owner of an undrilled acreage" could refer to either a lessor -- a mineral owner or a lessee.

A That's correct.

MR. STOVALL: I have no further questions.

CROSS EXAMINATION

BY MR. CATANACH:

Q Mr. Alexander, did the Committee ever

consider a minimum distance between two producing wells in the same spacing unit?

A Yes, we did, and we addressed such issues as a clustering of wells that an operator may want to adopt at a later date upon the proper hearing and notice, and so we felt it probably wasn't appropriate for us at this time to try and just strictly define distances between wells, because there may very well be some need to drill additional wells or drill additional wells that may not be producing gas, that may be dewatering the formation involved here.

Since we are dealing with a unique reservoir that does in most instances require a dewatering process. So we did recognize that problem; however, we decided that we did not want to address a specific footage requirement between wells, to leave open the flexibility of an operator to handle these situations.

Q Okay, so it's possible that we could have two producing wells 260 feet away from each other, the way the rules are written.

A Not --

Q The proposed rules.

A Not under the proposed rules because that would be in effect an increased density well if it was used for production and the increased density well, the

only time you could have that, you're talking about the distance between the two quarter sections on 130-foot setback requirements, that would apply and that would be the only instance that I know of where we could have that situation because we have provided that each well should be located in a separate quarter section.

Q Right, but your -- your second well could be located 260 feet away from your first well.

A In the other quarter section, that's correct.

Q Right. But you -- the Committee felt that they needed that flexibility to have that in there?

A Yes, that's correct. We saw the need, possibly, that we would want the increased -- or the more dense drilling pattern in the case of dewatering, first, and that that would give some flexibility in that regard without having to go to a hearing before the Commission to accomplish that.

MR. CATANACH: Any other questions of this witness?

If not, he may be excused.

Can we get a count of who else is going to put on individual testimony or evidence?

MR. ROBERTS: Mr. Examiner, the Dugan Group will put on three witnesses and that direct

testimony will last about forty-five minutes.

MR. CATANACH: For all three.

MR. ROBERTS: Yes.

MR. STOVALL: Mr. Examiner, the Aztec Office of the OCD wishes to put on some separate testimony as the Aztec Office of the OCD. Mr. Chavez will testify for you. I don't imagine that would take fifteen, twenty minutes.

MR. LUND: Amoco has (unclear) just a few minutes, one witness.

MR. KELLAHIN: I'll have a witness this afternoon.

MR. STOVALL: For the record, Sally, I'd like to point out that this does end the Committee presentation and all further testimony will be by individual parties to this hearing, companies or individuals wishing to present evidence.

There will be no further, to my knowledge, no further Committee evidence presented in support of the application.

MR. CATANACH: Okay, is there going to be anybody else presenting any witnesses?

I'm going to go ahead and let Bob put on Mr. Frank Chavez at this time.

Do you want to go on at this

time?

MR. STOVALL: For the record let me indicate at this time that this morning when I examined Mr. Busch I did so as OCD attorney, but Mr. Busch was not appearing truly as an OCD witness but rather a committee chairman.

While I may not be exactly switching hats right now, I'm at least turning my hat around now and acting as OCD attorney examining Mr. Frank Chavez as an OCD witness. He is not representing a committee. He is representing the Aztec Office of the Oil Conservation Division.

FRANK CHAVEZ,

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

DIRECT EXAMINATION

BY MR. STOVALL:

Q Mr. Chavez, would you please state your name and place of employment?

A My name is Frank Chavez. I'm District Supervisor of the Aztec Office of the Oil Conservation Division.

Q Have you previously testified before the

Division and had your credentials accepted?

A Yes, I have.

Q Have you reviewed the application in this case and the proposed order?

A Yes, I have.

Q Are you familiar with the background and the work of the Methane Committee in preparing the application and the proposed order?

A Yes, I am.

Q In general, do you support the concept and the provisions of the order?

A Yes, I do.

Q Do you have any specific provisions of the order to which you would like to address some comments or make alternative suggestions?

A Yes, I would in the sense that in my duty to enforce the regulations of the Oil Conservation Division sometimes the wording or the application of the rules can be awkward.

First of all, the horizontal limits as described in the application are very specific, and I'll be addressing the application under Part B of Mr. Busch's Exhibit One.

The horizontal limits are large enough to take in several townships that include some areas where

there is no Fruitland present, or Fruitland Coal present.

For administrative purposes it could be easier, for the purposes of warning and administering this -- this rule, to define the horizontal limits of the proposed pool as the Fruitland Coal Producing Interval in the San Juan Basin in part of San Juan, Rio Arriba, Sandoval and McKinley Counties.

We already have a precedent like this set in defining the horizontal limits to the Basin Dakota Pool, which includes the Dakota producing interval of the -- within San Juan and Rio Arriba Counties.

Some of the specific rules I'd like to talk about, first are Rule 3(A).

Rule 3(A) does not specify any particular quarter section within the 320-acre drill tract in which the well should be drilled. I think there will probably be later testimony indicating that there is a preference for this and I would recommend that the Examiner look closely at that because of the possibility of clustering four wells at a section corner that could occur should there be no preferential quarter section for drilling the first well in a drill tract.

Q Excuse me, Mr. Chavez, you're talking about quarter section? Perhaps we should look back up the last Meridian exhibit. Would that be --

A Well, not necessarily. I'll just specify that we should prefer the diagonal quarter sections, either the northeast and southwest or southwest and -- I'm sorry, either the northeast and southwest or the northwest and southeast quarter as preferential for the first well in the half section.

That would, I think, lead to more orderly development of the pool and of the sections that will be drilled.

Q And it wouldn't matter whether we're talking a laydown or a standup orientation as far as you're concerned.

A No, it would not.

The second matter I'd like to speak about is Rule 4, which allows for increased well density.

The application as proposed by the Committee does not require that an operator make any kind of engineering data presentation to show that a second well is necessary to effectively and efficiently drain the drill tract or that there are any reserves that would otherwise be lost. So there is no conservation proof required of the operator wanting a second well.

Also, at this time the Colorado Commission has not adopted a provision for increased well density, although they will, my understanding is they will

reopen the case to hear that one provision.

And along the state line we'd want to be sure that the spacing was at least complimentary. I think that's one of the reasons that we originally set up this committee, so that we would have uniformity throughout the development of this resource.

The next one I'd like to speak on is Rule 6(A).

There are some problems with a 24-hour shut-in period in that we don't know that the information is necessarily that usable or actually that necessary.

We do need some testing provisions and since we're at the very, I would say the beginning of the development of this resource, it would be important to the State and to the operators, to the industry in general, to develop the data base of pressures and testing that would help us evaluate this resource as we develop it through the next few years.

Under Rule 6(B) the existing rules and the way they're applied in the field allow for the venting of such gas as is necessary to clean up a well after fracture or if it was necessary to blow down a well should it become waterlogged.

The operators have expressed a concern about needing to qualify wells drilled on Federal lands as

paying wells under a paying well determination procedure set up by the Bureau of Land Management.

This rule as written applied to all wells, including wells on State and fee lands, which do not necessarily require this type of testing.

The Committee should stay in session and -- or should at least not disband and continue to study this problem and work with the Bureau of Land Management to develop criteria which could help make a determination necessary to satisfy Federal laws and yet prevent the venting of unnecessary gas.

I recommend that if there is any gas to be vented, it should be done only after obtaining written permission from the District Office and after a showing that such venting is necessary to maintain the producability of the well or obtain necessary test information.

Basically this is our current policy and therefore, no special rules would be necessary; the existing rules and policies would cover it.

A problem that's developed in developing the coal resource is that due to the nature of the shales that separate the coals and the sandstone, it is not uncommon for a hydraulic fracture initiated in the Fruitland Sand or the Pictured Cliff Sandstone, to break through the shale into a coal. When a well which has been previously

identified as a sand well is found to be producing from the coal, the operator should be allowed sufficient time to come into compliance with these rules.

The last thing I want to talk about is the name of this pool. The Committee report or proposed rules include a name or designation as San Juan Basin Fruitland Coalbed Methane Gas Pool.

Administratively this is rather awkward to handle, although it could be abbreviated. I would recommend that we consider a shorter name and just one recommendation could be Basin Fruitland Coal Gas Pool. This designates the Fruitland formation, that the gas is produced from the coal, and it is in accordance with the way we've named the Basin Dakota Pool.

Also, I don't think at this time it would be appropriate to say "methane" to designate or separate the methane from the gases produced from these wells. As of now we're producing 5 to 10 percent carbon dioxide from these wells and there's a possibility that in the future that may be commercial given the nature that Mr. Busch testified that -- or the information he testified to that an estimated 56-trillion cubic feet -- I'm sorry -- yes, 56-trillion cubic feet of gas is available in the pool, if you consider 5 to 10 percent of that is carbon dioxide, we have a very large resource in there that may be

available in the future.

And that is all I have to comment on the proposed rules.

Q Let me take you back a moment as to Rule 6(A), the testing rule.

Are you stating -- I think Mr. Busch testified that the 24-hour minimum shut-in period was much shorter than is normally required by OCD prior to well testing, is that correct?

A That's correct.

Q Are you suggesting that that 24-hour period may be too short?

A No. What I'm suggesting is that the information that's gained from this may not actually be usable in some cases. The 24-hour shut-in period, as I understand it from the committee -- other committee reports, is a minimum amount of time at which many wells can reach a point of build-up that they've successfully accomplished a build-up test; also, there is a concern about the possibility of formation damage to a coal well after extended shut-in.

All I was commenting on was that the information may not be that valuable or that usable, and that the Committee, I think, should still address testing for the purposes of future development and study of the

pool.

Q Do you have any specific recommendations with respect to testing which could be placed in this rule if the rule were to be adopted pending further study?

A Not at this time.

Q Can we go back to Rule 4 for just a moment. You've indicated you have some concern there because there's no requirement that there be any engineering evidence to support the need for a greater well density to drain a particular spacing unit.

A That's Correct.

Q I believe Mr. Alexander testified that one of the concerns they have is that you may have dewatering wells within the spacing unit which, while not able to be productive of gas, if I understood him correctly, it would assist in the production of gas by taking the water out and allowing the gas to be produced from the other wells.

A If that is necessary it should be listed as one of the requirements for approval to drill a second well within a tract, and the way the rule is stated, a permit could be filed and there the operator does not necessarily have to state that he's drilling a dewatering well.

Q Okay, thank you.

MR. STOVALL: I have no fur-

ther questions.

MR. CATANACH: Any other questions of this witness?

Mr. Kellahin?

CROSS EXAMINATION

BY MR. KELLAHIN:

Q Let me direct your attention, Mr. Chavez, to proposed Rule 3(A). The proposed rule is to create 320-acre spacing for the entire Basin Fruitland Coal Gas Pool within the outer boundary, as shown on the various exhibits.

Do you have a position or a recommendation as to whether or not 320-acre spacing ought to initially be applied to the entire Basin Fruitland Gas Coal Pool?

A Yes. I recommend that the Division adopt the recommendation of the Committee for 320-acre spacing throughout the pool.

Q What's the basis for that recommendation, Mr. Chavez?

A The information that the Committee discussed indicated that 320 acres was adequate. We have also seen other information and -- or have been informed of it by other operators, though we haven't absolutely studied

it nor has it been made a matter of record here, that would indicate that that would be appropriate.

But one of the more important reasons on a conservation standpoint, would be that the information we have is 320 and to start out with a new pool it is much easier to space on a larger spacing and allow for the pool to start to be developed, information gathered, and then we could down space. The possibility of the violation of correlative rights is greater when you start with smaller spacing and it -- that's basically my opinion on the 320 spacing.

Q If we're dealing with 320-acre spacing within a given township of the pool and we have a certain portion of that reservoir being developed on 160 acres, how many additional wells in a township does that entail?

A Well, in one township that would be 72 other wells.

Q Potentially unnecessary wells, true?

A Yes.

MR. KELLAHIN: No further questions.

MR. CATANACH: Any other questions of this witness?

CROSS EXAMINATION

BY MR. CATANACH:

Q Mr. Chavez, you recommended that we not adopt a -- the horizontal boundaries of the pool as proposed?

A No. What I recommended was that we could alternatively describe the horizontal limits as the Fruitland Coal productive interval within the four counties rather than looking at the -- each township individually, because some of the acreage included within the township specified in the application do not contain any Fruitland.

Q How do you know that?

A If you'll look at Mr. Busch's Exhibit Part A, you'll notice that the proposed boundary follows the Fruitland formation outcrop. Outside of that outcrop there is no -- neither Fruitland -- well, the Fruitland is present only at the surface, I should say there, and it would not be a reservoir quality.

So the outline following the formation outcrop would otherwise -- otherwise be adequate but for the purpose of administrative ease, to define it like I had recommended might be less complex and would be more definitive.

MR. CATANACH: No further questions. You may be excused.

MR. ROBERTS: Mr. Examiner, I

have some questions for Mr. Chavez.

MR. CATANACH: Oh, Mr. Roberts.

CROSS EXAMINATION

BY MR. ROBERTS:

Q Mr. Chavez, you have indicated in response to a question by Mr. Kellahin that you felt a 320-acre poolwide spacing was appropriate for the Fruitland Coal -- Coalbed Pool because basically the Committee had reviewed data available to it and you'd come to that conclusion yourself.

Now have you been presented with any data which would indicate the 320-acre poolwide spacing might not be appropriate for the entire pool?

A Not -- not any drainage data.

Q If you were presented with that data would your opinion change based on that data?

A Well, of course.

Q That's all.

MR. CATANACH: We'll go ahead and break for lunch at this time and reconvene at about 1:20, 1:25, something like that.

(Thereupon the noon recess was taken.)

MR. CATANACH: At this time we're going to turn it over to Tommy Roberts.

MR. ROBERTS: Mr. Examiner, my name is Tommy Roberts and I'm representing today five independent oil and gas producers whose operations are primarily limited to the San Juan Basin.

Those independent producers are Dugan Production Corporation, Merrion Oil & Gas Corporation, Hixon Development Company, Robert L. Bayless, and Jerome P. McHugh and Associates.

We will have three witnesses today.

The first witness will be Kurt Fagrelius and at this time I'll go ahead and have him -- he's already sworn in, okay.

KURT H. FAGRELIUS,

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

DIRECT EXAMINATION

BY MR. ROBERTS:

Q Mr. Fagrelius, for the record,please, will you state your name and residence?

A My name is Kurt Fagrelius. I live in

Farmington, New Mexico.

Q What is your occupation?

A I'm a petroleum geologist for Dugan Production.

Q How long have you been employed by Dugan Production?

A For nine years.

Q Have you testified before the Oil Conservation Division on any prior occasions?

A Yes, I have.

Q In what capacity did you testify?

A As a geological witness.

Q Were you qualified as an expert in that case?

A Yes, I was.

Q Are you familiar with the application in this case today?

A Yes, I am.

Q Have you conducted a study of relevant geologic data and information for purposes of testimony here today?

A Yes, I have.

Q Would you briefly describe that, please?

A I have researched published reports prepared by others that deal with the regional geologic

aspects of producing coalbed methane from the Fruitland formation in the San Juan Basin.

MR. ROBERTS: Mr. Examiner, I would tender Mr. Fagrelius as an expert in the field of petroleum geology.

MR. CATANACH: He is so qualified.

Q Mr. Fagrelius, would you describe the purpose of your testimony in this case today?

A Dugan Production Corporation, Merrion Oil & Gas Corporation, Robert L. Bayless, Hixon Development Company and Jerome P. McHugh and Associates are each independent oil and gas producers owning substantial oil and gas leasehole interest in the San Juan Basin.

Each of these independent producers owns oil and gas leasehold operating rights in the Fruitland formation in various areas of the San Juan Basin, and each of them is interested in the establishment of pool rules which will facilitate the orderly and equitable development and production of coal based gas from the Fruitland formation.

This group of independent producers believes that the creation of the San Juan Basin Fruitland Coalbed Methane Gas Pool and development of rules applicable to development, operation, and production in the pool

is timely.

We want to express our appreciation to the members of the Fruitland Coalbed Methane Committee and their significant efforts in generating proposed rules and regulations for the pool.

This group of independent producers is not here today to oppose the creation of the pool. The creation of a pool and the adoption of pool rules is timely and necessary. We have reviewed the proposed special rules and regulations for the pool and our reaction to those special rules and regulations is favorable. Our major concern is the requirement for poolwide 320-acre spacing and proration units. The purpose of our testimony today is to suggest for consideration and review a rule with respect to spacing that would reflect the existence of different geologic and engineering data between areas within the horizontal boundaries of the pool.

Toward that end I will present testimony regarding applicable geologic data and information.

Kevin McCord, representing Robert L. Bayless, will present testimony regarding gas analysis data and information.

Rob Willis, representing Hixon Development Company, will present testimony regarding

drainage data and information.

Finally, Mr. McCord will identify problems which may arise if 320-acre poolwide spacing is adopted for the pool.

Based on this testimony, this group of independent producers will suggest a temporary spacing rule for the pool that will differ from the spacing proposal recommended by the Fruitland Coalbed Methane Committee.

The proposal which will be submitted by this group of independent producers will be to divide the pool into two areas. The line dividing the two areas will be established on the basis of available geologic and engineering data and information. Those lands generally located to the north of the dividing line would be developed on 320 acres. Those lands generally located to the south of the dividing line would continue to be developed on 160 acres for a period of three years, at which time the temporary spacing rules would be re-examined by the New Mexico Oil Conservation Division.

We will also propose that a buffer zone one section deep on each side of the dividing line be established in an effort to lessen the likelihood that 160-acre development south of the dividing line would encroach on 320-acre development north of the dividing

line.

Within the area of the buffer zone an operator would have the option to develop on either 320 or 160-acre spacing.

Q Mr. Fagrelius, do you have a copy of the exhibits to be presented by the Dugan Group and can you get that in front of you?

A Yes, I do.

Q I'd like for you to refer to what's been marked as Exhibit Number One, please, and identify that exhibit and describe its contents.

A Exhibit Number One is an isopach map of the interval between the Huerfanito Bentonite bed of the Lewis Shale and the top of the Pictured Cliff Sandstone showing lines of cross section A-A', B-B' and C-C', and a line of demarcation highlighted in yellow and proposed by Dugan, et al.

This exhibit shows the time transgressive nature of the Pictured Cliff - Fruitland interval, which becomes younger and rises stratigraphically to the northeast.

It also demonstrates that the Pictured Cliff seas did not regress to the northeast at a constant rate. As the rate of regression slowed or came to a stop, a thickening and stratigraphic rise in the Pictured Cliff

occurred and thicker Fruitland coals were deposited landward of the up-building Pictured Cliff shoreline.

Q Will you refer to what's been marked as Exhibit Number Two and please identify that exhibit and explain its significance to your position?

A Exhibit Number Two is a composite map showing the total thickness isopachs for Fruitland formation coal and the location of the large stratigraphic rise of the Pictured Cliff Sandstone, which trends northwest to southeast across the north central San Juan Basin.

This exhibit shows that the thickest accumulations of coal occur in a northwest/southeast trend which is southwest of the stratigraphic rise of the Pictured Cliff and north of the proposed line of demarcation.

Q Please turn to what's been marked as Exhibit Number Three and identify that exhibit.

A This exhibit includes three coal rank maps contoured on fixed carbon and isoreflectance values obtained from Fruitland coal samples.

All three maps are indicators of coal rank and correlate well with each other. They depict an increase in coal rank from the southwest to the northeast part of the Basin. This increase in rank can be attributed to deeper burial and a closer proximity to the San Juan Mountain intrusive complex.

The original demarcation line, proposed by Dugan, was along the 55 percent fixed carbon contour of Fassett's in the north central part of the map.

The other two maps were published after our initial proposal; however, they correlate well with Fassett's map and provide us with additional data to support the location of the demarcation line.

Rice's data indicates areas C through F in the north produce a distinct coal gas.

Area B produces a mixed Pictured Cliff and Fruitland Coal gas.

And coalbed gas produced in Area A is distinctly different from the underlying Pictured Cliff or that of coalbeds in Area C through F.

Also, Rice concludes that significant thermal methane generation for Fruitland coals begins at a reflectance of 0.7 percent or a rank of high volatile A bituminous, which occurs one to two townships north of the proposed demarcation line.

Q You've referred to a line of demarcation originally proposed by Dugan. Can you elaborate and explain to whom that proposal was made or when it was originally proposed?

A That line of demarcation was proposed to the rules writing committee, Coalbed Methane.

Q And when did that happen?

A I don't have an exact date. It was very close to the time of them writing the rules.

Q Mr. Fagrelius, turn now to what's been marked as Exhibit Number Four and identify that exhibit.

Q This was an isopach map showing the thickness of the overburden on Fruitland coal deposits.

This exhibit shows the thickness of overburden on Fruitland coal and drilling depths to the coal increases from 500 feet on the southwest rim of the Basin to about 3500 feet northeast of the demarcation line.

The region of thickest overburden trends northwest to southeast, lies northeast of the demarcation line and is located above the regions of thicker coal accumulations, higher rank, over-pressuring and gas in place for the Fruitland coal.

Q Turn to Exhibit Number Five, identify that exhibit and identify the contents relevant to your position in this case.

A Exhibit Number Five is a gas in place contour map for Fruitland coal in the San Juan Basin. The map depicts an area of highest coalbed methane potential and also shows a rapid and large increase in gas in place north of the proposed demarcation line.

South of the line Fruitland coals

contain zero to 5 BCF of gas per square mile, whereas, north of the line coals contain 5 to 35 BCF of gas per square mile.

Q Mr. Fagrelius, for the purpose of clarity, would you describe how the proposed line of demarcation is depicted on each of these exhibits?

A The proposed line of demarcation is the black dashed line which has been highlighted with a yellow marker.

Q Now refer to what has been marked as Exhibit Number Six and identify that and what it shows.

A Exhibit Number Six is a structure contour map drawn on the Huerfanito Bentonite bed and includes major tectonic elements of the San Juan Basin. This composite map shows that the northwest, north, and northeast edges of the San Juan Basin are bound by a steeply dipping monocline with flexures radiating into the Basin.

Also it shows the southern Basin is a relatively undeformed, gentle northeast dipping slope that grades into a deeper flat lying region with several anticline and synclinal fractures in the north central part of the Basin.

The lack of structural deformation south of the demarcation line suggests that the permeability in this area has not been greatly enhanced by fracturing,

whereas, north of the line the increased density of existing structural elements enhances the potential for natural fractured permeability in the north central part of the Basin.

Q Please refer to Exhibit Number Seven, identify that exhibit, please.

A This exhibit has two maps of the Fruitland overpressured area. Kelso's map on the left is based on drilling mud weights and Kaiser's map is based on DST data and calculated shut-in pressures.

Both maps correlate well with each other and depict an area of over-pressuring exists in the north central basin, northeast of the demarcation line, and Kaiser's map also shows that the region adjacent to and southwest of the demarcation line is underpressured.

Q Now turn to Exhibit Number Eight, identify that exhibit and explain its contents.

A Exhibit Number Eight is a potentiometric surface map drawn for the Fruitland formation.

It shows that the Fruitland has two distinct hydrologic basins; a northern and southern basin, which are separated by a pronounced deepening of the potentiometric surface that trends northwest and southeast across the Basin and is located approximately two townships north of the demarcation line. Both hydrologic

basins are different. The northern basin has a very strong active recharge area along the north and northwest rim of the Basin, which results in a strong influx of meteoric waters flowing basinwards.

The southern basin has a weak, limited recharge area along the southern Chaco slope and southeast rim of the basin.

Q Turn to Exhibit Nine and identify that exhibit.

A Exhibit Nine is a legal description of the proposed dividing line that we're proposing. This line is illustrated on all previous exhibits as a dotted line highlighted in yellow.

Q Turn to Exhibit Number Ten, please, and briefly summarize the contents of that exhibit.

A Exhibit Number Ten is a list of references I used to prepare my exhibits from .

Q Mr. Fagrelius, would you summarize the conclusions that you have drawn from the data illustrated in these exhibits with respect to the geologic differences between the area south of the proposed line of demarcation and the area north of the proposed line of demarcation?

A In summary, the geologic setting which favors the extraction of coalbed methane the most lies north of the proposed demarcation line. This area is over-

pressured and contains deeper, thicker, higher rank coals that have a large amount of gas in place and enhanced permeability due to fracturing; whereas, the geologic setting which favors extraction of coalbed methane the least lies south of the demarcation line. In this area the coals are underpressured, shallow, thinner, lower rank, contain less gas in place, and lack structure related permeability.

Q In your comments before you began any discussion of the exhibits you had prepared, you indicated that this group of independent producers would be proposing the establishment of a buffer zone one section being on either side of the proposed line. Can you elaborate on the purpose for that proposal?

A The purpose for the buffer zone is to make it less likely that 160-acre spacing would encroach upon the 320-acre spacing area.

Q In your opinion is the location of the proposed line of demarcation justified geologically?

A In my opinion, yes.

Q Mr. Fagrelius, were Exhibits One through Ten prepared by you or at your direction and under your supervision?

A Yes, they were.

MR. ROBERTS: Mr. Examiner,

we'd move the admission of Exhibits numbered One through Ten.

MR. CATANACH: Exhibits One through Ten will be admitted into evidence.

MR. ROBERTS: We have no other questions of this witness on direct.

MR. CATANACH: Questions of this witness?

CROSS EXAMINATION

BY MR. KELLAHIN:

Q Mr. Fagrelius, you prefaced your comments awhile ago when you mentioned your direct testimony with the fact that you'd researched published reports done by others.

Did you independently perform any geologic assimilation of data to reach your conclusions?

A We've been assimilating gas analysis data and water analysis data.

Q Apart from the assimilation of the gas analysis and water analysis, then, the conclusions and opinions you've expressed have been based upon the published reports of others.

A That is correct.

Q Specifically you have relied on some of

the mapping done by Mr. Fassett and I think originally published in his paper of 1971?

A That's correct.

Q And that paper has been updated, has it not, sir?

A Yes. He comes out with an updated version in 1988.

Q When we look at the demarcation line that you have proposed to separate the pool between 320's and 160's, the demarcation line you propose today is different than the one that you circulated to the working study committee back on April 28th of this year, is it not?

A It is.

Q In that first draft of the demarcation line, sir, you in effect took similar exhibits as we've seen today and you've drawn a line generally from the northwestern portion of the basin to the southeastern corner somewhat different than the one we saw today.

A That's correct.

Q When we look at the line that you've presented us today do we find any coal wells being produced or operated by any of the group you represent above that line?

A We have acreage above that line and we are contemplating developing that. But currently we do not

have any producing wells, Dugan Production. I cannot speak for the companies all over.

Q So there are no producing coal wells operated by Dugan north of the current proposed line.

A No wells operated by Dugan Production; however --

Q (Not clearly understood.)

A Yes, we do.

Q When we look below the line, Mr. Fagrelius, how many coal wells does Mr. Dugan operate?

A There are quite a few and it depends --

Q Do you have an approximation?

A Well, I've completed two here in the last month and a third one two months ago.

We've got a program that we're working on where we plan to drill additional wells, and we feel that we have a large holding in the WAW Fruitland-Pictured Cliff Pool, and we believe we're producing Fruitland Coal-bed Methane from that pool.

Q Are the coal analyses and water analyses that you've alluded to generated out of your production in the WAW Field?

A A good part of them are, yes.

Q Do you have any core analysis from any of those wells that demonstrate core information from

penetrations through the coal seams?

A Could you reword that for me, please?

Q My question is do you have any core information from any of your wells?

A We do not have core information from our wells. We are not sure that the information gained from the core is indicative of what to expect.

Q The answer to my question is you do not have core information.

A No, sir, we do not.

Q When we look at Mr. Craney's exhibit behind you, sir, I believe that's Exhibit Number Four from the Meridian book, you're familiar with that display, are you not?

A Yes, I am.

Q That's a display that shows the net thickness of the coal seams in the basin, is it not?

A That's correct.

Q And it values those on a contour map.

A That's correct.

Q And if we were to place your demarcation line across that basin, we're going to find coal thicknesses south of the line that represent some 40 to 60 feet of thickness.

A That's possible, yes.

Q And north of that line we'll find thicknesses of 40 to 20 feet in some instances.

A That's correct.

Q We cannot use the demarcation line you propose today and honor the data on the thickness map, Exhibit Number Four, can we?

A There is not any one map that will support the demarcation line. It is a preponderance of data upon which the line has been located.

Q Let's turn to the first exhibit you presented, Mr. Fagrelius.

I believe I understood this to be an isopach map?

A That's correct.

Q This does not isopach a coal seam, does it?

A This isopachs the interval between the Huerfanito Bentonite bed of the Lewis Shale and the top of the Pictured Cliff.

Q For illustration, when we look at the current demarcation line, if you'll look at the southern end of that line where it runs horizontal for about four townships and then suddenly goes north?

A Uh-huh.

Q Do you see that?

A Yes, sir, I do.

Q Your first proposal was not to take that line north, was it? It would have gone straight across to the east.

A We've gathered additional data from the time of our first proposal which supported that area did not drain 320-acres either.

Q My question, sir, was that the original proposal went straight to the east, did it not?

A That's correct.

Q This does not purport to map on an isopach a coal seam, does it?

A Could you reword that for me, please?

Q This is not an isopach of a coal seam.

A No, sir, it is not. The Exhibit Number Two is.

Q And the line that you've drawn vertically at the point of departure from the earlier draft is a line that does not honor the data on this display, does it?

A I will not make that conclusion. That line honors a propensity or a preponderance of geologic anomalies that occur northeast of it.

Q You're using other information apart than what's depicted on this display to cause that line to go vertically to the --

A I'm using all of the exhibits that I've presented today.

Q In using this display, you have to go inconsistent with the contour lines on the Isopach to draw that line vertically.

A There are other maps which support it going north.

Q This map does not do that.

A No, but the gas in place map does.

Q Can you determine recommendations on spacing based upon a gas in place map?

A No, you cannot.

Q Can you determine spacing from the gross structure map that you presented?

A You can make inferences.

Q But you can't make any direct determination or calculations of spacing based upon that gross structure map.

A No, sir, we have engineering data, testimony that will follow mine to support our position.

Q When we focus on the geologic presentation you've made, however, you cannot take that flexure map that you presented in here and use that to determine what spacing ought to be, can you?

A Again, I've used numerous maps to pick a

location for a line as a starting point. The spacing will be dealt with by our engineer.

Q Do you see anything on your structure map that you've presented to us that would isolate the reservoir structurally into two separate sources of supply?

A No. We feel that there is one common source of supply.

Q Within the Basin area you don't have any disagreement, then, with the vertical and the horizontal boundaries for the Basin Coal?

A We agree with the vertical limits and the horizontal limits are what we're addressing right now.

Q The issue, then, is the question of what portion, if any, of the basin would be spaced upon 160-acre spacing.

A That's correct.

Q Exhibit Number Two, sir, I think I understood this to be a gross coal thickness map?

A That's correct.

Q And this is the Fassett map from 1971 updated to '88?

A That's correct.

Q Is this different from the one that Mr. Craney presented in Meridian Exhibit No. 4 behind you or is this the same display?

A This map is from Fassett, 1988, and the map behind you is from Kelso, 1988.

Q Is there any material difference between the two interpretations on each of those displays?

A The map behind you done by Kelso is -- shows quite a bit more detail, whereas, the Fassett map is based more on a regional contour.

Q For specificity on developing rules for this pool, which of these exhibits as a geologist would you use?

A Well, it's obvious I preferred to use the Fassett paper.

Q And why, sir?

A It has withstood time and he is a highly accredited authority on the Fruitland Coal, and Picture Cliff.

Q Well, let's look at the Fassett No. 2 display then, if you will.

I find values when we contour that gross coal thickness that are inconsistent and do not -- are inconsistent to the demarcation line you've put on that display, isn't it?

A I'm sorry, I didn't follow that.

Q Well, look at the yellow line.

A Sure.

Q See the yellow line? It crosses through and over an area that's shaded as having a contour thickness of -- what's that general contour thickness shaded? I can't make it out.

A Everything shaded is greater than 40 feet thick.

Q 40 feet? It doesn't follow the -- the demarcation line does not honor, does it, sir?

A No, it doesn't.

Q Okay. When we look at the coal ranking maps, those were on display number three, Dugan Exhibit Number Three?

A That's correct.

Q The -- the Kelso display on that exhibit, the one to the far right, that was one of the attachments to Mr. Busch's exhibit book this morning, wasn't it?

A That's correct.

Q It's contained in that information. In fact, all this information is generally published, known information among you geologists that are working this particular area.

A That's correct.

Q And it was know to the other geologists working on the work study group?

A I don't believe that the Kelso, Wicks and Kuuskraa map was in publication at the time the committee was meeting; however, the Fassett paper was.

Rice had a paper in '83 which is very similar to the one he's presenting here in '88.

Q When we look at the three displays on coal ranking that are shown on Exhibit Number Three, none of those are consistent with the demarcation line that you have put on each of those displays, is it?

A Initially the demarcation line ran right along the 55 percent fixed carbon contour in the northern part of the basin on the Fassett map.

Q Okay, on the Fassett map the contour line that you were mapping is the 55 percent number?

A That's correct, in the north --

Q And then you gave -- I'm sorry.

A -- in the north central part of the basin.

Q You used a value awhile ago on the reflectance map. I think a .7?

A 0.7 percent.

Q 0.7 percent was the value used on the reflectance map? And that was a display that Mr. Craney had earlier today, was it not?

A I don't believe so. Craney's map was a

Kelso, Wicks and Kuuskraa map.

MR. KELLAHIN: If I might approach the witness, Mr. Examiner.

A Okay, I thought you were talking to the Rice map. I'm sorry; I missed the cue. That was one of Craney's exhibits.

Q I didn't make myself clear. Exhibit Number Four that Mr. Craney was using is this Lewin Energy 1988 depiction of the vitrinite reflectance values.

A That's correct.

Q All right. When we look at that display what point or what value on that display is one that is utilized by you in picking the demarcation line?

A In Rise's paper he states that significant thermal methane generation does not occur or begins to occur at a reflectance of 0.7 percent and -- or a rank of high volatile A-bituminous. And the Kelso, Wicks, Kuuskraa map shows the area that is shaded in white as being high volatile A-bituminous.

And the southwest line of that coal rank coincides very closely with Rice's 0.7 percent reflectance line.

Q When we look at Mr. Craney's display number four, do you have a copy of that?

A Not in my hands, no.

Q Let me show you. What value would you peg as the point to place that demarcation line on that display? Is it the area between the yellow area and the next shaded green area?

A Well, these lines are not drawn on reflectance value. They're drawn on coal (unclear).

Q If we use that display and superimpose your demarcation line, the demarcation line again would not honor the data on that display, would it?

A The demarcation line would be south of the area of high volatile A-bituminous coal and this is an area where we decided to move our demarcation line south in order to allow, if you will, a buffer zone between the better areas of coal gas production and the poorer area.

Q The over-pressuring map, I think it's Exhibit Number Seven, the area of over-pressurization on the display, is that area shown with the dark, black shading?

A On Kelso and Wicks map, yes.

Q Yes, sir, the one on the left of the two.

A That's correct.

Q When we look at the area of over-pressurization, the only thing we can conclude from this display is those areas of over-pressurization are north of the

demarcation line.

A That's correct.

Q Again, the occurrence of an area of over-pressurization is not going to tell you what the spacing ought to be for the area, does it?

A No, it does not.

Q The presentation including the legal description in Exhibit Number Nine, is this information that you circulated among the operators and the owners and participants of the work study before today?

A The legal description as it is in Exhibit Nine, no; however, I did contact them all on the phone and we went over the line.

I contacted all voting members of the Coalbed Methane Committee.

Q And did you participate on behalf of Dugan as a voting member on the issue of spacing?

A I was delegated to the Water Disposal Committee.

Q Was there a representative of Dugan that voted on the spacing issue?

A No, there was not; however, we made our position clear for the subcommittees. The committee was broken up into small subcommittees..

Q Was -- was Dugan's vote the dissenting

vote on that issue before the work study committee?

A Yes, we were and I believe there was -- yes, sir, we're the only one.

Q Do you have anything where you've attempted to map the permeability of the reservoir?

A I made inferences from my structure map with the structural elements on it.

Q Did you participate with the work study when they made a tabulation of all the wells by operator that would produce (not clearly understood)?

A Yes, I did.

Q And there is such a tabulation available, is there not?

A I'm not sure of its availability.

Q There was one discussed and used by the work study?

A That's correct.

Q And would reference to that tabulation show us where to find the Dugan, the Merrion, the Bayless, and the McHugh wells?

A The Dugan wells are on that map and as far as I know the Merrion wells are also. The McHugh and Bayless wells were not because they were not participating in the committee.

Q If the Division were to adopt 320-acre

spacing for the entire basin area, would an alternate avenue of procedure that would be available to you be one where you could come in and file an application and set aside a certain portion of this southern acreage on 160-acre spacing?

A We felt that our needs were best served by approaching it in this form here.

Q The approach I suggested would be an alternative.

A I cannot speak for the companies I'm representing on that issue.

MR. KELLAHIN: Thank you.

MR. CATANACH: Other questions of the witness?

MR. KELLAHIN: Mr. Fagrelius, I misspoke. I'm reminded that that exhibit behind you is not Exhibit Four, it's Exhibit Number Five.

Make note of that in the record. I apologize.

CROSS EXAMINATION

BY MR. LUND:

Q I'm sorry, your answer to Mr. Kellahin on whether you furnished your testimony and your exhibits to the committee members prior to this date, what was your

answer on that?

A The answer was yes.

Q And that was orally?

A Over the telephone.

Q When was that?

A It spanned the period of a couple of weeks. The exact date I don't have in my head.

Q The last couple of weeks before the hearing?

A No, sir, it was probably five or six weeks ago.

Q Are you going to have a landman testify by Dugan today?

A No, we're not.

Q Are you familiar generally with the Dugan lease situation?

A Yes, I am.

Q South of the demarcation line is it fair to say that Dugan's leases are primarily on a 160-acre basis?

A Yes, that would be a fair assumption.

Q Don't have any 320-acre leases south of your demarcation line?

A Not that I can recall.

Q Exhibit Seven and Eight of yours are

stamped "Draft". Why is that? Does that mean that they haven't been published previously?

A They are works that are currently being undertaken by the University of Texas at Austin by the Bureau of Economic Geology. They are, as I say, being studied for GRI. Currently they have not been published.

Q Does that mean that they're subject to change?

A In my personal communication with the authors it did not appear there will be any drastic changes in this report, no.

Q Primarily what your testimony boils down to is differences in gas in place, isn't it?

A Differences in geology of the coal.

Q And differences in the geology of the coal results in differences in gas in place, right?

A That, you may assume that.

Q I'm sorry?

A I believe so.

Q Isn't that primarily what you're focusing on? You're saying that there's more gas in place to the north of your demarcation line and less to the south?

A There's more gas in place north of the line. There's thicker coals north of the line. There's higher rank coals north of the line. There's an increase

fracture permeability associated with structural elements which also increase north of the line.

The bulk of my testimony is to show that all these geologic factors favor coalbed methane production increased or -- or better north of this line.

Q And so I think what you said to Mr. Kellahin was your testimony can't really give us any indication about the drainage, can it? That's more of an engineering function?

A That's correct.

Q And drainage is -- your testimony says nothing about a well's ability to produce, is that correct?

A It says something about the ability of the coal, whether it's a good coal or a bad coal, or --

Q And geologically that depends a lot on deep formation, isn't that right?

A That's right.

Q And basically the permeability, right? Yes?

A Yes, sir.

Q And you're familiar that under the proposed rules it's already possible to develop this particular area on 160's, aren't you familiar with that?

A Could you reword that for me, please?

Q Sure. Are you aware that under the

proposed rules by the Committee it's possible to go in and seek development on 160's based on a showing of a particular (unclear).

A Okay, Colorado did not adopt that option, and --

Q Well, it hasn't acted finally yet.

A Okay, and in New Mexico the nature of your competitor is such that you will have a hard time getting administrative approval for 160-acre spacing.

They will oppose you. They do not want to be offset by a 160.

Q So what you're saying is if you don't -- if you show a technical basis to justify 160 you're not going to get an order from the Division?

A No, you'll have to go to hearing and I work for a small, understaffed company, and people and time are very important to us.

Q So you're concerned about the administrative burden on the company.

A That is part of it, yes.

Q Is it a large part of your concern?

A No, it is not. The major part of our concern is we do not feel the coal wells in the southern part of the basin are capable of draining 320 acres.

Q Well, let's talk about the southern part

of the basin. There's not many wells drilled there, is there?

A Dugan Production has 18 wells in the WAW Fruitland Pictured Cliff Pool that are open hole completions in the Fruitland Basal Coal and the upper Pictured Cliff Sands.

In the WAW Fruitland Pool we have gas analysis data that will support we are producing Fruitland coal gas. We are recompleting many old abandoned wells in the Fruitland coal zone development.

Q So what you're talking about is commingled production?

A In some cases our gas analysis data indicates that it is commingled. In other cases it indicates we're producing strictly the Fruitland coal gas.

Q You've got data that shows separation of production from coal as opposed to from sand?

A We have data that will support a distinct coal gas and also a distinct Pictured Cliff gas and also a mixed Fruitland coal and Pictured Cliff sandstone gas for the southern part of the basin.

Q Is that an engineer's (unclear)?

A That's correct.

Q Well, let's get to the bottom line. If you're wrong about the 160's, we're going to drill about

7000 too many wells in this area, are we not?

A Currently the coal play in the southern part of the basin, if you will, is very inaccurate and that is also why we decided to incorporate a 3-year temporary ruling on this because we feel with additional data there will be -- the data will either support or negate the conclusions that we're drawing from our area today.

Q Yeah, but to answer my question, then, if you're wrong about spacing we're going to drill way too many wells?

A I don't believe that those wells would get drilled in the southern part of the basin.

Q The answer is yes?

A The answer is no.

Q Thank you.

MR. CATANACH: Any other questions?

MR. STOVALL: Tommy, before you go to redirect I'd like to ask a question.

CROSS EXAMINATION

BY MR. STOVALL:

Q With respect to the -- if you go to 160-acre spacing, Mr. Fagrelius, what would you recommend in terms of well location criteria? Would you recommend a

different rule than is proposed with the 320-acre spacing?

A We would go with the statewide rules, the 160-acre spacing.

Q The statewide rules being --

A I don't have those numbers in front of me but I believe it's 790 from the section line.

Q Basically what you'd say is to change the proposed spacing in this proposed order to -- the real change would be on that quarter section line, you'd have to go to 790 all the way around rather than have that 130?

A That's correct.

Q What about -- would your proposal affect the rule with respect to horizontal completions, horizontal drilling?

A I'm not sure. I haven't studied that angle.

Q That's it.

REDIRECT EXAMINATION

BY MR. ROBERTS:

Q Mr. Fagrelius, I'd like for you to once again address the reason for the change in the location of your proposed line of demarcation which you had originally from, oh, from that as it is now proposed.

A We moved our demarcation line south one

to two townships from the Fassett 55 percent fixed carbon contour in hopes of creating a buffer zone which would make it less likely 160-acre spacing could encroach upon 320-acre spacing.

Q Thank you. Is it accurate to say that your group does not object to 320-acre spacing north of the proposed line of demarcation?

A No, we don't. We feel that the data that has been presented supports 320 acres and we are in agreement with that.

Q Do you know how many defined Fruitland Pictured Cliff pools there are below this proposed line of demarcation?

A The exact number I'm not sure of. I can just (unclear). The Ojo Fruitland Pictured Cliff Pool, the WAW Fruitland Pictured Cliff Pool, the South Gallegos Fruitland Pictured Cliff Pool, the Harper Hills Fruitland Pictured Cliff Pool and I know there are several more and they'd be listed on the docket for this hearing.

Q Do you have any ballpark figure estimate of the number of wells completed and producing in those combined Fruitland Pictured Cliff Pools? Is it over 100?

A Way over 100.

Q Over 200?

A I would say 200, 250, something in that

range.

Q Mr. Lund posed a question to you and paraphrasing it I think that he was asking you whether you would feel there was any relief from the proposed rule regarding increased well -- any -- any relief (not clearly understood) that you may perceive as existing in the -- if spacing is made on 320-acres.

A I'm --

Q Do you -- go ahead.

A I'm sorry, Tommy, I didn't follow your question.

Q Well, you're one of three witnesses. Is there someone here today who will testify on behalf of this group of independent producers who can address the relief that may be provided by an increased well density provision in the proposed rules?

A Yes.

Q Okay. Then I'll withdraw that. I have no other questions of the witness.

MR. CATANACH: Any other questions?

If not, the witness may be excused.

MR. ROBERTS: Mr. Kevin McCord.

KEVIN H. McCORD,

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

DIRECT EXAMINATION

BY MR. ROBERTS:

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

A My name is Kevin McCord and I live in Farmington, New Mexico.

Q And what is your occupation?

A I'm a petroleum engineer.

Q How long have you been employed as a petroleum engineer?

A Approximately ten years.

Q Have you testified before the New Mexico Oil Conservation Division on any prior occasions?

A Yes, I have.

Q And in what capacity?

A As petroleum engineer and a Registered Professional Engineer in the States of New Mexico and Colorado.

Q Are you familiar with the application in this case?

A Yes, I am.

Q Have you conducted a study of relevant engineering data and information for purposes of providing testimony in this case?

A Yes, I have. I've examined many gas analyses in the south of our area line of demarcation and also looked at some decline curve production on some wells south of the line of demarcation.

MR. ROBERTS: Mr. Examiner, I would introduce Mr. McCord as an expert in the field of petroleum engineering.

MR. CATANACH: He is so qualified.

Q Mr. McCord, refer to what's been marked as Exhibit Number Eleven and identify that exhibit.

A Exhibit Number Eleven is a list of gas analyses taken from wells in the San Juan Basin.

The purpose of this exhibit is to demonstrate that Fruitland Coal Gas south of the proposed demarcation line can be distinguished from Pictured Cliff gas and Fruitland coal gas south of this line is not similar in composition to Fruitland coal gas north of the demarcation line.

Exhibit Number Eleven consists of four pages of gas analyses the majority of which are from wells south of the proposed line of demarcation.

The first page of Exhibit Number Eleven is a summary table showing the average normal molecular percentage components for 79 gas analyses taken from wells south of the demarcation line which were either perforated in the Fruitland coal or possibly producing Fruitland coal gas from Pictured Cliff perforations.

Also, there are wells that are perforated in Fruitland sands in this, also.

Also presented in page one of Exhibit Number Eleven is average gas analysis data from the Cedar Hill Fruitland Basal Coal Field, which was taken from Decker, et al's paper entitled Geology, Geochemistry, Reservoir Engineering and Completion Methods at the Cedar Hill Field, San Juan County, New Mexico, A Field Study of Classic Coal Degasification Behavior", which was printed in the Guidebook for Geology and Coalbed Methane Resources in Northern San Juan Basin, Colorado and New Mexico, and this was a symposium which was given -- held in June of 1988.

The remaining pages of Exhibit Number Eleven are the individual gas analyses used to come up with the averages presented on page 1 of the exhibit.

A total of 79 gas analyses were examined mainly from WAW and South Gallegos Fruitland PC wells.

These wells are commonly perforated in Fruitland coal, Fruitland sands, Picture Cliff sand, and

any combination of these, and these zones are generally commingled.

To determine the average gas analysis for the area I grouped these gas analyses together, first of all, by BTU values and by grouping them as such it was then obvious how Fruitland gas and Pictured Cliff gas were separated apart from each other.

The summary results shown on the first page of Exhibit Number Eleven give the results of the groupings.

I've listed these averages as average Fruitland dominated gas and average PC dominated gas because I'm not sure if these analyses are 100 percent Fruitland or 100 percent PC gas, but the mixture is dominated by one or the other zones.

On page one of Exhibit Number Eleven note the average BTU content for a Fruitland dominated gas versus a Picture Cliff dominated gas and you'll see that the Fruitland is much lower in BTU, being 1023 while the Picture Cliff is much higher, 1139.

The average methane is 95 percent in the Fruitland zone and only 88 percent in the Pictured Cliff.

Average ethane, 2 percent in Fruitland and 6 percent in the Pictured Cliff.

Average specific gravity, .59 in the

Fruitland and .66 in the PC.

I've also listed a column called average C1/C1-5, which is a factor used in Dudley Rice's paper, and this is called the ratio of methane gas to total hydrocarbon gas, and in the Fruitland zone this value is .97 while the Pictured Cliff value is .89.

Also note that the CO_2 value in the Fruitland in this area is quite low, 1.3 percent and 0.9 percent in the PC.

The combination gas analysis values shown fall between the Fruitland dominated gas averages and the PC dominated gas averages and probably represent a split mixture of the two formation gases in those wells.

Note at the bottom of the page the Fruitland coal gas analysis averages from the Cedar Hill Field, which is north of the demarcation line. These numbers are drastically different from those south of the demarcation line for the Fruitland coal gas.

Q Looking at CO_2 to the south, the average is 1.3 percent, and north of the line in the Cedar Hill Field the average is 6 percent.

Average BTU, 1023 in the south; to the north in Cedar Hill, 951.

The average methane percentage is about the same, 95 percent in the south, 94 percent in Cedar

Hill.

Average ethane, 2.2 percent in the south; 0.2 percent at Cedar Hill.

Average specific gravity, .59 in the south; .61 at Cedar Hill.

And the average ratio of methane gas to total hydrocarbon gas in the south, .97; Cedar Hill, 1.0.

It is also interesting to recognize that the Fruitland coal south of the demarcation line tends to produce gas with very little or no water production at all. There are drastically different production characteristics in the Cedar Hill Field.

Note that Rice, et al, printed a paper on Fruitland coal analysis in the same guidebook I mentioned earlier, which states that Fruitland coal gas in the southern part of the basin exhibits different gas characteristics than gas analysis in the northern part of the basin.

My study represents quite a few more southern wells than Rice examined and his findings seem to hold true. Rice's paper is entitled "Identification and Significance of Coalbed Methane Gas" -- excuse me, "Coalbed Gas, San Juan Basin, Northwestern New Mexico and Southwestern Colorado."

I'd like to also add here that the gas

analysis presented today by Mr. Busch, and a gas composition study presented today by Mr. Craney for Fruitland coal fit very well with the averages just presented for the Cedar Hill Field and the area north of the line of demarcation, not with the averages for the area south of the line of demarcation.

Q Mr. McCord, would you now direct your attention to your Exhibit Number Twelve, identify that exhibit and its contents?

A Exhibit Number Twelve is a map of the Fruitland formation outcrop in the San Juan Basin, showing contours of coal isoreflectance throughout the San Juan Basin.

The map was reproduced from Rice's paper I just mentioned. This map is presented to indicate the gas analysis samples used to calculate the average gas characteristics in Exhibit Number Eleven with relation to the line of demarcation.

I have labeled the number of Fruitland coal dominated gas wells, PC dominated gas wells, and combination gas wells per section on this map. Note also the location of the Cedar Hill Basal Coal Field, which is marked as Area E on Rice's map and marked as a solid area in this exhibit.

Q Now turn to what is marked as Exhibit

Number Thirteen and identify that exhibit.

A Exhibit Number Thirteen is a decline plot to support that there is no drainage interference on 160-acre spacing in the Fruitland - PC formation in South Gallegos Field.

This exhibit shows the decline trends for four combined Fruitland - PC producers in the South Gallegos Field. These wells are the Nassau No. 5, No. 6, No. 7 and No. 8 Wells located in Section 36 of Township 27 North, Range 12 West, and operated by Jerome P. McHugh.

The bottom curve is a running average production plot of the Nassau No. 5 Well, which started producing in late 1973.

The upper curve is a combined running average production plot of the Nassau No. 6, No. 7, and No. 8 Wells, which began producing in 1977.

Three months running average production was used to generate both curves to smooth out production data on the curves due to production rate variation throughout the years.

The Nassau No. 5 has an established decline trend which did not vary throughout its production life, even with the large production volumes taken from the 320-acre offset wells.

The total production from all wells is

now over 2 BCF of gas. All of these wells were perforated in the Fruitland coal. The gas analysis for these wells were either Fruitland dominated gas or combined gas from the gas analysis study presented in Exhibit Number Eleven.

It is interesting to note that these wells all have production declines and make small amounts or no water at all. There is not classic coal gas -- this is not classic coal gas reservoir behavior, but this is a good example of how no interference taking place on 160-acre spaced wells producing all or a large part of their gas from the Fruitland coal.

320-acre spacing would definitely not be appropriate in this area.

Q Does this (unclear) to you or would you expect to be able to do similar conclusion (unclear) on an analysis of other wells in the area south of the proposed line of demarcation?

A It would be my guess if enough data was available we'd find the same situation time and time again. Definitely not coal gas behavior as exhibited north of the line. We do not, in bringing on a Fruitland well south of the line, it exhibits normal decline curve tendencies; it does not incline; you do not see large amounts of water. It's a whole different formation.

Q Do you know of any evidence that will

contradict that conclusion?

A Not to my knowledge, no.

Q Were Exhibits Eleven through Thirteen prepared by you or at your direction and under your supervision?

A Yes, they were.

MR. ROBERTS: Mr. Examiner, I'd move the admission of Exhibits Numbered Eleven through Thirteen.

MR. CATANACH: Exhibits Eleven through Thirteen will be admitted into evidence.

MR. ROBERTS: I have no other questions of Mr. McCord on direct.

MR. CATANACH: Are there questions of this witness?

Mr. Kellahin.

CROSS EXAMINATION

BY MR. KELLAHIN:

Q Mr. McCord, you're an engineer for Mr. Bayless?

A I own my own company called KM Production Company and he's my major client, yes.

Q Do you have any information south of the demarcation line on wells that are not otherwise

communicated the PC sand or the Fruitland sand where we can isolate out the production attributable solely to the coal seam?

A I think with enough study and analysis you could come up with a candidate or two, but for the most part it's going to be very difficult to find that situation when wells south of the line, mainly, this is an area dominated by independent by independent producers, when they drill and complete their wells they're -- initially they were looking for Pictured Cliff sand production, they perforate the Pictured Cliff, stimulate the Pictured Cliff, and I believe for the most part they are fracing up into the coals.

There have also been instances of perforating the coal, Fruitland coal, from the Fruitland sand, and accomplishing roughly the same result. Whether you can -- this is why I classified my average Fruitland dominated gas as Fruitland dominated gas, because I don't know that you can specifically say this is 100 percent Fruitland gas.

So I guess the answer to your question is at this point in time, no, but I think that work could be done. It would be a massive job but I think an example or two could be found.

Q When we look at Exhibit Number Eleven and we look at the last page, we're looking at the analy-

sis of gas from wells that there is absolutely no disagreement are producing solely and singly out of the coal seams in those wells. Yes or no?

A If that's in the form of a question, yes.

Q There are one, two, three, four, five, six wells shown on that tabulation.

A Uh-huh.

Q And it's your understanding that each of those represents the values for the gas composition from which there is no dispute that gas is produced out of those.

A That's correct.

Q When we turn to page one of Exhibit Number Eleven, and we look at the top portion of that display and look at the average Fruitland values, is this a summary of the information that's on the next page?

Help me understand how to --

A There again, page two, it's solely the first line, average Fruitland dominated gas.

Page three is average Pictured Cliff dominated gas and also average combination gas.

Q Do you have the data available from which we can see the spread of the values which you have averaged?

A It's on page two and on page three.

Q All right. When we look at page two, then, you say these are Fruitland dominated gas. Are all of these wells producing out of simply the Fruitland formation? We don't have PC wells in this tabulation at this point.

A The way I define PC wells, no, we do not. We have Pictured Cliff perforated wells in this analysis. We also have Fruitland coal perforated wells in this analysis. We also have Fruitland sand perforated wells in this analysis.

This analysis shows that this combination of wells, no matter where they're perforated, are producing Fruitland coal gas.

Q Can you pick out any of the wells on the page two of the display and tell me that that well is perforated and producing only out of the coal seam?

A I answered that question before. That is a very tough analysis to do. It would be a very large task, as I said with your first question.

Q How have you determined that it is Fruitland dominated production?

A As I stated in my testimony, if you'll look on page one, the average on page two, look at the BTU content and look at the large spread between the BTU con-

tent and the Pictured Cliff dominated gas. Compare that to the CO_2 values, which are different; the methane values, which are different; the ethane values, which are different; the propane values, which are different; and specific gravity values, which are different; along with the C1/C1-5 ratio values, which are different.

Q Do we know whether or not any of the wells shown on the tabulation as Fruitland dominated gas are specifically isolated to the coal gas?

A No, I think that also answers -- is answered in question one.

Q When you indicate that production is PC -- Pictured Cliff dominated gas production, how have you made that determination.

A Once again by the comparisons I just gave you, BTU, specific gravity, nitrogen, methane, ethane, propane. They're all considerably different.

Q But in each of those wellbores for a Pictured Cliff well, we have that wellbore open to something other than Pictured Cliff production.

A That's correct.

Q When we look at Exhibit Number Thirteen, Mr. McCord, does the information tabulated on this display from these four wells, are any of those wells specifically isolated to the coal seam?

A They are all perforated in the Fruitland coal. Their data, gas analysis data, is presented in Exhibit Number Eleven about -- almost toward the bottom, six, seven and eight.

And the BTU's, for example, range from 1023 to 1049 and they fit very well with the averages; therefore, I'd consider these to be dominated Fruitland coal producers.

Q While these are perforated in the coal, they are not exclusively perforated in the coal seam, is that correct?

A They are exclusively perforated in the coal seam, yes.

Q Do you have any core information from any of those four wells?

A No, sir, I don't.

Q In making your analysis of the fact that there's no drainage interference on 100-care spacing -- 160-acre spacing on Exhibit Number Thirteen, the basis for the fact that you see no drainage interference is based upon these production decline trends that you've shown on the display?

A Yes.

Q What would happen, in your opinion, if these were in fact communicating with each other on 160

acres?

A What you would see is a well like the Nassau No. 5 showing a drastically different change in decline trend when the other wells came on line, especially large wells like they are. You'll see the drainage dominated by one of the other wells and an established decline from the existing well will change drastically.

Q Was your engineering method of analysis the additional analysis that Mr. Wood testified about over here today?

A Not at all.

Q What did you estimate to be the permeability of these wells?

A No estimation given. It must be fairly high.

Q Have you run any similar interference tests on any of the coal producing wells south of the demarcation line that is similar to the information developed by Amoco in the Cedar Hill?

A No, we have not.

Q On Exhibit Number Thirteen I notice that you've got gas volumes displayed in here. Have you tabulated and reported any water production?

A To my knowledge there is -- this is once again another operator's well -- to my knowledge no water

production is being tabulated and being reported.

Q Do the coal wells that you see below the line, I think you've indicated to us that you see a performance that's different from the coal wells above the demarcation line?

A Yes. I've indicated that you can, in this specific instance, Exhibit Number Thirteen, you'll notice from the Nassau No. 5 you have an established decline, not an incline, in gas production, and making little or not reported water is definitely not classic Fruitland coal production trend as, for example, is seen up in the Cedar Hill field.

Q Does that cause you to be suspicious that the information reported on this analysis might be influenced by the fact that you have Fruitland sand production?

A No, considering the PC sand in these wells had absolutely, or very little, reservoir quality compared to other Pictured Cliff sands throughout the Basin and that its gas analysis falls within the Fruitland coal trend that I've described in Exhibit Number Eleven.

It all points to the fact these wells are producing from Fruitland. They've produced over 2 BCF of gas.

Q When you look at Exhibit Number Twelve,

the demarcation line on the southern end goes horizontally and then moves vertically and then horizontally again. The information you've provided for us on the display predominantly comes from the WAW area shown in the left side of that display?

A That's correct.

Q And it's that are below where the City of Farmington is shown on the exhibit?

A That's correct.

Q What is the area indicated on the contour line at value 0.7 percent? Do you see that one? There is another circle and it's got a hatched mark through it? It says C.

A Yes.

Q What is that?

A That is the original area of data that Dudley Rice put together in trying to come up with average -- I hope I'm stating this correctly -- he was looking for an average for gas analysis for the Fruitland coal and comparing that to the Pictured Cliff sand and also the Fruitland sand and I believe these areas are the different groupings that he presented in his paper.

Q Do we find any groupings on the display that are inconsistent with the demarcation line?

A I'm not sure I fully understand the data

presented by Dudley Rice generally agree with the averages I came up with. The problem with his data was that they were not full gas analyses presented. There was only, I believe, the methane percentage presented and also the C1/C1-5 ratio was presented, but generally it was not a full gas analysis.

MR. KELLAHIN: Thank you, Mr. Examiner.

CROSS EXAMINATION

BY MR. LUND:

Q Mr. McCord, I'll try not to duplicate what Tom is asking, but let me just see if I understand what you're testifying about.

Is it fair to say that most of your analyses, these 79 analyses you got (not clearly understood)

A I don't think it's fair to say that I tend to like the Fruitland dominated, PC dominated, and combination affect, because it's not really commingled production if it's dominated solely by one zone and I think by looking at enough of these analyses you can pick out which zones are the dominant producer in the well.

The only problem with doing it that way is you do not know the 100 percent number, if I can say it

that way; otherwise, I don't know exactly what the 100 percent Fruitland Coal number is. I feel by looking at enough of these analyses it's going to be the same or very close to my Fruitland dominated gas analysis average.

Q But isn't it cleaner and more accurate to look at just the coal production, for example, and then comparing these to just the sand production?

A I would absolutely love to have that data if it was around. It is not around in the southern part of the basin.

Q In Cedar Hill data is just coal production, is that true?

A That is correct, yes.

Q Now, the desorbed gas from coal is nearly all methane, isn't it?

A Coal in the published, classical, Fruitland coal gas, yes, it is almost entirely methane. That's what the C1/C1-5 value shows.

If you'll look at the average for the Cedar Hill Field, you'll see that .997.

What I'm saying here today is that is different gas than you're seeing in the southern part of the basin, also being Fruitland gas, and I think Mr. Rice alluded to that, also. It is not a consistent form.

Q But again in the southern data that

you're talking about, it's not just a coal production, isn't that right?

A I think generally speaking, once again I'm going to lean very heavily to my Fruitland dominated gas, if it's not 100 percent Fruitland coal gas, it's going to be very close to that.

Q So you don't agree that your samples for the south are contaminated or not representative of what the sands would do as opposed to what the coal would do?

A They are contaminated to the extent that I can't be 100 percent definitely sure, if you want to put it that way, that it's all coal as in the Cedar Hill Area, but I think if you look at enough of these analyses, you can come up with a very -- let's call it a low contamination factor.

Q Only methane absorbs from the coal, isn't that right?

A I think that's published, yes.

Q The ethane and the heavier matter does not, right?

A I -- I have to say I question a lot of that data when I look at things like this. As published, and as well known as it is, I'd have to question it.

Q Now, when you've got commingled production, you agree, don't you, that it's necessary to drop the

production in the reservoir to absorb the methane from the coal? Do you agree with that?

A From a classic coal reservoir, yes.

Q Okay, and in some of the commingled areas that you've been discussing the reservoir has to -- the reservoir pressure has to drop and absorb a lot of methane from the coal.

A That might -- I don't know that exact answer to that question, but that might be a correct statement, and once again I feel that this whole analysis leads to this is not a classic coal gas area to the south of the line.

Q Well, do you have any indication of how the Cedar Hill Area would perform with the PC open and commingled?

A Probably very differently. It's a different area. It's a different coal; the same common source.

MR. LUND: Nothing further.

MR. CATANACH: Mr. Carr.

CROSS EXAMINATION

BY MR. CARR:

Q Mr. McCord, you would agree with me, would you not, that when we're talking about spacing rules what we're really talking about is the area that an indi-

vidual well can be expected to drain?

A Correct.

Q And what you're proposing is temporary spacing rules for a 3-year period of time at which time this body would again examine the rules.

A I do propose that and I would sure hope that we can iron out some of the problems just presented, trying, especially in our area, to come up with 100 percent Fruitland coal gas analysis to prove if all this is correct or not.

I believe it is but I would sure like to see more data, also. I think that's a very good reason to have a temporary 3-year period.

Q And the real reason for the 3-year period is the limited data that you have on the characteristics of the -- producing characteristics of these coalbeds south of your line of demarcation.

A That's one of the reasons, yes.

Q And you would hope three years from now to have better information so a final call could be made.

A I would hope that to be the -- true, yes.

Q And you're hoping that at that time to have definitive information and show 160-acre spacing to be appropriate.

A I'd also like to have some pressure interference data, too.

Q And then it's also possible, is it not, that when you get that information it might show that 320-acre spacing is appropriate.

A That certainly is possible.

Q Now, if your recommendation is granted, during the next three years individuals could south of the line of demarcation develop this acreage on 160-acre spacing units.

A Yes.

Q And if it was determined that 320-acre drainage is in fact appropriate, we could have more wells than are necessary to produce the reserves south of that line, isn't that true?

A That's correct.

Q So we could have some unnecessary wells.

A You could.

Q In the meantime before the rules could be changed, we might also have situations occur where you'd have 160 acres dedicated to a well when the well in fact could drain more than 160 acres, isn't that also possible?

A Yes, sir.

Q If you go ahead and develop on 160 acres during the next three years, just assuming that 320 is the

appropriate spacing, you wouldn't really expect to have any additional recovery by virtue of the fact that you for a time drilled on 160-acre spacing, would you?

A Let's call it economic production -- economic recovery, then.

Q You would increase your cost of developing the reserve, would you not?

A Yes, you would.

Q And then when we get three years down the road and we'd have to change to 320-acre spacing, you would be confronted with having to find additional acreage to dedicate to those wells that are now on 160-acre spacing, wouldn't you?

A And I'll -- yes, that's correct, and I'll bring out that same type of scenario that this proposal right now will cause us to look at hundreds of wells already dedicated to the combination Fruitland-PC zone as a 160-acre common reservoir. That same type of scenario would happen in what you just described. It's already a problem.

Q But it would be a greater problem if in fact you develop on 160 and three years from now had to go to 320.

A Yes.

Q Now if we go with the Committee report

and we adopt rules to provide the 320-acre spacing, and in fact the interference information that you have was just an isolated set of circumstances, there are provisions in these proposed rules where you could infill a 320 in that area, isn't that correct?

A Yes, but it doesn't adequately address the problem right now of operators drilling Pictured Cliff wells on 160-acre spacing and having a problem of all of a sudden finding out that they are producing Fruitland gas and having to go back and redetermine their ownership in the well. Yes.

Q You also, if in fact it is determined 320-acre spacing is appropriate across the southern portion of these coalbeds, and you had any isolated area or any portion of that area where 160-are spacing was appropriate, you would be able to drill an infill well, would you not?

A Yes. I think infill drilling is the wrong term, though, because you'd obviously --

Q You could put a second well on the other --

A You would put a second well on the other 160, yes.

Q That's all I have.

MR. CATANACH: Any other

questions?

CROSS EXAMINATION

BY MR. STOVALL:

Q I do have one question, Mr. McCord. In talking about your Exhibit Eleven, yeah, Exhibit Eleven, what bearing does the differing gas analyses depicted on here have with respect to drainage? What's the correlation you made between the evidence on composition of the gas and the appropriate drainage area?

A The correlation I've made is that the commingled wells are truly producing Fruitland gas, not Pictured Cliff- Fruitland combination. That's what I've done and tried to analyze and group these analyses, is try to prove from the wells that we're looking at that will infer (sic) drainage, are they producing predominantly Pictured Cliff gas or are they producing predominantly Fruitland gas, and therefore through that analysis I've come up with the conclusion that they are producing predominantly Fruitland dominated gas and therefore the spacing.

REDIRECT EXAMINATION

BY MR. ROBERTS:

Q I have one question on redirect.

Mr. McCord, do you now have any data or

information available or are you aware of any data or information which would indicate that 160-acre spacing is not now the appropriate spacing for the area south of the line of demarcation?

A I don't have any data that suggests that. The only thing we've seen so far is the interference data presented by Amoco in the Cedar Hill Area and I think we're not talking in the same reservoir.

MR. ROBERTS: I have no other questions of this witness.

MR. CATANACH: Any other questions of this witness?

If not, he may be excused.

MR. ROBERTS: Mr. Examiner, I'd call Rob Willis.

ROB A. WILLIS,

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

DIRECT EXAMINATION

BY MR. ROBERTS:

Q Would you state your name and your place of residence for the record?

A Yes. My name is Rob Willis. I live in

Farmington, New Mexico.

Q What is your occupation?

A I'm a petroleum engineer.

Q Who are you employed by?

A Hixon Development Company.

Q How long have you been employed in that capacity?

A Approximately three years.

Q What are your employment responsibilities for Hixon Development Company?

A I'm responsible for drilling and completion, production, and reservoir work on Hixon operated leases in Farmington -- or in New Mexico, Oklahoma and Kansas.

Q Have you testified before the New Mexico Oil Conservation Division or Commission on any prior occasions?

A No.

Q Would you briefly describe your post-high school educational background?

A Yes. I have a Bachelor of Science degree in petroleum engineering from the University of Wyoming in 1984.

Q And have you practiced your profession for any other employer other than Hixon Development

Company?

A No, I haven't.

Q Are you familiar with the application in this case?

A Yes, sir.

Q Have you conducted a study of relative engineering data and information for purposes of providing testimony in this case?

A Yes.

Q Will you briefly describe that data and information?

A I've run through some drainage types of calculations incorporating volumetric gas calculations and P/z curves to try to formulate the drainage of some Fruitland - PC wells Hixon operates

Q And those are -- those are applicable -- that information is applicable to wells Hixon Development Company operates in the area south of the line of demarcation?

A Yes, that's -- that's correct.

MR. ROBERTS: Mr. Examiner, I would tender Mr. Willis as an expert in the field of petroleum engineering.

MR. CATANACH: He is so qualified.

Q Mr. Willis, let's turn to what we've marked as Exhibit Number Fourteen and identify the exhibit and point out the pertinent data on that.

A Exhibit Fourteen is an area map which indicates the location of the study wells, Mandana State No. 1, Mandana State No. 2, N.T.B. No. 1 and the Sam Jackson State No. 1.

They were used to sample wellbores drilled on 160-acre spacing penetrating the Pictured Cliffs formation, and all these wells are operated by Hixon Development Company.

Q Mow the dark line that appears to be drawn in on this map, that is the boundary of the WAW Fruitland - Pictured Cliff Pool?

A Yes, sir.

Q Go to Exhibit No. 2, please, and identify that exhibit.

A Exhibit Fifteen contains information provided from the Mandana State No. 1 Well.

The first section depicts open hole logs, this is an induction log, of that Mandana State No. 1.

Of note are the indicated Pictured Cliff perforations. The Fruitland coal section in this wellbore is encountered directly above the Pictured Cliff sand. The

perforations were fracture stimulated upon completion.

With the small amount of separation between the PC and the Fruitland coal it is possible that the treatments through these Pictured Cliff perforations enhance communication with the Fruitland coal seam.

This type of completion procedure is consistent with all four sample wells.

Section Two is a gas producer's P/z curve from the Mandana State No. 1. The best fit curve yields a value of original gas in place at approximately 720,000 MCF with an abandonment pressure of 25 psia.

In referring to Section 3, which are calculations regarding original gas in place and coal contribution, with the assumptions as stated on this paper, volumetric calculations from the Pictured Cliff sands with 160-acre well spacing yielded original oil -- an original gas in place value of approximately 85,000 MCF.

In referring to the aforementioned P/z curve, the recoverable reserves from the wellbore are approximately 720,000 MCF.

The difference between the two calculated gas in place values is approximately 634,000 MCF. With the amount of Fruitland coal present in this wellbore one can suggest that the discrepancy in gas in place calculations is due to methane generation or liberation from the

coal seam, and that is on the magnitude of 5.1 MCF per cubic foot of coal section.

The last part of the exhibit is a production history on a monthly basis from the Mandana State No. 1.

This wellbore was offset nine months post initial production and no drastic change in the P/z curve was noted and therefore leading me to believe that we're not seeing much interference, if any.

Q Mr. Willis, I'd like to direct your attention to the third page of Exhibit Number Fifteen, your gas in place and coal contribution calculations.

A Yes.

Q Could you very, very quickly describe how you selected the parameters for that calculation?

A Yes. As far as the initial gas in place it was a volumetric method. These parameters were used -- the parameters that were used were mostly averages taken from either log calculations or samples taken at the well-site.

Q Now turn to your Exhibit Number Sixteen and just kind of describe that -- that exhibit.

A This is information pertaining to the Mandana State No. 2, which is 160-acre offset to the Mandana State No. 1. The first section of this exhibit shows

that it has been just perforated in the Pictured Cliffs formation with the same type of treatments, fracture treatment as the Mandana State No. 1.

The next page is the gas produced versus P/z curve and it indicates a value of 950,000 MCF.

Referring to the third section, the volumetric calculations suggest that the initial gas in place is 117,000 MCF, whereas, if we laid the two of those together we'd find a discrepancy of 830,000 MCF, which suggests that with this Fruitland coal seam of 21 foot in this well, that would give you a coal contribution of approximately 5.7 MCF per cubic foot of coal section.

Q Now, Mr. Willis, refer to your Exhibit Number Seventeen and identify and describe that (unclear).

A Exhibit Seventeen is similar to the aforementioned exhibits.

This was another area offsetting approximately three miles to the west of the Mandana State Wells.

This well was also perforated in the Pictured Cliff formation and fractured.

Referring to the P/z curve we find a value of approximately 2950 MMCF original gas in place.

Calculations volumetrically suggest that this wellbore should be draining -- or should be -- have an

original gas in place value of approximately 215,000 MCF.

The discrepancy between these two values for original gas in place is approximately 2,735,000 MCF, which would suggest the coal contribution of approximately 18.7 MCF per cubic foot of coal section in this wellbore.

Q Now turn to your Exhibit Number Eighteen and identify that for the Examiner.

A Exhibit Number Eighteen pertains to information from the Sam Jackson State No. 1, which is a 160-acre offset to the N.T.B. No. 1.

This well was also perforated in the PC and fracture stimulated.

A P/z curve gives us a value of approximately 1.020 MMCF original gas in place.

Volumetric calculations suggest that the initial gas in place for this Pictured Cliff sand is approximately 173,000 MM -- or MCF and the discrepancy in these two calculated values is approximately 846,000 MCF and with this 22 foot section of Fruitland coal present in this wellbore, it suggests a coal contribution of approximately 5.5 MCF per cubic foot of coal.

Q Mr. Willis, based on your analysis and review of the data illustrated in Exhibits Fifteen through Eighteen, do you have an opinion as to what kind of gas of being produced from each of these four wells?

A Yes. In referring to Exhibit Eleven, handled by Mr. McCord, these wells all fall in the combination Fruitland coal - Pictured Cliff gas scenario.

Q Are you able to, or have you drawn any conclusions from the data you've mentioned illustrated on these exhibits with respect to 320-acre poolwide spacing?

A It is my opinion that these calculations support 160-acre spacing for the Fruitland coal in this area south of the demarcation line.

One could pose the question with the high recoveries from these wells it is possible that -- is it possible that this wellbore is draining more than the calculated 160 acres.

And my feeling is no, based on the information provided by the 160-acre offsets, the initial reservoir pressures provided show pressures of the same magnitude and the older well showed no appreciable pressure depletion indicating possible interference.

Q Mr. Willis, based on your study of relevant engineering data which you have now testified to, do you have any -- any knowledge of the availability of any other data or information that would indicate that 160 acres is not now an appropriate basis for the area south of the proposed line of demarcation?

A I've seen no data to suggest that these

conclusions can't be extended throughout the area south of the line.

Q Were Exhibits Numbers Fourteen through Eighteen prepared by you or at your direction and under your supervision?

A Yes, sir.

MR. ROBERTS: Mr. Examiner, I move the admission of Exhibits Numbers Fourteen through Eighteen.

MR. CATANACH: Exhibits Fourteen through Eighteen will be admitted into evidence.

MR. ROBERTS: And I have no other questions on direct of this witness.

MR. CATANACH: Are there questions of this witness?

Mr. Kellahin.

CROSS EXAMINATION

BY MR. KELLAHIN:

Q Mr. Willis, other than the analysis that you've presented on these four wells operated by Hixon south of the demarcation line, did you do any other volumetric calculations?

A Other than these presented, no.

Q What made you select these four?

A These four were -- had probably the greatest amount of P/z data that we have, and so I just grabbed these.

Q Let's start with Exhibit Number Sixteen, I believe. Based upon your analysis, how do we quantify the amount of gas that is attributable to the Fruitland coal?

A As I stated, there's a volumetric value calculated that was attributed to the Picture Cliff formation. This value was then subtracted from the P/z curve -- or the amount of oil -- or original gas in place indicated from the P/z curve and this discrepancy was the value that I felt was attributable to the Fruitland coal seam.

Q What made you select a volumetric P/z methodology for analyzing the performance of these wells?

A Mostly that's the only data that I had available to me.

Q You heard earlier today, did you not, Mr. Woods concern using volumetric and P/z methodology in a diffusion reservoir such as this?

A Yes, I did hear it.

Q Do you disagree with Mr. Wood on that?

A No, I don't disagree. I think this is a different type of area whereas I think this is applicable. The curve suggests -- the P/z curves that I came up with

flow fairly well, I think.

Q Well, when we look at Exhibit Number Sixteen, you have given us the volume of gas that you attribute to the coal. Have you calculated the drainage area attributed to the coal production?

A Well, once again, no, I -- I just used the 160-acre spacing as my area interpretation.

Q Did you go and make an interpretation of what would occur with a 320-acre assumption?

A No, I didn't.

Q You plugged in an assumption of 160 acres.

A Yes, that's what those wellbores were drilled on, yes.

Q Yeah, but you didn't go through and make an analysis to see what it would be if you made an assumption of 320.

A No, I felt that that wasn't pertinent.

Q Well, the subject matter for the hearing --

A Well, it's pertinent, I agree, but to these wellbores, no.

Q Oh. You didn't give us a drainage radius area for the Exhibit Sixteen. Did you do the same thing with the other four, Fifteen, Seventeen and Eighteen?

A Yes, sir.

Q You'd made the assumption that you had 160 acres and used that assumption in your calculation.

A Yes, sir.

Q And you've made no comparison as to what would happen if you made an assumption on 320 acres.

A Since these wellbores were drilled on 160 acres and I believed there wasn't any interference, I did not do that.

Q Now, which one of these analyses is the one you discussed where you said you had small separation between the PC and the Fruitland and because of the fracture stimulation of these wellbores on completion you might have communicated the PC and the Fruitland?

A That would be Exhibit Fifteen.

Q Fifteen. Again what is the method by which you have analyzed that production to separate out, then, Pictured Cliff sand and Fruitland sand from the Fruitland coal gas production?

A What is the method is attribute to that?

Q Yes, sir.

A Exhibit Eleven.

Q You as an engineer, then, how do you separate that out for yourself?

A The composition of the gas from analy-

sis.

Q When we look at Exhibit Number Seventeen, Mr. Willis, if I remember correctly you've got a 2.7 BCF difference?

A Yes.

Q And that's a difference between what?

A That's a difference between the calculated P/z value and volumetric gas in place.

Q And that difference, the 2.7 BCF, you attribute to the Fruitland coal production?

A It would be suggested, yes.

Q That's suggested, and have you calculated the drainage area for that, other than what you've told us?

A I used the same 160, since the offset was 160.

Q In the calculation what was the assumption of the thickness of the coal?

A 21 feet, and that's from the log section.

Q Do you have a gas analysis for that well?

A Yes, sir.

Q And is that one of the exhibits that Mr. McCord gave us? Is it on that display?

A Yes.

Q When we're talking about the volume of gas in a cubic feet -- foot hole, can you translate that into what it represents in terms of cubic feet of gas in relation to a ton a coal?

A It can be done. I haven't done it.

Q You have not done it?

A No.

Q In plotting your analysis did you see any of the typical signature of a gas produced from a coal seam whereby we have inclining gas allowables?

A No, sir, not in these samples.

Q You talked in relation to Exhibit Number Eleven about an inference of interference data? Did I misunderstand when you were addressing Exhibit Number Eleven you talked about the interference between wells?

A Not referring to Exhibit Eleven but the only inference I made to interference dealt with the fact that I saw no drastic pressure depletion in the P/z curve at the time the offset well was drilled and completed.

Q And what wells were you specifically referring to when you saw no interference?

A Both Mandana Well No. 1 and the Sam Jackson State No. 1. I'm sorry, Mandana Well No. 2 and the Sam Jackson State No. 1.

Q In providing the data for each of these four wells, Mr. Willis, did you actually plot a production decline curve?

A No, no, I didn't. No, sir.

Q You've got the tabulated data here but you didn't plot --

A No.

Q -- a decline curve.

A No. No. The curve would certainly have some fluctuations in it due to market conditions and being dropped down. I did not plot the actual curve, no.

MR. KELLAHIN: Thank you.

CROSS EXAMINATION

BY MR LUND:

Q Mr. Willis, I'm afraid I'm way over my head. I've already confused absorption and desorption, so I'll -- I've got to just ask you a couple of questions --

A Okay.

Q -- and then let the engineers talk about this.

Let me see if I can -- see if I understand your testimony.

In calculating your recoverable reserves you did the P/z calculation and then the difference -- the

difference between what's actually produced and what your calculations were you attributed to the coal, is that right?

A Yes.

Q On your Exhibit Number Fifteen, would you turn to that, please?

A Yes.

Q On your second page, am I incorrect? It looks like your last two data points are not on that curve, is that right?

A Certainly this is approximation or a best fit according to my eye. They are not certainly in contact with that line, no.

Q So the 146 and 137 would be over above that decline line, right?

A Yes. I believe that the 110 number is probably a little bit low.

Q All right, that's my second question. You've got over on your far righthand column, you go 144, then it goes up, 148, then it goes down to 110. Then it goes up to 146 and and down to 137. Is that typical?

A That's possible with mechanical operations, yes; possibly just some bad data, bad gauge or something.

Q Our engineer will talk about it later.

Okay.

MR. CATANACH: Any other questions of this witness?

MR. ROBERTS: Mr. Examiner, I have one question on redirect.

REDIRECT EXAMINATION

BY MR. ROBERTS:

Q Mr. Willis, you would expect, would you not, that the use of a 320-acre drainage parameter for your gas in place calculations would -- would affect the bottom line calculation, would it not?

A Yes, it would.

Q But would it change your conclusions with respect to the absence of interference?

A No.

MR. ROBERTS: I have no other questions.

CROSS EXAMINATION

BY MR. CATANACH:

Q Mr. Willis, in your four exhibits you've got a number for the coal's contribution. Three of them are basically the same and one of them is significantly higher.

A Yes, that's correct.

Q Can you explain that?

A No, I cannot explain that. It's certainly a better well.

MR. CATANACH: That's all I have. You may be excused.

MR. ROBERTS: Mr. Examiner, I would like to recall Mr. McCord to address some of the potential problems these operators have identified with 320-acre poolwide spacing.

KEVIN H. McCORD,

being recalled as a witness and remaining under oath, testified as follows, to-wit:

DIRECT EXAMINATION

BY MR. ROBERTS:

Q Mr. McCord, have you identified some potential problems associated with 320-acre poolwide spacing?

A Yes, I have.

Q Would you discuss those -- these problems?

A The Fruitland formation in the area south of the proposed dividing line is currently primarily

developed on 160-acre spacing.

The primary objective of much of the shallow depth drilling in this area is the Pictured Cliff formation, which is currently also developed on 160- acre spacing.

With spacing for the two formations uniform, downhole commingling has proven to be relatively simple from an administrative perspective because -- primarily because it is extremely unusual for ownership to be segregated vertically. With ownership of the two formations common, administrative approval of request for downhole commingling is commonplace. This has relieved operators of the time and expense of a hearing before the NMOCD to obtain approval for downhole commingling.

The practice of completing and producing wells in this manner has not created allocation of production problems or correlative rights problems because spacing and consequently ownership of the two formations has been uniform.

If spacing for the Fruitland formation south of the proposed demarcation line is changed from 160 acres to 320 acres, then administrative problems, allocation problems, and correlative rights problems will begin to surface.

The ownership of the two formations may

no longer be uniform; in fact, this would be a common situation.

It not uniform, then request for downhole commingling will be gathered -- will be granted only after incurring the time and expense of notice and hearing. This is an administrative burden both for the NMOCD and the the operator.

In addition, accurate and equitable allocation of production between the formations becomes a critical process under circumstances in which ownership is not common. Allocation is not an exact process and the potential for abuse exists.

Non-uniform ownership of the two formations may also provide a setting in which violation of correlative rights is more likely to occur.

For example, in the Chaco area where the main Fruitland coal is located just on top of the Pictured Cliffs formation, the common practice of fracture stimulation -- stimulating the Pictured Cliff formation commonly results in drainage of gas from the Fruitland coal thereby damaging the correlative rights of the owners of the Fruitland formation.

This is a potential problem regardless of whether the two formations are commingled downhole or completed and produce separately.

Another possible problem that could arise if the vertical limits are contracted to exclude the Fruitland coal zone and 320-acre spacing is given to the Fruitland coal zone in the WAW Fruitland - PC Pool, for example, would be the case where in a given well you could have a Fruitland sand with 160-acre spacing overlying a Fruitland coal overlying the Pictured Cliff sand with 160-acre spacing. This would generally be a case of a pool within a pool having different spacing and very little control completionwise to produce these zones separately.

If the Fruitland coal was spaced 160 acres in this situation, at least a correlative rights question in this situation would not be such a problem.

It was suggested by Mr. Chavez that if an operator is found to have fracture stimulated into the Fruitland coal while completing the Pictured Cliffs formation and thus produce gas from both formations, then the operator should have the opportunity to come into compliance with the regulations.

This would be a near impossible task to do physically other than simply plugging the well.

The other possibility would be to readjust ownership, costs, and revenue distribution for the well, which would be very difficult to do.

The potential problems I've identified

illustrate the kinds of problem that may surface if spacing for the Fruitland formation in the area south of the proposed dividing line is changed from 160-acres to 320-acres. I've not attempted to describe all potential problems.

Other problems such as the allocation of cost of operation between the owners of the two formations under circumstances in which ownership is not common, are foreseeable and I've just pointed one case out; however; most of these kinds of problems can be avoided simply by maintaining 160-acre spacing for the Fruitland formation in the area south of the proposed dividing line.

Q Mr. McCord, in earlier testimony it was inferred that the increased well density provision that Rule 4 of the proposed special rules would give the operator the flexibility to drill on 160 acres.

In your opinion does the increased well density provision in Rule 4 serve to alleviate all or any of the problems that you have identified?

A It does not and the most glaring example is common ownership of the 160's. If the two 160's side-by-side are not common ownership, then you have a situation of trying to allocate production between the two zones, which could be a terrible problem.

MR. ROBERTS: I have no other questions.

MR. CATANACH: Any other questions of this witness?

Mr. Lyon.

QUESTIONS BY MR. LYON:

Q Mr. McCord, is there not a subsidy that has (not clearly understood)?

A Yes, that's correct.

Q If you have a combined stream there can you allocate that production?

A I don't see any other way to do it. I mean you, first of all, you're going to have to identify gas being produced from the Fruitland zone, Fruitland coal zone and as has been pointed out through my gas analysis, that's not easily done. You have to make some assumptions so it does become a real problem, yes.

Q Are you collecting a subsidy on your wells now?

A No, sir.

Q Did you think that you might be able to as a result of this hearing or other hearings before the Division?

A I don't believe any more so than we would be able to at this point in time. That situation exists to an individual operator depending on his tax sit-

uation. It is not open and free to everyone. Tax consequences certainly come into effect with the use of that tax (unclear)

Q Well, if you -- if you have to allocate to collect the subsidy then there wouldn't -- there -- you wouldn't have the problem of allocating specifically to -- to meet our requirements, is that right?

A I'm not sure I can answer that exactly. Why don't you state it again?

Q Well, if you have to allocate the gas in order to collect the subsidy, then you have to allocate by a well basis, would you not?

A Yes.

Q And whatever the spacing that we set up for the Fruitland, you would have made that allocation anyway, would you not?

A That's correct.

MR. LYON: That's all I have.

MR. CATANACH: Any other questions?

The witness may be excused.

MR. ROBERTS: Mr. Examiner, I'd like to ask Mr. Fagrelius to come to the witness stand for a brief (not understood).

KURT H. FAGRELIUS,

being recalled as a witness and remaining under oath, testified as follows, to-wit:

REDIRECT EXAMINATION

BY MR. ROBERTS:

Q Mr. Fagrelius, would you briefly summarize the recommendations you would submit today with respect to the adoption of the special pool rules applicable to this proposed Fruitland coal pool?

A We propose that the following recommendations be incorporated into the special pool rules adopted for the San Juan Basin Fruitland Coalbed Methane Pool:

First, that a line be established dividing the proposed San Juan Basin Fruitland Coalbed Methane Gas Pool into two areas. The area generally located to the north of the dividing line would be developed on 320-acre spacing and proration unit.

The area generally located to the south of the dividing line would be developed on 160-acre spacing and proration units.

The legal description of the proposed dividing line is set forth in Exhibit Number Nine.

We also propose that a buffer zone one section deep on each side of the dividing line be esta-

lished. An operator would have an option to develop lands within the buffer zone on either 320-acre or 160-acre spacing.

We also propose that the development of the San Juan Basin Fruitland Coalbed Methane Gas Pool south of the dividing line continue on 160-acre spacing and proration units for a period of three years from the date of the issuance of an order in this case, at which time the New Mexico Oil Conservation Division would re-examine the spacing rules.

Q Mr. Fagrelius, in your opinion would the adoption of these recommendations be in the best interest of conservation, protect correlative rights, and result in the prevention of waste?

A I believe it would.

Q Have you contacted the members of the Fruitland Coalbed Methane Committee regarding these recommendations?

A Yes, I have.

Q Would you describe the reaction of those members whom you contacted?

A Of the twelve voting members of the committee contacted, seven approved or did not oppose our proposal; four chose to go with the committee recommendation and one was undecided until they could view our data.

MR. ROBERTS: I have no other questions. That concludes our case, Mr. Examiner.

MR. CATANACH: Thank you, Mr. Roberts.

Mr. Kellahin? Mr. Lund, do you have something else?

MR. LUND: Could we have five minutes to see if we could consolidate it and it could go quicker?

MR. CATANACH: That would be great. Let's take five minutes.

(Thereupon a recess was taken.)

MR. CATANACH: We'll turn it over to Mr. Lund at this time.

MR. LUND: Thank you, Mr. Examiner. What we'll do is Mr. Wood will first respond to the last three witnesses' testimony and real quickly set forth Amoco's additional testimony.

So, Mr. Wood has already been qualified and sworn. Are his qualifications acceptable?

MR. CATANACH: Certainly.

C. ALAN WOOD,

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

REDIRECT EXAMINATION

BY MR. LUND:

Q Mr. Wood, would you please just comment on the last three, or whatever portion of the last three witnesses' testimony as it was and give our side of it?

A Yes, I would.

In particular I'd like to address the information and data shown on Exhibits Fifteen through Eighteen.

If you take a look at Exhibit Number Fifteen, and in particular the third page of the exhibit, excuse me, the second page, which is the P/z plot, it's my understanding based upon what Mr. Willis said, that that this was a "best fit" as to visual fit of the data that's available.

It's also my understanding that the data that was used to construct this particular plot is listed in the table in the upper righthand portion of the exhibit. There are dates. There are gas cum volumes, and also a P/z calculated number, or a P/z number.

The last two numbers, one corresponding

to the June '85 date, as well as the April, '86 date, do not appear to be plotted on the -- on the graph. I've taken the liberty to plot those and they fall substantially above the extrapolated line Mr. Willis had put on this plat.

We have heard that their conclusion is that these four wells may be producing volumes of coal gas in conjunction with a Pictured Cliff gas volume. Right now I do not have sufficient data before me to support that conclusion nor to completely deny that conclusion.

In looking at the data that has been presented, in particular these four exhibits, there are some funny things happening we need to talk about.

The first thing we need to discuss is the technical background for using the P/z extrapolation to determine recoverable reserves or even original gas in place numbers for a given well.

Traditional gas well engineering tells us that within a volumetric reservoir whenever we have withdrawal of a gas volume, you see a corresponding decrease in the reservoir pressure. It's that theory that allows us to construct a P/z plot and to utilize it for reserve extrapolations or extrapolations of original gas in place.

The things that can affect us in a trad-

itional gas reservoir is we have an external pressure source, such as do we have some type of water influx or if we're in an extremely tight reservoir we always question the validity of our pressure data, our measurements of the pressure.

What happens within a coal reservoir is that we're producing from a different mechanism. We're producing from a desorption mechanism, and as opposed to a volumetric reservoir, traditional sand type reservoir, we do not see a linear relationship with gas volumes and pressure drops.

In coal wells as we increase -- as we further decrease the reservoir pressure we see increasingly large volumes of gas being produced for that same delta P.

I've stated earlier in my testimony with regard to Cedar Hill that one of the problems we recognized was the inability to apply traditional engineering calculations to coal wells. These exhibits, in my opinion, represent their problem in demonstrating that problem.

The difference that we actually see here is that you cannot utilize a P/z extrapolation to determine recoverable reserves from a well that's producing coal gas.

That's what they've attempted to do here. They have said, I've got well performance that says I'm going to recover X volume of gas. Based on volumetric

calculations I can only contribute a certain portion of that to the sand production; therefore, the remaining volumes must be produced from coal.

My contention is, given the different producing characteristics of coal as compared to traditional gas sand reservoirs, you cannot utilize this P/z plot to make that type of reserve determination or an original gas in place determination.

There are some things, strange things, happening on these four plots.

If you'd take a look at Exhibit Number Fifteen and the tabulation of the data in the upper right-hand portion of the exhibit, you do see that there is a significant fluctuation in the calculated and presented P/z data points.

In January, 1984, we have 144 psia. Six months later in June of 1984 they report 148. Five months later they go down to 110 and then they go back up seven months later in June of 1985 to 146.

In a volumetric reservoir you cannot have increasing reservoir pressure unless you have some type of external pressure source or possibly in this case you're producing something other than sand gas.

Another thing you can look at is Exhibits Sixteen and Seventeen. You also see that the his-

torical P/z numbers do not show a consistent decline. You see numbers that are higher than numbers that were measured in the previous test or even the test before that.

One of the other things we can also do on a volumetric reservoir is we can make a calculation on the volume of gas that will be produced that corresponds to a drop in the reservoir pressure, an MCF per delta P calculation, if you wish.

Utilizing that approach on Exhibit Fifteen, in April of 1979, which is the first reported data, you have produced approximately 1100 cubic -- 11,000 cubic feet of gas per 1 psi pressure drop.

That same performance in March of 1983 has gone up to 5900 MCF per delta P.

If you look at Exhibit Number Seventeen, based on the July, 1980, test we can make that calculation 5600 MCF per delta P and in November of 1982 that increases to 12,000 MCF per delta P.

On Exhibit Number Eighteen on the June, 1984, test data we can calculate 3700 MCF per delta P.

In October of 1985 that number increases to 9,900 MCF per delta P.

That may indicate that we are seeing contribution from coals on these wells. As I've indicated, we don't have enough data, I do not have enough data before

me to draw that conclusion.

If in fact we are seeing a contribution from coals in these wells, then the engineering approach is in utilizing the P/z plot to make a determination of recoverable reserves or original gas in place is technically incorrect.

Q Do you think that the -- that information about the Cedar Hill Area has been altered or changed by anything you've heard from the last two witnesses?

A No, sir, I do not. As I indicated in my previous testimony, Cedar Hill gave us some very useful data. We had a single producing well and we had three pressure observation wells surrounding that well that we could physically take pressure data (unclear).

We had, I guess you could say, as close to laboratory conditions as you could possibly hope to find.

Q Before we turn to our two individual concerns, do you have anything else to add about the (unclear)?

A Not on this.

Q Real quickly, we're going to make two more points that show how Amoco deviates a little bit from the proposed rules. We have two short exhibits.

Mr. Wood, while I'm passing these out,

would you please first identify Exhibit Number Four and explain this exhibit, please?

A Exhibit Number Four would represent four sections and they could be any four sections within a township.

On each one of the sections by virtue of a dashed line I have indicated the half section line, which would be the division between what I've assumed to be two stand-up 320-acre drilling and spacing units. Within each of those 320-acre stand-up units I've indicated by another box what would be the permitted well location under the recommended rules from the Methane Committee.

On the righthand side of the exhibit I have presented the calculations of the drainage radius that would correspond to different spacing sizes, on a 40-acre spacing size up to a 640-acre spacing size.

Below that we present some information as to what the effective drainage radius would be if in fact an operator or any number of operators elected to develop the reservoir at locations which would be legal under the recommended well location requirements from the Methane Committee.

In the interior portion of my 4-section plot, I've got four gas well symbols. Those would indicate 4 legally drilled, legally located wells.

Q Now, both Mr. Catanach and Mr. Chavez expressed some concern about the possibility of well clustering.

What is your recommendation on behalf of Amoco to alleviate that problem?

A Well, we certainly agree with the previous comments that the proposed well locations could result in well clustering. It's my opinion that could be a wasteful action in that you would have de facto spacing much less than your 320-acre spacing and it could result in ineffecient production and recoveries from the reservoir.

Amoco's recommendation is to adopt a staggered well location that actually honors the fact that we're looking at 320-acre spacing and we are advocating that this Commission adopt in a requirement that wells, the initial well within each 320 be located in either the southwest quarter or the northeast quarter of the section with the footage requirements as specified by the Methane Committee.

Q Now your Exhibit Four indicates that you've got in fact both 40-acre offsets and 80-acre offsets. If your recommendation is granted isn't it true that there would still be what would be in fact an 80-acre offset?

A That's true but you have to take a look

at what happens to the section to the north of my four sections and also to the sections to the south.

If you had similar development down here you can in excess of 8000 feet between producing wells because of operators' decisions to cluster wells in the unit.

Q Is your suggestion unique in your experience as a proration and unitization expert?

A No, it is not. It's been my experience that states on numerous occasions will adopt staggered well locations whenever they adopt rectangular spacing units.

Q So the staggered locations go with the rectangular spacing units, is that --

A Yes, sir, they do.

Q Was Exhibit Number Four of Amoco's prepared by you or under your supervision and control?

A Yes, it was.

MR. LUND: I offer Exhibit Four in evidence.

MR. CATANACH: Exhibit Number Four will be admitted as evidence.

Q Let's turn to Exhibit Number Five, now, Mr. Wood, please. Would you identify it, please?

A Exhibit Number Five is a 16-section plat of the Cedar Hill spaced area, currently spaced on Divi-

sion orders. As I indicated in my previous testimony, Cedar Hill was spaced in 1984 and that was under Order No. R-7588, dated July 9th, 1984. That was granted for a temporary period of two years and subsequently reviewed on March 7th, 1986, resulting in Order No. R-7588-A, which made the spacing permanent.

If you notice in the hearing the OCD staff identified a number of existing Fruitland spaced area, Fruitland fields, for address -- to be addressed by this Division to delete from the nomenclature in those fields the coal seams. One of the fields which was absent from that list was in fact Cedar Hill.

Cedar Hill was spaced only for the Basal Coal. If you could remember Busch's type log, you would then find that there's a number of up-hole coal stringers that by virtue of today's cost may be spaced 320 acres.

We have a concern within Cedar Hills that our production to date has been predominantly from the Basal coal seam. We have dewatered that coal seam; our concern is that if we're obligated to utilize that same wellbore for an up-hole coal seam completion, we may be seeing water that would be found in that up-hole coal seam being dumped upon the Basal coal member which in Cedar Hill has been effectively dewatered already.

And we are concerned that there is a

potential for subsurface waste if that was allowed to happen.

Q And what is Amoco's proposal to prevent that potential waste?

A Our proposal is for the lands currently included within the Commission's order for Cedar Hill, but in particular for the 320-acre tracts that have been developed with a wellbore, that they be allowed to produce the up-hole coal stringers from a separate wellbore than the the current wellbore that's producing only from the Basal Coal stringer -- seam.

Q What about -- would the spacing and the orientation be the same --

A We are recommending --

Q -- for this new wellbore?

A -- that the spacing and the orientation for the 320-acre spacings would be the same.

Q And is it possible for Amoco to do that because they have (not clearly understood) in the proposed open hole completion?

A Yes.

Q Did you want to comment on Rule 3(B) about the (unclear)? That's the last thing I have on my list.

A Very briefly.

Q That's about the unorthodox well locations?

A I believe the Examiner had a comment as to deleting -- or I guess it was Mr. Stovall.

That's right, in Rule 3(B) Mr. Stovall asked Mr. Alexander whether or not he would have any objection to delete the notice and, or to specify that the administrative approval would be granted after hearing, since the applicant had already given notice by virtue of this mailing to the affected owners.

I think Mr. Alexander's reply was that it probably should be left as recommended by the Methane Committee.

We would support that position because what we are talking about here are two different animals.

The first portion of proposed Rule 3(B) allows the Director to grant without any notice or any hearing when an exception was necessitated by topography. That means that the applicant or the operator doesn't have to go to the offset owner. The rest of the proposed rule deals with a procedure to allow administrative approval of location exceptions which may be necessitated by something other than topography, and sets forth a mechanism by which they can give constructive notice to the offset owners. The offset owners would have a finite period of time, i.e.

twenty days, in order to file an objection.

Failing to receive an objection, the Director can certainly grant the exception.

The other comment I would make is that the notice requirements specified under this rule, that meaning certified letter, are different from the notice requirements to call a hearing. We don't have the published notice requirements and so it's my opinion that the language should be retained as recommended by the Methane Committee.

Q I don't think -- I'm sorry, housekeeping -- on Exhibit Number Five I forgot to get that into evidence.

Did you prepare Exhibit Five or was it prepared under your supervision and control?

A Yes, I did.

MR. LUND: I offer Exhibit Five into evidence, Mr. Examiner.

MR. CATANACH: Exhibit Five will be admitted into evidence.

MR. LUND: Nothing further, thank you.

MR. CATANACH: Any questions?

MR. STOVALL: I've got a -- I've got a couple of quick ones, just a couple of point of

clarification.

RECROSS EXAMINATION

BY MR. STOVALL:

Q With respect to your Exhibit Four, I'll call it the designated drilling order proposal, do you know how that would affect existing wells in the proposed pool that might already be drilled into the formation. would it become part of the pool?

A Unfortunately I did not make the attempt to review all of the current Fruitland pools to determine what the orientation may have been.

The orientation presented on this exhibit is the orientation that was adopted from Cedar's.

Q And so it might be difficult to put this in place in light of existing wells and there might have to be some exception made for existing wells based on location rather, not necessarily the orientation we have, is that correct?

A Possibly.

Q Now, let me -- let me go back and raise a point on the Exhibit Three and make sure that I understand your response compared to Mr. Alexander's.

I understood Mr. Alexander that he is distinguishing the requirements for notice prior to admin-

istrative approval of the unorthodox location based upon whether or not the unorthodox location is closer to another proration unit rather than unorthodox within the existing proration unit; that is, between the two quarter sections of the proration unit.

You're suggesting that the distinction as to whether notice to offset operators would be required would be based not on the nature of the unorthodox location but rather the cause for the request. Is that correct?

A I would agree with Mr. Alexander that the proposed language from the Methane Committee does read by virtue of being closer to the outer boundary of the spacing unit.

Q Okay.

A So an internal exception, I don't think, would be addressed under this proposed rule.

Q Okay.

MR. CATANACH: You may be excused.

MR. ROBERTS: I would --

MR. CATANACH: Oh.

REDIRECT EXAMINATION

BY MR. ROBERTS:

Q Mr. Wood, Mr. McCord and again Mr.

Willis testified that the coal reservoir in the South Gallegos Fruitland - Pictured Cliff Pool and the WAW Fruitland - Pictured Cliff Pool did not exhibit classical reservoir characteristics. Do you agree with that testimony?

A I haven't seen the data to -- that would lend itself to that conclusion one way or the other.

Q Do you know of any data which would contradict that testimony?

A No, I don't, none I've seen with the production performance curves.

Q Was it your testimony that the Cedar Hill Fruitland Pool is a classic coal reservoir?

A I think as we get into additional wells within the basin, as we develop additional data bases, we're going to learn more as time goes on. My testimony before that coal, as exhibited by the well performance in the Cedar Hill certainly has presented some unique producing characteristics and that those characteristics have carried forth and are giving us some problems in applying traditional conservation calculations.

Q Mr. McCord and Mr. Willis, I think, were implying through their testimony that it's their opinion that the South Gallegos Fruitland - Pictured Cliff Pool and the WAW Pictured Cliff Pool represent more of a convention-

al coal reservoir. If this is a conventional type reservoir in that area would you expect that a P/z versus cumulative analysis would be appropriate?

A I don't think it would be, no.

Q Why not?

A Because coals are producing from a different depletion mechanism than what you see with a volumetric gas sand reservoir, and that's the desorption of the gas from the face of the coal.

Q But in your opinion would it be possible -- I think on one exhibit you were pointing out some data points that seemed to give some (unclear), to represent something that -- is it possible to have (unclear) that data point when doing a P/z type analysis?

A As I indicated, hopefully, In indicated in my opening comments, that I really haven't seen enough information to fully substantiate or deny the allegation made by your client that this well is producing coal, or these four wells are producing coal. In looking at the data that has been presented, certainly the pressure data presented raises some questions, and before you'd actually want to render a professional opinion as to exactly what that means, you would like the opportunity to review the data that went into it.

Q Now, if -- if we could just for the

purpose of this question assume that the WAR Fruitland - Pictured Cliff Pool and the South Gallegos Fruitland - Pictured Cliff Pool were conventional type reservoirs, coal reservoirs, would your Cedar Hill interference data be relevant to those particular pools?

A I don't understand the question.

Q Okay, do you extrapolate the interference data you have on your Cedar Hill Pool to other areas in the basin?

A Could you try one more time? I apologize.

Q That's about the best I could do.

A Well, just restate it, then; I'll try.

MR. LUND: I think what he was asking is can you use the Cedar Hill data in other part of the pool.

MR. ROBERTS: Yeah, that's essentially it, what he stated.

A Okay.

Q I thought that's what I asked.

A Okay. It may have been. It's probably not what I heard.

I think you have to recognize the Cedar Hill data for what it is. It's reliable data. I think it's probably the most reliable data that I'm aware of

within the basin. And it's relatively conclusive data for that specific area, that 320 acres is appropriate.

You've got to couple that knowledge with an understanding of the complexities that you have in determining appropriate spacing for coal wells. I've addressed this in previous testimony; I'll try it one more time.

If you have inclining production or even if you have flat production, you are hard pressed as an engineer to make a calculation of what that well is going to recover. That's an integral calculation and it's needed prior to making a determination of what appropriate spacing may be.

The Methane Committee's recommendations honor the only physical evidence that I'm aware of and that's Cedar Hill. That data was applied in an extremely large area but there are provisions carried forth in the recommendation that allows the industry, as well as the State, to react to future information. If we're wrong we want to make sure we're wrong on the big side. We don't want to be wrong on the small side.

That's what the information from Cedar Hill was used for. Does the data apply directly to your client's property? Without seeing some additional information I don't know.

Q Thank you.

MR. CATANACH: Any questions? The witness may be excused.

MR. KELLAHIN: Mr. Examiner, we'd like to address some comments with regards to the Dugan, et al, presentation with regards to 160-acre (inaudible) -- Meridian Oil, Inc.'s proposal with regard to the rule changes.

We swore this witness earlier but we thought he was not going to testify.

JOHN CALDWELL,

being called as a witness and being previously sworn, testified as follows, to-wit:

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q Will you state your name and occupation?

A Yes, sir, John Caldwell. I'm a petroleum engineer with Meridian Oil, Inc.

Q Have you previously testified as a petroleum engineer before the Division?

A No, sir, I have not.

Will you relate briefly your educational background and work experience as a petroleum engineer?

A Yes, sir. I received a Bachelor of Science in civil engineering from the University of Idaho in December, 1977.

Subsequent to that I worked for Texaco, Inc., in Hobbs, New Mexico, for two and a half years for production engineer.

I worked in Farmington for two years for Southland Royalty Company, in drilling and production engineering.

I worked for about two and a half years with Southland Royalty also, in Oklahoma City in reservoir engineering.

Worked in Houston for about a year, also, with Southland Royalty Company in reservoir engineering.

Spent two years in Billings, Montana as a reservoir and drilling engineer (unclear) when they purchased Southland Royalty Company.

And the last three months I've been employed by Meridian Oil here as Regional Reservoir Engineer for Meridian in the Farmington Region.

MR. KELLAHIN: We tender at this time Mr. Caldwell as an expert reservoir engineer.

MR. CATANACH: He is so qualified.

Q Mr. Caldwell, let me direct your attention to the packet of additional exhibits. Have you made made an investigation to find a well south of the demarcation line that Dugan, et al, proposed to establish in the Basin, to find a producing well that produces from the coal gas seam?

A Yes, sir, we have. We did a (unclear) conversely available Dwight's data status sort on all proven coal gas in the basin and excluding the wells that we knew about, we found several wells in the southern part of the basin, south of the demarcation line and the Dugan Production (unclear) for Fruitland coal recompletion performance curve, and that's what I've tabulated here.

The Dugan Knauff Well, the Dugan Knauff Well, actually the location, I don't believe, is on Exhibit Ten. It is on the top of Exhibit Eleven. It's in Section 31, Township 28 North, Range 10 West. I thought I had the unit letter on here but I do not.

Q Describe for us how you as an engineer are satisfied that you're dealing with a well that is producing from the Fruitland coal seam

A We've investigated the logs on this particular well and are satisfied it's perforated in what we think is the coal. And looking at Exhibit Number Eleven we have a production performance curve with time. We've

got a history of when the well was originally completed or recompleted, rather, in 1976. We have approximately four years of inclining production and an additional (unclear) of flat production, which to us suggests a typical Fruitland coal production fingerprint, if you will.

Q Have you satisfied yourself that this well is -- the data is not otherwise than for Fruitland sand gas production or PC?

A Yes, sir, we have.

Q In plotting that data what have you found?

A What we determined, in essence, from both Exhibit Ten and Exhibit Eleven is we've seen some characteristics typical of Fruitland coal performance and we've extrapolated, based on our best knowledge at this point, a decline projection, which is labeled on Exhibit Eleven, of what we feel that well would ultimately recover using existing history. There's been some severe curtailment and I think starting in 1982 but for sure in 1984, '85 and '86, and even, perhaps, '87, and we, through Exhibit Ten, have attempted to accommodate those curtailments with production volumes to arrive at an estimated ultimate recovery for this well of 668-million cubic feet on Exhibit Ten. That is the first double underlined value.

From decline curve extrapolation then,

based on approximately ten years of production, 686-million cubic feet of recoverable gas, we calculated using a volumetric calculation -- I'm sorry, the next line there is gas in place determined using a recovery factor, we really don't know what a typical recovery factor is for a coal well but we think 6.5, 6.7 represents our best estimates for the model that we've done and we've got an estimated ultimate recovery of this 980 MMCF.

1800 tons per acre foot, which is a reasonably common parameter throughout the basin, 250 SCF, standard cubic feet per ton desorption factor, a little bit less or a little bit more, I'm sorry, of half what is present in Cedar Hill, and then the 6 feet of thickness, bed thickness, net coal thickness, we calculated a drainage area for this well of 262 acres, and that's the third double underlined value there on Exhibit Ten.

Q Will you turn now, sir, to Exhibit Twelve and identify and describe that exhibit?

A Yes. Exhibit Number Twelve is some recent work that Meridian Oil is -- is attempting to do in sections south of the demarcation line. It represents our first three recompletions in the Fruitland coal section, all in Section 20 -- I'm sorry, in Township 27 North, Range 10 West.

What I have tabulated on -- on Exhibit

Twelve is the well name, the legal description, the date that Meridian performed the recompletion, the net coalbed thickness in feet, our initial rate, and our initial back pressure, our initial line pressure that we're tested these wells at.

What this exhibit shows is just the tip of the iceberg of what Meridian Oil plans to do. We have at least 25 proposed recompletion candidates we're looking at across the area that's south of the demarcation line, and what we're finding in our recompletion at this point is significant gas rates, initial rates on the order of what has been achieved at Amoco's original rates in Cedar Hill.

I believe their average rate was about 220 MCF per day per well, and what we're extrapolating from the initial rate performance and from the calculations on an off well is that indeed these recompletions will drain 320 acres. So a significant gas production initially; we feel that the gas production is going to incline with time; at this point we don't have significant water production. I have tabulated it here but it's -- it's on the order of 5 to 20 barrels a day.

We have significant pressures. We feel there's going to be significant coal gas production that effectively and efficiently drain a 320-acre spacing unit.

Q Do you mean to infer that the Dugan

Knauff Well and the three Meridian wells shown on Exhibit Number Twelve are the only wells that you're going to find south of the demarcation line that represent or exhibit the ability to drain 320 acres of gas coal seams?

A No, sir. We're very confident that a lot of our recompletions will efficiently drain a 320-acre section based on initial rates.

We've got some -- at least 25 identified candidates at this point. We have a significant number of abandoned or currently marginal wells in the Mesaverde or the Pictured Cliff that could easily be recompleted up the hole to the Fruitland coal formation. Meridian is not stimulating these wells. These are natural completions, and these are the kinds of rates that we're getting. We feel there's maybe on the order of hundreds of candidates out there that are going to cause us, perhaps, some problems in spacing to go from 160's in the PC to 320's, but we feel like there's lots of candidates out there that we can do this work on.

Q Apart from the difficulty of accomplishing the conversion from 160 to 320-acres, do you have an opinion as a reservoir engineer as to whether that is a reasonable problem to work through in order not to drill unnecessary wells south of the demarcation line?

A Yes, sir, I have a very definite opinion

that I think the up front hardship, if you will, of trying to develop 320-acre spacing is much more preferable than drilling 72 -- 72 unnecessary wells per township and we've got tens of townships that might be potential candidates for recompletion.

Q Mr. Caldwell, you had the opportunity to hear the three witnesses present their position on behalf of the Dugan group with regards to 160-acre spacing below a certain demarcation line. Are you in favor of or opposed to their position?

A I'm opposed to that position for several reasons.

I think Alan Wood has brought out a lot of those reasons, but the main point's really that I would find fault with, I guess, is number one, there's not really a permeability map or a drainage map that is site specific in the basin. I think there's enough different parameters that go into the coal gas production within the San Juan Basin.

But we really have to have some good interference data and we really have to have some good pressure work and some good production data to determine that 320's or 160's are the most appropriate method of producing the coal, and I would agree with Alan completely that we need to err on the large side because all the cal-

culations that we've done internally and that have also been presented today show that 320 acres would be the most efficient way of developing this resource.

Q Let me direct your attention now, sir, to the specific position Meridian has with regards to any of the rule changes, and let me take a moment and direct you to Rule 7 which speaks as to existing wells. Did you have an opportunity to hear Mr. Wood's discussion of designated well locations in the northeast and the southwest quarter of the section?

A Yes, sir, I did.

Q Do you have any concerns or comments with regards to what is the impact of having dedicated locations in the sections in terms of Meridian's operations?

A Yes, sir, I do. I have -- Meridian at this point has staked and invested approximately #1000 per location on in excess of 200 locations, the majority of which are on BLM acreage and the majority of which are on northeast/southwest staggered locations, if you will, based on 320-acre sections.

But there are some that we -- that we have, and I think the estimate is around 50, that do not fall within that category, and what we'd like to request would be to avoid in essence a minimum of six weeks delay

time in processing the APD's through the BLM and also $1000 per location capital expense, we would like to insert into the language of Rule Number Seven of that order a stipulation that we could grandfather in all staked locations as well as APD approved locations and the other languages in there.

Q Let's go specifically to Rule Seven, sir, and have you find first of all the line and then the words at which you would make the additional language change.

A I believe I left my copy over at my desk. May I get that?

Q We'll get it for you.

A Thank you.

Q Do you have page six that shows out of Mr. Busch's exhibit book, Rule Seven?

A Yes, sir, I do.

Q And we go to what line?

A Line number three.

Q And within line three where do we start?

A Let's start at the lefthand side and read "And (B) of this order and is drilling to, completed, or" strike the or and insert "or has a location staked as of the effective date of this order."

Q All right, do it again slower.

A I'm sorry, after the comma following the word "completed", insert the verbiage "or has a location staked as of the effective data of this order."

Q And what is accomplished with that proposed rule change to Rule Seven?

A What this change does for Rule Seven is cover all the wells that are currently drilling, currently completing, currently have an approved APD through the New Mexico Oil Conservation Division, or have been currently staked as a Fruitland Coalbed Methane Gas Pool Well as of the effective data of the order.

Q Do you have on behalf of Meridian Oil, Inc. any other proposed language changes to the rules that are shown in Mr. Busch's exhibit book?

A No, sir, I do not.

Q With that addition, then, what is Meridian's position with regards to the adoption by the Examiner and the Division of the proposed rules for the Basin Fruitland coal gas production?

A Meridian's position at this point is we wholeheartedly endorse all the work that's gone into this full committee Rules One through Seven as you see them here.

Q And is that recommendation based upon the fundamental understanding that adoption of those rules

will be in the best interest of conservation, prevention of waste, and the protection of correlative rights?

A Yes, sir, most definitely.

MR. KELLAHIN: Move the introduction of Meridian Exhibits Ten, Eleven, and Twelve.

MR. CATANACH: Meridian Exhibits Ten, Eleven, and Twelve will be admitted into evidence.

MR. KELLAHIN: That concludes our examination of Mr. Caldwell.

MR. CATANACH: Mr. Roberts?

CROSS EXAMINATION

BY MR. ROBERTS:

Q Mr. Caldwell, can you tell me in what formation this Knauff No. 1 Well was completed and is producing?

A I'm sorry, I don't have that log in front of me, but I believe it's recompleted, I'm sorry, in the Fruitland coal formation.

Q Okay, but wasn't that originally completed in the Pictured Cliff formation?

A I believe that's right. I apologize I don't have my notes in front of me on that scout ticket.

Q To your knowledge is the Pictured Cliff

formation still open?

A To my knowledge it was -- they had bridge plug set over the top of the formation.

Q Do you have any gas analysis from the top of the (unclear)?

A No, sir, we do not.

Q Is there any water production from the well?

A That's a very good question. We've tried to track that down. To the best of our knowledge, we don't believe there is any significant water production; very typical to our three recompletions in that area.

Q Now, how do you -- how do you conclude that this is Fruitland gas being produced from the wells?

A We conclude it's Fruitland gas in essence from the performance curve, which is very uncharacteristic of any kind of a tight sand reservoir, which would be hyperbolic concave (unclear) as well as the correlation of logs.

Q Do you have any opinion as to why this well does not produce water?

A Yeah, I do.

Q What is that?

A My best description, if you will, of coalbed methane gas behavior is that the matrix porosity of

the coal contributes nothing, or very little, typically to the gas production. The matrix porosity of the coal contributes to the water production. The relative permeability curve defines the ratio of gas production and water production and the matrix through diffusion actually provides the gas production through absorption.

So my interpretation of what's going on in the southern half of the basin is we don't have a high matrix porosity; therefore we don't have a high initial or even over the life of the well high water concentration or high water production.

What we have is diffusion through the coal matrix to the porosity channels, if you will, the complete system to the wellbore of primarily gas, a small amount of water. You have a high relative contribution occur, therefore we're getting high gas with little water and we have primarily diffusion mechanism going on.

In other parts of the basin we have regional tectonic events, if you will, that have -- that have fractured the coal and created a pretty significant free gas component that provides a high early gas rate, perhaps declining with time at some point and then inclining at the gas desorption process; the other half of the gas is coming out of that well from the Fruitland coal takeover.

Q Is low water production or the total absence of water production characteristic of a classic coal reservoir?

A No it's not characteristic the coal reservoirs that I'm aware of to the north but low water production is characteristic of the three recent recompletions we've done.

Q Now, in the absence of a gas analysis for the gas production from Knauff No. 1 Well, would you concur with the decision that the data submitted by Mr. McCord with respect to a gas analysis from numerous wells within the area is the best data available for that area?

A I'm not exactly sure just where he gathered the data on the 79 wells that he investigated. I believe it's in the same area. If he had this particular well I would accept that appraisal.

Q If he didn't have this particular well, do you know of any other available that would be better, better data?

A I would collect a gas sample from the well probably through El Paso Pipeline's records.

MR. ROBERTS: No other questions.

MR. CATANACH: Any other questions? This witness will be excused.

MR. KELLAHIN: Mr. Examiner, that concludes our presentation on behalf of Meridian.

MR. CATANACH: Is that it for Amoco, Mr. Lund?

MR. LUND: Amoco will (unclear).

MR. CATANACH: Okay. I guess we'll take the -- okay, we'll take any kind of statements now at this time from anyone, whoever wants to start.

Mr. Dwyer.

MR. DWYER: Mr. Hearing Examiner, may I make the statement from here, please?

MR. CATANACH: Yes, sir.

MR. DWYER: I'm Dennis Dwyer appearing on behalf of El Paso Natural Gas Company.

El Paso as an interstate pipeline would like to support the designation of the Basin Fruitland coal gas formation as a separate source of supply. We believe the evidence that was presented shows that it has a markedly different production characteristic and after production that gas has (unclear) different physical characteristics. I'm referring specifically to the high CO_2 content, the lack of heavier hydrocarbons, such as natural gas, that affects my client which very frequently provides the getaway facility.

In order for us to plan for the orderly development of gathering facilities whether we are the purchaser or the transporter, El Paso feels it's extremely important that this separate and very significant source of supply be separately designated as such.

El Paso as a pipeline also supports the adoption of (unclear) rules, specifically those rules that were recommended by the Fruitland Coalbed Methane Gas Committee.

We recognize that there is not unanimity of opinion. We think that that difference of opinion in fact shows that these rules are balanced.

El Paso does have a few very minor exceptions that we'd like to offer for consideration.

El Paso is in agreement with Mr. Chavez that the Director should consider changing Rule Number Six, which would allow the (not clearly understood) to dedicate for the flaring of gas right at 30 days or 50-million cubic feet without approval in advance. El Paso takes this position for two reasons.

First and foremost it's simply blatant self-interest. Any gas that goes up the stack is neither transported through our pipe or sold by us and we earn absolutely no revenues.

But I think there is a greater

public interest involved, too.

As you know, El Paso got its start by taking gas from the (unclear) going to market with it, clearing it up and then finding a more beneficial and economical use for it.

Also in the forties when Texas first engaged in its no flare order, in 1944 El Paso agreed to take all the casinghead gas and find a way to move it to market rather than shutting in wells. It was a war effort.

So El Paso has a long history of trying to insure that natural gas, a valuable wasting asset, is not depleted without using its very valuable whole content.

Lastly, El Paso would like to support the proposal based on 320-acre spacing with the flexibility of administrative approval for either unorthodox locations or for increased density without the formality of a formal hearing. We think that is a reasonable (un- clear.)

We have a genuine concern as has been expressed here that too many uneconomic wells are not being drilled. El Paso at the present time and based on the evidence, has no desire to lay out a number of un-necessary and uneconomical connections to those wells. We feel that doing so could possibly change the economics and

make it difficult to market that gas.

And lastly, with respect to Rule 3(B) and Rule 4(B), we note that under this expedited procedure where administrative approvals could be given without the requirement for formal hearing, there is in fact no notice at all to people who may be interested parties; people who may be affected parties, and it raises a concern to us both as a person who in great likelihood would be expected to help and assist in providing getaway facilities, that if we don't have notice of these things until after a decision is made, it's probably not possible to plan on the orderly getaway of that gas.

Secondly, there's potentially a due process problem. People who are genuinely affected have absolutely no notice of these administrative actions and without having a positive suggestion, the possibility exists that even though a hearing would not be held, there could be some notification by publication in the newspaper or perhaps the fact that an administrative action was supposed to be taken could be placed on the Director's docket.

That completes my statement, sir.

MR. CATANACH: Thank you, Mr. Dwyer.

Are there any other statements

at this time?

MR. STOVALL: Mr. Examiner, I'd like to make just a brief closing statement and the only purpose for this statement is to make the connection between Case 9420 and 9421.

The evidence which has been presented today is basically supporting the creation and formation of the Fruitland Coalbed Methane Pool, whatever the pool name may be ultimately adopted.

I think it should be pointed out that the evidence also supports the application in Case 9421, which is a corollary application which simply requests that the lands, formations, producing horizons, whatever, included within the order, whatever they may be, should be deleted from existing pools of which they are now a part.

I think it is -- the evidence which was presented in this consolidated hearing should be applied to both, both cases.

I have nothing further in the way of a closing statement; however, I am going to request that Case 9420 be continued to the next Examiner docket of July 20th in order to enable us to advertise it properly in The Gallup Independent. Apparently we missed that advertisement in the original advertising of this case.

MR. CATANACH: Okay, Case 9420 will be continued to the July 20th. I assume there won't be any more evidence or testimony presented at that time.

And with that, we'll --

MR. CARR: Mr. Examiner. I have a written statement from Blackwood & Nichols but I wanted to make it clear that (not clearly understood) and also supports the Committee recommendation, but instead of reading it I will simply provide you with a copy of it after the hearing is concluded.

MR. CATANACH: Okay. That would be fine.

Is there anything further in either one of these cases?

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.

_____

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