STATE OF NEW MEXICO

ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT

OIL CONSERVATION DIVISION

CASE 10,778

EXAMINER HEARING

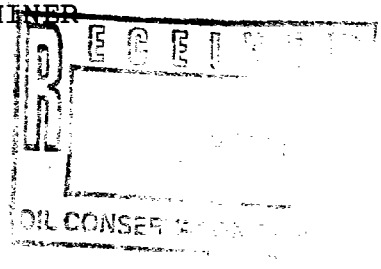
IN THE MATTER OF:

Application of Conoco, Inc., for a high-angle/horizontal directional drilling pilot project, special operating rules therefor and an unorthodox producing interval, San Juan County, New Mexico

ORIGINAL

TRANSCRIPT OF PROCEEDINGS

BEFORE: MICHAEL E. STOGNER, EXAMINER



STATE LAND OFFICE BUILDING

SANTA FE, NEW MEXICO

July 29, 1993

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WHEREUPON, the following proceedings were had at 12:21 p.m.:

EXAMINER STOGNER: Call the next case, Number 10,778, which is the Application of Conoco, Inc., for a high-angle/horizontal directional drilling pilot project, special operating rules therefor and an unorthodox producing interval, San Juan County, New Mexico.

At this time I'll call for appearances.

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

EXAMINER STOGNER: Are there any other appearances in this matter?

Will the witnesses please stand to be sworn?

(Thereupon, the witnesses were sworn.)

EXAMINER STOGNER: You may be seated.

Mr. Kellahin?

MR. KELLAHIN: Thank you, Mr. Examiner.

I'd like to call at this time Mr. Reed Meek.

Mr. Examiner, while Mr. Meek is finding his way to the witness chair, the advertisement is not intended to be any surprise to you. Both the surface and the producing interval is intended to be no closer

than 790 from the setbacks of the 320 spacing unit consisting of the east half of 21.

The last phrasing of the ad about an unorthodox producing interval was intended to mean that we're going to cross over a quarter quarter line, as well as the quarter-section line, and I think if you look at Rule 4 of the Basin Fruitland Coal Gas Rules, there is at least the appearance that this case might require that kind of exception, so we threw it in the ad.

EXAMINER STOGNER: In other words, your intention was, naturally you're going to be crossing over some internal --

MR. KELLAHIN: And that's the only way it's unorthodox.

EXAMINER STOGNER: All right. Thanks for clarifying that, Mr. Kellahin.

REED H. MEEK,

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

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q. Mr. Meek, would you please state your name and occupation?

A. Yes, my name is Reed Meek, and I'm a

geologist.

Q. Mr. Meek, on prior occasions have you testified before the Division as a petroleum geologist?

A. I have.

Q. You were one of the geologic witnesses in a tight-sand application, I believe, before Examiner Stogner, the hearing for which was actually conducted at the BLM office in Albuquerque, was it not?

A. That's correct.

Q. With regards to your geologic duties for Conoco, have you made an investigation of the geology surrounding this particular Application?

A. I have.

Q. As part of the presentation of exhibits, do the geologic maps that are contained in here represent your own work?

A. Yes, they do.

MR. KELLAHIN: We tender Mr. Meek as an expert geologist.

EXAMINER STOGNER: Mr. Meek is so qualified.

Q. (By Mr. Kellahin) Let me have you turn, sir, to the identification locator plat, which is Number 1. Let's use that as a reference point and have you outline for me what you're proposing to do.

A. All right. We're proposing to drill a

horizontal well in the basal seam of the Fruitland Coal formation. This is in Section 21 of Township 29 North, Range 8 West.

And in this section, Conoco currently operates two vertical Fruitland Coal wells. These are the Hughes B18 in the northeast quarter and the Hughes B20 in the southwest quarter. This is an area where -- Neither of these wells is a particularly good well in terms of performance, and we would like to drill this horizontal well as an experimental pilot-type project to see if horizontal drilling can help us to recover more of the gas in place in the Fruitland formation.

Q. Let's talk about some of the incidental items before we talk about the specific geology, Mr. Meek.

First of all, does the Exhibit Number 1 correctly display Conoco's belief as to the offsetting operators?

A. Yes, it does.

Q. The proposed drilling producing window is a setback of 790 from each of the four side boundaries of the spacing unit?

A. Right.

Q. And the surface location for the well is to be located within that drilling producing window?

A. That's right.

Q. Has Conoco made an investigation of the surface to determine if you have an approvable surface location from which to commence the well?

A. Yes, we have.

Q. What kind of lease are we dealing with here?

A. This is a federal lease.

Q. What is the current status, to the best of your knowledge, of your approvals of the use of the surface by the Bureau of Land Management?

A. Archeological surveys have been approved. I believe the surface location is still pending, but we anticipate that it will be approved.

Q. Okay. The use of high-angle horizontal technology to test for production in the coal formation, has that been utilized in this area?

A. Not in this immediate area, no.

Q. Let's turn now to Exhibit 2 and look at what the status of current development is of coal gas wells.

Section 21 is in the center. Are we looking at only coal gas wells when we look at the well symbols in this exhibit?

A. Yes, this is a nine-section area surrounding our proposed location, and it shows all of the Fruitland Coal gas wells that have been drilled to date in the area.

Q. What kind of information is shown in addition to the well locations?

A. To the right of each of the well locations is the daily average rate in MCF per day, during the year 1992, and then posted below each of the well symbols is the cumulative gas production from the well.

Q. What is Conoco's plan for the Hughes B18 well, which is the existing vertical well in this spacing unit?

A. We intend to abandon that well and produce the Fruitland with the horizontal well that will replace it.

Q. If the high-angle horizontal well is successful, then you would not concurrently produce the horizontal well with this vertical well?

A. No.

Q. Give us an indication of what causes you to believe that the vertical wells are not very productive in this immediate vicinity.

A. Well, primarily that's based on the production performance that we see from the wells, which I've shown on this map. Every well surrounding the location is what we consider a low-rate producer.

These wells are completed by drilling vertically through the coal, setting casing, cementing

casing, and then perforating and fracture stimulation.

Q. Do you see any difference in the method of drilling and completing the vertical wells that gives you an explanation as to why they're such poor producers?

A. We believe that it's inherent in the quality of the reservoir rock.

Q. As opposed to some mechanical or completion technique utilized for the vertical wells?

A. That's right. There's been a number of different types of fracture stimulations used. None of them seems to be much more effective than others, but this is simply an area where the Fruitland Coal tends to be tight and have low permeability.

Q. Other than Conoco and Meridian, are there any other operators with vertical coal wells in the nine-section area?

A. Yes, there's a company, McKenzie Methane, that operates, I believe, three wells within the nine-section area.

Q. Has Conoco provided Notice to Meridian and to McKenzie Methane of your Application for hearing today?

A. Yes, we have.

Q. To the best of your knowledge, has there been any objection from any of the parties?

A. No, none.

Q. No objection?

A. No.

Q. Let's turn now to the geology. Let me have you identify first of all Exhibit Number 3.

A. Okay. This exhibit really relates to the previous exhibit in that I'm showing the average daily production rate from Fruitland Coal wells, throughout a fairly large portion of the Fruitland Coal field. It's a 21-township area, and in the southeastern portion is the Township 29 North, Range 8 West where we propose to drill the horizontal test.

The reason for showing this is to illustrate two different areas of the Fruitland Coal reservoir. In the northern portion where the areas are colored red, these are high-rate, high-volume wells. They have high pressures, so that it's -- we believe that the coal reservoir in this area is overpressured and that the coal permeability is relatively high.

Q. What is your criteria for determining whether a well is in the overpressure or underpressure area? Is there a range of pressures that cause that well to be classified in one area or another?

A. Yes, the -- Overpressure is anything greater than hydrostatic pressure, which is .43 pounds per foot

-- or pounds per square inch, per foot of depth.

Q. Has any other operator in the immediate area where you find yourself in the underpressured coal, drilled a high-angle horizontal well at this point?

A. Not to my knowledge.

Q. Let me ask you to turn to Exhibit 4. Would you identify and describe for us Exhibit Number 4?

A. Exhibit Number 4 is a coal thickness isopach map of the basal seam of the Fruitland formation, and the reason for including this in the exhibits is to illustrate that there is substantial coal thickness outside of the area of overpressured production.

We feel like there is a tremendous amount of gas in place in this coal, but in general the coal -- the wells drilled in the underpressured portion of the coal reservoir are not effectively accessing the reservoir and producing the reserves that are there.

Q. Have you taken the information on coal thickness and reduced it to an isopach that specifically identifies your interpretation of coal thickness, the net coal thickness for Section 21?

A. On the next exhibit is a nine-section plat surrounding Section 21, which shows the thickness of the basal coal seam to be a little bit more than 30 feet in Section 21.

Q. Can you explain the poor productivity of the wells in this area in relation to coal thickness?

A. No, there doesn't seem to be a direct correlation between the thickness of the coal and what the wells are capable of producing.

Q. What is Conoco's technical opinion about the gas in place within the section and the opportunity to produce that gas with a high-angle well? Are there gas reserves there that can be accessed with a high-angle well?

A. We know that there is gas in place in the coal. We have taken measurements. The next exhibit is a -- we call an adsorption isotherm, which is a --

Q. Let's look at that. It's Exhibit 6?

A. Exhibit 6, right --

Q. Okay.

A. -- which is a method for measuring the ability of the coal in this area to contain gas.

We know that the reservoir pressure in this area is in the neighborhood of 800 pounds. So based on this data, this curve, we believe that there's about 300 standard cubic feet of gas per ton of coal in place in the Fruitland reservoir.

Q. Is that a sufficient volume of gas per ton of coal to make it profitable to drill for a coal gas

well?

A. Yes, we believe that there is plenty of gas in place to access, if we can get an effective completion in the formation --

Q. How does the high-angle horizontal technology help you to access and produce in the coal in a way that you cannot achieve with the vertical well?

A. Okay, on the next exhibit, Exhibit 7, I'm showing a diagram that illustrates the nature of the coal reservoir.

In the upper right-hand corner of the diagram is a square block illustrating the fracture system or the cleat system that is inherent to the coal reservoir.

And there are two directions of cleating. The face cleats are long and continuous, and the butt cleats are shorter cleats that run perpendicular to the face cleat direction.

In order to produce the gas, which is actually stored within the matrix blocks of the coal, the process that has to take place is that the gas needs to be desorbed from the coal matrix, then it has to diffuse through the matrix into the fracture system, and then it can move through the normal fluid-flow processes through the cleat system.

So the key to producing coal gas is to access as many of the cleats as possible.

Q. Is there any way that you as a geologist can map or make an interpretation as to the orientation of the face cleats?

A. Well, there are some methods. The data that we have that predicts which direction the face cleats are oriented is coming from published sources. There are at least four wells drilled in San Juan Basin where they have taken oriented cores and then studied the direction of the cleating pattern in these cores.

Q. When we look at Section 21, what is the general belief among experts in your area as to the orientation of the face cleats?

A. Well, I've illustrated on Exhibit Number 8 the anticipated face cleat orientation, and this is based on the four cores that I described a moment ago, the four studies of oriented cores, and they had a consistent pattern of the face cleats orienting themselves to approximately 30 degrees east of north.

Q. What then explains your basis for the orientation of the azimuth for the producing interval of the high-angle well?

A. We're running not quite perpendicular to the face cleat direction, but we've oriented the well so

that we can intersect as many of the face cleats as possible within the 320 proration unit, remaining within the 790-foot limits.

Q. By giving yourself the greatest opportunity to access the maximum number of face cleats with this orientation, and being in the underpressured area, is there anything that the horizontal well lets you do that the vertical well might not be able to accomplish in terms of pressure relationships?

A. Well, we believe that being able to access more of the cleats will allow us to draw the reservoir pressure down more effectively and therefore be able to desorb -- release more of the gas from the coal and produce more of it.

One of the problems with the vertical wells is that we fracture-stimulate those, and we feel that the fracture stimulation tends to run along the face cleat direction so that it isn't effectively intersecting additional face cleats; it's just propagating along the direction of one face cleat.

Q. Have you made a geologic investigation of the structure orientation of the coal beds?

A. Yes, I have, and that's shown on Exhibit Number 9.

Q. Identify and describe to us what that shows

you as a geologist.

A. This is a structure map on the top of the Pictured Cliffs, which is actually also the base of the Fruitland Coal formation.

It illustrates that there is a general structural dip to the horizons in this area, dipping to the north at about 30 to 40 feet per mile. So we believe that the well, the horizontal well, if we -- where we drill, where we intersect the coal in the northeast quarter, will experience about a 20-foot structural rise between that point and where we propose to end our drilling at the bottomhole location.

The other point is that there is apparently no faulting or any major structural elements other than this general monoclinal dip that affect our drilling proposal.

Q. Exhibit 9 shows a line of cross-section between two wells?

A. That's right.

Q. You have the existing vertical well in the northeast quarter, and the cross-section is tied to well 21 in the southeast quarter of 21?

A. That's right.

Q. What is well 21? That's not a coal gas well, is it?

A. No, well number 21 is a well that produces from the Pictured Cliffs formation, immediately underlying the coal formation.

Q. Let me have you turn to Exhibit Number 10 and identify and describe the cross-section.

A. All right. I have -- It's oriented from left to right in a north-and-south direction. The Fruitland Coal formation is about 250 to 300 feet thick in this area.

The Fruitland is underlain by the Pictured Cliffs and overlain by the Kirkland, and then within the Fruitland there are multiple coal seams. We generally separate those out into three seams, and I've just highlighted the basal seam, which is the target of our horizontal drilling project. It's a thick seam, it's about 30 feet in thickness in this area, and it's very continuous throughout this area.

Q. What is your geologic plan for the producing interval of the high-angle well? What coal seam are your targeting?

A. We're targeting just this basal coal seam that I've highlighted on the cross-section.

Q. What is your conclusion about the opportunity to access that coal as a continuous reservoir within the east half of the section?

A. I believe that it is a very uniform thickness throughout the entire section and that we will be able to drill continually through it.

MR. KELLAHIN: That concludes my examination of Mr. Meek, Mr. Stogner.

We move the introduction of his Exhibits 1 through 10.

EXAMINER STOGNER: Exhibits 1 through 10 will be admitted into evidence.

EXAMINATION

BY EXAMINER STOGNER:

Q. Mr. Meek, what -- Referring to Exhibit Number 2, at what rate would you consider probably not doing a horizontal well in that it would be too good or -- Because you were looking for a moderate to a mediocre rate or production rate, were you not, to do this horizontal section?

A. Right.

Q. And what would not fit that bill?

A. Well, generally we consider wells that produce over a million cubic feet per day as being good, strong wells. Anything less than that, we might consider a horizontal well.

This area certainly is a candidate because it's much lower than that. There are a number of wells

in other underpressured reservoirs that -- in other parts of the Basin that would produce at maybe 200 to 300 MCF per day, and I believe that this technology might have an application in those areas as well.

Q. But you're also going with thickness too; is that correct?

A. Right. The reason for selecting the location that we have is that we have -- Number one, it's a low-rate area, where we're not able to produce the reserves that are in place because of the nature of the reservoir.

Number two, it's an area Conoco has a hundred percent working interest, and we wanted to drill on that type of location. Many of the other areas we have interest in, we have several partners involved in wells. So that's the other reason for choosing this area.

Q. How was your number 18 completed? Was it an open hole, or was it cased?

A. It was cased and frac'd.

Q. Does that also hold true with the way the other wells within this nine-section area were also completed?

A. Yes, every well in this nine-section area is completed with the case and frac.

EXAMINER STOGNER: Okay, I have no other questions of this witness at this time. I want to hear what your other one has to say, Mr. Kellahin.

MR. KELLAHIN: All right, sir, we would call Mr. Don Eubank.

DON EUBANK,

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

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q. Mr. Eubank, would you please state your name and occupation?

A. My name is Don Eubank. I'm a drilling engineer.

Q. When and where did you obtain your degree in engineering, Mr. Eubank?

A. Texas A&M University.

Q. And what year was that?

A. 1985.

Q. Apart from your bachelor of science degree, do you have any other degrees in engineering?

A. I've got another degree in geology from Abilene Christian University in 1983.

Q. So you are degreed in both geology and engineering?

A. Yes, sir.

Q. Describe for us what has been your experience as a drilling engineer.

A. I've spent six years in drilling engineering with Conoco. I've worked in three different locations, Midland, Hobbs and Houston.

While in Houston, I worked international and offshore/onshore, North America in six to eight states.

Q. Is it part of your duties as a drilling engineer for your company to help design, implement and execute the drilling program for this high-angle horizontal well?

A. Yes, sir.

Q. And have you done that?

A. Yes, sir.

Q. You've completed your study and you now have opinions on this subject, on how to drill and complete it?

A. Yes, sir.

MR. KELLAHIN: We tender Mr. Eubank as an expert drilling engineer.

EXAMINER STOGNER: Mr. Eubank is so qualified.

Q. (By Mr. Kellahin) Let me have you identify each of your displays, and let's then come back and use

just one to describe to Mr. Stogner what you're proposing.

A. Okay.

Q. So rather quickly, let's have you tell me what Exhibit 11 is.

A. Exhibit 11 is a proposed well plan outline.

Q. This is the --

A. -- the composite.

Q. -- the composite of your information.

And then Exhibit Number 12 is what?

A. The proposed well plan outline.

Q. And this would be the vertical section?

A. That's right.

Q. And then we have a horizontal plan which is 13, is it not?

A. Yes, sir.

Q. And then you have a tabulation of the well plan information on Exhibit 14?

A. Yes, sir.

Q. All right. Let's go back to 11 now.

Using this display as an illustration, commence at the surface and tell us how you propose to do this.

A. We'll drill a 17-1/2-inch hole to 250 feet, where we will run 13 3/8 casing and cement it.

Out from under 13 3/8 casing we'll drill an 11-inch hole to a planned kickoff point of 2558 feet.

Q. Stop right there. Tell the Examiner how you have determined that your kickoff point will be approximately at 2558.

A. Okay, what we have done is, with the geological information of where the actual pay zone or the target zone is located, we've backed out at a 12-degree-per-hundred-foot build angle up to that kickoff point depth.

Q. What then are you going to do?

A. At the kickoff point we'll build hole angle at 12 degrees per hundred feet. And once we reach a terminal hole angle of 94.4 degrees, we'll be inside the target formation.

At that point we'll run 8 5/8 inch casing and cement it through the build section.

Q. At that point, how have you determined where you are in the subsurface?

A. From surface down to kickoff point, we will take single shots, which give us azimuth and drift.

During the build section of the hole we'll have an MWD tool in the hole, and that is the way we'll get our azimuth and drift and build angle.

Q. At what interval do you take these readings?

A. My MWD tool will mostly likely take those every Kelly-down, or 31 feet.

Q. Once you have found yourself in the basal seam of the coal, how then will you proceed?

A. After setting the 8 5/8 casing we will drill a 7-7/8-inch lateral at 90.4 degrees, out to a measured depth of 6400 feet. We'll be using an MWD tool and a motor in that hole section also.

Q. Will you have the means then to determine where you are down both horizontally and laterally within that coal seam?

A. Yes, sir, we will.

Q. What determines the end point of the lateral?

A. We chose an end point just short of the 790 setback.

We could have gone all the way to the setback. We felt that if, on this first attempt, that we got 300 or over 3000 foot of lateral, we'd be happy with that.

And so we terminated the lateral before the setback length, just for a little play in the length of the lateral.

Q. Is the plan then to have the entire well located within the drilling/producing window, as shown on Exhibit Number 1?

A. Yes, sir.

Q. How will you complete the will?

A. The well will be completed open-hole with no stimulation. We'll run tubing inside the 8 5/8 with a packer and complete it open-hole.

Q. The other illustrations demonstrate in other fashions the information concerning the drilling and completion plan, do they not?

A. Yes, sir, they do.

Q. Okay. Does this represent your work?

A. Yes, sir.

MR. KELLAHIN: That concludes my examination of Mr. Eubank.

We move the introduction of his Exhibits 11 through 14.

EXAMINER STOGNER: Exhibits 11 through 14 will be admitted into evidence.

EXAMINATION

BY EXAMINER STOGNER:

Q. The lateral will be open-hole, correct?

A. Yes, sir.

Q. Okay. Is there any stimulation that will be done --

A. No, sir.

Q. -- to that open-hole completion?

A. No, sir, there will not.

Q. I know we don't like to talk about it, especially at this stage, but how would such a well be plugged, hopefully in the far future, but how would a well such as this be plugged adequately?

A. We could go down and, according to the rules and regulations, set open-hole plugs along the lateral at any point.

Plugs can also be set up into the cased-hole portion also.

Q. Are you anticipating any water production or that you have to put a pump on this well, or does any other wells within the area have pumps?

A. No, sir, we don't anticipate that. If we encounter water while we're drilling, we've got contingency plans to mist-drill, foam-drill if we have to.

We don't encounter any water production in this part of the reservoir.

EXAMINER STOGNER: Any other questions of this witness?

MR. KELLAHIN: No, sir.

EXAMINER STOGNER: He may be excused.

Mr. Kellahin?

MR. KELLAHIN: The last exhibit, Mr.

Examiner, is my certification on the mailing notification, and it's marked as Exhibit Number 15.

We would move the introduction of that exhibit, and that concludes our presentation.

(Off the record)

EXAMINER STOGNER: Is there anything further in Case 10,778?

MR. KELLAHIN: No, sir.

EXAMINER STOGNER: If not, this case will be taken under advisement.

(Thereupon, these proceedings were concluded at 12:53 p.m.)

* * *

CERTIFICATE OF REPORTER

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

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

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

WITNESS MY HAND AND SEAL August 16th, 1993.

STEVEN T. BRENNER
CCR No. 7

My commission expires: October 14, 1994

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 10778, heard by me on July 29 1993.

Examiner
Oil Conservation Division