STATE OF NEW MEXICO

ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT

OIL CONSERVATION DIVISION

CASE 10,707

EXAMINER HEARING

IN THE MATTER OF:

Application of Amoco Production Company for a CO_2 injection pilot project and an exception to Rule 4, Order No. R-8768-A, San Juan County, New Mexico

TRANSCRIPT OF PROCEEDINGS

BEFORE: DAVID R. CATANACH, EXAMINER

ORIGINAL

STATE LAND OFFICE BUILDING

SANTA FE, NEW MEXICO

April 8, 1993

A P P E A R A N C E S

FOR THE DIVISION:

ROBERT G. STOVALL
Attorney at Law
Legal Counsel to the Division
State Land Office Building
Santa Fe, New Mexico 87504

FOR THE APPLICANT:

CAMPBELL, CARR, BERGE & SHERIDAN, P.A.
Attorneys at Law
By: WILLIAM F. CARR
Suite 1 - 110 N. Guadalupe
P.O. Box 2208
Santa Fe, New Mexico 87504-2208

FOR MERIDIAN OIL, INC., AND CONOCO, INC.:

KELLAHIN & KELLAHIN
Attorneys at Law
By: W. THOMAS KELLAHIN
117 N. Guadalupe
P.O. Box 2265
Santa Fe, New Mexico 87504-2265

ALSO PRESENT:

DAVE MARTIN
Director
New Mexico Petroleum Recovery and Research Center

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I N D E X

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E X H I B I T S

APPLICANT'S EXHIBITS:

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WHEREUPON, the following proceedings were had at 3:13 p.m.:

EXAMINER CATANACH: At this time we will call Case 10,707.

MR. STOVALL: Application of Amoco Production Company for a CO_2 injection pilot project and an exception to Rule 4, Order No. R-8768-A, San Juan County, New Mexico.

EXAMINER CATANACH: Appearances in this case?

MR. CARR: May it please the Examiner, my name is William F. Carr with the Santa Fe law firm, Campbell, Carr, Berge and Sheridan.

I represent Amoco Production Company, and I have three witnesses.

EXAMINER CATANACH: Other appearances?

MR. KELLAHIN: May it please the Examiner, I'm Tom Kellahin of the Santa Fe law firm of Kellahin and Kellahin.

I'm appearing today on behalf of Meridian Oil, Inc., and Conoco, Inc. I have no witnesses to present.

(Off the record)

EXAMINER CATANACH: Any other appearances?

Will the three witnesses please stand to be

sworn in?

(Thereupon, the witnesses were sworn.)

MR. CARR: May it please the Examiner, at this time we call Michael Cuba.

MICHAEL CUBA,

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

DIRECT EXAMINATION

BY MR. CARR:

Q. Will you state your name for the record, please?

A. My name is Michael E. Cuba.

Q. And where do you reside?

A. I reside in Nederland, Colorado.

Q. By whom are you employed and in what capacity?

A. I'm employed by Amoco Production Company as a land negotiator.

Q. Mr. Cuba, have you previously testified before this Division?

A. Yes, I have.

Q. At the time of that prior testimony, were your credentials as a petroleum landman accepted and made a matter of record?

A. They were.

Q. Are you familiar with the Application filed in this case?

A. Yes.

Q. And are you familiar with the status of the lands in the area immediately surrounding the proposed CO_2 injection project?

A. Yes, I am.

MR. CARR: Are the witness's qualifications acceptable?

EXAMINER CATANACH: They are.

Q. (By Mr. Carr) Would you briefly state what Amoco seeks with this Application?

A. As stated in the Application, Amoco seeks two approvals from the State today.

We seek approval for a carbon dioxide injection pilot into the Basin-Fruitland Coal.

We simultaneously seek an exception to Rule 4 of Division Order Number R-8768-A to admit a second producing well within the Basin-Fruitland Coal Gas Pool in the west half of Section 23, Township 30 North, Range 9 West, San Juan County, New Mexico.

Q. Would you identify what has been marked Amoco Exhibit Number 1 and then review that for Mr. Catanach?

A. Amoco Exhibit Number 1 is a nine-section plat centered upon said Section 23 of Township 30 North,

Range 9 West.

The center of that plat is a small circle that indicates the location of our Florence Gas Com S Number 7 A well, the intended injection location. Surrounding that we have circles a half mile and one mile diameter drawn, indicating the proximity of the offsetting lands to that location.

Each of the half sections within this nine-section plat are identified with a letter. That letter indicates either the operator of the existing Fruitland Coal Bed methane location within that half section. In the case where there is no existing well, the land is cross-hatched, and the letter in those cases indicates the working interest owners in the Fruitland formation within those lands.

Q. Was it your duty to provide notice of this Application pursuant to Oil Conservation Division rules?

A. It was.

Q. Could you identify what has been marked Amoco Exhibit 1B?

A. Yes, Amoco Exhibit 1B is an affidavit of mailing, indicating that Amoco did indeed notify all of the parties. The parties are listed on the attachment to the affidavit.

We did receive back from all of the parties, except for Fina, a green card indicating receipt. I personally spoke with Mr. Robert Dempsey, the land manager of Fina, at this address, to whom the card or the mailing was directed, yesterday and he verbally informed me they did receive it. We do not have a green card back from them, but the affidavit of mailing -- All these parties were mailed, and we have evidence of receipt either verbally or by the returned green card from all parties.

Q. So all leasehold operators within a half mile of the injection well have been notified?

A. Correct. All -- In fact, everybody within these nine sections has been notified.

Q. Is this federal land?

A. It is, the surface and minerals within the one-mile area surrounding the location is federal.

Q. Has the Bureau of Land Management been notified of this hearing?

A. They have.

Q. Will Amoco also call a geological and engineering witness to review the technical portions of this Application?

A. Yes, we will.

Q. Were Exhibits 1 and 1B prepared by you?

A. Yes.

MR. CARR: At this time, Mr. Catanach, we move the admission of Amoco Exhibits 1A and 1B.

EXAMINER CATANACH: Exhibits 1A and 1B will be admitted as evidence.

MR. CARR: That concludes my direct examination of Mr. Cuba.

EXAMINER CATANACH: Mr. Kellahin?

MR. KELLAHIN: No questions.

EXAMINATION

BY EXAMINER CATANACH:

Q. Mr. Cuba, the project area in the west half of Section 23, that's a single federal lease?

A. Yes, sir.

Q. And the -- is owned or -- That's operated by Amoco?

A. It is. The ownership at that particular half section and the lease is Amoco 50 percent, Conoco 50 percent. The wells in question within that half section, both the injector and the other wells you'll see later, are all operated by Amoco.

EXAMINER CATANACH: Okay, no further questions.

MR. CARR: At this time we will call Bill Pelzmann.

WILLIAM L. PELZMANN,

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

DIRECT EXAMINATION

BY MR. CARR:

Q. Will you state your name for the record, please?

A. William L. Pelzmann.

Q. And where do you reside?

A. Westminster, Colorado.

Q. By whom are you employed?

A. Amoco Production Company.

Q. And in what capacity?

A. As a geological associate.

Q. Have you previously testified before this Division?

A. No, I have not.

Q. Could you briefly summarize your educational background and then review your work experience for Mr. Catanach?

A. I received a bachelor's of geology degree from the University of California at Berkeley in 1974. I completed the course requirements for a master's degree from the University of California, Los Angeles, in 1976.

I obtained employment with Amoco Production Company in 1976. I attended their petrophysics training program at the Tulsa Research Center from 1980 to 1981, and since then I've been working on a variety of reservoir-engineering-description geological problems, since then.

I started working in the San Juan Basin, New Mexico portion, in 1989 to present.

Q. And the geographical area of your responsibility includes the property involved in this Application?

A. Yes, it does.

Q. Are you familiar with the Application?

A. Yes, I am.

Q. And have you made a geological study of the Fruitland Coal formation in this particular area?

A. Yes, I have.

MR. CARR: We tender Mr. Pelzmann as an expert witness in petroleum geology.

EXAMINER CATANACH: He is so qualified.

Q. (By Mr. Carr) Have you prepared certain exhibits for presentation here today?

A. Yes, I have.

Q. Could you identify first what has been marked Amoco Exhibit 2A? Identify this and then review it for

Mr. Catanach.

A. Exhibit 2A is a north-south cross-section, the trace of which is shown on Exhibit 1A. The cross-section starts on the left, in the north, with the Florence R4 well.

MR. CARR: Just a second, Mr. Pelzmann.

I think what we need to do, Mr. Catanach, is ask you to look at Exhibit Number 4, which is -- the trace for the cross-section is not on 1A; it's on Exhibit Number 4.

EXAMINER CATANACH: Okay.

Q. (By Mr. Carr) Now, let's go ahead and review this cross-section.

A. Okay, the cross-section starts at the left with the Florence R Number 4 in Section 14. It includes the Florence D2 well, which is our proposed monitor well. On the cross-section, the Florence D2 is labeled as the Shaw Number 2, which was the original well name.

It also includes the Florence 7A, which is the proposed injection well, and ends with the Florence U3.

The cross-section shows for each of the wells the gamma-ray and porosity curves.

The coals are identified in red. That is

based upon a density response of less than 2.0 grams per cc.

The cleaner sands, based upon the gamma ray, are shown in yellow.

The Fruitland seam correlations, labeled A through D, are shown on the right.

And the current perforations for each of the wells are shown in the depth track.

The proposed perforations and the monitor well are also shown in the depth track with the open brackets.

The exhibit shows good correlation between the Fruitland Coal seams within the pilot area.

Q. Okay, let's go to Exhibit 2B. Identify and review that.

A. Exhibit 2B has a similar format in its presentation as 2A. The cross-section traces from east to west and is also shown on Exhibit 4. It includes the Florence K3 well on the left, also the monitor and the proposed injection well in the center, and ends with the Florence S4 well in Section 23.

The exhibit also shows good correlation between the Fruitland Coal seams within the pilot area.

Q. From a geological standpoint, what conclusions can you reach about the proposed project

area?

A. The Fruitland Coal seam in the area consists of four very correlatable coal intervals, interbedded with shale and sandstone.

In general, the Fruitland Coals show relatively good continuity within this area.

The lowermost A interval does not exist in the injection well. However, the B, C and D intervals exist in all the wells.

The B and C intervals appear to be the most continuous between the wells.

The D interval is separated from the underlying coals by a 50-foot sand and shale section.

The coal correlation between the injection monitor well for this interval is very good, but due to variations caused by the interbedded channel sandstones, the D interval is not quite as correlative across the section from north to south.

In general, from the standpoint of coal seam continuity, this appears to be a good test area. The correlation of the individual seams, even the small coal splits, appears to be very good, especially between the injection and monitor wells.

Q. Were Exhibits 2A and 2B prepared by you?

A. Yes, they were.

MR. CARR: At this time, Mr. Catanach, we will move the admission of Applicant's Exhibits 2A and 2B.

EXAMINER CATANACH: Exhibits 2A and 2B will be admitted as evidence.

MR. CARR: That concludes my examination of Mr. Pelzmann.

MR. KELLAHIN: No questions, Mr. Examiner.

EXAMINATION

BY EXAMINER CATANACH:

Q. Mr. Pelzmann, are all three of these wells currently -- They're all currently drilled and -- What's the status of these three wells at this time? Do you know?

A. Three wells?

MR. STOVALL: There are four --

EXAMINER CATANACH: There are three wells in the west half of Section 23.

THE WITNESS: Three wells --

MR. STOVALL: The D2, the 7A and the U3, I think it was.

THE WITNESS: The D2 is currently completed in the Pictured Cliffs formation, as shown by the perforations shown on both cross-sections, 2A and 2B.

The proposed injection well is currently

completed in the Fruitland formation. And the other wells shown on the cross-sections, the Florence R4, the Florence U3, the Florence K3 and the Florence S4, are completed in the Fruitland formation.

Q. (By Examiner Catanach) Okay. The U3 is a Coal well, Fruitland Coal well; the other two, the U --

A. Yes.

Q. -- U6 and the Florence 56 --

A. The U6 is a Mesa Verde well, the Florence 56 is a Pictured Cliffs completion.

Q. Okay.

A. The Florence 59 is a Pictured Cliffs completion, the Florence D1 is a Pictured Cliffs completion, and the Florence Number 7 is a Mesa Verde completion.

Q. Okay. For purposes of the project, we're really talking about the D2, the 7A and the U3, those three wells, for purposes of the project?

A. Yes.

EXAMINER CATANACH: Okay.

(Off the record)

MR. STOVALL: Ask you again. It's a west-half unit for the current proration unit; is that correct? If I look at your Exhibit 1?

MR. CARR: Yes. Yes, it is.

EXAMINATION

BY MR. STOVALL:

Q. Okay. The 7A is currently perforated in the coal?

A. Yes, it is. It's a dual Fruitland-Mesa Verde, and it is perforated in the Coal.

Q. And the U3 is also perforated in the Coal?

A. The U3 is also perforated in the Coal.

Q. Do you have an approval for that 7A well, do you know? Or do you have --

MR. CUBA: May I speak to that?

MR. STOVALL: Okay, let's --

MR. CARR: In fact, we might defer the question, even, to Mr. Hawkins, who I think --

MR. STOVALL: Okay, let's do that.

MR. STOVALL: -- has been on top of the project and can explain the status of those wells and the formations from which they're produced.

MR. STOVALL: Okay, I'll hold the questions till we get to Mr. Hawkins. I'd love the chance to ask him.

FURTHER EXAMINATION

BY EXAMINER CATANACH:

Q. Mr. Pelzmann, the proposed project involves injection of CO_2 into the Coal formation?

A. Yes.

Q. Have you examined the geologic characteristics of the coal to satisfy yourself that it's of -- Is it fractured, or is the permeability sufficient to transport the CO_2, or what's your opinion on that?

A. The area based upon the more or less poor Fruitland production that has been exhibited in this area indicates that the coals are generally poorer quality than elsewhere in the Basin.

The purpose of the test, obviously, is to determine whether or not or what kind of injectivity we can achieve in this area.

And in fact, it was of great interest to look at one of these poorer areas to see what we could inject into it as opposed to the higher-perm areas.

Q. Now, you say it's poorer quality. Is that in terms of fracture -- presence of fractures?

A. It's poorer quality in terms of what we've been able to see from the productivity on the Fruitland completions. That's the full basis of the analysis.

We don't have any core data permeability measurements; just the productivity of the wells have been pretty poor in the area.

MR. STOVALL: There could be a variety of

factors, other than just fractures or cleat permeability or things like that, that could cause that; is that correct?

THE WITNESS: Yes, I mean it could be that -- you know, various completion techniques or completion procedures.

But in general, this area -- It's just not a single well that's generally poor; it's just the general area is characterized by poor production.

EXAMINER CATANACH: Let's go to the next witness, I guess, at this point.

MR. CARR: Mr. Pelzmann will be here if there are other geological questions that need to be directed to him.

And so at this time I will call Bill Hawkins.

MR. HAWKINS: Can you wait just a second? I'm going to get a couple of other notes. He might have more questions than I can answer off the top of my head.

JAMES WILLIAM HAWKINS,

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

DIRECT EXAMINATION

BY MR. CARR:

Q. Will you state your name for the record,

please?

A. James William Hawkins.

Q. Where do you reside?

A. Golden, Colorado.

Q. By whom are you employed, and in what capacity?

A. Amoco Production Company as a petroleum engineer.

Q. Have you previously testified before the Division?

A. Yes, I have.

Q. At the time of that testimony, were your credentials as a petroleum engineer accepted and made a matter of record?

A. Yes.

Q. Are you familiar with the Application filed in this case on behalf of Amoco Production Company?

A. Yes, I am.

MR. CARR: Are the witness's qualifications acceptable?

EXAMINER CATANACH: they are.

Q. (By Mr. Carr) Mr. Hawkins, would you refer to what has been marked Amoco Exhibit Number 4, identify that and review it for the Examiner?

A. Yes, Exhibit Number 4 is a well plat that

shows the key wells within the vicinity of our injection pilot project.

In the legend you'll see that there is a triangle that reflects the injection well, the Florence S 7A well, also the monitor well designated by a circle -- or a dot with a circle around it, Florence D2 well. That was previously named the Shaw Number 2.

We also show the four currently producing Coal wells in the near vicinity. Those are, to the north the Florence R4, straight to the east the Florence S4, to the south the Florence U3, and to the west the Florence K3. Those wells are approximately a half a mile from our proposed injection well.

We also show the existing conventional wells that are in the vicinity here. They all are at about the one-half-mile radius from our proposed injection well.

We also show on that the cross-sections that our geologist, Bill Pelzmann, showed to you.

Q. Mr. Hawkins, how many wells in Section 23 are currently producing from the Fruitland Coal?

A. Only one, the Florence U3.

Q. And what is the status of the Florence 7A?

A. That well is shut in, in the Coal.

It was originally drilled and completed as a

Fruitland Coal producer prior to the Basin-Fruitland Coal spacing hearings.

Subsequent to those hearings, Amoco shut in that well, and it was redrilled in a legal location.

So it's just been sitting there as a shut-in wellbore in the Fruitland Coal, shut-in completion.

Q. The Florence S4 well, what is its status?

A. It's currently producing in the Fruitland Coal.

Q. Now, in terms of this pilot project, Mr. Cuba indicated that Conoco was a 50-50 partner in this project; is that correct?

A. That's correct.

Q. With whom have you been working in terms of the research aspect of this project?

A. Well, we've worked primarily with our Amoco Research Office in Tulsa, but we are also working with a number of different agencies in helping us look at the research for this CO_2 injection pilot.

The New Mexico Petroleum Recovery Research Center in Socorro is helping us with some of the modeling in this area.

We're also working with REI, through a grant with Gas Research Institute, to look at pressure transient analysis and stimulation of the -- both the

from the Fruitland Coal, as compared to the current depletion method, pressure depletion method.

We have some significant concerns regarding CO_2 swelling as we -- or excuse me, coal swelling as we inject the CO_2, and we have designed this pilot to demonstrate or prove the long-term injectibility of CO_2 into this injection well.

We want to evaluate practical field implementation, what types of problems are we likely to encounter in trying to actually continue CO_2 injection in this well, identify potential areas for corrosion, and gather a limited amount of production pressure response data from the monitor well.

Q. Let's go now to Exhibit Number 8. There is no Exhibit Number 7. Would you identify it, please?

A. Yes, Exhibit Number 8 is the Application for authority to inject CO_2. It is the copy of our Application, and it includes a complete form C-108 for this project.

Q. This is a new project?

A. Yes, it is.

Q. To your knowledge, is this the first project for injection of CO_2 to enhance gas recovery that's been proposed in New Mexico?

A. Yes, it is.

Q. Could you refer to pages 9 and 10 of Exhibit Number 8? Identify those and explain to Mr. Catanach what they show.

A. Yes, Exhibit Number -- or page number 9 shows a nine-section plat, centered around our proposed injection well. It shows all of the wells within a half mile -- well, actually within the nine sections, but it also shows a one-half-mile radius around that proposed injection well and establishes an area of review for the Division.

If we look at page 10, it also shows all of the wells within, and leases within, a two- to three-mile radius around our proposed injection project.

Q. What is contained in pages 11 through 55 of this exhibit?

A. Eleven through 55 is a tabular set of information on all of the wells within the project area of review. It shows all of the detailed information on the well construction, completion and production from all of those wells.

Q. And this contains all of the information required by Form C-108?

A. Yes, it does.

Q. Are there any plugged and abandoned wells within the area of review?

A. No, there are not.

Q. Would you go to page 8 of this exhibit and identify that for the Examiner?

A. Yes, Page 8 is a set of information on our proposed injection well. It has a diagrammatic sketch of the wellbore configuration and the completion information on that well.

Q. Now, the thickness in the portion of the Fruitland Coal that's the subject of this project was reviewed by Mr. Pelzmann, correct?

A. That's correct.

Q. You've indicated the course of the CO_2 to be from --

A. -- the Williams Field Service Membrane Unit at Horse Canyon.

Q. And the maximum volumes you propose to inject would be what?

A. Whatever the emission from that membrane unit is. Currently it's designed for 3 million a day, but it's only making available to us about 2.4 million a day of injection fluid.

Part of the tests that we're going to run is to determine how much injection can we put into the well, and we would like to have the flexibility to use, you know, whatever is available out of that unit.

Q. And you'll be using a closed system?

A. That's correct.

Q. What is the maximum pressure you intend to use for injection?

A. We have established the maximum pressure at 2000 pounds. We've looked at the fracture gradients in the nearby area. They range from .6 to about 1.03 p.s.i. per foot. Two thousand pounds represents about .77 p.s.i. per foot in this area.

We will start out initially at about 1700 pounds, and then we may have to increase pressure if the injectibility goes down, but we will not exceed parting pressure in this area.

Q. To establish that, if the OCD should require, would you be willing to meet with the Aztec office and review current data on the information to satisfy the Division that you will not exceed the formation parting pressure?

A. Yes.

Q. And if they should require step-rate tests you would be willing to also run those to confirm that you're keeping the CO_2 in the injection interval?

A. Yes.

Q. You indicated the composition of the CO_2 as 80 percent carbon dioxide and 20 percent methane.

A. That's correct.

Q. Is that an exact figure?

A. That's the current, latest measurement we have from that unit. As I say, it was designed for about 3 million a day, of about 90 percent CO_2.

I think we may see some concentration changes off of that unit with time or with some modifications. It has only been installed for the last couple of months.

So we are relying on that as our injection source, but we do expect it will be primarily CO_2 with some methane.

Q. Prior to actual injection, will Amoco provide the Division with a compositional analysis of the CO_2 so it can be established exactly what you're injecting into the reservoir?

A. Yes, we will.

Q. And this is simply CO_2 that's been produced from the Fruitland Coal; is that correct?

A. That's correct.

Q. So there should be no compatibility problems?

A. Exactly.

Q. Is there any fresh water in the area?

A. Yes, there is.

Q. Is there -- What formations would those be?

A. That would be the Alluvium, the Nacimiento and the Ojo Alamo.

Q. Are there any freshwater wells within a mile of the injection well?

A. No, there are not.

Q. Is there any reason to believe that any injection of carbon dioxide, as you are proposing, could pose any threat to freshwater supplies in the area?

A. No.

Q. And have you reviewed the available geologic and engineering data on the area to confirm that there are no hydrologic connections or other natural channels that would permit the CO_2 to escape from the injection zone into fresh water supplies?

A. No, there is none.

Q. Is a log on the well that you propose to convert to injection on file with the Oil Conservation Division?

A. Yes, it is.

Q. In your opinion, would granting this Application and approval of this pilot project be in the best interests of conservation, the prevention of waste and the protection of correlative rights?

A. Yes, it will.

Q. And the reason you're seeking an exception to Rule 4 of Order R-8768-A is to simply permit you to have two wells that are active in the Fruitland Coal in the west half of Section 27?

A. That's correct. The purpose for that second well is strictly as a monitor well for the injection well project.

Q. And what is the anticipated date for commencement of injection?

A. We would expect to commence injection around mid-June this year, although that may be subject a little bit to getting some of our field work completed.

Q. And how long would you anticipate it would take to actually run the pilot project and obtain the results that you're -- or the information you're hoping to obtain?

A. We would expect it to be a year or less.

Q. Were Exhibits 4, 5, 6 and 8 either prepared by you or compiled under your direction?

A. Yes, they were.

MR. CARR: At this time, Mr. Catanach, we would move the admission of Amoco Exhibits 4, 5, 6 and 8.

EXAMINER CATANACH: Exhibits 4, 5, 6 and 8 will be admitted as evidence.

MR. CARR: And that concludes my direct examination of Mr. Hawkins.

EXAMINER CATANACH: Questions, Mr. Kellahin?

MR. KELLAHIN: No questions at this time, Mr. Examiner.

EXAMINATION

BY EXAMINER CATANACH:

Q. Mr. Hawkins, your Exhibit Number 6 says that you have modeled injection into the Coal with CO_2?

A. Yes, we have.

Q. And your model indicates that you get increased rates in the recovery?

A. That's correct.

Q. Can you quantify the increase?

A. Well, the preliminary results that we have from our model indicate that there can be a three- to five-, say, percent -- or three- to fivefold increase in producing rates, and I think it's certainly dependent upon a number of different model parameters.

Obviously, what we're doing right now is the first CO_2 injection pilot project in the world. I think our model results have given us enough indication that we expect significant increase in recovery using this technology, but there's still a big question to be answered about, you know, how can we actually implement

this in the field, and will we actually see the results that our models predict?

I think at this point it would be a little preliminary for us to try to put too much emphasis on the quantification for model results until we can see a little bit more -- see some results in the field.

Q. Can you explain the mechanism for the increased recovery?

A. I can give you a very general description of that. The CO_2 is injected into the formation. The CO_2 molecules will replace the methane molecules that are adsorbed on the coal, releasing them for production.

The injection pressure will maintain reservoir pressure and provide a driving force to push those released methane molecules toward producing wells, and we would expect to see a significant, say as much as 90-percent, recovery of the methane in the coal, based on our laboratory results.

That compares to about a 50-percent recovery based on pressure depletion that's in current field development.

I think the 90-percent recovery that we're seeing is probably an indication that the physics in this process work. What we have questions on are maintaining injection, looking at sweep of the

reservoir and a number of practical considerations, as opposed to just laboratory considerations.

Q. Are you confident that the coal will be able to transmit the CO_2 over an area?

A. We feel like there is a very good chance that we can demonstrate a -- some pressure and production response in our monitor well 850 feet away, assuming that we do not have a significant reduction in permeability that would cause us to lose injection into our injection well.

And these are some of the questions that we're trying to answer ourselves with the pilot.

Q. Mr. Hawkins, why would you run a model or a pilot project in one of the poorer producing areas of the Basin?

A. Well, in the highest producing part of the Basin where we have high pressures and high permeabilities, the wells there are obviously economic.

We have a large part of the Basin where the permeability is significantly lower, producing rates are on the order of 100 MCFD or less. This part of the Basin is very marginal -- marginally economic. This is where we see a significant benefit or potential benefit to improve the economics for this portion of the Basin.

We also believe that if we can demonstrate

that this process will work in a low-permeability, low-pressure part of the field, that it will have, you know, less problems working in a high-permeability, high-pressure part of the field.

So we feel like this will give us a lot of answers that will help us determine viability throughout the field. If we were to only do it in a high-perm area, we still might not have an answer as to what would happen in a low-perm part of the field.

Q. You mentioned something about the fracture pressure of the -- Was it the coal formation in this area?

A. Yes.

Q. And you said it ranged from -- I missed the range. .6 --

A. Well, I know I have a sheet here that has some figures that I wanted to read to you, but they are -- The fracture gradient, as I recall, was about .63 p.s.i. per foot to about 1.03 p.s.i. per foot, and that was taken from the wells in the nearby vicinity of this proposed injection well.

Here we go. That's correct. The .63 gradient was from the State Com K Number 11, and these are from the fracture treatments on those wells. The Florence S4 has a fracture gradient of 1.03, Florence

R4 a fracture gradient of .9, and the Florence E Number 3 a fracture gradient of .9.

Q. So you want to initially inject at 1700 p.s.i., and you believe that's below fracture pressure in the coal?

A. Yes.

Q. What kind of problems do you anticipate with corrosion in the injection well?

A. We don't expect a significant corrosion problem in the injection well. The reason for that is that by compressing the injection fluid through a four-stage compression, we will dehydrate that fluid to the point where it should not have any significant degree of corrosivity.

We will be able to -- We believe we will be able to transport that through the pipeline and into the injection well without any significant problem.

We will, for safety's sake, install some stainless steel packer at the base of the injection interval and some stainless steel joints of tubing across the injection zone on the Mesa Verde tubing stream in the injection well.

But beyond that, we really don't see any significant concern over corrosion, although we will be monitoring that, and that's again one of the questions

we're trying to answer is, where are the places that we need to be most concerned over corrosion? And maybe we'll get some answers to that from this project.

Q. Is it my understanding that -- Which wells will actually be produced in the west half there?

A. In the west half, both the monitor well, the Florence D2, will be produced, and the Florence U3, which is the current producing Coal well, will be produced.

We intend to produce the existing four Fruitland Coal wells that are at about the one-half-mile radius to show -- you know, to be able to monitor for any CO_2 that might show up in those areas and find out if there's some kind of problem with trying to keep the CO_2 within the area of our project.

At this point, our theory tells us that the CO_2 should adsorb under the coal readily. We would not expect to see that move out to this half-mile radius.

I think we will be looking to see if there's any indication that there's a lot of deviation from our lab results.

Q. Would you expect any problem with the CO_2 migrating into any of the sand intervals in the Fruitland?

A. Well, we're going to try to keep this within

a -- the perforated intervals. We think that the primary movement for this CO_2 will be in the Fruitland Coal and be adsorbed into that Fruitland Coal very readily, and we would not expect it to stay movable throughout the reservoir, to be able to migrate through those sands.

Q. Are there any wells completed in the Fruitland sand in this area?

A. Not that I'm aware of.

EXAMINER CATANACH: I think that's all I have. I know we're missing something, but --

MR. STOVALL: Mr. Carr, what is Exhibit 3?

MR. CARR: There is no Exhibit 3.

MR. STOVALL: There is no 3 or no 7?

MR. CARR: No, these were my secret exhibits that Mr. Kellahin and I made peace, and we'll keep them secret.

(Off the record)

EXAMINER CATANACH: Is there anything further?

MR. KELLAHIN: I have a short statement in the case, Mr. Examiner.

EXAMINER CATANACH: Okay, Mr. Kellahin, go ahead.

MR. KELLAHIN: Mr. Examiner, on behalf of

Conoco, Inc., they support Amoco's project in this area for the opportunity to test this concept in the field.

On behalf of Meridian Oil, Inc., we also support the concept of a field test of the viability of CO_2 injection to enhance recovery of gas from the coal.

You may note in the hearing we have filed a prehearing statement on behalf of Meridian as an interested party. There was a request made in the prehearing statement to place in this Examiner Order an obligation on the operator to report data and information with regards to the project.

What Mr. Carr and I have committed our clients to do is to continue their discussion about the technology involved in this project, separate and apart from this hearing process. We think at this point it is premature to ask the Division to obligate Amoco to file that data with the Division, and based upon representations between Mr. Carr and I, we are not seeking to ask you to order them to produce data to the Division.

We will continue to discuss with Amoco and Mr. Carr how we might come to some mutually agreeable solution on the science involved and the information available so that we may continue to cooperate with each other, as we have successfully done so, in the

coal gas development in this pool.

MR. CARR: Mr. Kellahin has correctly stated our agreement.

EXAMINER CATANACH: Anything further?

MR. CARR: Nothing further.

EXAMINER CATANACH: There being nothing further --

MR. STOVALL: Mr. Martin has a --

EXAMINER CATANACH: Oh, I'm sorry. Yes.

MR. MARTIN: Yes, Mr. Examiner, I'm Dave Martin, Director of the New Mexico Petroleum Recovery and Research Center, and I would just like to state that we feel that Amoco's planned enhanced gas recovery project, if successful, could have a significant impact on methane production from the Fruitland Coal, and we feel that this project would be very beneficial to New Mexico. We endorse the concept, and we look forward to working on the project and enhancing the reservoir description. Thank you.

EXAMINER CATANACH: Thank you, Mr. Martin.

There being nothing further, Case 10,707 will be taken under advisement.

(Thereupon, these proceedings were concluded at 4:02 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 May 1, 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. 10707, heard by me on April 8, 1993.

David R. Catanach, Examiner
Oil Conservation Division