NEW MEXICO OIL CONSERVATION DIVISION

STATE OF NEW MEXICO

CASE NO. 10534

IN THE MATTER OF:

The Application of American Hunter Exploration, Ltd., for a pressure maintenance project, Rio Arriba County, New Mexico.

BEFORE:

DAVID R. CATANACH

Hearing Examiner

State Land Office Building

August 20, 1992

REPORTED BY:

DEBBIE VESTAL
Certified Shorthand Reporter
for the State of New Mexico

ORIGINAL

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I N D E X

E X H I B I T S

EXAMINER CATANACH: At this time we'll call Case 10534, application of American Hunter Exploration, Limited, for a pressure maintenance project, Rio Arriba County, New Mexico.

Appearances in this case?

MR. CARR: May it please the Examiner, my name is William F. Carr with the law firm, Campbell, Carr, Berge & Sheridan of Santa Fe. We represent American Hunter Exploration, Limited. And I have one witness.

EXAMINER CATANACH: Other appearances?

MR. KELLAHIN: Mr. Examiner, I'm Tom Kellahin, of the Santa Fe law firm of Kellahin & Kellahin, appearing on behalf of Benson-Montin-Greer Drilling Corporation. I have no witnesses today.

MR. BRUCE: Mr. Examiner, my name is Jim Bruce, from the Hinkle law firm of Santa Fe, representing Billco Energy, Inc.

EXAMINER CATANACH: I'm sorry, Mr. Bruce?

MR. BRUCE: Representing Billco, B-i-l-l-c-o, Energy, Inc., of Farmington. I have no witnesses.

EXAMINER CATANACH: Any other

appearances?

Could I get the witness to stand and be sworn in.

JIM ARTINDALE

Having been duly sworn upon his oath, was examined and testified as follows:

EXAMINATION

BY MR. CARR:

Q. Would you state your full name for the record?

A. Jim Artindale.

Q. Where do you reside?

A. Calgary, Canada.

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

A. I'm employed by Canadian Hunter Exploration, Limited, in the capacity of Chief Exploitation Engineer.

Q. What is the relationship between Canadian Hunter and American Hunter, the applicant in this case?

A. American Hunter is a wholly-owned subsidiary of Canadian Hunter.

Q. Have you previously testified before the New Mexico Oil Conservation Division?

A. I have.

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

A. They were.

Q. Are you familiar with the application filed in this case on behalf of American Hunter?

A. Yes, I am.

Q. Are you familiar with the Jicarilla 2-A well, which is the subject of this application?

A. Yes, I am.

MR. CARR: Are the witness' qualifications acceptable?

EXAMINER CATANACH: They are.

Q. (BY MR. CARR) Mr. Artindale, would you briefly state what American Hunter seeks with this application?

A. Yes. American Hunter seeks to have approval granted for a pressure maintenance scheme within the Niobrara member of the Mancos Formation whereby gas that's produced by the Jicarilla 3-F-1 location would be reinjected into the same formation at a location at the Jicarilla 2-A-1.

Q. I think initially it would be helpful, Mr. Artindale, if you could review for Mr. Catanach the background events which have resulted in this matter coming for hearing today.

A. Okay. American Hunter drilled the Jicarilla 3-F well, and it was completed in February of 1992. On May 1, 1992, a request was sent to the BLM for exemption or basically allowing us to continue to flare the gas from the 3-F location. A copy of this request was sent to Mr. Ernie Busch of the New Mexico Oil Conservation Division.

At the request of the BLM, another letter was sent May 13, 1992, providing additional information. Once again a copy was sent to Mr. Ernie Busch.

On June 3, 1992, American Hunter met with Mr. Al Greer to discuss the possibility of building gas pipeline into the area. On June 4, the following day, we met with the BLM with Mr. Duane Spencer, who informed us that the BLM was granting American Hunter a six-month testing period for the 3-F well, which would end in September 1992 to allow us to gain additional information and review the situation of flaring or conserving the gas.

On Friday, June 5, 1992, the OCD informed us that the request was really denied on their part and that the well was in a state of overproduction relative to the gas venting order. It was recommended that we continue this matter at a hearing, which we did so on July 9 of this year.

At that hearing American Hunter proposed, first of all, a reservoir testing program, which we had already discussed with the Aztec office of the OCD. We also recommended that we be allowed to inject the solution gas from 3-F into our 2-A location.

It was discussed and determined that an additional hearing would be in order to provide the details of such an injection scheme.

Q. That's why we're here today?

A. Yes, it is.

Q. Could you identify what has been marked as American Hunter Exhibit No. 1?

A. Yes. Exhibit No. 1 is a copy of Form C-108, in which we've provided all the necessary backup information for this application.

Q. What zone do you propose to inject

into?

A. We propose to inject into the Niobrara member of the Mancos Formation.

Q. This is not an expansion of an existing project; this is a one-well injection program?

A. That's right.

Q. And what is the present status of the Jicarilla 2-A well?

A. The Jicarilla 2-A well is suspended at the moment. The pumping rods have been removed, and currently a GRC pressure gauge is in the well.

Q. Let's go to the plat in Exhibit No. 1, which I believe is the last page of page 32, of that exhibit, and I'd ask you to refer to that plat and review it for the Examiner.

A. In compliance with the requirements of the C-108 form, we prepared this plat which shows primarily two areas. The first area is called the area of review, and that equates to a half-mile radius around the proposed injection location.

Q. Now, in doing that, what did you use, since this is a horizontal well, to determine the center of the area of review?

A. Okay. The area of review is in the center of the plat. And it basically is a circle of a half-mile radius surrounding the Jicarilla 2-A location.

As you mentioned, the Jicarilla 2-A location is a horizontal well. The surface location is the hollow dot; whereas, the bottom of the horizontal section or the end of the horizontal section is the little "x."

The well was completed with the pre-perforated liner. However, when we drilled it, there was a specific fracture system that we encountered. And that fracture system is where we referenced our half-mile radius because that's where the injection would go into. That's marked by another little, I guess, like a little cross.

Q. In essence what you're doing is centering the area of review on the completion interval on the wellbore?

A. That's right.

Q. Let's go ahead and review the other information on this exhibit.

A. This plat provides the lessors and lessees for all the sections. It also references all the wells within the area. The wells are clearly visible, and each well has a number associated with it. The numbers reference the scout ticket completion cards, which are contained within the package for easy reference.

We've also marked a two-mile radius surrounding our injection well. And there are approximately twelve wells that are contained within that radius. The only well that's contained within the area, within the radius of area of review is our injection well.

Q. There are no other wells in the area of review that penetrate the injection zone?

A. No, there are not.

Q. And there are no plugged and abandoned wells within that area of review?

A. There are not.

Q. Could you refer to the tabular data on the Jicarilla 2-A well, which I believe is set forth on page 5 of the enclosed material, and also to the schematic drawing on page 10 of the exhibit, and using these review for Mr. Catanach the present and proposed completions.

A. Yes. It would be somewhat easier to follow on the completion diagram. We've also summarized a significant amount of this data on pages 2 and 3 as well.

The Jicarilla 2-A well was completed as a horizontal well in attempt to find production, commercial production in the Niobrara zone. The surface casing or the surface hole was drilled and casing was set at a depth of 250 feet.

We then drilled with a 7-5/8 -- I'm sorry. We then drilled down and set 7-5/8 inch casing just at the top of the producing interval. And we set that casing at a depth of 4569 feet measured depth.

We then ran a liner. And, as I mentioned, it was a pre-perforated liner, although the perforations were selected to basically run across the fractured interval. The top of the liner is at 4218 feet measured depth, and the bottom of the liner is at 6625 feet measured depth.

The proposed injection interval is identified as an interval where we lost returns while drilling. And it's identified as being between 5324 feet in measured depth to 6632 feet measured depth.

The casing, production casing was cemented. It was cemented from the bottom all the way up to, I believe, 330 feet. And the cement was determined to be in place by using a temperature log. As I mentioned, the liner is not cemented.

Q. Now, what is required to convert this well for injection?

A. Very little is required. All the formations other than the Niobrara have been cemented through the production casing. The only zone that is open is in fact the Niobrara member.

Likely what we will do is rerun the tubing at a slightly higher depth than we had for the well when it was producing. And we'll likely set either a tubing anchor or a packer just to stabilize the tubing in place.

Because we are injecting solution gas, there's no corrosive of component to it. It is natural to the formation, and we foresee very little problem with injecting into it.

Q. So basically you're going to be injecting into the liner; is that correct?

A. That's right.

Q. And the zone that you'll be injecting in is well segregated because of the cement and the packer is used primarily to stabilize the tubing?

A. That's right.

Q. Exactly what is the footage interval, the measured depth, if you could give me that on the injection interval?

A. Okay. The injection interval that we believe the gas will be going into is in fact the natural fractures which occur within the formation. And they occur between 5324 feet and 6632 feet measured depth.

Q. What is the source of the gas that you're going to be injecting in this well?

A. The gas comes from the 3-F location, which is completed in the same zone, but down-dip. And its solution gas will be reinjected into this location.

Q. And you're not proposing to inject gas from any other source?

A. No, we're not.

Q. What is presently being done with this gas?

A. Gas is presently being flared during the time that we're now producing in accordance with our pressure test injection.

Q. You do have the Division approval to continue this during the testing period?

A. Yes, we do.

Q. What volumes are you proposing to inject?

A. The average daily rate will likely be between 600 and 800 Mcf per day. And there may be rates as high as 1500 Mcf per day, but that is just a maximum rate that we're designed for. The average rates will be likely be between 600 and 800 Mcf per day.

Q. This is a closed system, of course?

A. Yes.

Q. And what pressures do you anticipate you would be utilizing?

A. Injection pressures likely would be between 600 and 800 pounds PSI.

Q. What maximum pressure would you request be authorized for injection?

A. Maximum injection pressure would likely be no more than 1200 pounds. We base that on an analysis of what the original pressure in this formation was at this depth, and it was approximately 1200 pounds.

Q. So injection at this pressure would not

damage the reservoir?
A. No. The reservoir is extremely under-pressured, and we wouldn't even be close to a fracture pressure.
Q. Mr. Artindale, are there freshwater zones in the area?
A. We are not familiar with any freshwater zones.
Q. Are there any freshwater wells in the area?
A. We are not aware of any freshwater wells in the area.
Q. Is Exhibit No. 2 a copy of an affidavit confirming that notice of this application has been provided to all offsetting owners and the surface owners required by OCD rule?
A. Yes, it is.
Q. Are there similar applications in the area which have been granted for the injection of gas into this formation?
A. Yes. In fact, the pool that we are producing from, the West Puerto Chiquito Pool, in fact has approvals for gas injection south of us in the West Puerto Chiquito Field where Benson-Montin-Greer in fact has been injecting

gas since the late 60s in a similar situation.

Q. How long will it take you to actually convert this well to injection?

A. We anticipate that if we expedite the matter it will take between 45 and 60 days to build the pipeline, bring in the compressor, and get all the necessary approvals --

Q. And --

A. -- facilitate it.

Q. Do you therefore request that the application be expedited?

A. Yes, very much so. We are currently in the midst of an injection -- an interference test between the 3-F and the 2-A location. And this test will probably continue for another 30 to 40 days after which this well would again be in a penalty situation due to the gas flaring. And we would like to remedy that situation as quickly as possible.

Also within three months the conditions out there could change fairly significantly in terms of operating.

Q. In essence you're racing with the end of the test period to get this thing going; is that right?

A. Yes.

Q. Could you just summarize for Mr. Catanach what it is that American Hunter hopes to achieve by being able to inject this gas in terms of pressure maintenance?

A. Yes. By reinjecting the solution gas into the 2-A location, we hope really to achieve two things: Number one, we will be conserving the gas; but number two, we also will be partially maintaining the pressure within the reservoir.

And it has been well documented that this reservoir is in fact a gravity drainage system and pressure maintenance can be extremely beneficial in such a system. And so that's really our intent.

Q. In your opinion will approval of this application prevent the waste of hydrocarbons?

A. Yes, it would.

Q. In fact, it will be reinjected instead of flooded?

A. Yes. That's right.

Q. Will approval of this application in your opinion have an adverse impact on the correlative rights of any other interest owner in the area?

A. We do not believe it would, no.

Q. Were Exhibits 1 and 2 prepared by you or compiled at your direction?

A. Yes, they were.

MR. CARR: At this time, Mr. Catanach, I move the admission of American Hunter Exhibits 1 and 2.

EXAMINER CATANACH: Exhibits 1 and 2 will be admitted as evidence.

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

EXAMINER CATANACH: Mr. Kellahin.

MR. KELLAHIN: Thank you, Mr. Examiner.

EXAMINATION

BY MR. KELLAHIN:

Q. Mr. Artindale, if you'll, please, help refresh my memory about the current status of the test, am I correct in now remembering that American Hunter and Mr. Greer finally worked out a mutually agreeable test procedure to arrive at reservoir data for the test?

A. Yes.

Q. And you're continuing on with that

test?

A. Yes, we are.

Q. The area affected by the gas injection, concerns me, Mr. Artindale. And when you look at page 32, perhaps this display can help me understand the arrangement. You have not yet proposed a unit agreement to then have a unit area in which to contain the pressure maintenance project, have you, sir?

A. No, we have not.

Q. Without the unit area, you propose to operate this as a leasehold pressure maintenance project?

A. Yes.

Q. When we look at the lease that is affected in Section 2 where the injection well is, what additional acreage is included in that same lease?

A. I guess --

Q. Did I confuse you?

A. Yeah.

MR. STOVALL: Let me back up, Mr. Kellahin and help lay a little groundwork so I understand. Is this a leasehold relationship or a joint venture relationship with the tribe? Is it a lessor/lessee or both?

THE WITNESS: It really is a joint venture. In fact, the solution gas from the 3-F well or the -- in fact the whole well is a jointly-owned well with the tribe. And in fact we have certainly a -- kind of almost like a partnership with the tribe versus it strictly just being a lease.

It's somewhat unusual in the arrangement. That's why it's sort of difficult to put a normal --

MR. STOVALL: That's why I ask. The context of Mr. Kellahin's question is in the more traditional leasehold rights interest. My understanding is that you are joint venturing out there in some arrangement?

THE WITNESS: Yes, very much.

Q. (BY MR. KELLAHIN) All right. Let's pursue that. When you look at Section 2, the joint venture arrangement among those owners participating with a well in the injection well location, are those the same interest owners that would participate for Section 11 to the south, or do we now have different parties involved?

A. Okay. Let me explain somewhat the

ownership. I believe all the acreage on this plat is owned by the Jicarilla Tribe.

Q. Okay.

A. We have an arrangement with the tribe that covers Sections 2 and 3. I believe Section 11, there is no current arrangement with any other party with the tribe.

Q. That would be acreage outside then the joint venture arrangement.

A. Yes, it is outside the joint venture arrangement. And the Jicarilla Tribe has given us written consent to this proposal.

Q. Okay. When we look over in Section 10, that looks like Jicarilla tribal lands, but now you have Benson, Montin, and Greer as the operator?

A. That's true.

Q. And that is not part of this joint venture?

A. No, it's not.

Q. And when we go to Sections 9, 15, and 16, those are also Benton, Montin, and Greer operated sections that are not part of the joint venture arrangement?

A. That's true.

Q. Okay.

MR. STOVALL: If I might interrupt again, just to build the information, do you know if those are traditional leasehold relationships between BMG and --

THE WITNESS: Yes. I think they're traditional leases.

Q. (BY MR. KELLAHIN) With regards to this joint venture arrangement, are there overriding interests that we would see applied to the joint venture properties that we might be more familiar with in other transactions with oil and gas properties?

MR. STOVALL: You mean overriding royalty, Tom?

MR. KELLAHIN: That's what I asked.

Q. Are there other royalty interests, overriding royalty interests that affects the tribal interest?

A. Well, I certainly don't feel at liberty to explain the details of the deal between the tribe --

Q. I'm not asking you to do that. I want you to identify, are there parties that are different?

A. No. I think all the parties are in fact similar between the two sections, between Section 2 and Section 3, yes. The same parties are in both sections.

Q. Okay. Do you have plans to unitize this area for pressure maintenance purposes?

A. We are certainly not opposed to the concept of unitization. We are somewhat at a dilemma because many of the sections that are owned by, for example, Benson-Montin-Greer are under contention right now with the tribe. In fact, the tribe has put a moratorium on development in this area. And so really there just is no opportunity to consider unitization at this time.

However, when the legal aspects of the ownership are clarified, we're certainly not opposed to reviewing that possibility.

Q. So your proposal to the Division is to obtain approval for the pressure maintenance project independent of unitization for pressure maintenance?

A. Yes.

Q. When we look at the injection interval --

A. Uh-huh.

Q. -- is this injection interval now the total Niobrara member of the Mancos, or have you subdivided the injection to isolate a different portion of the Niobrara?

A. No, we have not segregated the wellbore. As I said, it's an openhole liner. The injection will be going into the fractures that we encountered in the Niobrara.

Q. I don't remember from the last presentation whether that horizontal, that lateral exposes the A, B, and C of the Niobrara in that wellbore.

A. It would expose primarily what you would term the A.

Q. Okay. You mentioned a while ago that this area had the opportunity for gravity drainage again. The gas injection had the potential effect to assist the gravity drainage in production of oil in the Niobrara for you?

A. Yes. As a matter of fact, we just completed a research of literature on gravity drainage systems throughout the US. And in pretty well every case, they recommended that you should at least consider in the early stages the concept of gas reinjection.

Now, our intent is by doing this we are going to be conserving the gas. We are going to be implementing a technically sound pressure maintenance scheme. And that within approximately a year to year-and-a-half, we will review the whole situation. We'll be able to review the concept of unitization. We will have drilled several more wells in the area. And we'll just evaluate the advantages of continuing with the injection schemes.

Q. Okay. Again, I didn't bring your structure map from last time, but how does your structural relationship compare to what Benson, Montin, and Greer has in the Canado Hito Unit?

A. In fact the structural environment here is substantially more favorable than the Canado Hito Unit for gravity drainage and for gas injection. The dip at the West Puerto Chiquito Field is, I think, up to 4 degrees. Here it's up to 20 degrees. And the concept of gravity drainage is directly dependent on the depth of the formation.

So we have a much more intense gravity mechanism working for you. Plus that gravity mechanism also helps to segregate the gas from the well when you inject. So it's much more effective to inject gas in that environment than in an environment that has less dip.

Q. Can you give us a visual picture that we can overlay on Exhibit 2 to show us where Sections 9 and 10 are structurally in relation to the injection well and the producing well?

A. Well, I can somewhat relate it. I assume most of you are familiar that we are dealing with a steeply dipping monocline. Between Section 2 and Section 3, as I mentioned, it has a dip of around 20 degrees. And the vertical displacement is approximately 2,000 feet between those two wells.

Once you move further west from Section 3, you basically reach the base of the monocline, and the dip changes to around 2 to 3 degrees.

Q. Show me where I am with Section 10.

A. Just a second. I need to -- well, I'm trying to recall the structure map. But I believe Section 10 would be in similar, somewhat similar placement as section -- the well in Section 3 potentially. Of course we do not have any seismic data through that area, so it could move either way.

And Section 9 would be likely at -- along the base of the monocline.

Q. I am interested in how far the gas injected into the injector well is going to migrate or invade throughout the reservoir and what potential risk Mr. Greer's sections have with regards to that gas injection.

A. Okay. Well, let me relate it, first of all, to the wells in West Puerto Chiquito. When Benson-Montin-Greer proposed their scheme, they have a series of injectors on the up-dip portion of the reservoir, and then their producers are of course further west along the down-dip side.

They have approximately 1400 feet of vertical displacement over six miles. We have substantially more vertical displacement over one mile. Benson-Montin-Greer have never recorded any concept of a gas override problem.

And, in fact, when you look at the calculations for gas segregation within the literature, there really should be no reason to believe that you would have gas override at the allowable that the state has set of 800 barrels a day.

From our situation, in fact, it's much more positive because you have steeper dip, more vertical displacement. We just see no technical merit in considering that there would be a problem with gas override in this situation. It just almost is technically impossible.

We made the calculation as to what the maximum oil rate could be before you would have gas override. And it's substantially higher than the current allowable.

Q. Perhaps you have -- part of your reservoir study has already addressed my concern and you may be able to share it with me. What I'm interested in knowing is whether or not as part of this study you have made the calculations to determine the gas advancement, if you will, through the reservoir and how long it may take under this operation to advance into Section 10.

Is that the kind of thing you've studied?

A. Yes. There are two things that will cause gas to migrate down. One is gas override, and that results when you produce the oil producer too hard and it basically draws the gas towards the oil well. That calculation is fairly well established in literature. It's fairly easy. The difficult part with that is coming up with the reservoir parameters.

We used fairly conservative reservoir parameters and determined that the maximum oil rate that we could withstand would be thousands of barrels of oil per day.

Q. Without going through the tedium of having you tell me all the calculations, do you simply have those calculations and information that you could supply me?

A. Well, I haven't brought the details of calculations. I could quote the paper from which it's very simple to make. One of the two references, one is a paper called "Gas Injection for Up-Structure Drainage." It's by George Combs and Knezek, both with Esso or Humble. And it was published in March of 1971. And it was published in the Journal of Petroleum Technology. And the appropriate page is page 362, Equation 1.

The equation relates to the maximum segregation rate. And the equation basically calculates the maximum rate which you could produce oil. And it's a direct function of permeability, the reservoir length, which we assumed in our case would be one mile, which is the spacing.

The permeability we assumed to be 1 darcy, which is extremely conservative based on all the measurements in the whole field. Reservoir thickness, which we assumed to be very conservative as well, we used 10 feet. The reservoir angle, which we used as 20 degrees. And then it's a function of the specific gravity, viscosity, and the formation volume factor for oil, all of which are fairly readily available.

As I said, when you go through the calculation, you look at rates of between 3- and 5,000 barrels of oil per day before you'd have a segregation problem.

Q. Let me interrupt you, because I don't want to belabor this. If counsel will agree to supply me with the parameters and the calculations as they apply to your project, it will go a long way to satisfy my client that he's not at risk in Sections 9 or 10 with the reinjection of gas?

A. Well, I could also quote your client's own information that he provided for his reservoir that suggested rates.

Q. I don't want to argue with you, but he was doing it in a unit context. And I'm concerned about the close proximity of this property to your injection well.

A. Yeah. Well, I'm just saying, from a calculation point of view, it doesn't really matter whether you're a unit or a non-unit; it's just a technical calculation.

The information that he used was for a reservoir that has a dip of approximately one-fifth our dip. So ours has a much more favorable circumstance. The relative closeness really has nothing to do with the segregation component. It's the technical parameters of the reservoir that are important here.

Q. Let me ask you some of those parameters. Have you made an estimate of what you consider to be the important volume of the reservoir?

A. You're mixing apples and oranges here. As I mentioned, there are two components. The first one is segregation or gas override. This calculation determines that there's no reason to believe that there will be gas override due to producing the 3-F well.

The second component that you have to be concerned about with gas migration is in fact the volume of oil or reserves in place between the 3-F and the 2-A location.

Q. It's that part of this discussion that I want to pursue with you.

A. Yes. Now, that really has very little bearing on whether or not you should implement a gas injection scheme. If anything, the gas injection scheme will help to increase the recovery of fluid between those two points.

If you are not to inject gas, you still are dealing with the same amount of reserves. And you will get gas breakout, but it will just be due to solution gas breakout.

Q. Can you answer my question? How many barrels of oil per acre do you estimate for your area?

A. Right now we're in a testing program that may be able to give us some of that information. However, there is information available directly to the north of us and directly to the south of us. It has been estimated that there are anywhere between 300,000 and 500,000 barrels of recoverable reserves per section. That's based on work primarily that was done by people like Benson-Montin-Greer, Mallon, Sun, and companies that were involved to the south.

In a fractured reservoir it's impossible to accurately determine the amounts of reserves in place. And it's particularly very difficult when you're dealing with a gravity drainage system because it's very difficult to apply material balance calculations to the system.

Q. Do you have a range of the percentage of displacement of oil that might occur in your area due to gravity drainage?

A. I don't understand the question.

Q. As the gas is injected up-structure and the oil is produced down-structure, there is going to be, I assume, an engineering calculation you can make to show the percentage of displacement you're going to have in the reservoir that is directly attributable to the gravity in the reservoir.

A. Well, in fact, the displacement due to gravity will occur with or without gas reinjection. That's a gravity drainage. All you're doing is assisting the effectiveness of the gravity drainage system by gas reinjection.

Q. Separate and apart from the gas injection, what is your opinion of the percentage of oil that will be displaced by gravity?

A. We really have no information that would give us a number. Again, I can just reference you to what other people have cited down south. But it may or may not be applicable where we're producing from. For example, you know, it was mentioned that the recovery from the Boulder Field was up to 500,000 barrels per section.

Well, in the Boulder Field they didn't implement a gas injection scheme; whereas, in the West Puerto Chiquito Field, where Al Greer has proposed values of approximately 300,000 barrels per section, they did implement a gas injection scheme that seemed to be very effective.

So it's quite a broad range. And to be honest with you, we just do not have the reservoir information to give you a qualitative number.

Q. If Mr. Greer was to tell you that 60 percent is the displacement efficiency of oil, then you have no way to determine whether or not that's a reasonable number to use in the calculation?

A. Well, that -- again, I'd have to question Mr. Greer. Is that based on a gas injection scheme being in place?

Q. No. Just straight gravity drainage.

A. Yeah. That number, certainly you could not agree to that number without more information because there are many gravity drainage schemes throughout the continent of which have had better and of which have had lower due to a myriad of reasons so --

Q. What is the volume of gas that you propose to inject into this 2-A injector?

A. Okay. Well, we plan to inject just the produced solution gas from the 3-F location. So, in fact, it will not provide full voidage replacement. In fact, it will be extremely partial voidage replacement.

Another scheme is identical to the concept that Benson-Montin-Greer implemented to the south. It should have a very positive impact on the reservoir; at least that's what we anticipate. There should be really negligible or no adverse effects caused by the reinjection of solution gas from a well produced down-dip.

Now, the actual rates we anticipate will be 600 and 800 Mcf per day injected into the reservoir.

Q. I guess, under the allowable that applies to the pool, it could be a maximum of 1600 Mcf a day?

A. It could be.

Q. But your production is coming from the 3-F well, and it does not produce that volume of gas?

A. We are not producing that well at that rate.

Q. Okay. Does is it have the ability to produce at maximum allowable?

A. In the short-term it probably could, but it would be probably very short-term. And at this point we do not want to produce it that hard for a couple of reasons. Number one, we have been in an overproduced state and we want to try to retire that overproduction.

But also we are, you know, and as we expressed at the last hearing, at this point in time, you have to be concerned about the production of large quantities of gas from the reservoir. See, the opposite concept to gas reinjection is just flaring or the sale of gas from the reservoir.

And most experts in gravity drainage would suggest that you should be very careful about doing that before you understand the reservoir. Because in a gravity drainage system, you do not want to have solution gas breakout happening at large levels early on in the project.

Q. Have you selected the parameters and made the calculations to determine the rate at which you would move oil through the reservoir with the gas injection?

A. Well, again, it's strictly a function of how much oil exists up-dip of the 3-F well. And in a fractured reservoir there is just absolutely no way of qualitatively assessing that other than possibly through an interference test which we are proposing.

Now, an interference test is a good way of quantifying that. However, because of the amount of free gas that's already present in the 2-A location, we're not sure how good the data we'll able to retrieve is that will give us that qualitative number.

So, number one, it's very difficult to quantify the amount of oil in place. And producers that have been operating here for years have not been able to do an accurate job of that.

Also, number two, we are faced with the fact that we have production up-dip from us. The Boulder Field has produced several million barrels. East Puerto Chiquito has produced 4 million barrels. We're not sure of the effects of drainage and depletion on our properties from those sources.

Certainly the 2-A well and the 3-F well were depleted in pressure when we drilled them. So it's very difficult to quantify the amount of oil.

Q. Okay. So I don't misunderstand you, we don't yet have data, and perhaps the interference data will help generate that information, but we don't now have data to determine what the effect will be of gas injection in moving oil up to and through Sections 10 or 9; you just don't know?

A. No. I think you're trying to put some words in my mouth. In a sense we know technically it's very sound and prudent to reinject gas up-dip in a gravity drainage system.

The migration of oil down-dip, regardless of the volumes -- we do not know quantitatively the volumes between the 3-F location and the 2-A location, but then I would contend that if you took the 200 wells in the Mancos zone that, you know, surround us, the operators wouldn't know how much oil exists between very many of those wells either.

It's a difficult calculation. You just cannot acquire the necessary information very easily to quantify that.

However, it really doesn't have any technical bearing on whether or not it's prudent to inject gas up-dip. Because if you don't inject gas, you still have the same amount of oil, and it will still -- not only will it -- if you produce it at the same rate, come down just as quickly, but you will of solution gas breakout which will or certainly could significantly impede your recovery in the reservoir.

Q. To go back, do you have the parameters and the calculations to share with me on the gas breakthrough analysis?

A. Well, we certainly have the calculations. The parameters, I've already mentioned the ones we've used. They are not quantitative. We've used very conservative numbers to be on the safe side. Certainly the permeability is much greater than 1 darcy.

You -- really Mr. Greer should assess the calculation himself. I provided the numbers that we've used. The calculations are very simple. There are certainly more complicated calculations you can get into. And I could give references for those. However, this reservoir even to the South and West Puerto Chiquito does not have the information that would enable you to make those calculations.

MR. KELLAHIN: No further questions.

EXAMINER CATANACH: Mr. Bruce.

EXAMINATION

BY MR. BRUCE:

Q. Mr. Artindale, looking at your map again, as to probably rehashing something of what Mr. Kellahin went over, looking at Section 4, there's a dotted line down the middle. What does that provide?

A. Oh, okay, Section 4, in our agreement with the tribe, there are different terms between the odd and the even sections. When we drilled the well in Section 3 horizontally, we were anticipating in fact going across the -- potentially going across the section line. So we created a 640-acre spacing unit that combined the west half of Section 3 and the east half of Section 4.

Now, that was through a pooling arrangement with the tribe. So that's what those dots refer to.

Q. Then looking at Section 3, up in the west half it says, "American Hunter, 100 percent joint venture." Over in the east half it says, "Jicarilla, 100 percent joint venture." Are those different?

A. Again, it comes to the deals of our agreement. The odd sections, there is a different agreement than in the even sections. And in the odd sections, in essence, the tribe is the owner and operator of the odd sections. But through our agreement we have the opportunity to drill in those lands under different terms, but they still hold the rights to them.

Q. Okay. And then going over to the east, Section 6, there's the American Hunter 6-A well?

A. Yes.

Q. Is that a proposed well or --

A. No. As the symbol would suggest, it's been drilled and abandoned.

Q. Okay. And then the wells to the north, the Billco wells, and I guess there's some Jicarilla wells there, are those all Mancos oil producers?

A. Yes, they are or were. "Were" is the operative word.

Q. What was the pressure in the 3-F well when you drilled it?

A. I believe it was just under 1400 pounds.

Q. Is that what the current pressure is?

A. Well, we took a fluid level just prior to implementing this interference test and it appeared that the reservoir pressure was approximately the same. However, we have bombs in the hole now, and once they're retrieved, we'll have a much better handle on the current reservoir pressure.

Q. It may have decreased some, but it's still fairly close to 1400; is that what you're saying?

A. Well, the fluid level suggested that, but we'll have to wait until the bombs are retrieved to get an accurate measurement.

Q. What was your pressure in the 2-A well?

A. Well, in the 2-A well we've had two pressure measurements. The first was a buildup after we swabbed the well. Unfortunately the pressure was not very stable, and it required, you know, significant interpretation. We've interpreted that the original pressure could have been anywhere from 550 pounds to 600 pounds from that measurement. As I said, it was very difficult to interpret.

We then ran a static pressure on the 2-A well on June 27, 1992. And when you calibrate this pressure to the midpoint of perforations, it's approximately 500 pounds.

Again, we have pressure bombs in the 2-A well right now that should give us a more accurate reading from that well.

Q. Do you have any idea what the pressures are in the wells to the north, the Billco and

Jicarilla wells?

A. Well, we certainly do not have what I call current pressures. However, we do have an historic, the historic pressures that were recorded.

Q. What are those or what are the latest figures you have on those wells?

A. Well, based on information that, I believe, has been previously presented to this Commission, there was included in that a bottomhole pressure versus cumulative production for the Boulder Field. And it suggested that, at a datum depth of approximately 3300 feet, the bottomhole pressure had been reduced to below 200 pounds.

Now, we've talked with operators in the area. Unfortunately they did not have current pressures. Some of them believed that there might have been some recharge since this time where the pressure has gone up. But they were not able to provide any data that could clarify that.

Q. Would you be surprised that the pressure was 300 or 400 pounds in those wells?

A. No, I wouldn't be surprised. Three

hundred wouldn't surprise me. Four hundred still wouldn't surprise me. No.

Q. And those same wells to the north, looking at your 2-A well, are those wells down-dip from the 2-A well? Are they structurally higher or lower?

A. In fact the Boulder wells kind of represent both down-dip and up-dip locations. I might just want to clarify that, if you'll look at the plat, there was in fact a gas cap well drilled into the Boulder Field when it was being developed in the southeast quadrant of Section 26. That is up-dip, slightly up-dip from our well. But there are wells drilled in Section 27 which are in fact down-dip from our well.

I believe, and we've looked at the production from the Boulder Field, I believe that it's producing in the order of under 600 barrels of oil per month from all the existing wells. So very much in a stripper stage. In fact, the wells in Section 26, I believe, are producing, you know, a couple barrels per day on average.

Q. Okay. And I believe at this point there's no gas gathering system in this area; is that correct?

A. That's right. In fact all the gas from the Boulder Field has been flared. And in fact, looking at the current data, it would suggest that even at the low oil rates, the GORs are extremely high in the Boulder Field.

Q. If you have an approximate number, what are the GORs?

A. Well, I'm just looking at the data that is available from the state for April 1992. And it suggests the GORs are between 2500 and 3000. I don't know again how accurately they're measuring the gas rates out there.

Q. That's fine.

A. But once again that is, I guess, encouraging to us in the sense that we're injecting or we propose to be injecting gas in an up-dip point, which is structurally on strike with an existing gas cap. So that's kind of the best of both worlds.

Q. American Hunter, do they have any plans for a gas gathering system in the area?

A. We have reviewed the concept of gas gathering system. Our basic philosophy right now is that within the next 12 months, 12 to 18 months, we do not want to commit to producing large amounts of gas from this zone.

If in fact the analogs and the technology and the literature is correct, we may very well want to conserve as much gas as possible into the reservoir to optimize the recovery and performance of the gravity drainage system.

However, we, I guess, are willing to say that within a year to a year-and-a-half after we've drilled more wells, got more information, we would then review the whole situation and reevaluate the feasibility of continuing with a gas injection scheme or, you know, building pipelines to produce the gas.

MR. BRUCE; Thank you. I don't have anything further, Mr. Examiner.

MR. STOVALL: Mr. Examiner, I just want to show that all of us attorneys can go out and try to get our own little information for whatever reasons. And I've got a couple of questions which are just for me really for interest.

EXAMINATION

BY MR. STOVALL:

Q. The strike, the dip is mostly

east-west; right?
A. It is.
Q. What's the orientation of that structure? I mean, if I lay my hand on it and try to make -- do you have -- I mean, just roughly.
A. Primarily north-south.
Q. Primarily north-south?
A. In this plat primarily north-south. There is a little jog in it to the south part, but primarily north-south.
Q. And you said in the East Puerto Chiquito it's a much flatter dip?
A. No, not East Puerto.
Q. I mean West Puerto Chiquito. Excuse me.
A. See, it dips steeply and then, at what we call the base of the monocline, it flattens right out. The West Puerto Chiquito, the unit has the base of the monocline running through it. So part of it is on the steeply dipping part, and part of it is on the base.
However, there the monocline when it runs through the West Puerto Chiquito, it is not nearly as steep as it is here.

Q. And it runs on up into the Boulder. So if I laid it down, it would be somewhere -- come down to roughly 25, 26 on the north part of this plat or right in that boundary area, the east boundary?

A. What would come down there?

Q. The monocline.

A. Well, the monocline goes across the whole plat.

Q. I mean the strike of it, the length of it.

A. Oh, from the 2-A location? I guess, I'm somewhat confused.

Q. Okay. The steepest part of your monocline --

A. Yes. It would run from -- let's, first of all, look at our lands from, say, Section 6 where our 6-A well is all the way down to 3-F well, that's extremely steep.

Q. Right.

A. Then it flattens off west of the 3-F well. Now, the Boulder would be very similar from Section 25. It would be very steep all the way down to, I guess, somewhere in Sections 27 or 28.

Q. Okay. And then if you went down to the south, say, section -- what is that? Right between the East Puerto Chiquito-West Puerto Chiquito boundary?

A. Say Sections 10, 11, in there?

Q. Yes.

A. Again, there's no wells for well control, but we'd estimate that the monocline is very steep between Section 7 all the way down to, say, Section 10 and then it would flatten off in Section 9.

Q. 18 to 15?

A. Yes.

Q. I was just trying to get an orientation of it.

A. Approximately that's true.

MR. STOVALL: Okay. That's all I have. I got all my information. I like building structure maps by oral examination.

MR. CARR: You should be happy.

MR. STOVALL: I'll try cross-sections next.

EXAMINATION

BY EXAMINER CATANACH:

Q. Mr. Artindale, you mentioned that you had already been to hearing, I believe, before Examiner Stogner on a reservoir testing request?

A. Well, the hearing actually centered around several concepts. Primarily it was centered on our request to get exemption to continue to flare or vent the gas that we're producing from the 3-F.

Now, as a component of that, we discussed this interference test. Also we discussed the concept of what to do with the overproduction that had accumulated between the time we had made application to the BLM and the hearing. So that was the general discussion with the hearing. It was basically --

MR. STOVALL: Let's clarify that, if I may. The actual hearing itself had to do with the nonproductive disposition of gas produced from the 3-F well and how much you'd be allowed to produce and whether you'd have to get back in balance for any overproduction from venting or flaring. And that was the subject of the hearing.

Concurrent with that you had developed a testing procedure in conjunction with the Aztec office --

THE WITNESS: That's right.

MR. STOVALL: -- with some input from Mr. Greer. And part of the process was you wanted to be able to flare gas to determine all sorts of things to make some of these decisions about reinjection, selling, et cetera, et cetera; is that correct?

But the order itself coming from that hearing and the subject matter at the hearing did not address a specific testing procedure. It only addressed --

THE WITNESS: That's right.

MR. STOVALL: -- how volumes of gas that were vented or flared would be handled or permitted; is that correct?

THE WITNESS; I believe that's true. We did not discuss the details of the --

MR. KELLAHIN: Is there an order?

MR. CARR: I don't believe there's an order entered on that.

MR. STOVALL: I thought maybe that had come out while I was gone. Sorry about that. That was the discussion, and that was the subject of the hearing; is that correct?

MR. CARR: We're assuming you're going

to order us back here today at some point in time.

MR. STOVALL: Let me say I don't know what's in it because it doesn't exist.

THE WITNESS; What's resolved, as I said, we got approval from the BLM to continue to flare gas for a period while we gain more information. We then worked out an arrangement with the Aztec office where we began quite an involved interference test between these two wells. We also worked with Mr. Al Greer to come up with kind of an acceptable program between all the parties. That was done.

The test is now being conducted. We are hoping it will provide us some quality reservoir information. But the presence of a large gas saturation around the 2-A well, you know, puts technical risk on the test. But we are willing to spend the money in at least an attempt to acquire it.

Also at the hearing we discussed the concept that we were willing to proceed with the gas injection plan; that at this time we do not feel it's prudent or technically wise to spend the money to bring in a pipeline and then produce a large volume of gas from this reservoir.

In fact, based on negotiations we had with Benson-Montin-Greer, with Northwest, with other pipelines in the area, it looked that we would have to guarantee at least 1 billion cubic feet of gas to be produced from the reservoir to justify bringing a line in. Just technically that was not acceptable at this point in time.

So we believed that it would be prudent, technically beneficial, and economically reasonable to go ahead with a gas injection scheme whereby we would take the 3-F solution gas and reinject it into the 2-A well.

Now, we have not received, as was mentioned, an order relative to the first hearing, so we're at somewhat of a loss as to the conclusions that were reached. We're proceeding with the test. We really don't know where the overproduction stands. And we're proceeding with the gas injection scheme at this hearing.

Q. (BY EXAMINER CATANACH) Does the outcome of the original case have any effect on this case in your opinion?

A. No. And, in fact, what this would really help to do was that the whole problem arose out of the concept of venting gas. We've never produced above the GOR level. We've never produced, you know, on a monthly average over the oil allowable.

It really was a case that we were venting the gas contrary to the state provision. This would enable us to really comply with --

MR. STOVALL: What you anticipate might come out in the issues that were raised in the order; is that fair to say? I think, again knowing now that I know there's no order out, is it not fair to say one of the issues was, one of requests you had was for a temporary permission to vent the gas to conduct these tests?

THE WITNESS: Yes.

MR. STOVALL: One of the issues that came out -- and this is in response to the issue, not to the order -- is that at some point in the fairly near future the OCD was probably going to require a beneficial disposition of the gas either through reinjection --

THE WITNESS: In fact they've already requested that by applying an overproduction penalty against our well for venting.

MR. STOVALL: Okay. Back to that

thing. The overproduction is based upon the Aztec District Office --

THE WITNESS: Right.

MR. STOVALL: -- limitation of 30 Mcf a day vented.

THE WITNESS: They're basically saying you have to do something with the gas as we'll continue to penalize you. You have to conserve the gas. Technically it's not reasonable at this point in time to build a pipeline, both from a reservoir point of view and an economic point of view.

The only effective option to comply with the venting order and to do what's prudent is to reinject gas. It's technically sound, and it's economically feasible.

MR. STOVALL: If I hear you correctly, we're here today because of a response from OCD requirements. But what you're seeking today makes good sense from a reservoir standpoint; is that correct?

THE WITNESS: Yes. Now, as I mentioned, we would certainly monitor this system, monitor the performance of this system, both at the 2-A location and the 3-F location.

And within a 12-month period we will reassess the validity of the system. So --

MR. STOVALL: One of the issues you will be concerned with, but which does not affect this order, is what level of overproduction you may be at as a result of venting based upon the order that Examiner Stogner will enter from the other hearing?

THE WITNESS: Yes. That's very critical to us. Because, of course, if the order is that you will shut down and make up that overproduction now, we of course wouldn't go ahead with the gas injection scheme until we had made up the overproduction.

One thing I do want to, I guess, address here is that we would -- you know, we are within the West Puerto Chiquito Pool. They are under -- they have similar operations going on for gas reinjection. We are very much comfortable with the rules set out for them, and we would certainly like to have similar rules.

Number one, we will comply with the allowable. We will injection gas. The GOR calculations should be a net GOR calculation. So any gas injected should not count towards a GOR base, and that's standard for the southern pool.

So we're really asking for a standard approval here for a scheme that's been tried and true several times to the south.

MR. STOVALL: The only other thing, and you mentioned something with respect to the relationship between this hearing and the previous hearing before Examiner Stogner, is the only thing I heard you say is even if you get approval here, if Examiner Stogner says shut it in until you catch up --

THE WITNESS: We would wait. Exactly. If we have approval, we would just time it accordingly.

MR. STOVALL: But you would go ahead and get the approval at this time?

THE WITNESS: Oh, it's very important because the hearing in July really dealt with the issue up to today. This hearing deals with how we deal with this gas from this day forward. If we cannot inject the gas, basically the only other option economically is to continue to flare it.

And so, you know, this body would then have to decide whether that's what they really want to do. Because it's not really economic to build a million dollar pipeline for a single well at this point in time, even with these existing wells around it. And technically you just don't want to do that; you want to inject gas.

MR. STOVALL: From a business decision-making standpoint, and again this is more for my own information, if this results in an order approving your injection, am I correct in assuming it would be helpful to you to have an order out from the other case to help you make the decision with respect to timing?

THE WITNESS: Oh, very much. In essence, in order to implement this, we have to expedite the whole process. As locals you're very familiar with the winter conditions up in the Jicarilla tribal lands. It's extremely difficult and extremely costly to operate.

MR. STOVALL: Something like northern Alberta; right?

THE WITNESS: Yes. And so we really need to do this in the next three months. And we very much want to do it concurrently with the final portion of the test. So that when the test is done everything is clear, and we can begin our injection under an approved basis. And then this whole concept of conserving gas has been dealt with in an efficient matter.

So I think it's important that everything be sort of tied up in a neat, little --

MR. STOVALL: I will say to you now, in the context of this case, that I will discuss with Examiner Stogner, and I'm sure Catanach and Stogner will get together to see that you get two orders that will allow you to make a decision. Regardless of what they are, at least you'll have the whole thing tied up.

THE WITNESS: We certainly would encourage the OCD to try to expedite that process of getting an order out. I know you're very full and have a lot of cases, but, you know, it's a very significant issue to us.

EXAMINER CATANACH: Are you done?

MR. STOVALL: I was just trying to clear a few things up for you, Dave.

Q. (BY EXAMINER CATANACH) Mr. Artindale, generally when we approve a pressure maintenance from a waterflood project, there is a project area associated with the order. Do you have any recommendations as to maybe what that project area should initially consist of?

A. Yes, I would recommend that it would consist of Sections 2 and 3.

MR. STOVALL: Would that include the east half of 4 just because it's part of the proration for 3-F?

THE WITNESS: Sure. You could certainly include that.

I assume your project units include the producing wells as well?

EXAMINER CATANACH: Right.

THE WITNESS: Yeah. You could include Sections 2, 3, and 4 or the east is half of 4.

Q. (BY EXAMINER CATANACH) What is the fracture orientation direction in this area?

A. Well, in fact there are two fracture directions. One runs north-south, and the other a conjugate set runs east-west. The gravity drainage system depends on the east-west set.

Just like most fracture systems, you have two sets, a primary set and then a conjugate set.

Q. The primary set being the east-west?

A. No. The north-south.

Q. North-south?

A. It's primary in the sense that it has extremely good permeabilities, but from our information, contains a lot less storage. Your primary storage fractures are in fact the conjugate set, running east-west.

Q. Injection into the No. 2 well will have some effect on the wells to the north?

A. They likely will, yes. They -- in fact, it may help to maintain pressure in that environment. Certainly it should not affect their production because they're already producing under a gas cap and highly gas saturated conditions.

And also our data suggests that their reservoir pressure is between 200 and 300 pounds currently. Our initial pressure was 500, so there wasn't absolute direct communication already. They produced 2 million barrels out of there and dropped our reservoir pressure down to theirs. So we know that it's not going to an instantaneous direct communication, which also is very favorable.

As I mentioned, all the wells in Section 26 basically are stripper wells. Gas injection into Section 2 should be nothing other than beneficial to them.

MR. STOVALL: That would raise a question. First prefaced, I understand you to say that you don't think there will be a very significant volume of gas going up that way; is that correct?

THE WITNESS: Well, it's all a function of the communication. But we're putting in 800 Mcf a day of gas. That's not a large volume of gas. Don't forget it will disburse in all directions.

MR. STOVALL: Correct.

THE WITNESS: It will primarily try to maintain the pressure from the number one source of production. They're producing 30 barrels of oil per day north. We're producing 600 barrels of oil per day west. Its primary reaction will be to maintain pressure in an east-west direction. There's no pressure driving going, you know, north-south.

MR. STOVALL: Where I'm going with that, I mean, those wells, to the extent they're producing gas, they're venting it; right? So if there were a line of communication, one of the concerns would be that you would put gas in that we're not permitting you to vent from the 3-F. If it were too open, you would send it north and let them vent it from the Boulder Field.

THE WITNESS: That's why I say it's kind of a guess in both senses that you do not have, you know, great communication between the two sources. You can just tell by the initial pressures. We almost have twice the pressure that they have.

MR. STOVALL: So what you're saying is that the issue I've raised is not a practical concern because you don't think there will be enough gas going there to --

THE WITNESS: Well, you have to understand 800 Mcf a day of gas -- let's assume that it would go north.

MR. STOVALL: I understand all that. You don't have to repeat that.

THE WITNESS: It has to disburse, number one. So it's not as if it goes to one well and --

MR. STOVALL: I understand.

Q. (BY EXAMINER CATANACH) You've stated at this point in time you can't assess what increase in recovery will result from gas reinjection?

A. Well, all we can do is share with you what people have found in other cases and other circumstances. You know, it's difficult to put a number on it. I could put a number on it and be very convincing, but I'm just telling you that you truly can't quantify numbers at this point in time.

Every bit of information we've been able to assess or read in literature or other case studies suggests that it will be beneficial in some fashion. We don't know if it's going to be widely beneficial or only marginally beneficial.

Q. Let me talk a little bit about the mechanical configuration of your well.

A. Yes.

Q. You've got an uncemented liner in 4218 down to total depth, or close to total depth.

A. Yes.

Q. Do you have any -- do you anticipate the gas going anywhere but in the Niobrara Formation?

A. No, we do not. Of course, this well

was producing gas prior to injection, and we certainly didn't sense any loss of gas to any other formation while it was producing. The whole production liner has been cemented. The only zone that the liner is completed into is in fact the Niobrara zone. So it really doesn't have any access to another zone other than the Niobrara.

Q. I'm sorry. You said the production liner?

A. No. The production casing --

Q. Okay.

A. -- that's been set to 4569 feet, has been cemented to almost all the way to the surface, to 330 feet from surface, so just about 80 feet from the bottom of the surface casing. So in fact all the other zones have been cemented in this wellbore.

The liner, which is not cemented, is only set through the Niobrara zone. So the whole liner is within the zone of application here.

Q. Right. But in fact the annulus is open up to a depth of 4218?

A. The annulus between the production casing and the liner, yes. But the production casing itself is cemented, so the annular area is. But that would be the same annular area that's available in the tubing; right?

Q. Uh-huh. The liner, right out of the shoe of the production casing, are those perforations at that point?

A. Yes, they are. And the reason we like to perforate near there is for workover reasons. If you ever want to circulate out anything or any material that might be in the well, you like to have perforations close to the top of the liner. Again, those perforations are within the Niobrara Formation.

Q. Where would the top of the Niobrara Formation occur in this well?

A. Well, we have an attachment in here that shows all the tops. And the top of the Niobrara A at measured depth is 4348. The top of the Mancos is 3155. In fact, the top of the Niobrara A that we quoted, 4348, is the top of the Niobrara A sand interval, not truly the top of the Niobrara A.

So a good reference point is in fact the Mancos top, which is 3155. And then you have what's called the gray zone, and that goes down from there. And somewhere between 3155 and 4348 is in fact the true top of the Niobrara A zone. So we're well within the Niobrara and Mancos members.

Q. Okay. Injection wells in the state are required to pass mechanical integrity tests. How would you propose to demonstrate mechanical integrity on this well?

A. Well, I guess there are several ways. One way we could propose, which in fact we have already done, is that we ran a short-term injectivity test into this well to determine the permeability of the 2-A so that we know we could inject into it. And that test certainly established that we had mechanical integrity in the wellbore, unless the state has some other suggestions which we would certainly be open to.

You know, one thing that's very difficult with this is that you're dealing with fractures that are extremely permeable. As soon as you apply any sort of pressure, you basically get a vacuum condition and the fluid is gone into the fractures. So it's very difficult to ever challenge the true integrity of the wellbore because the system is just so permeable.

Q. And the way the well is set up now, you can't run the traditional pressure test on the liner?

A. No. There's no way that you could run a pressure test on the liner. You could conceivably run a pressure test on the casing, but I don't know why that would be necessary.

Q. Where do you intend to set the packer?

A. The tubing packer?

Q. Uh-huh.

A. That hasn't really been determined yet. Likely we would set it, you know, right near the end of the production casing, around the bend. There's no real need to set it into the liner as we have. We did that for production pumping purposes.

You know, I don't know exactly -- oh, that would be the end of the tubing. I'm not sure exactly where we would set the packer. Likely the packer would be set more uphole out of the severity of the horizontal bend. But the end of the tubing would likely be moved up somewhat.

Q. Have you supplied an analysis of the fluid you're going to be injecting?

A. I don't believe I've provided it in

this documentation. We have an analysis that could be sent to this department. As I mentioned, it is the solution gas from the 3-F-1. So it's native gas to the system. We certainly have a gas analysis that we could submit.

Q. Is it generally dry gas?

A. There appears to be liquids in it. We're going to be running it through a different separator to remove those liquids.

Q. Prior to injection?

A. Prior to compression because the compressor is the key thing here. And in fact, in talking with Mr. Al Greer, he suggests that it's beneficial to maintain as much of the liquids as we're comfortable with in injecting because in fact a little bit of liquids in the injection gas can be beneficial.

So we're more concerned about the liquids in the compressor stages than we are in the injection stage.

Q. You don't have any plans to utilize any different tubing? Generally we require lined tubing. Do you have an opinion on that?

A. Well, I guess our position is that it would probably be just an economic waste in the sense that this is native gas. The tubing was designed to produce the same gas that we're going to be injecting. Therefore, we would certainly not want to change out the tubing. It would not be technically necessary. There's no corrosive components to this gas.

Q. You stated that you were going to drill or you had plans to drill more wells in this area. Do you anticipate more gas production from the new wells that may be added to the No. 2-A?

A. Well, we certainly have plans to drill more wells. The wells that we are drilling are to the west of the Section 3 well. They are on the base of the monocline. We will have to deal with the gas.

When we drill them and test them to determine the quantities of gas that they're going to be producing, we will then have to assess whether or not we want to inject that gas into the Section 2 location or whether in fact it's prudent to produce or to sell that gas.

Because on the base of the monocline, you could do not have gravity drainage; it's a solution gas-drive mechanism. So it's kind of like apples and oranges. So really once we drill those wells, we have to assess the validity of gas injection or gas conservation through a pipeline at that point in time.

I can assure you, though, that we're going to respond quite a bit quicker than we did this time.

MR. STOVALL: You say you know about the 60-day rule now.

THE WITNESS: It's drilled into our minds.

Q. (BY EXAMINER CATANACH) At this point in time you have no foreseeable plans to add any more injection wells?

A. We do not.

EXAMINER CATANACH: I believe that's all I have.

Any further questions?

MR. CARR: Nothing further.

MR. KELLAHIN: I have a statement of our position.

EXAMINER CATANACH: Okay. Mr. Kellahin, I would welcome your statement.

MR. KELLAHIN: Thank you. On behalf of Mr. Greer, Mr. Catanach, he sympathizes with the difficulties American Hunter has had in jumping over a multitude of various jurisdictional hurdles to accomplish the success of their project. And it seems to never end for them, and he certainly has sympathy for them.

They're nice guys, good engineers. He's developed a friendship and rapport with these people on both a personal and a professional level. However, he must oppose this application until it is coordinated with the formulation of a unit area so that the pressure maintenance project can be done under a unit concept.

I think that's the appropriate way to do this, Mr. Examiner. You can see that by the extreme permeability of these fractures, the gas injected in this well, that we simply have no clue as to how far it will go and how fast it will take to get wherever it's going to be.

Mr. Greer overcame that problem in his area when he developed an entire unit, a substantial area to give everyone protection, comfort, and satisfaction that the gas injection was going to stay confined among those properties that were participating in that effort.

Mr. Artindale referred several times to expedite the process. And I think what you have seen today is not a pressure maintenance project but simply an application for gas disposal. This gas is their way; they need to get rid of it; and here's a place to put it.

The application is premature. It is in advance of its science. He's gotten ahead of his data, his calculations, the kinds of questions I asked as a layman, to give me comfort that he has studied the reservoir and has the data from which to make those calculations, he candidly admits are going to await the outcome of some of this interference data that's being generated.

The presentation is incomplete. We, as lawyers, have to sit here and guess at the geology. You have to speculate about some of these items, and yet you're supposed to approve this and take comfort in the fact that the gas instead of being flared is being reinjected.

I maintain that they're ahead of their proof. It's premature to approve it at this point. And their desire to expedite the process should not cause you to jeopardize the correlative rights of other interest owners.

For example, when you asked him what a project area ought to be, he suggested Sections 2, 3, and the east half of 4. If that's his project area, he has got area dedicated to this project that is farther removed from his injection well than a substantial portion of Section 10 controlled by Mr. Greer. You know, there's no rhyme, sense, or reason to that project area.

We ought to go back and build this boat right. It's got to float through all these regulatory hurdles, and it's got a bunch of holes in it right now. It's going to leak. And one of the big leaks is that it doesn't have a well-defined, defendable project area. And the only way you're going to get that is to form a unit so that parties that are potentially affected with this gas injection have the opportunity to share in that risk and derive the benefits if it's successful.

I'm not suggesting that this can't ultimately be approved, but they have come before you too soon. Until the data is there to justify and answer some of the questions posed, then it serves no one's purpose to approve this gas disposal application at this point in time.

Thank you.

EXAMINER CATANACH: Mr. Bruce.

MR. BRUCE: Mr. Examiner, Billco's primary concern is that injected gas will migrate to its leases and gas out its wells. Current pressure by this witness' own testimony of the 3-F well is still close to 1400 pounds. The injection pressures are about 6- to 800 pounds.

We do not believe that the pressure or the injection of gas into the 2-A well will enhance the 3-F well at all due to the difference in the bottomhole pressures. Rather we believe that the gas will migrate over to the Billco wells which have pressures of about 300 pounds.

Billco's wells are stripper wells in a depleted field. At this time they're producing small amounts of oil, several wells. Billco fears that the injected gas proposed by American Hunter will migrate to Billco's wells, gasing out of the wells, and causing them to be nonproductive of oil.

Since there is no gathering, gas gathering system in the vicinity, Billco's wells will then have to be shut-in and abandoned, and we do not think that's proper. As a result, we would request that you deny the request by American Hunter. Thank you.

MR. CARR: May it please the Examiner, American Hunter is before you in an effort to comply with requirements that we believe are being imposed by the Oil Conservation Division, although admittedly we have not received an order in that regard as of yet.

We've been out developing an area in which there's really been no development for over 12 years and where the wells are in an advanced state of depletion. And yet the people who have been there for 12 years suggest that trying to do something that is consistent with sound conservation principles with the gas we are producing is premature. Maybe we should go back and sit back for another 12 years.

You see, what we've done is triggered an awful lot of activity up here and we're wading through a regulatory maze only now to discover that the section in which these wells are located is under study by the federal authorities and no drilling will be permitted.

Until we get over that hurdle, until

the actual status of the leases involved in the area can be determined, because there are questions about whether or not they've been prudently developed and are in good standing, we can't form a unit.

And so the option is to, say, shut down the effort of the people who have come out here and taken the risk, developed the property, and are making a good faith effort to comply with your directives as best we can understand them.

What you have today is a lot of speculation but no technical evidence from competent witnesses that say anything except this application will prevent waste. This application will protect correlative rights.

I have great respect for both Mr. Kellahin and Mr. Bruce, but what they have been saying is simply commentary emanating from the lips of counsel, not from technical witnesses. And on the record before you, you have no alternative, I submit, if you follow your statutory directive and look at this record but to grant this application.

And we would request that it be done in an expeditious fashion because, yes, we have gas that we are producing, and we do need something to do with it. And we are before you with a proposal which will permit us to handle this in a way which is sound from a conservation point of view.

EXAMINER CATANACH: Thank you, Mr. Carr. There being nothing further, Case 10534 will be taken under advisement.

[And the proceedings were concluded.]

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 10534, heard by me on August 6 1992.

David R. Catanach, Examiner
Oil Conservation Division

CERTIFICATE OF REPORTER

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

I, Debbie Vestal, Certified Shorthand Reporter and Notary Public, HEREBY CERTIFY that the foregoing transcript of proceedings before the Oil Conservation Division was reported by me; that I caused my notes to be transcribed under my personal supervision; 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 26, 1992.

Debbie Vestal

DEBBIE VESTAL, RPR
NEW MEXICO CSR NO. 3