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

16 July 1987

COMMISSION HEARING

IN THE MATTER OF:

Application of Amerind Oil Co. for an unorthodox oil well location, Lea County, New Mexico. CASE 9143

BEFORE: William J. Lemay, Chairman
Erling Brostuen, Commissioner

TRANSCRIPT OF HEARING

A P P E A R A N C E S

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I N D E X

I N D E X CONT'D

E X H I B I T S

MR. LEMAY: We'll call next Case 9143. Application of Amerind Oil Company for an unorthodox oil well location, Lea County, New Mexico.

Applicant in the above styled case seeks approval of an unorthodox oil well location for a well to be drilled 330 feet from the south line and 1980 feet from the west line, Unit N, of Section 33, Township 16 South, Range 37 East, Shipp Strawn Pool, the east half of the southwest quarter of said Section 33 to be dedicated to the well.

Appearances, please.

MR. CARR: May it please the Commission, my name is William F. Carr with the law firm Campbell & Black, P. A., of Santa Fe. I represent the applicant, Amerind Oil Company. I have two witnesses.

MR. LEMAY: Thank you, Mr. Carr.

MR. KELLAHIN: Mr. Chairman, I'm Tom Kellahin of the Santa Fe law firm of Kellahin, Kellahin, & Aubrey. I'm appearing on behalf of certain offset operators and working interest owners that are opposed to this case.

I represent Tipperary Corporation, Pennzoil Company, and Mr. W. A. Moncrief, Jr. I will

have three witnesses.

MR. LEMAY: Okay. Can the witnesses stand. I will swear them in at this time.

(Witnesses sworn.)

MR. LEMAY: Do you care for any opening remarks, gentlemen, or just like to go into the hearing.

MR. CARR: I have none.

MR. KELLAHIN: No, sir.

MR. LEMAY: All right, fine. We'll begin then with Mr. Carr.

MR. CARR: At this time I'd call Mr. Greg Hair.

GREGORY L. HAIR,

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

DIRECT EXAMINATION

BY MR. CARR:

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

A Gregory L. Hair, Midland, Texas.

Q Mr. Hair, by whom are you employed and in what capacity?

A I'm a consulting geologist presently employed by Amerind Oil Company in the -- this case.

Q Would you briefly review your educational background for the Commission?

A Yes. I received a Bachelor of Science in geology from Illinois State University in 1974; Master of Science in geology from University of Texas at El Paso in 1977.

Q Would you now summarize your work history, please?

A Yes. I began work with Pennzoil Company in Houston, Texas, in 1976; transferred to Midland, Texas, in 1979; worked in Midland, Texas, with Pennzoil from 1979 through 1986. Since 1986 I've been a consulting geologist, since December of '86.

Q Could you briefly review your involvement with Strawn exploration and development in Lea County, New Mexico?

A I began working the Lovington area Strawn with Pennzoil Company right after I moved to Midland.

I worked it off and on for about three years, from 1979 to 1982.

Starting about 1982 it was my primary

responsibility. I worked it exclusively from 1982 through 1986 and the consulting work that I have done since has been in this area.

Q Have you been involved either as a witness or in preparing testimony in all cases heard by the Division or this Commission concerning the development of the Shipp Strawn Pool?

A Yes, I believe I've been a witness in every case before the Commission on the Shipp Strawn.

Q Are you familiar with what Amerind Oil Company seeks with this application?

A Yes, I am.

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

MR. LEMAY: His qualifications are acceptable.

Q Mr. Hair, would you briefly state what Amerind seeks with this application?

A Amerind seeks permission to drill a Strawn oil test at a nonstandard, unorthodox location, in the west half of the southwest -- or east half of the southwest quarter of Section 33, Township 16 South, Range 37 East.

The exact location of that well is proposed to be 1980 feet from the west line and 330 feet from

the south line.

Q Would you now refer to what has been marked for identification as Amerind Exhibit Number One, identify this exhibit for the Commission and review the information contained on that exhibit?

A This is a land plat of the area in question. The proposed location is marked with a red arrow, as are the footages off of the lines marked for the well.

It shows all of the wells in the area. The primary purpose of this exhibit, however, is to show the major working interest owners. I'll comment as an aside that the working interest out here, the mineral interest is very chopped up. There are many, many owners, many lessors.

So primarily, just the major operators and owners are shown on this map.

In the section, or in the unit that we're talking about here, Amerind is the operator and John L. Cox and Texaco are major owners.

Q When you said unit we're talking about -- are you talking about the proposed proration unit?

A Yes.

Q And that would be the west half -- or the --

A East half.

Q -- east half of the southwest quarter --

A That is correct.

Q -- of Section 16, or Section 33.

A Yes.

Q Would you identify the Amerind interest on this plat?

A Amerind has interest in the south half of Section 33, specifically in the southeast quarter of Section 33, and in the west half of the southwest -- or east half of the southwest quarter of Section 33.

They also have interest in Section 4 in the west half of the northeast -- or -- yeah, west half of the northeast quarter.

Q Would you identify for the Commission the current pool boundaries of the Shipp Strawn Pool?

A Yes. As the pool, as I understand the pool to exist now, the pool boundaries -- the pool is included in Section 4, the north half of Section 9, the north half of Section 3, and the east half of the southeast quarter of Section 33.

Q Mr. Hair, I'd now like to direct your attention to the -- what has been marked Amerind Exhibit Number Two, the Isopach map, and I would ask you to, referring to this map, identify the discovery well for the Shipp Strawn Pool. Then, if you could, would you review the order in which the wells were drilled and the pool developed?

A Yes. The discovery well was the Pennzoil Viersen No. 1, located in the southeast quarter of Section 4 and that well was followed subsequent drilling, I'll go through the producers first.

The Viersen No. 2, and the Tipperary No. 1s. The Viersen No. 2 is also in the southeast quarter and the Tipperary No. 1-4 is in the northwest quarter.

And the Pennzoil Shipp No. 1 and --

Q That's in the northeast --

A That's in the northeast quarter, and the Tipperary No. 2, which is in the northwest quarter.

There are some other producing wells down to the south. They're really not germane to this case but the Exxon "EX" State 2 and the Barbara Fasken Consolidated State, and the Pennzoil Viersen No. 3 were drilled at a somewht later date.

Q Now what you've mapped is the porosity in this area?

A Yes.

Q And what you appear to have is separate pods of porosity, is that correct?

A Yes, through Pennzoil's work, Pennzoil's drilling and the pressure information, we observed that there were several separate reservoirs in this field.

Q But they're all in the Shipp Strawn

Field.

A They're all within the Shipp Strawn Field and they're contained within the Strawn formation.

Q Is this typical for Strawn development in this area?

A Yes, it is.

Q Would you briefly review the history of the development of rules for this particular pool?

A Yes, I can. Pennzoil applied -- had a hearing for special pool rules in September of 1985. At that time we proposed, "we" being me with Pennzoil at that time, proposed that the Shipp Strawn should allow 80-acre spacing units; that there should be a minimum distance of 990 feet between the wells; and that operators should be allowed to drill within 330 feet of their lease boundary as a standard location.

Q What action did the Division take on that application?

A The Commission granted that application and accepted those rules.

Q Did -- how long did those rules stay in effect?

A I believe it was three months.

Q And what happened at that time?

A The Commission called by its own call,

asked that the rules be amended. The amendment, as I understand it, is that the standard location for a well would be within 150 feet of the center of a quarter quarter section, and that there was no minimum distance, prescribed minimum distance, between wells.

The 80-acre spacing units were kept.

Q Those rules, as amended, did they provide for the rules to have effect for a mile outside the described pool boundary?

A Yes, they did. There was a mile buffer zone, right.

Q What did the Commission do at that time with wells that had been drilled within 330 feet of the boundary of the proration unit?

A They grandfathered those in and made those standard locations under the current field rules, or acceptable locations, not penalized, acceptable locations.

Q Could you identify those wells that were grandfathered in?

A Certainly. On this map, the Tipperary No. 1, the Pennzoil Viersen No. 2, the Exxon "EX" State No. 1 and 2.

Q Those are in Section 9?

A In Section 9, as we're working our way south, and not on this map but in Section 3, just east of

here, the Pennzoil Waldron, just off the map.

Q And did you testify at that hearing?

A Yes, I did.

Q And what was the general nature of your testimony?

A That the pool rules, as the Commission proposed them, did not allow enough flexibility to balance the risk of drilling these wells; that the pool rules, as Pennzoil proposed them, allowed operators enough flexibility to where they could reduce their risk and be able to drill wells that would be economic without -- without accepting the considerable risk.

I've said at that time that I felt that 330 feet was still allowed for maximum flexibility and allowed operators to develop the pool efficiently.

Q Now the rules, as amended in December of -- at the December, 1985, hearing, have those rules become permanent rules for the Shipp Strawn Pool?

A I believe they have, yes.

Q And that was pursuant to a hearing in November of 1986.

A That's correct.

Q Have you previously been called upon in your work for Pennzoil to interpret this particular reservoir or reservoirs?

A Yes, on several occasions.

Q And have you done that again for today's hearing?

A Yes, I have.

Q Would you explain how your interpretation today differs from the interpretations previously made?

A Yes. In other cases the -- the interpretation today looks very similar with one minor change, and that is an extension of the reservoir which we'll call the Tipperary Shipp reservoir, the northern reservoir, to the north into Section 33. That is the only significant change in the interpretation from previous interpretations.

Q And when you extend it to the north into Section 33, you're extending it into acreage that -- in which Amerind has an interest.

A That is correct.

Q Can you explain what caused you to change your interpretation to extend it there?

A Yes. It's based on new engineering data which Amerind has gathered and they called upon me and asked me if -- they felt that the reservoir was somewhat larger than I had previously interpreted it with Pennzoil and they asked me, if it is larger, how would you make it larger? Where do you think that this reservoir could be -- could be larger?

And upon further, you know, re-evaluation of the data, I pretty much decided that the only place that this reservoir could be larger is to the north. My thinking behind that is that the reservoir is fairly well encircled everywhere else with either separate reservoirs or dry holes.

If you look at the very southern end of the reservoir, there's a well there, the Chevron Lea "YL" State. It's a dry hole in the Strawn, a bonafide dry hole. It limits the reservoir on the southern side.

As we move up the western flank of the reservoir there's a well called the Tidewater State 1-U. This well was drilled back in the early fifties and it did produce in the Strawn, I believe, approximately 60,000 barrels.

It was plugged in the Strawn and produced out of a shallower zone.

The well is interpreted to be in a very limited reservoir, which we have seen others like it out here. That reservoir limits the extent of the reservoir we're talking about today on the west.

As you move on north, the Cox Meyers Well also is a dry hole in the Strawn and it limits the reservoir again on the west.

As we move on around, there's a Tidewater

Meyers Well. It was drilled back in the fifties; again dry hole. It limits at the extreme northern end, northwestern end, it helps limit the reservoir.

On the north end is the Amerind Meyers No. 2, which is a dry hole in the Strawn. It limits it on the northern end, also.

As we move down the eastern flank, the Pennzoil Shipp No. 2 is a dry hole in the Strawn which was interpreted by Pennzoil to be on the very edge of the reservoir, the very edge of the reservoir, so it limits the eastern edge of the current -- the reservoir we're talking about today.

As you moved on down, the Pennzoil Viersen No. 1 has been interpreted and shown by pressure data to be in a separate reservoir. Again it limits the reservoir on the southeast side and the Pennzoil Viersen No. 2 does essentially the same thing. It has been shown by pressure data to be another separate reservoir and it limits the large reservoir that we're talking about today.

Q Based on this well control information you constructed this interpretation, is that correct?

A That is correct.

Q Was anything done to confirm this interpretation?

A Yes. Amerind shot -- had shot, I think,

two seismic lines previously, previous to this in the -- that covered the proposed location, and since coming up with this engineering interpretation, they did shoot another seismic line.

Seismic is a tool out here which Pennzoil used to discover these reservoirs and has used to exploit them.

Other companies have used seismic and it is a valid tool in this area.

I reviewed Amerind's seismic data and it certainly convinced me that there is a possibility that this reservoir does extend into Section 33.

Q Now, Mr. Hair, you previously have stated that you advocated locations 330 feet from the boundaries of hte proration units.

A That's correct.

Q Would you explain why you felt was appropriate and do you feel that way today?

A Okay. Let me start off by saying, yes, I do feel that way today, and the reason I think so is the porosity distribution within these reservoirs.

We're dealing with fairly small pods of porosity scattered over a large area here and you can see by the map that the porosity pods are really very small. I've attempted to show by this map, we don't go from the maximum

porosity and slowly wedge out of porosity. We don't go 60 feet and 50 feet, 40 feet. We go from 60 or 70 feet to almost zero, almost immediately. It's almost like an edge. It's facies controlled. That creates a tremendous amount of risk. When we look this data on seismic and we look at it on other things, we see the overall shape of these pods but we cannot see the porosity distribution with it, and I don't believe anyone can do that.

So the fact that you go from maybe, in this area it looks like 75-or-6 feet of porosity is about standard, down to nothing very quickly, makes the risk tremendously high, and I've always felt, and other companies concur, that because that risk is so high, you need a lot of flexibility in where you drill these wells.

Q In prior hearings when you were advocating 330-feet setbacks from the proration unit boundary, was there any opposition expressed by any other company to that kind of rule?

A None in the hearings, no, none that I'm aware of.

Q In your opinion do the rules that provide for -- require wells within 150 feet of the center of a quarter/quarter section, do they provide sufficient flexibility to provide for development of the reservoir?

A No, and I think that's borne out by the

number -- the tremendous number of unorthodox well locations that have been heard before the Commission in the Lovington Strawn area. There have been numerous of these and I think that that's due to the restrictive nature of the rule and that operators realize the risk in drilling the reservoirs.

Q Would you now refer to what has been marked for identification as Amerind Exhibit Number Three, identify that and review it, please?

A This is a cross section containing four wells in the reservoir.

Starting on the left or south side, we have the Chevron "YL" State, and again this is the dry hole that limits the southern end of the reservoir.

There is no porosity present in the well and it was plugged and abandoned as a dry hole.

The next well, moving up is the Tipperary No. 2. This well is a very good well. It has 127 feet of porosity, excellent producer. You can see the massive nature of the porosity there.

The next well, going to the north, is the Tipperary No. 1, another excellent producer; it has 84 feet of porosity; again, very massive.

The next well, and that well is, I believe, only like 840 feet away, is the Pennzoil Shipp No. 2 and it has no porosity.

So we've gone from in the Tipperary No. 2 to the Chevron No. 1, you've gone from 127 feet of porosity to zero in one location.

Between the Tipperary No. 1 and the Pennzoil No. 2, in 840 feet you've gone from 84 feet of porosity to none in one, in less than one standard location as the rules now exist.

Q What does this show about the risk involved?

A I think the risk is tremendously high. You can see that the Pennzoil Shipp No. 2, at the time we drilled that, when I was with Pennzoil, we considered that a fairly cinch well, it was an inside well, wasn't any big deal, and yet we missed the reservoir being that close to three producing wells.

It shows that the termination of porosity is very abrupt.

Q Why is Amerind proposing the particular unorthodox location which is the subject of this hearing?

A Excuse me, I didn't understand you.

Q Why is Amerind proposing this particular unorthodox location?

A The one -- the proposal is to limit the risk. Again we realize that the reservoir probably extends to the north. It is very difficult to tell exactly how far

to the north. I have made my best interpretation how far, but again, I can't predict exactly where the porosity is going be.

We have a compounding factor in this area which again has testified to on numerous occasions, and that is that the bore holes in this area drift to the north. Bottom hole locations are almost all north of surface locations. This is in the record. We've -- various companies have submitted directional surveys showing that the general drift is to the north. They take slightly other courses but they get there, and in the Drinkard-Abo section there are some dipping beds which give you this north drift.

So while the Amerind Meyers Well is 330 feet from the south line, the bottom hole location will probably be north of that, as happened in the Shipp No. 1, probably happened in the Tipperary wells, and definitely happened in the Shipp No. 2. We showed it in the Viersen. Exxon had it in their wells. It happens in the area, that these wells drift to the north. That certainly adds to the risk of the abrupt termination of porosity.

Q CAn you estimate how many feet the well will -- could be expected to drift to the north?

A In my experience it's been approximately 80 to 100 feet. I think the maximum may be around 120 and there have been some as little as like 75, but I'll say 80

to 100 feet.

Q In your opinion should a well in Section 33 be drilled at a standard location?

A I think that a well drilled at the standard location, taking into account again the termination of porosity, the uncertainty of it, the drift, would be an extremely risky well; probably so risky that it would be difficult to justify drilling it.

Q What conclusions can you draw from your work in the area and your study made in preparation of this hearing, of the possibility of reserves existing under the Amerind property in Section 33?

A I think after reviewing the engineering data that Amerind will present by their next witness, looking at the seismic data, knowing the area as well as I do, that there is a very good possibility that oil exists under Section 33.

I think that a well that would be allowed to be drilled at the proposed location would be able to recover those reserves efficiently. I do not think that it would significantly affect drainage as it now exists. I believe it would recover mostly its own reserves.

Q Do you believe that a penalty should be imposed on production from the proposed well?

A No. As I testified in the field rules, I

do not believe that a well at this location should ever merit a penalty. The wells are risky enough as they are.

Q And why not?

A Because, again, I think you need this much flexibility. I think the reservoir will drain -- the well will drain only on their own tract and I don't believe that a penalty is necessary.

Q Have you compared the productive acres based on your study under this tract and other tracts in the pool?

A Yes, I have.

Q And what does that show?

A It shows that at least between the Amerind tract, according to my interpretation, and the Tipperary No. 1 tract, Amerind shows approximately 26 acres of productive acreage, and Tipperary approximately 25. They're very equal, and spaced over the pool they still seem to be fairly equal. The two southern ones have a bit more acreage.

Q How close to the offsetting property is the Tipperary well to the south of the proposed location?

A It's 330 feet from the Pennzoil.

Q The same as your proposing today.

A That's correct.

Q If a penalty was imposed, could you make a recommendation to the Commission as to how they go about

setting a penalty on this well?

A Yes. I don't believe productive acreage should enter into this because we have no way of knowing what the productive acreage is going to be beforehand. I don't think anyone does when they drill their well.

I believe the penalty should be based strictly on the distance factor, in this case the distance being 330 feet from the line. The minimum allowable distance is 510.

Using that ratio we came up with a 35 percent penalty. That penalty should be applied against the allowable, which is 445 barrels a day, and I believe that's the maximum penalty that should be imposed.

Q And this would be using surface location.

A That is using surface location, yes.

Q If you use bottom hole locations, would that tend to reduce the penalty using this approach that you recommend?

A I think that that should be allowed for by the Commission, that if it is shown that the bottom hole location is, say, 100 feet north, I think the penalty should be reduced by that -- that distance factor, because the bottom -- the bottom hole location is where the Strawn is and that's where the well will be produced.

Q Is Amerind prepared to run a bottom hole

survey to establish that bottom hole location?

A I have been told that they will, yes.

Q What would be the impact on Amerind's plans for development of this area if a penalty in excess of 35 percent is imposed on the well?

A I don't believe that they -- they'd have to seriously look at whether they would drill the well or not, and it would make it difficult for them to, to drill such a well.

Q In your opinion will granting the application of Amerind Oil Company be in the best interest of conservation, the prevention of waste, and the protection of correlative rights?

A Yes, I think so.

Q Were Exhibits One through Three prepared by you?

A Yes.

MR. CARR: At this time I would offer into evidence Amerind Exhibits One through Three.

MR. LEMAY: Without objection those exhibits will be admitted.

MR. CARR: And that concludes my direct examination of this witness.

MR. LEMAY: Thank you, Mr. Carr.

Mr. Kellahin.

MR. KELLAHIN: Thank you, Mr. Chairman.

CROSS EXAMINATION

BY MR. KELLAHIN:

Q As you understand, Mr. Hair, the current Commission is not the Commission that you and I presented a great many of these Shipp Strawn cases to and I would like to have you help me refresh their recollection of what has been some of the activity in the Shipp Strawn Pool, if you will, sir.

First of all, was it not your geologic testimony that helped Pennzoil create the Shipp Strawn Field in the first place, back in, I believe you told us, in September of '85?

A That is correct.

Q And you were an advocate at that time of 80-acre spacing and I assume that you're still such an advocate of 80-acre spacing.

A Yes, I am.

Q When we talk about the Shipp Strawn Pool, so that there's no confusion, that field or the Shipp Strawn Pool includes all the algal mounds that you show on Exhibit Number Four?

A It includes all the reservoirs that I show on Exhibit Four, yes.

Q The Commission or Division has not separately identified each of these reservoirs as their own separate pool.

A I'll say I'm not aware that they have.

Q I want to give some names or labels to the different mounds so that you and I can keep each other straight as we discuss them.

When we look at the Viersen mound, that in fact was the discovery well that you and I used as a basis to establish 80-acre spacing for Pennzoil and the pool.

A That's correct.

Q When we look to the south we're in what I've come to know as the Exxon mound in the north portion of Section 9, and it is in proximity to the Viersen No. 3 Well drilled by Pennzoil.

A That's correct.

Q When we talk about the Exxon mound, Mr. Hair, that was the subject of a Commission hearing back, I believe, in November of '86, was it not, sir?

A Yes, it was.

Q And the purpose of that hearing, was it not, was an effort by Pennzoil to obtain an unorthodox sur-

face location 150 feet from the north boundary of Section 9.

A That is correct.

Q The presentation you made at that hearing was to justify geologically the drilling of the Viersen No. 3 Well without a penalty.

A Yes.

Q All right. As a result of that presentation, the Commission entered an order over our objection, if you will, --

A Yes.

Q -- that not only penalized the location but involved a penalty that allocated the potentially productive acreage as outlined on one of the Isopachs.

A That is correct.

Q All right. You have asked today that Amerind not suffer any penalty in relation to what you have identified as potentially productive acres as they may relate to an 80-acre spacing unit.

A That is correct.

Q However, we know at least in one occasion the Commission in fact has used that very process to penalize Pennzoil in the No. 3 Well.

A Yes, they did.

Q It is not displayed on this exhibit but let me direct your attention to an area just to the west of

the Viersen No. 3, somwhere in between the Tipperary Jons No. 4 Well --

A Yes.

Q -- there was a case that involved a Phillips application for an unorthodox location in the Shipp Strawn Pool.

Do you recall that hearing?

A Yes, I do.

Q And that was a hearing in which Pennzoil had requested to take an 80-acre laydown unit in the -- I believe it was the south half of the southwest quarter of Section 4 --

A I'll trust your recollection.

Q Fine.

A I do not remember exactly.

Q Do you recall that the distance that Phillips wanted from the common line with Pennzoil was a distance of approximately 104 feet.

A Yes, I do recollect that.

Q And the subject of that hearing was whether or not that well should be penalized based upon the fact of the condemned acreage from the Tipperary Jons No. 4 dry hole.

A Yes.

Q And in fact that order entered by the

Division resulted in such a penalty whereby it included a potential productive acreage factor.

A Yes.

Q When we discuss these algal mounds that are located on your exhibit, you characterized them today as I believe you have in the past as rather steep-sided, abruptly ending mounds. They are difficult to find. They are certainly extremely hard to project for subsequent development. Is that a fair characterization of what you said?

A I would say they're getting to be fairly easy to find; they're very difficult to develop.

Q Can you give us an opinion as to what your belief is in terms of the height or relief of the mounds?

A In this particular area the height or relief of the mound would be on the order of around 80 to 90 feet. I believe.

Q When we're talking about Strawn oil pods they are approximately 11,000 feet below the surface.

A That is correct.

Q When we look at your exhibit, there is a final area or pod that includes the Shipp wells and I'll simply characterize it, if I may, as the Shipp Tipperary pod, so that you and I can keep track of that. Is that all right?

A That's fine.

Q I believe you've testified that you have reviewed some engineering information or at least been provided with an engineering opinion that asks you how would you increase the size of the Tipperary Shipp pod.

My question for you, sir, is in the absence of being requested to do that, based upon some engineering information, are there any geologic data or matters that would cause you to redraw the Tipperary Shipp pod other than how you depicted it before the Commission in December of 86?

A If you will allow me to say that geologic data also includes geophysical data, yes.

Q All right, let's further qualify that. In absence, then, of the engineering information and the subsequent seismic work that you've looked at, is there any other -- is there any subsurface information that would cause you to re-draw the December '86 Isopach that you presented?

A I do not believe there have been any wells drilled since then that affected this reservoir.

Q When we look -- I believe you've expressed in some fashion that the seismic information is, I believe you called it a valid and perhaps useful tool for -- for picking well locations.

A Absolutely.

Q All right. When we look at the Shipp No. 2 Well in the northwest of the northeast of 4, that is a well that Pennzoil drilled based upon your recommendation and also based upon seismic data.

A Yes, it was.

Q And what was the result of that?

A Well, I want to thank you for asking because it points out the risk of these reservoirs.

We drilled that well based on seismic data thinking that, boy, we had it down pat. Unfortunately, the well drifted about 100 and -- well, about 112 feet, if I remember it right, to the north/northeast, and we missed the reservoir, and we, at that time, within Pennzoil even tried to talk our management into deviating the borehole. Now, not deviating it towards anyone, but just trying to drill a straight hole, because we still thought we were that close.

That shows the risk in developing these reservoirs. You're so close that 100 feet makes a big difference between an exceptional well and no well at all.

Q Was the Amerind No. 2 Meyers north of your Tipperary pod in Section 33, was that well not also drilled based upon seismic?

A I don't know that of my own knowledge.

Q In the adjoining Section 3 to the east of

the Viersen pod, Pennzoil drilled a Waldron No. 1 Well based upon seismic data, did it not?

A Absolutely.

Q And what was the result of the Waldron Well?

A The Waldron Well was a terrible dry hole.

Q Is it fair to charactize your and my effort, Mr. Hair, to get the Division to give us 330 locations and despite that effort they wouldn't do it and we've got permanent rules for this pool that require wells to be within 150-feet of the quarter quarter section?

A I think it's fair to say that the Commission allowed those -- that ruling. They did make an order allowing 330 feet; thus we have numerous wells which had to be grandfathered in when for no reason that was ever explained to me, they changed their mind.

Q The distance that the Tipperary No. 4 Well, Section 4, is unorthodox is only insofar as it relates to its east boundary line with the Pennzoil tract, is that not true?

A Yes, that is what makes it an unorthodox location.

Q That's a 330 distance, is it not?

A That is correct.

Q And what is the distance from that well

to the common line with Amerind to the north?

A I'm not positive about that. I -- probably 660 but it may even be farther than that. I do not know.

Q If we look at your Isopach and look at that area in the 80-acre stand-up unit for the Amerind No. 3 Well, and we move the proposed location to the closest standard location, which would be 510 feet from the common south line, approximately where would that place you on your depth pay contour lines?

A I don't have it marked off but I would imagine it would place us near the 80-foot contour line.

Q Do you have an opinion or a judgment as a geologist about approximately what type of net pay thickness you would be comfortable with in order to establish what I will characterize as a commercial well? We're talking about a thickness that is not discontinuous, a continuous thickness that you as a geologist are comfortable with to say yes, in this area I need X number of feet?

A As I've testified to previously in other cases, it is possible to make a commercial well with 10 feet of porosity.

Q You talked generally about the drift of the wellbore to the north, Mr. Hair. I don't propose to spend much time on it. My question is whether or not, to your knowledge, Amerind proposes to control the drilling of

the well so that they get a straight hole?

A To my knowledge, no, they will not. It's too expensive and thus they're ready to provide deviation surveys to show, you know, what the bottom hole location is.

Q When you responded to Mr. Carr about your approximation of the productive acres in the two tracts, and you attributed to the Amerind tract 26 acres and you attributed to the Tipperary tract, which is the north half of the northwest quarter, I believe you said 25 acres, were you using this Ispoach as a method by which to make that judgement?

A Yes, I said that was based upon this interpretation.

Q Would that include simply planimetering the area contained within the zero contour line?

A That is absolutely correct. No volume was applied to that.

Q You have recommended to the Commission that the maximum penalty that you would believe appropriate for the location would be one that would be a 35 percent penalty. The top allowable, if I'm correct, for the pool is 440 barrels a day.

A 445, I believe.

Q 445, yes, sir. My quick math shows that's approximately 289 barrels a day for the well?

A I think I came up with 288, so we're --

Q Do you know, sir, what the minimum volume of daily oil production is necessary in order to drill this well?

A No, I have no idea. That's based on Amerind's economics which they -- they're the ones that have to invest. They have to decide.

Q Are you prepared to present any of the seismic data itself or the seismic lines or runs in which I guess you place some comfort in redrawing your Isopach?

A As you and I have discussed many times, that is proprietary data and no, no one presents that, plus, anything that would be done off of it is still based on an interpretation that Amerind would make. They're the ones who have to live with the interpretation when they drill the well, whether it's there or not. It's just based strictly on interpretation.

Q Let me tke a few minutes with you, Mr. Hair, and go over some of the various interpretations you had in the Shipp Strawn.

Mr. Carr has talked about some of the cases that you've been involved with and I have taken some of the Isopachs and other displays that you have worked up and I'd like to show some of those to you.

A Surely.

Q So we might expedite the process here, Mr. Hair, if I may have the Chairman's permission, I will number these exhibits just to keep track of them as Tipperary Exhibits A, I'll use alphabet letters, my other exhibits for Tipperary are numerical, so that if you'll do me the favor of simply noting this is Exhibit A for Tipperary, I will after the hearing go ahead and mark all the copies.

To refresh your recollection, Mr. Hair, this is an exhibit I have extracted, it's Exhibit Number Twenty-five from the compulsory pooling cases between Pennzoil and TXO, done in, I believe, October and November of '85. Do you recall that map?

A Very well.

Q Does this represent, in fact, your work?

A Yes, it does.

Q Just very briefly so we understand the context in which this was presented, this was at a point in time in which the Viersen No. 1 discovery welll had been drilled and there was a competition between TXO and Pennzoil in the northest quarter of Section 4, each operator proposing to orient the 80-acre tract in a different fashion. Is that not true?

A That is correct.

Q And the fuss was over how you were going to speculate about drawing the algal mounds and who was

going to be right and wrong.

A That is correct.

Q And we got lucky and we turned out to drill the well (unclear)?

A As I remember, yes.

Q All right. My point is that in October of '85 you had separated the Viersen No. 1 into the first ellipse running northeast/southwest and that is the one to the southwest corner of the two pods. That's the Viersen 1 pod, is it not?

A That is correct.

Q What was intended to depict -- be depicted by the pod to the north and west of the first pod?

A That was the prospect at that time that Pennzoil drilled the Shipp No. 1 on.

Q At this point what is the black symbol up to the northwest? Is that the Tidewater State No. 1-U Well?

A Yes, I believe it is.

Q The two lines running north and south, those are seismic lines, are they not?

A Yes, they are.

Q And this is a display of those two pods using the available seismic information at that time.

A At that time.

Q All right, and it was your conclusion

based upon that seismic information that the Shipp No. 2 or the Shipp No. 1 pod, based upon that shot line 97, was not extending on into Section 33.

A That is correct.

Q And in fact it does not even show an extension to where the reservoir in fact was developed in the Tipperary No. 4 Well.

A That is correct. Well, excuse me.

Q Yes, sir.

A I don't believe that the Tipperary No. 4 Well is on that line and we -- it's very difficult, as we found out by drilling the Waldron and a couple other wells, you can't extend off of the lines very far. This is a very preliminary grid and certainly was not tight enough for us to develop this reservoir, as we found out.

Q Mr. Hair, let me direct your attention to what I will identify as Tipperary Exhibit B. This also represents a total Strawn porosity Isopach that you prepared on December of 1985.

A That is correct.

Q And this was subsequent to the TXO confrontation, I believe, --

A Yes. Yes.

Q All right, and this is at a point in time where the Shipp 2 Well -- I'm sorry, the Shipp No. 1 Well

that we've just talked about, in fact has been drilled.

A That is correct.

Q In addition, we now have the Tipperary 4-1 Well in the north half of the northwest quarter of 4.

A That is correct.

Q All right. This is your re-evaluation of the Isopach for the Shipp Strawn Field at that point, is it not?

A Yes.

Q Mr. Hair, this is the last Isopach I will show you. I, for the record, will identify this as Tipperary Exhibit C, and this represents your work in October of 1986 in preparation or in fact was submitted as a Pennzoil exhibit at the Commission hearing in its Case Number 9003 of November 21st, 1986. This is your work product, is it not?

A Yes, it is.

Q And to set the stage for what was involved in this case, is this represents the effort to obtain the approval of the Commission for the Viersen No. 3 Well that is located just to the north in the Exxon pod.

A That is correct. It's the open circle down at the bottom, the southern part of Section 3, just north of the number 74 on your map.

Q Let's see, the Viersen 3 will be in the southern end of Section 4, using your display for today,

which is Number Two, if you'll set those together I think we can all keep track of where we are.

A Yes.

Q The Exxon pod on Exhibit Number Two shows the Viersen No. 3 Well and on the Tipperary Exhibit C that is your October '86 depiction of the Shipp Strawn pods, including the Exxon pod as you believed it to be.

A That is correct.

Q All right. Let's focus for a moment on the Exxon pod. The question at the November Commission hearing was in an effort to offset the Exxon well location in Section 9. Pennzoil was seeking an unorthodox location in the southeast quarter of Section 4 for its Viersen No. 3 Well.

A That is correct.

Q Part of the question in that case was the fact that the Exxon well had a bottom hole location approximately 150 feet from a common line with the Pennzoil tract.

A Correct.

Q All right. Other than the Vierseon No. 3 Well, are there any other Shipp Strawn wells on Tipperary Exhibit C that have been drilled since this exhibit was prepared for which we need to make some adjustments?

A On Exhibit C, yes, but they are in the northwest quarter of Section 3. There have been wells dril-

led there. I don't think they're germane to this issue, but, yes, there are wells there.

Q What was your opinion in the November '86 Commission hearing with regards to your anticipation of the thickness of the Strawn lime at the Pennzoil location for the Viersen 3 Well?

A I show here that I thought it might contain as much as 80 feet of porosity.

Q 80 feet. When the well was drilled and completed, Mr. Hair, how many actual feet of porosity did that well encounter?

A I do not know.

Q You have shown it on your display No. 2 today, have you not?

A Yes, I have.

Q And where do you place it on the Isopach for today?

A I place it on the very edge of the pool, or the pod. I believe it's a very marginal producer. It did have some shows of porosity in it. I do not know any more about it than that, so I've put no numerical value to it.

Q The configuration of the Tipperary Shipp pod to the north on Tipperary Exhibit C, that display --

A Yes.

Q -- contains the three wells we've discussed, the Shipp 1, the Tipperary 2, and the Tipperary 1, and it also identifies the Shipp 2 dry hole.

A That is correct.

Q Are there any other wells that you attribute to that pod --

A No.

Q -- since the preparation of this exhibit?

A No.

Q When we look at your Exhibit Number Two for today's hearing on behalf of Amerind, when we look in Section 33, the Cox Meyers No. 4 Well, was that well in existence at the time you prepared the October '86 display that's identified as Tipperary Exhibit C?

A To the best of my recollection it had been drilled, yes.

Q And how about the Tidewater Meyers No. 1 Well, was that well in existence when you prepared Tipperary Exhibit C?

A Yes. It was drilled in the early fifties.

Q And the Amerind Meyers No. 2 Well, was that well in existence at the time you prepared the Tipperary Exhibit C?

A I do not recollect.

MR. KELLAHIN: May I take a moment here?

Q One final point, Mr. Hair, if you'll take a moment for me, sir, and focus on the Tidewater State 1-U Well, on your display for today you give that 35 feet. If you'll look at the October '86 display it also has 35 feet. If you go back the year before to December '85, that's Exhibit B, Tipperary B, am I correct in understanding you placed that one in a mound with wells in Section 32 and at that point you attribute it with 20 feet?

A I, as it's labeled there, the NL above the 20 feet means no log. I did the best I could with what I had.

Subsequent to that I was able to obtain the logs on the well and used those to re-interpret the reservoir. I also came up with some production and pressure data that I did not have when I made the first map, and that's the difference for the change in interpretation.

Q All right, sir.

MR. KELLAHIN: Thank you, Mr. Chairman.

MR. LEMAY: Thank you, Mr. Kellahin.

Additional redirect?

MR. LYON: May I?

MR. LEMAY: Yes, Mr. Lyon.

QUESTIONS BY MR. LYON:

Q I'm V. E. Lyon, Chief Engineer for the Oil Division.

Mr. Hair, I'm an engineer and not a geologist and I need a little help on the geology.

A All right.

Q The cross section that you prepared here indicates that the algal mounds and the reservoir you've been talking about are in a given section of the Strawn. Are those mounds found throughout at a common level, at a correlative interval, or are they scattered through the Strawn, floating in space (inaudible)?

A Let's look at one of the logs and let me go through it.

For an example, let's take Tipperary State No. 1. We'll just use that log, it's an easy one to look at.

The Strawn in this area is -- starts where the heavy line is the datum and we call -- I call that the Upper Strawn. You have a massive limestone there. It's approximately -- well, on this well it looks like it's about 15/18 feet thick. Then you go into a shale that's about 12 feet thick, and then you break out into a limestone again.

That limestone is what most operators in the area call the Lower Strawn Lime.

That limestone extends down to approximately on this log 11,212 feet. That is what we call the Lower Strawn Lime. It's, in this two township area it's very consistent; changes a lot in thickness but it doesn't have any real shale breaks in it or anything else.

Just below that is a sandstone which some operators call the Lower Strawn Sand and some operators call the Atoka. It's the base which all this limestone grew on. That is the end of the Strawn section.

So the bottom of this log is probably in the Atoka.

So we're really only looking at a section here that extends approximately from, well, it looks like 11,000 feet down to a 11,212 feet, is what we're really interested in.

MR. LEMAY: Excuse me one moment. Mr. Hair, could you repeat where the massive limestone was on your -

A Right, the massive lime, the depths are covered up here, but I believe it's at 11,000 -- right around 11,030, I think. Let me look.

Right about 11,030, the top of the massive lime, the Lower Strawn Lime, if you will.

MR. LEMAY: At the base of your perforations, we're talking about the Tipperary 4 State 1?

A 4 State 1, well, if you look at the line that is labeled "Top of Lower Strawn, where it cuts through that wellbore, that's the top of the Lower Strawn Lime, the massive lime.

MR. LEMAY: The top of the massive, that would be --

A That the Lower Strawn is the section that we're really interested in here, just below that shale. All -- I'm sorry.

MR. LEMAY: We're trying to orient ourselves. That would be 11,000 even where your datum is, -7200, so --

A That's right.

MR. LEMAY: -- that would be 11,000, 10, 20, 30, 11,030 feet --

A 30, that's correct.

MR. LEMAY: -- would be the top of the massive lime and the base of th massive lime would be, broadly, 52, then?

A 11,212.

MR. LEMAY: 11,000 --

A 212.

MR. LEMAY: Okay, I follow you.

thank you.

A Okay. The porosity unit in this particular well is fairly near the top of that Lower Strawn Lime. In other wells in the area it's near the base. Sometimes it's in the middle. There are wells that have more than one porosity occurrence within the same lime and they're totally separate. They're just different stages of mound growth within that limestone.

Q Mr. Hair, relative to you 7200 datum line, where -- where is the top of the Strawn?

A Okay, in that particular well the top of the Strawn section as I interpreted it, varies. It's right on the datum, it happens to be in that particular well. That's one of the reasons I chose it.

That's what we call the Upper Strawn Lime, that little lime stringer there.

Q So the Upper Strawn is very thin.

A Yeah, and it does not produce. We only, when we talk about production out here, it's all in the Lower Strawn Lime.

A Okay. Now, in regard to Exhibit Three, between your Chevron Well and the Tipperary 4 State No. 2, you show the jagged line there indicating that the end of the reservoir --

A An end to the porosity, yes, sir.

Q You testified as to the abruptness of the change in there, that the reservoir changes very abruptly where 100 feet can make a great deal of difference.

A That is correct.

Q You also indicated that there is a tendency of the bit to drift to the north.

A Correct.

Q That all of the wells have migrated to the north.

A I believe all of them have; all of them that I know have had directional surveys run, drifted generally to the north, yes. Not all of the wells have been surveyed.

Q That was going to be my next question.

A I think -- I think most of the operators will agree that they have, at least if they've dropped a TOTCO (sic), they have had directional problems in the well. They may not have surveyed to see where it went.

After we got to having problems with this and it became an issue with all the nonstandard locations of trying to get wells in, several people started surveying. Well, the surveys that did come out, I believe, in Case 9003, showed that these boreholes were drifting generally to the north. Now, like I said, they may have an easterly or westerly route in their beginning but their bottom hole location

ends up north.

Q But those wells that have been surveyed drifted to the north.

A That is correct. Now generally by the time they reached the Strawn they've got a dogleg in them. They drift above the Strawn and then straighten again, but the bottom hole location is 100 feet, more or less.

Q Referring to your Exhibit Two, the contour lines for the pods that we're talking about --

A Uh-huh.

Q -- don't show very abrupt sides there. If it corresponded to your cross section here, wouldn't you find your contour lines much closer together than they are here?

A Yes, you would, and I think if the draftsman could get them together where you could see them, I'd do that, but it's very difficult to represent that. That's why verbally I've tried to get across that it's like putting a pod of porosity in there and just cutting it on either end with a knife. Unfortunately I can't get my contour lines in there small enough that it shows that.

I suppose if I put a zero and a 120 I could do that but it wouldn't be very graphic.

Q Right, then if you'd been able to get Pennzoil to deviate Well No. 2 and move it to the west, in-

stead of encountering 10 feet of pay you might have brought in 40 or 50?

A What we think was -- I think certainly -- now remember that that zero was based on a bottom hole location that isn't where this well is spotted. Okay. I think that if a well had been drilled straight down, I think, based on an interpretation, I don't have the logs here to present, I think they could have found as much as 60 feet of porosity.

Q And the thicknesses that you have taken from your logs are shown on here at the surface locations of the wells rather than the possible bottom locations.

A Yes, and the reason I did that was that I don't have surveys on all the wells, so I'd have to show where, yes, this bottom hole is here and this one may be there but I don't really know. That's not a very accurate way to do it, of course, and that's --

Q Okay, let me ask you a couple more questions and I'll (not clearly understood.)

A Sure.

Q In the edge of your pool, which you say is due to a facies change, is there permeability outside the algal mounds?

A In the wells that we have drilled outside the algal mound, the Shipp No. 2, the Waldron, which is just

off this map, there was absolutely no permeability, none.

Q Well, what kind of material is that?

A It's still limestone. It's just non-porous. In the Waldron we took a core. Now, it's just off the edge of the Viersen No. 1 pod. The core was black, laminated limestone, very dense, with absolutely no porosity, whereas in the reservoirs the porosity ranges anywhere from -- it can be effective as low as 2 percent, I think, and it goes up to 16 or 17 percent. I think the average may be 8 or 9, somewhere in that reach. It's crystalline, vuggy limestone with good porosity and super permeability in the limestone.

Q Is there water underneath your oil accumulation?

A Only in very -- in a very few reservoirs out here. There does not, at least in my opinion and engineers that I have talked to have the opinion there is no active water drive in any of these reservoirs because they're self-contained.

Q So, so far as you can tell in your knowledge of the geology of this area, there is no reason to suspect that there's pressure communication between the various pods in the reservoir (not clearly understood.)

A We have shown -- we've tried to show, when I was with Pennzoil and we testified on why these were

separate pods, I think we showed a pressure data then, and I'm sure it's become even more evident now, about how these things are declining at totally different rates.

The Viersen No. 2 pod, the pressure is very low. I don't -- I'm not privy to the information any more, but it's very, very low. It's a very small reservoir. It's almost depleted.

As we produced the Shipp Tipperary pod in the Viersen No. 1 we noticed a shift in pressure there with different withdrawal rates, three wells in one and one in the other, and it separated out the pressures in the reservoir. Yeah, we've seen separate pressures in all of these.

We don't know -- I've never been able to find out from anyone why they think there are so many different pressures readings.

Q In looking at your various exhibits, the reservoirs that have been tapped, and so forth, we have 80-acre spacing and then we have a lot closer to 40-acre density in those.

A I think that's been a problem that's been recognized out here since the very first field rules were put together, that there -- everyone drills on 40-acre spacings. I'm afraid, though, if you went to 40-acre spacings and didn't allow for 80, you would over-drill the reser-

voirs. That would at least be my opinion. You're going to get to where you have so many straws in the reservoir it's not going to do the best job, but effectively, everyone drills wells on 40-acre spacing, yes.

Q Are you familiar at all with Louisiana?

A A little bit. Where at? What part, let's put it that way?

Q Well, there's (not clearly understood.)

A No, I'm not.

Q This is strictly an observation, but Louisiana has a very unusual type of regulation for this type of accumulation and it looks like this is something that -- in order to avoid the drilling of unnecessary wells, it looks like the Commission ought to be able to recognize reservoirs outside of the governmental survey spacing and provide for unitization of those things so everybody could -- everybody's rights could be protected.

A Can I make a comment about that, because I -- I understand what you're saying. I think Mr. Kellahin has pointed out the big problem with that, showing all my old exhibits.

You can see how through time we shot much more seismic; we drilled wells at Pennzoil, and how this evolves from two simple reservoirs into at least four. When do you unitize? And then it's so competitive, I think if we

had -- if I had -- when Mr. Leibrock puts on the pressure data, you'll see now the pressure decline has been very rapid in these reservoirs.

It's so competitive Amerind comes in now -- we've created a tremendous mess on what is the production sharing here, because they're so small. If they were larger I think we wouldn't have that problem but they're so small.

MR. LYON: That's all I have. thank you.

MR. LEMAY: Additional questions of the witness. Do you care to redirect after we have our questions or do you mind?

MR. CARR: Whatever you prefer.

MR. BROSTUEN: I have one question, Mr. Hair.

MR. LEMAY: Sure, Mr. Brostuen.

QUESTIONS BY MR. BROSTUEN:

Q On your Exhibit Two, your proposed location, you've extended your Isopach line to include the -- a portion of the -- of Section 33. Are you confident that the -- based -- I should say based, if you based it on seismic, are you confident those lines continue or would you be looking at a separate reservoir here, as well?

A I -- I really believe that you'd be look-

ing at the same reservoir in this case. I based it on seismic on the engineering data that was presented to me by Mr. Leibrock, which you'll hear in a minute, and strictly that was it. I extended it to the north again because of all the dry holes that I outlined otherwise.

Q Okay, thank you. One other question, also alluding to your Exhibit Number Two, and Exhibit C, presented by Mr. Kellahin.

A Yes.

Q Looking at the well locations in the -- in Section 4 on the -- on Exhibit C and comparing them to the -- your Exhibit Two, it appears that there is some discrepancy.

Was Exhibit C prepared by you for a previous hearing? Is that my understanding?

A It looks like the only discrepancy that I see is in the Tidewater State U Well.

Q That's correct.

A Yeah, I --

Q I was wondering, is that based on bottom hole location or --

A It's on surface location and I'm --

Q -- surface location?

A -- not sure what the discrepancy is. I'll have to admit that slipped by me, and I do not know.

Q So the correct location is as is shown on Exhibit Two.

A Does anyone have a ruler? I want to make sure of what that -- I'm one, you know, without being obstinate about the thing, I'd like to know what that location actually shows there, because it's -- well, the locations are off by approximately 100 feet and I can't tell you which one's correct. There's 100 feet of difference and I hope that that's a draftsman's error.

Q One final question. You testified that on the Pennzoil Viersen No. 3 in the southern part of Section 4, that you did not know the -- how thick the pay was there. Was there a log run on that well?

A Yes, it was, but I have not been able to get a copy of the log.

Q Thank you. That's all I have.

MR. LEMAY: Mr. Kellahin, do you move for those Exhibits A, B, and C to be admitted into the record?

MR. KELLAHIN: I have not done so yet. If procedurally you'd like me to do so, I will do so at this time. We have no objection.

MR. LEMAY: Okay. Well, I have one correction to make just for the record, that your Exhibit Number A, I'd like the record to show that Tipperary Ex-

hibit A refers to Section 4 of Township 17 South, Range 37 East. There's no notation on that section, township, and range.

And the same is true of Exhibit B, that it refers to Township 37 -- or 17 South, Range 37 East.

MR. KELLAHIN: Thank you.

MR. LEMAY: Without objection those exhibits will be admitted into evidence.

QUESTIONS BY MR. LEMAY:

Q I would like to identify the Waldron Well that you referred to. That would be over in Section --

A In Section 3.

Q In Section 3.

A To the best that I can spot it, it's going to be approximately on the heavy border line of my -- of Exhibit Number Two, Amerind Exhibit Number Two.

If you take the heavy border line that borders the map, it's approximately on that line. It may be one side of it or the other, and --

Q How far up?

A -- it's, I believe, 1980 feet from the north, so it's going to be approximately in line with the Shipp No. 1 and over on that dark line. That's going to be

an approximate location but it's very close to that.

Q And you referred to that well, I think, as the terrible dry hole.

A It was horrible.

Q Compared to a not so terrible dry hole?

A This one was so bad it was really -- like I said, we didn't even find anything like we were looking for; it was very terrible.

Q By definition, I don't know of a dry hole that is not terrible.

A Well, at least some you learn something. Well, I guess it shouldn't say it was terrible. We did learn something from that dry hole, so that's something, at least.

Q Thank you. And in regard to your Exhibit Number Three, Mr. Lyon was talking about the lithology in this reservoir, have you run some samples on the wells --

A Oh, yes, Pennzoil's got numerous cores. I've -- I've observed numerous cores through this.

Q And within the massive limestone you've referred to the algae mounds or reefs, I'm assuming that bioherms and algae mounds are used synonymous through here?

A Right. It's going to create some confusion, but so that I don't hear about this if I come back up and testify again, Pennzoil believes, and I'm the one who

made this interpretation, the Viersen No. 1 Well is in an algal mound reservoir.

The Exxon well, the Viersen No. 2, the Shipp No. 2, the porosity distribution's very similar. The animal that created, or the plant that created the reservoir, though, is somewhat different. It's a chaetetes.

Q It's not ivanovia?

A No, it's not ivanovia, chaetetes, C-H-A-E-T-E-T-E-S, a little coral.

No, it is not ivanovia in that case. We cut cores in those wells and found a tremendous amount o chaetetes and chaetetes debris. It appears that they're intimately associated with the algal mounds, the porosity appears to be in the same stage of development but they are not strictly in algal mounds, but the reservoirs were very, very, similar.

Q So where you do not encounter the -- I assume it's a seaweed type, or not?

A No, the chaetetes is more like a coral. The ivanovia, the algal mound is more like a seaweed, yes, it all -- it grows fixed to the bottom.

Q Once you get off those, those mounds, you encounter the dense limestone, as you describe it, it's black limestone, is it, or a dark color?

A In the Waldron it was a very dark, black,

laminated limestone. Now there's a reason for that. The Waldron is in a unique position. There's another large algal mound just off to the northeast of it and it's in a kind of little trough between them. It's in a unique position.

Other wells show a dark gray limestone that's a little more massive than that.

Q Your Pennzoil Shipp State 2 right off the mound, what was encountered in that well?

A It was a very light gray limestone. That's another reason why we think it was -- almost white; had some crystalline material in it; we thought it was very near the reservoir again and it's showing the edges of that facies. Again we lost the porosity before we totally lost the facies.

Q And when you're exploring for these things are you looking for a velocity contrast within the massive Strawn interval or are yu seeing some topographic, stratigraphic relief on top of the algal mound?

A About, in my estimation, 75 percent of the time we're seeing topographic relief.

The other 25 percent of the time we see various things. Sometimes it's an expression of massive porosity, depending on how thick the (unclear). It can be lots of things. We've identified numerous types of anomalies on the seismic. That's been one of the problems. You

do get different types, but most of the time the major anomalies are topographic relief. This limestone isn't thick enough for major velocity anomalies and 200 feet just doesn't give you enough, there's not enough resolution at 11,000 feet, major velocity --

Q So where you see this -- this topographic relief --

A Yes.

Q -- on top of the algal mound, you're talking about relief on, referring to your Exhibit Number Three, on the top of the Lower Strawn, not top of the porosity?

A That is correct, it's on the top of the Lower Strawn.

Q Again referring that back to that same cross section, your last well on the Chevron Lea "YL" State No. 1 --

A Yes.

Q -- it looks to me like there isn't much relief at all there, from that well compared to the Tipperary 4 State 2, is there?

A Just a second here. All right, remember that this ia structural cross section hung above the limestone, so it's going to tend to ruin some of that relief. I've made the relief strictly in terms of thickness.

If you look at the thickness of that well, if you'll permit me, I'll just -- I'll count it off real quickly here, the limestone in that well is approximately, I'll say 135 feet thick in that well. And let's, we'll just use my figures to be consistent and I think 135.

Q And which well are we referring to again?

A The Chevron --

Q Yes.

A -- "YL" State, yes, Lea State.

Okay, if we look at the Tipperary No. 2, and I'll count that off very quickly here, has about 100, I'll say 192 feet of massive limestone.

So in reality, if you hung this on the bottom, where the bottom, or the bottom were flat, which it basically is, it's a gently sloping surface, you'd have about 60 feet of relief on that mound. Yes, it shows considerable.

Q Helps my understanding quite a bit. Thank you.

MR. LEMAY: I don't believe I have any additional questions.

If there are no other questions, Mr. Carr.

REDIRECT EXAMINATION

BY MR. CARR:

Q Mr. Hair, listening to you and Mr. Kellahin reminisce about your experiences, your successes and failures in this area, makes me feel somewhat like an outsider.

You, for Pennzoil, opposed a change in the pool rules, did you not --

A Yes, sir.

Q -- back in December of '85?

A Yes, I did.

Q And at that time I represented Tipperary in support of that change, did I not?

A I believe so.

Q And you and Mr. Kellahin advised us at that time if the spacing requirements were changed for subsequent development operators would need to seek exceptions to the spacing requirements.

A That is correct.

Q Now, Mr. Hair, seismic information is not always the -- absolutely accurate but it is still a valuable tool, is it not, in making your evaluation?

A Yes. As I alluded to in my direct testimony, we think we've gotten to where it's fairly easy to

find these things, or easier to find them, based on seismic, but as I also said, seismic shows us the edges of the pod. It doesn't necessarily show us the edges of the porosity.

So developing one of these reservoirs by the use of seismic is much riskier than finding it. Pennzoil would concur, I'm sure, at least I did when I was there, and we can go out and see these things in gross character, but to find the edges of them is much more difficult.

Q And, Mr. Hair, knowing what you do about the limitations of the tools available to you and the way the wellbores tend to drift in this area, do you recommend to Amerind that they drill a well in 33 at a standard location?

A After reviewing all of their data, not just what is on the subsurface, but the engineering, the new engineering data that they have in their interpretation, and the new seismic data that they have, yes, I could recommend that location.

Q At a standard location?

A Oh, at a standard location, no, I think that would be too risky. It is within the strict limits of a seismic anomaly but it's getting -- it's a very, very risky location. It would be very difficult to drill.

Q If no well was drilled in 33, would (unclear)?

A Well, I would assume that Pennzoil and Tipperary would share in that, with Tipperary getting the lion's share of what would be under 33.

Q If we look at Tipperary Exhibits A, B, and C, they show different interpretations made by you of this reservoir.

A They show the evolution of this reservoir as new data was added, yes.

Q And we have another interpretation by you which has been marked Amerind Exhibit Number 2 in this case?

A That's correct.

Q When you make an interpretation of a reservoir, do you consider all factors, all information available to you?

A I try to.

Q And is one of the things you consider engineering data?

A Yes.

MR. CARR: Nothing further.

MR. LEMAY: Are there any additional questions of the witness?

If not, he may be excused.

Let's take a fifteen minute recess.

(Thereupon a fifteen minute recess was taken.

MR. LEMAY: We will resume. Mr Carr?

MR. CARR: At this time I call Robert Leibrock.

ROBERT C. LEIBROCK,

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

DIRECT EXAMINATION

BY MR. CARR:

Q Will you state your full name and place of residence?

A My name is Robert C. Leibrock. I live in Midland, Texas.

Q Mr. Leibrock, by whom are you employed and in what capacity?

A I am with Amerind Oil Company. I'm a petroleum engineer and Vice President of Amerind.

Q Have you previously testified before this Commission and had your credentials accepted and made a matter of record?

A Yes, I have.

Q You were qualified as an expert petroleum engineer at that time?

A Yes, I was.

Q Are you familiar with the application filed in this case and what Amerind seeks here?

A Yes.

MR. CARR: Are the witness' qualifications acceptable?

MR. LEMAY: They are acceptable.

Q Mr. Leibrock, has Amerind been involved in the drilling of other Strawn wells in this area?

A Yes, we have been involved for over four years now in this particular play in these two townships. We are currently drilling our seventeenth well.

Q What caused you to look at the acreage in Section 33 and conclude that it was worth further investigation as a prospect to develop?

A When we first became involved in the area some four years ago, we made a detailed study of the producing history of the area, primarily to the north off the edge of this map in the Northeast Lovington Penn Field, which is essentially the same type of production. As I say, there's quite a bit more production history in that area and quite a bit of bottom hole pressure information, and by studying that information we were able to determine that it

was quite likely that the productive area to the north extended much beyond the prorationunits of the wells that were producing, and based on that we drilled an exploratory well and several subsequent wells that we think prove that theory based on our study of the reservoir performance, and as I will show some detail here shortly, we think we are able through performance of this so-called Tipperary-Shipp reservoir, to show that a similar type of reservoir performance leads to the conclusion that the reservoir probably extends into the Section 33.

Q Mr. Leibrock, what information in particular caused you to re-evaluate or have this reservoir analyzed.

A Well, first of all, as you noted earlier, we do have working interest in the Pennzoil "BE" Shipp Well in Section 4 and we have received all of their bottom hole pressure information from that well.

Also I've received some information from Tipperary which I think supports this same -- supports the same contention.

Q Is that information set forth on Exhibit Number Four?

A Yes, it is.

Q Would you identify that for the Commission, please?

A Okay, first of all, as you will note on this exhibit in the lower righthand corner, this was originally presented by Pennzoil, Case 9003, as their Exhibit Number Five.

The label of this at the top is the "BE" Shipp No. 1 reservoir, which I believe is synonymous with what we are referring to here today as the Tipperary Shipp reservoir.

At the bottom of the graph you will see the notation NsubP, 10 to the -5th. In other words, each one of these digits represents 100,000 barrels of oil production.

On the other axis is bottom hole pressure data ranging from 200 up to -- up to 25, or I believe 2450 is the number at the top of that axis.

Q Is this an extrapolation of the ultimate recovery they were projecting for this reservoir?

A Yes, I believe it is. If you will notice the last point that they had available at the time of their testimony is a point labeled August 1st, 1986, and using that point combined with some previous pressure information, they extrapolated using a dotted line which does not extend all the way down to the axis, but as you can see, you could extend that line down to that axis to come up with a projected ultimate recovery from the reservoir.

Q Have you placed some additional information on this exhibit?

A Yes, I have. Additional information was obtained earlier this year which is the cluster of three points you will see approximately in the center of the graph.

First of all, if you will look at the Figure 6 at the bottom of the graph representing 600,000 barrels of production from the reservoir, and coming up that line, a triangle is a pressure point taken in the Tipperary No. 1 Well about February 27th of this year.

Immediately below that is the bottom hole pressure taken in the Tipperary No. 2 Well on the same date, and then coming a little bit to the right there you'll see the Pennzoil "BE" Shipp No. 1 pressure point, which was taken about a month later, April 1st of 1987, at which time I believe the cumulative recovery is about 640,000 barrels of oil.

Q Now what do these pressure points show you?

A I think this is very significant, the fact that these three points cluster above this line. I believe there's only two possible reasonable explanations that could normally be drawn from this type of behavior; the first being oftentimes in water drive reservoirs you will --

you will see when you take subsequent pressure readings over a period of time, that they tend to come up above the line as this does.

As has been testified earlier, I believe everyone, all the operators in this reservoir do not believe that this is water drive, or any active water drive at all.

So I believe the only other possible conclusion from this behavior is that there is a significant amount of oil migration into -- into the reservoir portion in Section 4, coming in from some other area.

Q When you take these pressure points and extrapolate them out as they originally did on their Exhibit Number Five in the prior hearing, does this suggest to you a larger reservoir than was originally expected?

A Yes. I think it would give you a significantly larger reservoir.

Q Is there a pressure gradient within this reservoir?

A Yes, and again referring to these three points in the middle of the graph, I think you could note a very sharp pressure gradient. I have not labeled it on the -- on the exhibit presented by Mr. Hair, but if you would refer to the three wells in the reservoir, you'll notice the two southernmost wells, the Tipperary No. 2 and the Pennzoil No. 1 had about the same pressures at this point in time,

whereas the Tipperary No. 1, the northernmost well, had pressure a couple of hundred pounds higher, and I think this is extremely significant. If this was a more or less symetrical reservoir with each of these three wells approximately the same distance from the boundary, I think the reasonable expectation would be that the pressures would be much closer than they are, but the fact that the Tipperary No. 1 Well is a couple hundred pounds higher very definitely leads me to conclude that there is more, a significantly larger extent to the reservoir to the north.

Q Now based on this information, when you got this information what did you do?

A When I got it I immediately started trying to do this type of analysis as I pointed out that we had done earlier in other reservoirs.

Q Was this the information that caused you to bring Mr. Hair into this evaluation?

A Yes. As Mr. Hair has noted, he's been involved from -- with Pennzoil and more recently with us very extensively for the past several years, and since he was no longer with Pennzoil I asked him if he would, to give us his current interpretation on this area.

Q And in conjunction with that did you do anything to confirm his interpretation?

A Yes. I think that this pressure informa-

tion supports his very closely, combined with the seismic interpretation that he presented.

Q Has notice of this application been given to all offsetting operators and other mineral owners in the area as required by Division Rule 1209?

A Yes. Yes, it has.

Q Is a copy of that letter and the return receipts marked Amerind Exhibit Number Five in this case?

A Yes.

Q Were Exhibits Four and Five prepared by you or compiled under your direction?

A Yes.

MR. CARR: At this time we move the admission of Amerind's Exhibits Four and Five.

MR. LEMAY: Without objection Exhibits Four and Five will be admitted.

MR. CARR: That concludes my direct of Mr. Leibrock.

MR. LEMAY: Mr. Kellahin.

MR. KELLAHIN: Thank you, Mr. Chairman.

CROSS EXAMINATION

BY MR. KELLAHIN:

Q Mr. Leibrock, have you made any engineer-

ing calculations to determine the amount of original oil in place in the Tipperary Shipp pod?

A Yes, sir, we have made attempts to do so. I decided not to try to submit that here because I don't think that we have enough of the information to be able to conclusively use that, in my judgment.

Q Have you made a determination of what percentage of the reservoir area at pore volume are contained within the Amerind 80-acre spacing unit in Section 33?

A No, for the same answer that Mr. Hair gave, we have not tried to make any volumetric comparisons as you suggest; however, I am confident that were those to be done you would come up with very similar proportions of the reservoir that you come up with from the surface a planimeter measures.

Q The engineering data that you've relied upon is a study of pressure information?

A Yes.

Q Have you concluded from that pressure information that you have a quantity of oil in the reservoir that could not be contained within a reservoir the size and shape as depicted by Mr. Hair in October of '86 on the Tipperary Exhibit C?

A As to the shape, I don't believe this

pressure information gives you any specific determination on that, except as a I testified and the fact that the Tipperary 1 Well has an anomalously high pressure as compared to the other two.

Q I'm trying to categorize in my own simple way the degree of sophistication of the engineering information. I guess you have told me that what you have utilized the pressure information to tell you is that there is a difference that you see between the pressure in the Tipperary 1 Well to the north versus the pressure information for the two southern wells.

A I'd say that's correct.

Q And based upon that, you have reached the opinion that the reservoir must have a different shape to it than one presented to you on Mr. Hair's Isopach of October '86, where he has shown the three wells and the relationship of those wells within the pod to be approximately equidistant.

A Yes, sir, that is correct, and as I've testified, we have information that was not available to him at that time.

Q Taking that bit of information, engineering data, can we also redraw the Isopach that Mr. Hair did, and instead of extending it into 33 simply widen it at the top, moving to the west as opposed to the north?

A Well, you can certainly draw it that way but we think the most reasonable interpretation based on these pressure differences that I've noted, is to the north. As mr. Hair noted, it's pretty difficult to draw a significant extension in any other direction.

Q So the decision on the shape and size of the reservoir is a geologic interpretation based upon Mr. Hair's study of the geology with the additional fact that he needs to take into consideration the pressure gradient or the differences in pressure among the three wells.

A I would say yes.

Q Have you calculated, sir, the minimum volume of recoverable oil that you'll need to get for this well in order to repay its cost one time?

A No, I have not, although that would be easy to do. Recover the cost one time? In other words, pay out the well?

Q Sure.

A Probably on the order of 40,000 barrels.

Q You said that Amerind's had experience in the Northeast Lovington Penn Pool?

A Yes.

Q That's a Strawn oil pool, is it not?

A Yes, sir.

Q Very much like the Shipp Strawn?

A Very much.

Q Okay. Within the Shipp Strawn Pool itself, can you identify which wells Amerind has drilled?

A The Amerind Hager Well in the southeast of the southeast of 33 is not shown as a well. It's just recently completed a couple of weeks ago as a producer in the Shipp Strawn Field, although we think it is almost certainly in a reservoir totally separate from the one at issue here.

Q That was my next question.

A Okay, and also to answer your original question, also off this map in the northeast quarter of Section 3 in a third or additional reservoir, we have another well at that location in the Shipp Strawn Field.

Q Were you involved in the drilling of the Amerind Meyers No. 2 Well to the north?

A Yes.

Q Was that well drilled based upon seismic information?

A Partly, yes.

Q And what was the result of that one?

A It was a dry hole in the Strawn, completed in a shallow horizon.

Q Using a minimum recoverable oil volume of 40,000 barrels to repay the cost of the well one time, ap-

proximately what well cost are you using?

A Approximately 500,000.

Q And approximately what well -- oil price are you using?

A That's a good question. It's about $20.00 today.

Q Have you calculated or otherwise determined what would be the minimum daily oil allowable that you would need for this well in order to justify its drilling?

A I believe the testimony presented by Mr. Hair is the same that I would use as to --

Q His testimony was that a 35 percent penalty would give you approximately 288-or-89 barrels a day.

A Right, and I would say, as he did, that this is certainly the minimum we feel that we could tolerate.

For the same reasons he testified, we do not feel that we should be assigned any penalty.

Q At 288 barrels a day how long will it take you to pay out the well one time?

A Well, I'd just have to see. Let me calculate that out. Probably five months.

Q Comparing your wells in the Northeast Lovington Penn Pool, where that -- is the allowable for that pool 440 barrels a day?

A No, I believe it's 500 or it's somewhat more than in this pool.

Q There's a depth bracket difference, then?

A No, it's the same depth bracket. For some reason, when those pool rules were made they assigned a higher allowable.

Q That's an 80-acre spaced pool?

A Yes.

Q Well locations in that pool are 150 feet to the center of a quarter quarter?

A Yes, sir.

Q On unpenalized wells in that pool, how long does it take Amerind to pay out the cost of those wells?

A Well, you would go through the same analysis. Assuming it's making the allowable, it could be as little as four months.

Q And is your testimony that you wouldn't drill this well if the payout time was required to be in excess of five months?

A Well, the payout time to us is not that critical factor; obviously it's something of a factor, but I would say the ultimate recovery of the well is the primary factor.

Q So the ultimate recovery is going to have

to be what number in order for it to be economical?

A Well, I have not tried to calculate that, but we think based on our interpretation of the reservoir, that it should be the same order of magnitude as the current producing wells.

Q As a rule of thumb would you expect to recover your costs two or three times at a 2-to-1, 3-to-1 ratio?

A Hopefully at least that. I think these existing wells have already exceeded that.

Q Do you have an approximation or opinion as an engineer as to what the expected life of the Shipp No. 1 Well is to the south and east of this pod?

A I have not tried to calculate that exactly, but certainly, probably on the order of ten years.

Q You've testified before the Division on behalf of Amerind in cases involving the Northeast Lovington Pennsylvanian Pool, have you not, sir?

A Yes, sir.

Q In fact you testified on behalf of Amerind in opposition to Texaco's request for an unorthodox well location in that pool.

A Yes, I did.

Q And was it not Amerind's position in that case that the Texaco well location ought to be penalized

with regards to its ratio of nonproductive to productive acreage?

A That's correct.

Q And in addition, didn't you propose that that penalty for the Texaco well ought to be a penalty that was based not on top allowable but on the average current production for the other wells that were offsetting that location?

A Yes, I believe I did. If I may make another statement in regard to that testimony.

I think there's a key difference in that case, namely, in the case you referred to earlier, there was a Strawn dry hole very near or maybe exactly in the center of the 40-acre spacing unit; whereas, in this -- in this 40 acres, namely the southeast of the southwest, there is no well.

Q Your dry hole is farther away, then, from the proposed unorthodox location than the Texaco dry hole was away from their location?

A Yes, much more.

Q Nothing further.

MR. LEMAY: Additional questions of the witness?

MR. LYON: I'd like to ask one or two.

MR. LEMAY: Mr. Lyon.

QUESTIONS BY MR. LYON:

Q Mr. Leibrock, referring to your Exhibit Four, what is your datum at the extreme upper lefthand corner? I think that's marked October 28, 1985 (inaudible).

A Yes. And I was not at the hearing and do not have all the details of each of these points.

Q Do you know what well that represents, the pressure?

A No, I don't, although it probably would be fairly easy to determine. I'm not sure which one it is.

Q There are -- there are two lines on this exhibit. Are they related?

A I do not know for sure. Normally, on this type of graph you see the change in slope there at the bubble point in this type of reservoir. I'm not sure if that's what they were trying -- if Pennzoil was trying to show that being the bubble point in this case or not. The -- because the information that I have from other reservoirs indicates a bubble point up in the 2500 psi range.

Q Now on the three pressure points that you've testified to, the Tipperary 1 and the Tipperary 2 were evidently taken at the same time when the reservoir recovery was about 16,000 barrels?

A I believe that's correct.

Q And the Shipp Well was taken somewhat later when the recovery from the reservoir was something like 640,000?

A Yes.

Q If you were to attempt to evaluate the pressure at the same time in the three wells, in other words, migrate that Shipp pressure back to the same date as the Tipperary 1 and 2, about where would you place that?

A Well, I'm not sure I could say precisely how I would do that. I'm not sure that would -- that I would consider that a valid thing to attempt in this reservoir.

Q Okay. Let me ask you, at the extreme left side of this line that we're talking about, what does the F/Tip mean?

A I'm not sure either. Apparently that's one of the Tipperary wells but I do not know exactly what that designation is.

Q But your dashed line apparently is an extrapolation of that first point and the second --

A Yes.

Q -- point on August 1st, 1986.

A Yes, sir, I presume that's what they were doing.

MR. LYON: I believe that's all I have. Thank you.

MR. LEMAY: Additional questions?

QUESTIONS BY MR. LEMAY:

Q I have a couple, Mr. Leibrock. When you were talking about your economic parameters or discussed at payout and ultimate recovery, assuming you look at both of those as economic parameters as to whether to drill or not to drill, --

A Yes, sir.

Q -- the allowable was brought into focus as to when payout would occur based on that allowable, is the communication that good in this reservoir that if your allowable was reduced for some reason that your ultimate recovery would be reduced because it's like straws in the punchbowl, if you don't get yours out the others will take it?

A Yes, sir, I think that's a very appropriate analogy in this reservoir, because, as previous testimony that's been presented in other cases shows the communication is excellent, permeability is excellent in these reservoirs, so that the delay that we have already experienced here by not drilling a well, we feel like we've prob-

ably lost significant reserves that we cannot make up.

Q And what is the original bottom hole pressure here in this reservoir? Do you have that anywhere?

A Yes, sir, I believe on each of the three wells that are mentioned here, they're all in the range of 2400 to 2600 pounds.

Q That's virgin?

A No, sir, we think the virgin pressure probably was in the order of 4000 pounds and that due to slight communication, very slight communication between this reservoir and other reservoirs in the area over a period of several years, that the pressure was drawn down to what is probably the bubble point, but the fluid movement attributable to that pressure drop is very slight in our opinion, so essentially, from a production standpoint, it's essentially virgin situation, even though the pressure is down.

Q But it's your opinion that all these pods are in some form of communication? That's the reason for a reduction in the original bottom hole pressure?

A I don't know if I could say that each and every one is in communication, but from the development over the last few years it appears that -- that that is essentially true, in some communication, yes.

Q What --

A Excuse me, I was just going to say as a

practical matter, though, we consider this a separate reservoir.

Q What's the -- your estimated drive mechanism in here, gas solution?

A Yes, we think that is definitely the sole drive mechanism.

Q And what percentage of the original oil in place do you anticipate recovering with the gas solution reservoir?

A We think it's difficult to determine even at this stage. It could be as low as 20 percent or possibly as high as 30 percent.

MR. LEMAY; That's all I have. Additional questions?

If not, the witness may be excused.

MR. CARR: That concludes our direct presentation.

MR. LEMAY: Thank you, Mr. Carr.

Mr. Kellahin?

MR. KELLAHIN: Yes, sir, we'd like to commence our presentation. Let me take a moment and distribute our exhibits.

All right, sir, we're ready to go.

ERNEST E. McDONALD,

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

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q Mr. McDonald, would you please state your name, sir?

A Ernest E. McDonald.

Q Mr. McDonald, would you describe for us your eduational background?

A Graduated from Texas Tech, 1949, with a BS degree in geology.

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

A Employed by Tipperary Oil and Gas Corporation as geologist.

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

A No.

Q Would you take a moment, sir, and summarize for us what has been your professional experience as a geologist?

A Eight years in Midland working for Tide-

water Associated Oil Company; later Getty Oil Company; twelve years in Corpus Cristi, Houston, along the Gulf Coast; included on-shore, off-shore, Alaska experience; returned to Midland and in 1979, independent, working in West Texas, New Mexico; and in 1982 joined Tipperary Oil and Gas, connected with geological operations in various states and areas including West Texas and New Mexico.

Q Would you describe for us what has been your experience with regards to the Strawn development in Lea County, New Mexico?

A In quite a bit of detail since the summer of 1984 subsequent to the discovery of Pennzoil No. 1 Viersen.

Q Would you describe for us what your involvement has been in this area after that Viersen 1 discovery?

A Well, in acquiring the lease in the northwest of Section 4, the geological interpretation and selection of locations of initial -- of the initial well and the subsequent well, and continuing geological work along the entire Lovington trend, including Northeast Lovington, Shipp Area, Humble City South.

Q Were either of the two Shipp -- Tipperary Shipp Wells in this -- found in Section 4 drilled based upon your geologic recommendations?

A Yes, they were selected based on our interpretation with the control we had at that time.

Q Did that represent your direct involvement on behalf of your company --

A Yes.

Q -- the siting of those wells?

A Yes.

Q Okay. Let me direct your attention now, sir, to Exhibit Number One. Is this an exhibit that you have prepared?

A Yes, it is.

Q Have you prepared a geologic evaluation to assess your company's position with regards to the Amerind application for an unorthodox well location?

A Yes, insofar as the geological aspects.

MR. KELLAHIN: Mr. Chairman, at this time we would tender Mr. McDonald as an expert petroleum geologist.

MR. LEMAY: His qualifications are acceptable.

Q Mr. McDonald, let me direct your attention to Exhibit Number One and have you identify that for us.

A That is the top of the Strawn Montieth, being an industry designation for the Lower Strawn carbonate

bank.

Q What information have you utilized to prepare this exhibt?

A Used all the available subsurface control.

Q The exhibit is dated May of '87. Have you updated it past that date?

A Yes, this exhibit was -- has been very recently updated during the first half of July, this month.

Q That includes the Amerind No. 1 Hager Well in the southeast quarter of 33?

A Exactly.

Q Having made this Strawn Montieth, Mr. McDonald, would you describe for us what it is that you understand and interpret from such an exhibit?

A The Strawn mounds occur along the northeast flank of the Lovington high, and generally correspond to northeast structural nosing at the top of this carbonate bank zone, and that is what this map illustrates, under the Tipperary Shipp Field pod is the -- is a definite northeast structural nosing.

Q What use have you made of this exhibit in reaching opinions or conclusions about the Amerind proposed unorthodox well location?

A Well, we utilized dipmeter control in the

Tipperary No. 1 State 4 and in the Pennzoil 2 Shipp. It shows a strong northeast dip immediately above the Strawn carbonate bank, so that the northwest/southeast strike, which has been established, would need to be adjusted to make a strong case under the Amerind nonstandard location.

Q What is the significance of a dipmeter to you?

A The dipmeter establishes the dip, establishes -- in this case it increases in magnitude just as these mounds or in the shale zone just above the mound demonstrates a sudden increase in dip, in rate of dip, and this also establishes to some -- to a great extent the regional dip in the area.

Q Mr. Hair talked about steep sided mounds when he identified some of these wells in the Shipp Strawn Pool.

Do you also see steep sided mounds when you examine the geology?

A Yes.

Q Specifically what wells have you shown dipmeters for?

A Tipperary No. 1 State 4, Pennzoil No. 2 Shipp, and Pennzoil No. 1 Viersen.

Q How does that information affect your interpretation about the potential for an Amerind well at the

proposed unorthodox well location?

A Well, as far as mound occurrence, it indicates that the northwest/southeast dip, which has been established by these dipmeters, would have to be changed.

Q Now, in taking that as our first step, Mr. McDonald, let me direct your attention now, sir, to Exhibit Number Two. Again would you identify this exhibit for us?

A This is the Isopach or thickness of the Strawn carbonate bank. That's the Lower Strawn in this locale, the gross interval.

Q What is the purpose of preparing an exhibit like this, Mr. McDonald?

A To -- it became apparent that the thickness of this Strawn carbonate bank in which the mounds, porous mounds occur, had a relationship as far as thickness, a thickening of this overall bank was indicated that -- was an indicator for mound occurrence.

Q How does the gross Strawn carbonate bank Isopach aid you in an evaluation of the Amerind proposed unorthodox well location?

A In this immediate locale, in the Shipp Tipperary pod, the thickness of the overall carbonate bank, reaches maximum 200 feet in the Tipperary 2 State 4, and as it decreases in thickness, for example, at 165 feet, at that

amount of mound there is no production; there is no porosity. At 131 feet to the west, the production is marginal, noncommercial, there was -- in the Tidewater No. 1 State U, so that in the Cox Meyers only 122 feet tight, and in the Amerind Meyers only 149 feet tight, so that anything, any thickness below 165 feet would be in jeopardy as we have it contoured and interpreted in a reasonable contouring interval method with no extraordinary pullouts. The well comes in a little more than 140 feet, which would not be enough for any mound, porous mound, to occur.

Q Mr. Hair has expressed an opinion that he thought the use of seismic data in this area was a useful tool to incorporate in picking well locations.

Do you have an opinion on whether or not seismic information is useful?

A Our experience in Tipperary was that the margin of error of the seismic at the 11,000 foot depths is -- exceeds the amount of relief on these mounds, so that we have not depended on seismic.

Q Can you give us examples of which you are aware of wells that have been drilled with the use of seismic information?

A That I know of, the Amerind No. 2 Meyers was a failure drilled on the basis -- to some extent based on seismic. The Pennzoil 2 No. 2 Shipp, Pennzoil No. 1 Wal-

dron, Pennzoil No. 3 Viersen, a marginal noncommercial well.

Q Do you have an opinion as to whether or not there is a relationship between the mound thickness and the porosity thickness?

A The thicker the mound, the better the chances to have thicker porosity. In this particular instance there is a definite relationship, the thicker carbonate bank has thicker porous mounds.

Q And you have prepared a porosity Isopach showing the net pay on a subsequent exhibit?

A Yes.

Q Before we leave this exhibit, let me ask you to take a moment an do you have a copy of Mr. Hair's Isopach? Do you have a copy of his display that shows his Isopach? If you don't, I will give you one.

I think it's fair to say, Mr. McDonald, that there's a significant difference in interpretations between you and Mr. Hair, are there not?

A Yes, there is.

Q Let me address you to one of the first areas of difference and it's the relationship of the Tidewater 1 State U Well as you have depicted it and as Mr. Hair shows it.

Would you comment and express an opinion as to whether or not -- upon what basis you have made your

interpretation?

A The Tidewater No. 1 State U has -- in interpreted on our work as being on the -- as being a marginal edge well on the Shipp -- on the Tipperary pod, the reason being that we have no evidence that there is any separation between that area, that location, and the remainder of the location. We -- we could have drilled much closer to it but we were trying to stay in -- at that time we only had the No. 1 Viersen and that No. 1 State U and another well just northwest. So that we tried to make -- to drill between those two areas in order to keep our risk down, but at no time did we ever have the opinion that that well was on another pod.

Q Mr. Hair has reached the opinion that the Tidewater State Well is in fact in a separate pod.

Do you see any geologic evidence to cause you to believe it's separated?

A No, we -- we never -- have never seen that evidence. We have no evidence.

Now, to go back to Exhibit One, the structure, that well has always fallen along the flanks of the same structural nosing that we have under the No. 1 and No. 2 Tipperary Wells, which is an indicator that it is on the same pod.

Q As we move to the northeast, we get in-

volved with the two wells that you have dipmeters on. Do you have an opinion as to whether or not Mr. Hair has taken appropriate consideration of those dipmeters in drawing his Isopach?

A Not on the Tipperary State 4 and to some extent not on the No. 2 Shipp.

Q In your opinion if you take appropriate acknowledgement of those dipmeters, how then would you display the gross interval in the Strawn carbonate?

A Well, displayed as we have it now from the Exhibit Two, that it's -- they are generally along the easterly, or northeasterly side, I'm not sure whether to say the flank or edge, but they're along that side of the pod.

Q Let's go now, sir, to Exhibit Number Three, your Exhibit Three, and make a direct comparison between the two Isopachs, yours and Mr. Hair's.

You have used a 4 percent porosity cutoff in your net porosity map?

A Yes.

Q Is there any difference in methodology between you and Mr. Hair, between your Isopach and his 4 percent porosity Isopach?

A There's a difference in the -- in the mound porosity that we come up with. I'm not sure exactly what that's due to.

Q Let me take a moment and point it out. If we look at the Tipperary No. 1 Well, Mr. Hair's got 84 feet, and on your -- on your map you have -- what's the thickess, 52?

A Right.

Q Would you explain to us what you have done so that we will understand how you have mapped the Isopach?

A These numbers represent a fairly conservative count, averaging porosity values from electric logs.

For example, on No. 1 and No. 2, I mean on No. 1 Tipperary and No. 1 Pennzoil, averaging of about 10 values and on the No. 2 Tipperary, maybe as many as 20. It's a thicker zone. And when I say conservative, I mean that certain intervals that look a little tighter within the overall mound, I left them out in order to be -- to be sure that we had an accurate and not an over optimistic picture of this -- of risk or performance.

Q Is that something you did yourself?

A Yes.

Q You actually made the count on the logs?

A Yes.

Q Have you taken that same approach and consistently applied it to all the logs you examined in preparation of this exhibit?

A Yes, and prior to that.

Q Let me show you a difference between the two Isopachs and ask you for your comments and opinions.

As we go to the north of the Tidewater State Well, at the Cox Meyers 4, do you see that on your exhibit and Mr. Hair's exhibit?

A Yes.

Q Have you found that?

A Yes.

Q All right, and then let's move diagonally to the southeast and find the Pennzoil Shipp No. 2 Well. Have you found that one on both exhibits?

A Yes.

Q How have you contoured the Isopach in relation to those two wells and how is it different than the way Mr. Hair has Isopached?

A Well, again, incorporating all the available subsurface control that is available to Tipperary, the -- we show only, at the most, only a minor amount of mound or porosity present under the nonstandard location.

The strike established in Pennzoil No. 2 Shipp lends itself in normal contouring methods to a continuation of that dip or that thickness curving around to zero thickness or none in the Cox No. 4 Meyers.

The amount of extension of this pod on

the Exhibit Three is, in my opinion, is liberal, rather liberal interpretation and more bold than I think that is justified along in connection with the size of the pod.

Q You're describing Mr. Hair's Exhibit Number Two, where it makes the extension 33.

A Well, I'm looking at Number Three here.

Q Yes, sir, whatever exhibit it is that shows his Isopach extending into 33?

A Yes.

Q Is this a case where different geologists could have reasonably different interpretations based upon the available data?

A I don't think so but we have --

Q Well, you do have a difference of opinion.

A True.

Q Why do you believe yours is more reasonable than Mr. Hair's?

A I think the contouring is more normal and more conservative and fits in with the size of the pods better as, as I have it mapped.

Q How would you characterize or describe the availability of wellbore data and subsurface information in order to do the mapping for this particular 80-acre tract?

A The what?

Q Do you have sufficient subsurface information --

A Yes, I --

Q -- to satisfy you to become reasonably confident of the map?

A Yes, not only from this exhibit that we're looking at, but the previous exhibit, which shows gross Strawn carbonate. If you'll notice the two maps compliment, are complimentary in that one reinforces the other. The Strawn carbonate bank indicates a definite thinning of the overall zone northeast, northwest, and north from this proposed nonstandard location.

The evidence all comes together and each map backs up the other.

Q What is the position of Tipperary with regards to its opposition to the Amerind proposed location?

A Well, we are -- we're opposed to their unorthodox well location, it's nonstandard.

Q What is the reason for your opposition, Mr. McDonald?

A We feel like that they are in a minor, at the most, minor portion of the Tipperary pod and that they will be just draining that small area plus the area in our 80-acre proration unit due south.

Q What is the approximate footage location

between the common line between the two spacing units for the Tipperary well and the Amerind well? How many feet --

A How --

Q Yeah, how many feet away are you?

A Tipperary in 1 State 4 is 660 feet south of the north line. The Amerind location is proposed at 230 feet north of the north line of Section 4.

Q Let me have you go at this time, Mr. McDonald, to Exhibit Number Four, if you will, sir.

All right, sir, would you identify that exhibit, please?

A This is a north/south structural cross section across the Tipperary pod.

Q Would you help us orient the line of cross section by utilizing one of your previous exhibits?

A The Chevron Lea State "YL" No. 1 is due south of the Tipperary 160-acre lease, due south of Tipperary No. 2, State 4 No. 2, going northward through the Tipperary State 4 No. 1, through the Amerind proposed unorthodox well location, and on northward to Amerind's failure, No. 2 Meyers.

Q What are the significant points or observations you make as a geologist concerning this exhibit?

A Well, it illustrates the thickening of this Strawn -- of this gross Strawn carbonate bank over the

mound occurrences.

That's the primary illustration to me and the other illustration, of course, it shows the quality of these porous zones. These are very good zones. And thirdly, it shows the abrupt limits of these mounds, how they build up, come to an abrupt end, so that there is -- there is risk in the area.

MR. KELLAHIN: May I ask, Mr. Chairman, what the pleasure is of the Commission concerning a lunch break? I propose to go on for a little while longer with this witness.

MR. LEMAY: I would prefer to finish out the witness so the continuity is not lost and then we'll return for lunch (unclear).

Q When we make a summary of your evaluation, Mr. McDonald, does a penalty that Mr. Hair has proposed, which incorporates only a distance, and excludes any consideration of the produtive acres with a spacing unit for that Amerind well, is that, in your opinion as a geologist, a reasonable way to balance the correlative rights among the operators?

A No, it's not, in my opinion.

Q Why not, sir?

A Well, on the size, the size of the -- or any size at all if they -- that's present under that tract,

is related directly to Tipperary -- to the Tipperary pod, which will be directly -- it would be draining the Tipperary lease.

Q Do you have an opinion as to whether or not there is sufficient well control, geologic data, from which the Comission can appropriately determine the amount of productive acres underlying the Amerind proposed spacing unit?

A Yes, I do. The present control I think is adequate.

Q How would you determine someone calculate the productive acres on the Amerind tract?

A How was that now?

Q Yes, sir. In looking at the Amerind tract as you've mapped it on your Exhibit Number Three, how would you propose to allocate the reservoir between condemned or nonproductive or noncontributing acreage versus that acreage that's going to contribute?

A Well, I would use the Ispach maps, the net pay map that shows the well with a similar amount of pay is the Tidewater State U, which is submarginal, so that I would cut the acreage down from -- even further than from the zero line as shown on that map.

Q As we return to your Isopach and continue around -- continue around the perimeter of that Isopach,

your Isopach has a slightly different shape to it as we get to the south and west than the one depicted by Mr. Hair.

Would you describe for us, Mr. McDonald, what is the basis upon which you have selected to contour the lines as they cross through the southwest quarter of the northwest quarter section?

A Well, maintaining a reasonable, a normal or a reasonable rate dip, or not dip rate but a rate -- a contour interval that fits -- fits in a conservative, reasonable way with the control furnished by Tidewater No. 1 State U, by the Chevron No. 1 Chevron, and Chevron Lea State "YL", which had no pay and the Tipperary 2 State 4.

It's a contouring problem, question.

Q Mr. Hair has concluded that he attributes about 25 acres to the Tipperary State No. 1 Well in that laydown north 80 acres.

What is your opinion of the productive acres within that spacing unit?

A Well, we, as depicted by this map, there is probably 75 -- we've got 75-1/2 acres, which includes the -- most all of that proration unit including the Tidewater No. 1 State U.

Q Based upon information available to you, I'm sure a geologist such as you has reasonable degrees of confidence in various projects.

Can you classify or categorize for us, Mr. McDonald, your degree of confidence with regards to the mapping of the Tipperary Shipp pod?

A I have a high degree of confidence in the mapping of the pod considering the amount of control that's available.

MR. KELLAHIN: That concludes my questions for Mr. McDonald, Mr. Chairman.

We would move at this time his Exhibits One through Four.

MR. LEMAY: Without objection Exhibits One through Four will be admitted into evidence.

Mr. Carr?

MR. CARR: Thank you.

CROSS EXAMINATION

BY MR. CARR:

Q Mr. McDonald, let's go to Exhibit Number Three. If I understood your testimony, you were employed by Tipperary as a geologist at the time that the Tipperary No. 1 Well was drilled, is that correct?

A No, I was employed by Tipperary -- oh, during that time?

Q Yes, sir.

A Yes.

Q And were you involved in the location of the Tipperary well 660 from the north line of Section 4 and 330 feet from the Pennzoil lease to the east?

A I was involved in the location of that well in that quarter of that section. The location was adjusted with my concurrence as time went by.

Q And at that time was it your opinion that the Tidewater No. 1 State U Well was in the same pool?

A I had an opinion that there was proof that it was in the same pod.

Q But in fact you moved your location as far away from that well as you could get, is that not true?

A We didn't move it in consideration of that. We -- we set the location up in consideration of Pennzoil No. 1 Viersen, and it was sort of a midpoint location. It was a wild -- it was a stepout wildcat at that time, the way we felt, and midway between No. 1 Vierseon and the Getty No. 1 State P to the northwest. And that was our consideration at that time for drilling the well.

Q And that location is in your opinion in the midway location between those two wells.

A Well, it was semi-midway at that time, yes.

Q And you conclude that under the acreage that is dedicated to the Tipperary No. 1 Well, you've got 75

productive acres.

A Yes.

Q You've testified that you have no evidence that that Tidewater well is in fact in a separate reservoir?

A No, I don't.

Q Do you hae any evidence that would show it is in the same reservoir?

A Well, I don't have any evidence other than the subsurface information from the log and from known production and it did make 19,647 barrels, and was plugged back to the Paddock. There was no record that we found that indicates that the zone was left because it was depleted or over with or otherwise -- there may have been other problems.

Q Do you have any evidence on that one way or the other?

A We have, I could defer to our engineer who did check into the Commission offices in Hobbs to see --

Q We'll take that up with him. Do you have any --

A I can tell you who --

Q Do you have any information on -- no, I only want to know what you know.

A I have information from --

Q If you want to defer that question what I'm saying is you can do that, to the engineering witness.

A I'll be glad to. I can summarize what I -- what he said, but I won't guarantee that I would repeat it precisely engineeringwise.

Q If you feel comfortable answering, go ahead and do that.

A Well, they -- they pulled the tubing in two and left the tubing down in the bottom of the hole and pulled -- when they came back from that 11,000 foot interval, they came back to the Paddock, which is an upper zone in the Permian; completed in the Paddock, produced something, 114,000 barrels, they never went back -- they never, that zone was never re-tested or re-worked over and so that -- that's exactly as much as I know.

Q Wouldn't you anticipate a well that was in the same reservoir with the Tipperary No. 1, given the high degree of communication, would have produced something in the neighborhood of, oh, several hundred thousand barrels of oil instead of just 100,000?

A I believe that well was -- is on the edge of the mound. There are occasional occurrences along this trend where wells were drilled in the edges of the mound. The porosity is just not as -- is just not as good and it's a little bit tighter in all likelihood.

Q So it wouldn't have drained as large an area.

A That's true.

Q Now, if you take your structural interpretation and compare this well that's at the edge of the mound with the proposed Amerind location, they're fairly comparable, are they not?

A Both wells along with the Pennzoil No. 2 Shipp, are along a -- the same northeast nosing complex.

Q And they are on the edge of the mound, are they not?

A The -- which wells?

Q The Tidewater 1 State U and the proposed Amerind location?

A Yes.

Q And I think you stated that your interpretation was a liberal interpretation of the acreage under the Amerind property, is that not correct?

A That's -- that's correct.

Q And there's minor porosity available, isn't that right?

A As mapped I show a minor amount.

Q And if your interpretation is correct and they are in the same pool, they would perform probably as poorly as the Tidewater Well in your interpretation, isn't

that right?

A Yes.

Q And it's a high risk well, isn't it?

A Possibly.

Q Now, if we take a look at the way -- at your Exhibit Number Three and the way you have placed on the contours, there is a very sharp difference, a change in the reservoir, is there not, between the Tipperary Number 1 Well and the Pennzoil Number 2 Shipp Well to the right or to the east of that on the map.

A You mean the contour interval?

Q Yes, sir.

A Yeah, it's -- it's pretty sharp.

Q This is where we see sort of steep mounds or evidence of a steep mound in this area.

A Dip increases between those two wells.

Q If we look, if we go from the Tipperary No. 1 to the west, the contour lines seem to be fairly evenly spaced. Is that actually how you would contour that portion of the reservoir in view of the steep mounding I think both you and Mr. Hair have testified to?

A In that case, yes.

Q You think you would experience this sort of gradual decline like that?

A Sometimes. That's a -- that's a

condition that does exist. Three are steep edges and there are edges that not quite as steep.

Q Now if we look at your interpretation, you have, correct me if I'm wrong, you have used no seismic information in --

A No.

Q -- in constructing this map.

A No, no seismic information.

Q And you don't think it's of value?

A No, I don't.

Q And so to the extent that Mr. Hair believes you can place some weight on it, you don't have that same approach?

A No.

Q Now there were a number of dry holes, I think you mentioned that were drilled and seismic information was used to pick those locations.

A Yes.

Q Did you see any of the seismic data on any of those wells?

A No, I never have seen that data. I may have seen data on one, in one case.

Q Have you seen any of the seismic data on any wells that were successes in the area?

A No. Well, I did. I take that back. I

did. In one instance I saw seismic data across wells that were completions.

Q Mr. McDonald, I think you've indicated that between the Tipperary No. 1 and the Tidewater No. 1 State U there's nothing there that would cause you to believe that was a separate reservoir.

A That's what I have indicated on the information and control that I have.

Q Now, if we go to your Exhibit Number Four on the Pennzoil No. 1 Shipp and then we go south and east of that to the Viersen No. 1, is there any information that you have which would indicate that those in fact are separate reservoirs?

A I have information that's been reported involving the pressure data. I personally don't have the pressure data in my possession but our organization has acquired this information and our engineer, I would defer to the engineer to confirm that we do have that data.

Q Do you have any pressure data between the Tidewater No. 1 and Tipperary No. 1?

A I don't.

Q Then if there was -- if you had that available, that might also give you some additional tools with which to work in determining the extent of that reservoir.

A Yes.

Q If we -- if I understood your testimony you stated that thickness of the formation was important to have the porosity, is that not true?

A There does seem to be a correspondence, especially in this local Tipperary pod.

Q If I look at your Exhibit Number Three and I look at the J. L. Cox No. 4 Meyers Well, which is in the southwest of the southwest of 33, and compare that to your Exhibit Number Two, it appears to have 122 feet of thickness, is that correct?

A That's correct.

Q And you've drawn a contour line taking the (unclear) I guess in the reservoir right over to that.

A Yes, that's --

Q And when I said contour line, I mean on your exhibit.

A Yes, that's --

Q Okay, and that same contour line runs almost through the Pennzoil No. 2 Shipp in the northwest of the northeast of 4.

A Yes.

Q That well, to go back to Exhibit Number Two, has 165 feet.

A True.

Q Wouldn't it make sense that if the thickness is important to determine porosity, that your contours should not be so close to the J. L. Cox Well in Section 33?

A Could be. That -- that was apparently liberal contouring. I could have brought that zero much further down than I did, so that is somewhat --

Q If you brought that further down you could miss the Amerind location altogether, isn't that right?

A Well, that's true.

Q And if you miss the Amerind location altogether, that wouldn't pose a problem for Tipperary because it would be a dry hole, wouldn't it?

A That's right.

Q And your interpretation vastly differs from the interpretation of Mr. Hair.

A In that respect it does.

Q And yet you believe that there's sufficient control that we can interpret this reservoir and do some accurate calculations of reserves in place, is that correct?

A Yes.

Q And yet you have this great disparity between your interpretation and that of Mr. Hair.

A That's true.

MR. CARR: I have nothing further.

MR. LEMAY: Additional questions of the witness?

Mr. Lyon.

QUESTIONS BY MR. LYON:

Q Mr. McDonald, referring to your Exhibit Three, next to the No. 2 Shipp Well in the northwest northeast of 4, there is a symbol there, a D shaped symbol with the 12 degrees?

A Yes.

Q Is that the result of a dipmeter?

A Yes, it is.

Q And it shows the dip in the direction of the bottom of the D at approximately east/northeast?

A That's correct.

Q So that the strike would be running essentially north and west.

A That's -- that's correct.

Q And another symbol next to the Tipperary No. 1 State.

A Yes.

Q It shows a similar symbol with the dip to the northeast?

A Yes.

Q And a strike to the northwest.

A Yes.

Q That contour line doesn't seem to follow the -- that particular strike in there. Now, am I correct in understanding that that actually represents the dip at the well location, not where the symbol is?

A That's right.

Q And that's based on what, contacts with the massive lime?

A Just above the massive lime; shale zone.

Q That dipmeter also includes the directional indications, doesn't it?

A No, in this case it didn't. There is a directional survey, as previously mentioned, in the number -- in the Pennzoil well but in the Tipperary well, to my knowledge, we did not run a directional survey, I mean a detailed directional survey.

Q So you don't know where geographically that -- that particular dip was measured.

A Not precisely.

Q But if you were to honor that particular strike as indicated by that dipmeter, your excursion of the zero contour line would probably not be as far into Section 33, would it?

A That's right, with the -- with this control you have -- you are correct. We have, I have moved the strike either through drafting discrepancy or through contouring haste, but I would actually bring that zero line even closer in so that there would be some less possible porous band under the Amerind proposed location.

It's not really far off, I'll make that comment. It's minor, very minor.

Q I think we've discussed during this hearing this facies change that limits the reservoir, sometimes curves rather abruptly.

A It does.

Q Do you think that the structure map here indicates a reasonable representation of the thickness through there or is this just a result of conventional contouring?

A You mean on the thickness of this net porosity?

Q Yes.

A Does it represent an accurate --

Q Well, let -- let me rephrase it. My interpretation of what you said is that this represents the conventional technique in contouring an Isopach map based on the points that you have.

A Yes, sir.

Q Do you think that this is a more accurate or less accurate representation than if you gave weight to the fact that the facies change is rather rapid and that these contours probably are not actually that close together?

A These -- as far as the zero contour, the distance that it occurs from these dry holes along the flanks, there is plenty of room for adjustment.

The flanks of this -- from the wells which encountered the porosity, they could be steepened up; maybe steeper than they could be contoured, who knows? It's -- it is steep, so that a well drilled between the Tipperary No. 1 State 4 and the No. 2 Shipp, I mean, who knows how much porosity you would actually encounter, but by -- by the, I'd say fairly conservation, and yet reasonable, and maybe a little optimistic, to give a full recognition to the fact that it's gone in No. 2 Shipp. The contouring is spaced at the -- at that particular interval at that distance.

Q Let me ask you one more question, then I'm done.

There is obviously considerable difference in the thickness between your interpretation and Mr. Hair's. Do you have any explanation for why that is?

A Well, I could -- I can -- I can assume

that, that my counts, being conservative, eliminating certain tight appearing streaks, as opposed to a more liberal count of the porosity, within the mound, the true mound interval, which is shown on the cross section, for example, if you put the entire interval as porous in the Tipperary 2 State 4 instead of 107 feet it would come up to some -- around 133 feet, so -- but within that mound porous zone I tried diligently to not be optimistic, over-optimistic. That was the purpose, to be accurate and it was averaged, the numbers were -- I averaged the numbers as much as I could. We checked against resistivity logs and the other interpretations which show more than I do, I can assume that they used the same interval and even at the same cutoff, say 4 percent, it would be easy to come up with a little more, with more porosity if that overall interval was considered with no consideration of tigher streaks.

MR. LYON: I believe that's all I have. Thank you.

QUESTIONS BY MR. LEMAY:

Q Mr. McDonald, I'd like you to refer to your Exhibit Number One, a structure map with the nosing. On that exhibit wasn't your testimony that the Tidewater 1 State U was associated with this mound partly because it was associated with the same subsurface nose?

A Yes, that's what I said.

Q Would you go down and look at the Pennzoil Viersens 1, 2, and 3? Are those wells associated with the same nose?

A Not with precisely the same nose. Oh, you mean, oh, are they associated with the same nose?

Q On your structure map, it looks like they're all along in touch with the same nose.

A They're associated with the same -- the same nosing, yes.

Q And then referring to your thickness map of net porosity, you've honored the fact that, I guess, pressure differences from those three wells and therefore they are not from the same accumulation, that your interpretation is that they are from different mounds?

A Two small pods, yes.

Q But associated with the same nose?

A Yes.

Q So that would be in conflict to the situation to the northwest where you had the same nose but one -- one pod.

A Not necessarily. It can occur both ways. A nosing, there's -- in the overall entire trend along nosings, there are mounds which are not necessarily connected with each other. This -- this local nosing actually contin-

ues on to the northeast and in minor ways it -- with minor saddling, to the northeast there is a new pod which has recently occurred as illustrated by Amerind No. 1 Hager, but just south -- just south of that along that nosing, the Pennzoil No. 2 Shipp is a dry hole, and Pennzoil No. 1 Waldron seems to fall more in a saddling, but it would be on the flank of the, say, the Amerind pod, but no, to answer the question direct, that can be more than one pod to point a particular nosing. The structure just doesn't totally control the limits of the porosity. That's my --

Q Referring to -- I'm sorry.

A That's my opinion.

Q Yes. And referring to the cumulative production in the Tidewater No. 1 State U I thought it was testified that that well has produced 60,000 barrels of oil and you said approximately 20,000. I'm assuming 20,000 from the Strawn with a recompletion in the Paddock and the remainder of that production is 40,000 from the recompletion zone? Is that your understanding?

A No, that's probably an error, that it made 60,000. It's easy to get confused in some of the other wells.

That well made 19,647 barrels and was plugged back.

Q So 19,000 from the Strawn.

A Yes.

Q When it was depleted?

A Yes, sir.

MR. LEMAY: Any additional questions of the witness?

MR. BROSTUEN: I have a question of Mr. McDonald.

QUESTIONS BY MR. BROSTUEN:

Q Mr. McDonald, in the Tidewater No. 1 -- is that State, is that what that means?

A State U, yes.

Q State U, yes, that well was completed back in 8 of 1951, is that correct?

A Yes.

Q And do you recall when that well was plugged and abandoned, or when that -- when the perforations in the Strawn were closed off?

A I have -- I can't recall. It was about a couple of years, but that's -- the engineer knows.

Q Okay, perhaps I asked the wrong person. Considering the -- the technology in 1951, completion technology, the price of oil in 1951, do you -- do you feel that this well was depleted or was because of economic conditions at that time, or would they still produce at the economic

conditions today?

A I feel like the well was a little bit, was somewhat tighter. It had some -- it had some mound in it, but I don't feel like that the mound was as -- it was right on the edge and I don't feel like that it was quite good enough to make a highly commercial well. There again, that relates to evidence from the Commission office in Hobbs, which indicated two large acid treatments, which would indicate that they were having to -- that it was a little tighter than some of these wells.

There again our engineer, who went by that office, I would defer the precise numbers to him.

Q Okay. Thank you. Would you also restate to me your reasoning for not having faith in the seismic exploration in this pool?

A The seismic margin of error is -- at 11,000 feet, which is pretty deep, is not -- does not take into account the low relief of these mounds, which is in and around 50, 50 feet, more or less, which is low relief.

Q Thank you very much. That's all I have.

Mr. LEMAY: Additional questions of the witness?

If not, he may be excused, and we'll take a break for lunch returning at 1:30.

(Thereupon the noon recess was taken.)

MR. LEMAY: The meeting will come to order. We'll continue, Mr. Carr, Mr. Kellahin.

MR. KELLAHIN: Mr. Chairman, thank you. We'll call at this time our engineering expert, Mr. Joe Younger.

JOE YOUNGER,

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

DIRECT EXAMINATION

BY MR. KELLAHIN:

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

A Joe Younger, petroleum engineer.

Q Mr. Younger, would you summarize for us what has been your educational experience and employment as a petroleum engineer?

A I graduated from Tulsa University in 1957 with a degree in petroleum engineering.

Went to work for Marathon Oil Company. I worked for them 25 years in the Permian Basin.

In 1981 I went to work for Tipperary Oil and Gas and I'm presently their Operations Manager.

Q Would you describe for us what has been

your experience with regards to the engineering information that is available for the Shipp Strawn Pool in Lea County, New Mexico?

A Yes, sir. I've been involved in the drilling, the completion, and monitoring of production in the Shipp Strawn Field and I have prepared all the exhibits that we have here today.

MR. KELLAHIN: We tender Mr. Younger as an expert petroleum engineer.

MR. LEMAY: His qualifications are acceptable.

Q Mr. Younger, in reference to your exhibits, have you made a calculation and do you have various recommendations to the Commission for possible penalties to the Amerind proposed unorthodox well location?

A Yes, sir, I do.

Q Among the various penalties that you have considered, would you describe for us in a general way what the methods you have selected to present to the Commission today, what those are?

A Yes, sir. I'm presenting two methods here today, the first one being the double circle condemned acreage method. It's been used quite a bit by the Commission. I think most recently in October of last year in the Texaco case. I can't cite the case number, I'm

sorry.

The second method is based on acreage, productive acre feet for the Amerind well, and I've compared it to the average productive acre feet for the three wells with standard locations. I've taken a ratio of those two numbers.

Q In addition to considering methods for penalties to the Amerind well, have you also examined available pressure information for wells in the Shipp Strawn Pool?

A Yes, sir, I have.

Q Describe for us generally, and we'll get into the specifics later, Mr. Leibrock testified about some pressure information. Have you made a similar study of available pressure information?

A Yes, I have. I think in general I pretty much agree with what's been presented this morning in that there are separate, there are several separate pressure pods and when we focus on the Tipperary pod Mr. Leibrock testified that there were two recent pressures where there was a 200 pound difference. Those were Tipperary pressures and the pressure difference is really about 95 pounds.

Q We'll save for later your other comments and observations about Mr. Leibrock's testimony about the reservoir.

Let me commence, though, Mr. Younger, if you will, with what is marked as Tipperary Exhibit Number Five and have you first of all identify that exhibit for us.

A Okay. Exhibit Number Five shows two 80-acre radial drainage patterns, one of these being centered at a standard location marked as B, which if 510 feet from the south line of the section, and the other circle being centered at point C, which is Amerind's proposed unorthodox location.

Q What's the reason to put the double circles on the exhibit, Mr. Younger?

A It shows the encroachment of the unorthodox location over the standard location.

Q And this is part of doing the calculation to fulfill the allowable factor formula used by the Commission in the past when we -- when we calculate the double circle penalty.

A Yes, sir, that's correct.

Q And this represents the F1 factor?

A Yes.

Q All right. Describe for us what you've done with the F1 factor --

A Okay.

Q -- in relation to that exhibit.

A All right. In the F1 factor what I've

done, I've taken the encroached acres, which is shown in yellow on the exhibit, being 8.3 acres, and as shown on Exhibit Number Six --

Q Yes, sir, let's turn to Exhibit Number Six now, I think that would be helpful to go through the calculation.

All right, sir, on the F1 factor what have you done?

A Okay. What I've taken is the encroached acres which was shown 8.3 acres in yellow on the map, and I've applied it -- I've taken that F1 is equal to 80 acres, minus the 813 encroached acres, over 80, or given an allowable factor of .896, based on the encroachment.

Q All right, sir, let's turn to the F2 factor and what does that represent?

A The F2 factor represents the north/south footage factor, which is equal to the actual location with respect to the south line of the unit divided by the standard location distance from the south line of the unit, being 330 feet over 510 feet equals .647.

Q And then finally the F3 factor is really of no consequence to us. That is the relationship between east and west and the well thus far is not unorthodox that way.

A That is correct, the well is not -- it is

not unorthodox that way.

Q Following through the rest of the calculation to that point, what would be the allowable assigned to the well if the Commission only uses the location encroachment portion of the penalty?

A Okay. The allowable factor would be, you would add the three F1, F2, and F3 together and divide by 3 and that factor, the double circle allowable factor would be .848 or 84.8 percent.

Q Do you have an opinion as an engineer, Mr. Younger, as to whether applying the formula up to that point by itself would be an appropriate and adequate penalty to apply to the Amerind well location?

A I do not believe that that is sufficient penalty to apply to the Amerind location.

Q Why not, sir?

A Well, by the Isopach that we showed this morning, is that their productive acres, I think that there are some condemned acres that they do not have the 80-acres in which to apply it against, so we need to put the condemned acreage factor to it.

Q Have you applied a condemned acreage factor then to the balance of the calculation?

A Yes, sir, I have.

Q Describe for us how you've done that.

A That's noted as the condemned acreage

factor and I've got that equal to the maximum productive rate acreage divided by the unit acreage, being 16.1 acres that I have arrived at by planimeter, divided by 80, which equals a condemned acreage factor of .201, or 20.1 percent.

Q When you put all that together, what is the proposed penalty using this methodology?

A The penalty would be 83 percent. The final allowable factor would be 4.7 or 17 percent.

Q Let's look a the 16.1 acre number for a moment. Where did that number come from?

A That number came by planimetering the net pay Isopach that Mr. McDonald showed awhile ago and it would show the productive acres in the 80-acre unit where Amerind proposes to drill their nonstandard well.

Q Mr. Hair testified that he had calculated a productive acre, if you will, for his spacing unit of 26 acres, and he had done that by simply taking the area contained within the zero contour line on his Isopach.

How does your method relate to what Mr. Hair did?

A My method is exactly the same. I took the area within the zero contour. It's just that his map has more acreage for it.

Q Neither your proposal nor his take into consideration the thickness of the reservoir.

A That is correct.

Q All right. Using the formula as you presented entirely on Exhibit Six, does that correspond to any of the previous penalties applied by this Commission to other locations with the Shipp Strawn Pool?

A Sir, I can tell you that in New Mexico Commission 8993, Lovington Penn Field, which is in the proximity, October, 1986, that they used this method for imposing the penalty.

Q Let's talk now about the allowable that you apply the penalty against.

Mr. Hair has suggested that whatever the penalty is, you apply it against the top allowable.

A Yes. In most cases the Commission has -- and maybe in all cases, they've applied it against the top allowable for the pool.

Q Looking at the wells in the Shipp Tipperary pod, or mound, are those wells currently capable and in fact are they producing at the maximum top allowable?

A No, they are not.

Q Would you identify for us what is the current daily producing rates of the various wells?

A Yes, sir. For the Tipperary 4 State No. 1, this well is producing in excess of top allowable for 445 barrels per day. The latest test I have is 470 barrels per

day. Gas/oil ratio, 1500-to-1.

To the south in the Tipperary 4 State No. 2, this well is making 398 barrels of oil per day. Gas/oil ratio 1900-to-1.

The Pennzoil Shipp Well, I've asked those people for their latest tests. The well is still making top allowable, I can tell you that it's making in excess of 445 barrels per day.

Q Do you have a recommendation to the Commission that should they adopt this method of penalty, whether or not the penalty ought to be applied against the top allowable or whether it ought to be tailored to the actual producing rates of the given well?

A There will an exhibit that I show later that will help in my explanation, but I do believe that it should be applied to the existing production rates, and I say that based on the fact that it's typical of these wells in the Strawn Reef to produce top allowable and do that for a period of a year to year and a half, and once they've reached the critical pressure, bottom hole pressure I'm talking about, which is about 1000 pounds, the relative permeability to gas gets high and we start realizing a decline rate in the order of 70 to 80 percent per year.

So based on that, I'm saying that six months from now we could find that our production from the

Tipperary No. 1, the Tipperary 2, and the Shipp 1, six months from now, if my crystal ball is working, they could be down in the order of 200, 250 barrels a day.

Q If the penalty for the Amerind well is placed against the top allowable, then it will have an unfair advantage in competing with wells in standard locations?

A I think it's possible.

Q When we look at the Isopach and the engineering information available to you, we find that the proposed Amerind location is 330 from the common line.

A Okay.

Q The Amerind well location is 330 from the common line.

A Sure.

Q And we've got the Tipperary well 660 from the common line.

A Right.

Q Based upon what you know of the reservoir, the permeability, the drainage, the communication among wells, what is your concern as an engineer about the ability of Tipperary to protect its acreage from drainage from an Amerind well located as they propose?

A With the excellent qualities of the reservoir that we have, we have permeabilities on the order

of 46 millidarcies. Also I'll show an exhibit, I think Mr. Leibrock showed earlier of the pressure relationships between the wells, that if they drilled at this nonstandard location they would drill our -- they would drain our reserves on our -- on our State lease.

Q I believe that completes your discussion of one possible calculation of a penalty. You said you had considered a second possible penalty calculation and that was based upon net productive acres?

A Acre feet.

Q Acre feet.

A Uh-huh.

Q Let me turn to Exhibit Number Seven, Mr. Younger, and have you identify that exhibit.

A Exhibit Number Seven shows the reservoir parameters that I have used in calculating the volumetric reserves from the Isopach that we presented earlier.

The first item there being total acres, that was 281 acres, which is simply planimetered on the zero contour, everything inside the zero contour.

The second one is the total acre feet. That was arrived at also by planimeter, 12,119 acre feet.

The third item is average thickness. That was arrived at by just taking the total acre feet of 12,119 and dividing by 281, and then our (unclear), we're

showing an average of about 43 feet.

The first two items were planimetered and the third was calculated.

The fourth item there of porosity, Mr. McDonald testified that we've used 10 percent as an average. That's all based on well logs and core data, everything we had available.

Average water saturation was 21 percent, which we arrived at from the well logs.

Formation volume factor, I arrived at that by PVT data, which we obtained on fluid samples in the field.

And the recovery factor, I'm using 25 percent, which I believe that this reservoir is a solution gas drive reservoir, and in the range of solution gas you can run anywhere from 10 percent to 30 percent, but due to the excellent rock qualities that we're seeing in this reservoir, I believe that 25 percent is a very reasonable estimation.

Q Let me have you now turn to your next exhibit and identify and describe that.

A Exhibit Number Eight is the volumetric calculation that I've made of original oil in place, the recoverable oil, and the remaining recoverable oil for the Shipp Field Tipperary pod.

Q And what do you -- what do you show based upon that calculation that the original oil in place would be?

A The original oil in place I've calculated to be at 4.9 million barrels of oil.

The recoverable oil, based on the 25 percent recovery factor, is 1.2 million barrels of oil.

And as of the 1st of July we have recovered 760,000 barrels of oil, leaving 478,000 barrels of oil remaining to be recovered as of the 1st of July.

Q Is this a standard engineering calculation that's well accepted and utilized by your profession to determine oil in place for a reservoir such as this?

A Yes, sir, it is.

Q Mr. Leibrock testified that he had not calculated a volumetric calculation for the reservoir.

How comfortable are you with your calculation?

A I'm comfortable with the calculations.

Q Let's look at Exhibit Number Nine, Mr. Younger, and have you identify and describe that exhibit.

A Okay. Exhibit Number Nine, what I've done, I've calculated, I haven't calculated, I've planimetered the acre feet under each 80-acre proration unit in the Tipperary pod, and the first 80-acre proration unit that

I've listed is the proposed Amerind well, which has 16.1 acres, which I testified earlier, 321 acre feet, and a percent of total acre feet of being 2.7.

The second well is the Tipperary 4-1, which I've planimetered to be 75.5 acres; 3,733 acre feet; 30.8 percent of the total acre feet.

And of course I've listed it for the 4 No. 2, the Pennzoil Shipp No. 1, and the last item I've said other acre feet, which is actually acre feet outside of the proration units. That's some of the overlap, some of the remaining acre feet.

And what I've done is just come up with a total number of acre feet of 12,119, which corresponds to what we talked about earlier for the total, and I've assigned a percent to each one and on the Amerind Well, it's got 2.7 percent; 4 State 1, 31 percent; 4-2 is 43.3; Pennzoil Shipp 1, 16.4.

And then at the bottom of that I have taken the three standard locations and added the acre feet together for those three wells and come up with an average of 3,656 acre feet per well in an 80-acre proration unit.

Q How have you utilized this information in order to calculate a proposed allowable or penalty factor using the acre foot analysis?

A If you'll refer to the Exhibit Ten, I

have taken the acre feet in the proposed 80-acre Amerind well unorthodox location, which was equal to 321 acre feet, and divided that by the average acre feet in the three standard location 80-acre units, which was equal to 3,656 acre feet, coming up with an allowable factor of .087, or 8.7 percent.

Q Having gone through the process of selecting at least two methods by which a penalty could be applied, do you have a personal recommendation to the Commission as to which of the two methods you would select to apply to the well?

A My selection would be to go with the double circles and condemned acreage factor.

Q What's the reason for making that selection, Mr. Younger?

A My reason for that would be that it is a method that has been accepted by the Commission in the past and that's the primary reason, you know, I think it's something that's easy to work with.

I think it would be excellent.

Q Let me direct your attention to a different subject matter. I believe Mr. Hair has testified that Amerind was proposing to the Commission and the other operators that they would run a directional survey on the subject well if it was drilled.

Do you have any comments or observations about the need for a directional survey for the well?

A We most definitely would like for them to run a directional survey.

Q Let me ask you about the information you have placed on Exhibit Number Eleven, and before we discuss it in detail, have you simply identify that. I believe that's the reservoir pressure information?

A That's correct.

Q Did I get the right number?

A Yes, that's correct.

Q I think it's eleven.

A Yeah, that would be the graph.

Q Before we talk in detail about the graph, would you identify for us and describe the source of the information utilized?

A Okay. I'll first describe the graph. It's simply a graph like Mr. Leibrock had awhile ago, and it's showing the bottom hole pressured at datum depth versus cumulative oil production.

The source of the data came from bottom hole pressures run by Tipperary and by Pennzoil.

Q Do you have a copy of Mr. Leibrock's exhibit? I think it was Number Five, if I'm not mistaken.

A Yes, I do.

Q Do you have one before you?

A Yes, I do.

Q Would you describe for us, sir, in what ways you have disagreement with the way Mr. Leibrock has approached his analysis of the pressure information?

A I'm not real sure how he has analyzed what he's come up with on the pressures, the pressures themselves. They are plotted versus cumulatiave production and his data is exactly like mine.

Now his analysis of the data, I'm not sure whether he came up with an ultimate recovery. I didn't hear any numbers and testimony. If I follow your question --

Q My question is whether or not you have plotted the available data.

A I have plotted the available data and that's shown in Exhibit Eleven.

Q So you and Mr. Leibrock are using the same data.

A We're using the same data.

Q All right, now let's go to your Exhibit Number Eleven and have you explain to me how you analyzed that data and what conclusions you have reached from that data.

A Okay. I might start off by saying that

we calculated from our volumetrics that the oil in place in this Tipperary pod, about 5-million barrels of oil, these are rounded off; these are numbers that we presented.

Using a 25 percent recovery factor, the ultimate recovery would be 1-1/4 million barrels, and as of July the 1st of this year, we have produced 3/4 of a million, which means that we have 500,000, or 1/2 a million barrels of oil remaining.

So we can start off from that point.

Q Well, let me ask you about that point.

Mr. Leibrock was concerned that the shape of the reservoir as plotted by Mr. Hair in December of '86 wasn't going to match his engineering data.

Does your analysis of the engineering data confirm or is it contrary to the way Mr. McDonald has mapped his Isopach of the reservoir?

A Well, I'll start off by saying that Mr. McDonald, he did his work independent of mine. Ernie is a geologist and I'm an engineer and I took his Isopach, I don't understand geology too well but I took his Isopach and I contoured it, ran the planimeter around it, and when I came up with volumetrics, I came up with the answers that I told you and its sounds very, very reasonable.

I do not know the shape of that reservoir. Mr. Leibrock, he's an engineer also, I think he would

say the same thing. Which way it goes, we don't know, and I'm just telling you that it's a fact that I took his Isopach, I have no trouble in relating my production performance to Mr. McDonald's volumetric ultimate recovery.

Q Perhaps for my own simple way of understanding, does your volumetric, your quantity of oil in place in the reservoir, can that fit in the size, shape, and thickness of the reservoir that Mr. McDonald has plotted?

A It's very, very -- it does, and it's very reasonable and the assumptions I made for the porosity and all the parameters, yes, sir.

Q Please continue with your analysis --

A Okay.

Q -- of Exhibit Number Eleven.

A Exhibit Eleven shows the bottom hole pressures that have been obtained over the life of the reservoir.

The initial pressure was taken in November, 1985, and that was taken, they're coded down there, that's a Tipperary 4 State No. 1, that was the discovery well in this particular pod and the pressure on that well was 2571 pounds. That was the initial pressure, and as we produced oil, the pressure remained -- continued to come on down and when you get out to 650,000 barrels of oil, which equates to about April the 1st of 1987, as I have it marked,

you can see that all three wells have been -- pressures have been obtained on all three wells.

In Mr. Leibrock's testimony he pointed out that the Tipperary 1 and the Tipperary 2 had pressures obtained on the same date and he is correct and he also said that the variation between the pressures, between the Tipperary 1 and the Tipperary 2, was some 200 pounds and I would like to correct the record to say that it is not that much, it's around 95 pounds. They're a matter of record with John West Engineering.

Q What difference will that make?

A I think the same point, I don't really know how relevant it is. I just wanted to correct the record that there's not that much change. I would like to explain why I think, in other words, when we saw the 95 pounds difference between the 1 and the 2, if you look at the structure map, the Tipperary 4 No. 1 is slightly higher than the Shipp No. 1 or the Tipperry No. 1. Okay, and due to this I feel like due to the nature of the reservoir, this is a very vuggy, very high vertical permeability, horizontal permeability, I believe that we're seeing some gravity segregation in the reservoir. I think it pointed out in my testimony that the gas/oil ratio in the No. 2 Well is higher than it is in the No. 1 Well, and I think that due to the increased withdrawals around the area where you have the

Shipp No. 1 and the Tipperary No. 2, the density of the wells is causing a slight pressure sink over what you see in the No. 1, Tipperary No. 1.

Q What other conclusions and opinions can you reach based upon your analysis of the reservoir pressure versus the cumulative oil recovery?

A Okay. I'd like to point out that on the graph, as you can see, the last pressure obtained was in April the 1st, 1987. I have drawn a line down through the -- let me back up and answer Mr. Lyon's question this morning. He had one wondering why the slope changes and that is definitely the bubble point. Our bubble point is showing to be about 2400 psi.

But anyhow, after you've passed the -- gotten down below the bubble point, I have extrapolated a line through the pressures on out through the April '87, and we think that the bottom hole pressure is about 1200 psi as of now, because we produced 750,000 barrels of oil.

Then I can go back and extrapolate on down to 400 pounds.

Q What do you mean "we"? Do you mean all wells producing in that pod have produced a cumulative total of that.

A I'm talking about the three wells in the pod.

Q The three wells.

A That's right. They have produced 750,000 barrels of oil as of July the 1st and I estimate the pressure to be about 1200 pounds and I've arbitrarily picked 400 pounds as an abandonment, and I'm saying that to go down to the 400 pounds, which another additional 800 pounds, we would pick up another 500,000 barrels of oil, which you add it all together and you end up with 1-1/4 million barrels of ultimate recovery which agrees with the volumetrics.

Q All right, sir, is there anything else about the exhibit that you would like to conclude?

A No, sir.

Q Let me direct your attention then at this point to the Isopach, if you have one, that Mr. McDonald (not clearly understood.). The purpose is simply to give you a point of reference for my question, Mr. Younger.

A Okay.

Q Mr. Hair has separated out the Tidewater No. 1 State U Well from the Tipperary Shipp pod, isolated out all by itself.

Mr. McDonald has included that Tidewater Well within the pod.

Based upon your engineering studies and analysis of the information, what is your opinion with regards to where that Tidewater Well ought to be placed? Do

we have information that shows that in fact it is separated; that it has pressure depleted the reservoir; in fact it's in its own separate pod; or what is your engineering explanation of what's occurred to that well in the Strawn?

A I have no pressure data on the Tidewater Well. It would be most helpful if we did.

But I did check the Commission records down in Hobbs and what I found is that the well was drilled and completed in 1951. The well initially came in about 70 barrels a day flowing and they flowed it for a couple of months and then they shut it in for two months, said that it needed a pumping unit.

It came back on production with a pumping unit and was making 70 barrels again. They produced it for additional five years. I think they abandoned and plugged the well in 1956/57, in there.

But during the course of reading through the records I can see that they have some mechanical difficulties with the well. The things that I noted in looking through the record, one, they mentioned split casing.

They also, when they were ready to plug the well, they went in there to pull the tubing. They pulled the rods out okay but when they went to pull the tubing it was stuck, and this would indicate to me as an engineer that if the tubing was stuck, it could possibly have

serving as a packer. In other words, they could have been having some interference problem with gas coming through their pump and not being able to vent it up the casing.

Let's see any other factors. I'm trying to think that I did notice that on initial completion that they acidized the well with 5000 gallons of acid. They came back a month later and hit it with 10,000 gallons, which would indicate to me that the well is tight.

So I'm seeing a combination of that it's not a prolific well like were these three wells we're talking about, but I do see signs that it was a commercial well at the time and then they had some mechanical problems and it is tighter.

That was my opinion. No pressures.

I might, let me add one more thing on that, is the fact that they reported a high potential of something like 500 barrels a day and I have to discount that because in the first month they just didn't make 500 barrels a day. They made something like 700 -- 70 barrels per day.

Q Let me go back to an earlier point and that is the decline of performance of the wells in the Shipp Tipperary pod after a certain period of time.

A Okay.

Q Can you approximate for us what you would attempt or project in terms of the ability of these wells to

sustain performance at rates comparable to the model allowable?

A I hope our wells don't perform this way, but I've got one well in which to model it from and that being the Viersen No. 1. The Viersen No. 1 was actually the discovery well.

The Viersen 1 actually was producing discovery allowable, which was over 500 barrels a day. It made that discovery allowable for some four or five months. Then it went on the regular allowable, so I'm thinking that it probably produced top allowable for some twelve months, something like this.

But after it started on its decline, when the pressure got down around 1000 pounds, you get to this critical gas saturation, I called it, they have been on a decline rate of some 70 to 80 percent. Their current production is 100 barrels per day, thereabouts.

Q What is your concern about Amerind having another strawn in the small Tipperary Shipp pod, Mr. Younger?

A My main concern is that if they put it where they're going to drill it, is that they will drain our oil.

MR. KELLAHIN: No further questions of Mr. Younger.

At this time, Mr. Chairman, we would move the introduction of his Exhibits Five through Eleven.

MR. LEMAY: Without objection those exhibits will entered into the record.

Questions, Mr. Carr.

CROSS EXAMINATION

BY MR. CARR:

Q Mr. Younger, let's look at your Exhibit Number One. I'm sorry, Exhibit Number Six.

A Number Six?

Q Yes, sir.

A Okay. Excuse me and let me dig through here and get it. All right, sir.

Q If we come down to the F1 factor, you have -- I believe you testified that there were 8.3 acres of additional (unclear) due to the location.

A Yes, sir.

Q And you planimetered the area that's in the yellow crescent on Exhibit Five, is that -- is that what you did?

A Yes, sir.

Q In doing that did you include the portions of that crescent which extend onto the Amerind proper-

ty, the two tips?

A Excuse me, just let me make sure. I think I understand your question but I want to be as accurate as possible.

Q What area was it you actually --

A I -- I used the area that's marked in yellow.

Q So you would have picked up the acreage that extends up onto the Amerind property.

A Yes, sir, everything in yellow, that was 8.3 acres, I used that.

Q You used the Pennzoil acreage as well, on the Pennzoil tract.

A You bet.

Q So the -- to the extent that you used that figure, you're also imposing a penalty on the admittedly small but still some portion of that yellow area --

A Yes, sir, and I did not come up with this, you know, it's just a formula that the Commission's used and I understand your point.

Q And you were trying to follow what the Commission has done.

A (Unclear.)

Q And using that formula that you understand the Commission has employed in some cases in the past,

you would have come up with a restriction on that well that would have let it produce 84.8 percent of its producing capability, is that what that calculation would have resulted in?

A Yes, sir, that's right.

Q And you were of the opinion that that was an unfair figure.

A I was of the opinion that that's not enough penalty.

Q So they have 8.3 out of 80 acres as their extension on the offsetting property.

A That is their encroachment.

Q And some of that's on their own property.

A I will say that the 8.3 acres is shown in yellow and I think the exhibit speaks for itself and I think that's right.

Q All right, some of it --

A I don't know the ownership around here, so --

Q All right, some of it's on the property in Section 33, the one to the north.

A Yes. None of it is in that 80-acre proration unit.

Q That's right, but some of it is on the acreage in the north --

A Yes, sir, I understand the equation but I just don't know the ownership of it.

Q All right, I understand that. And so for the 8.3-acre encroachment a 15 percent penalty is imposed.

You knew that a .2 percent penalty wouldn't be appropriate.

A No, I'm just saying -- you're saying -- yeah, I understand that.

Q Okay.

A It would not be appropriate. That's not enough. That's not severe enough.

Q All right. So you want to multiply that figure by the maximum productive acreage.

A That's correct.

Q That gives you more of -- a greater restriction.

A Yes, sir.

Q In calculating the maximum productive acreage you have accepted the Isopach map of Mr. McDonald.

A Yes, sir.

Q And if that is incorrect, then that would also impact on your calculations.

A Yes, sir, it would.

Q Now, it appears that what you're concluding from this Isopach map is there are only 16.1 productive

acres under the 80 acres proposed to be dedicated to the Amerind well.

A Based on Mr. McDonald's map that's correct.

Q It's not condemned by any particular dry hole, is it? It's just his interpretation.

A His interpretation, exactly right.

Q Now, you've indicated you would like to have a directional survey on the well.

A Yes, sir.

Q That directional survey, even if we accepted your calculation, would impact on that. You could certainly propose that a penalty be based on the actual bottom hole location not a surface location.

A I don't know that I -- I don't know whether I have to answer that question. I --

Q Do you have an opinion on that?

A I think that if you're drilling -- I think it would be setting a precedent -- well, I have a hard time answering the question, I'm sorry. I'm not evading you and I -- maybe I need to answer that a little later, but I hope --

Q If the bottom hole location isn't important to the formula, why do you want to have a directional survey?

A We want it directionally surveyed so you don't get any closer to us. I think that's the main reason. We don't care if it goes north.

Q Are you familiar with the general drift of the bit in --

A I'm familiar that all of of the wells that I've looked at, kicked to the north, but I also know that our position is that we've been in the oilfield long enough to know that anything can happen. They can put more weight on the bit at a certain time, that we definitely would want one run.

Q Now, an initial --

A And I'm sorry about I'm not answering your one question, but I don't, I just don't know the answer.

Q Drainage occurs from the bottom hole location of the well, does it not, not the surface location.

A That's true.

Q So if we're talking about drainage from an unorthodox location, doesn't it make sense that you use a bottom hole location?

A Let me phrase it my own way. I would think that if we knew, if all our -- to me it would set a precedent on a lot of wells that have been drilled in the State of New Mexico, for one thing, because we've got all

sorts of wells. It would open up cases where all of these wells -- I just -- I don't want to get -- it seems to me that -- but you're right, from a technical standpoint, wherever the bottom of the hole is it stands to reason that's -- that's where the well is and that's where it should be.

I'm not imposing what the Commission rules on it.

Q I thought you testified that experience, and we're jumping subjects, now, experience with the Tipperary No. 1 and No. 2 was that they produced at a high rate initially and then when the pressure dropped down around 1000 pounds, they went to a lower level and sort of leveled off at a lower producing rate, is that fair?

A I testified that on the No. 2. I said that the No. 2 had declined down to something like 400 barrels a day and the Tipperry 1, it still remains top allowable, and also the Shipp Well.

I think I may have mentioned the Viersen 1, maybe that's where it's gone on a real steep decline.

Q Now the Tipperary No. 1, that well is at an unorthodox location, is it not?

A The Tipperary No. 1?

Q Yes, sir.

A The Tipperary 1 was drilled as a wildcat and it was drilled at a standard location, wildcate rules.

It's actually 660 feet from the north line, 330 feet from the east line.

Q And that was a grandfathered in unorthodox location in the pool rules.

A Yeah, you can say that it was grandfathered into this pool.

Now, as far as there was nothing illegal about that location, it was drilled at a wildcat 40-acre well, that's true.

Q But my question is, you know, you talk about wells at standard locations and the pool rules provide within 150 feet of the center of a quarter quarter section, this well is 320 from the side line, is it not? It is not within 150 feet.

A Yeah, it's 330 feet from the side line.

Q And there is no penalty on the production from that well, is there?

A There is no penalty.

Q I believe you testified about the gas/oil ratios and indicated that the No. 1 had a lower gas/oil ratio than the Tipperary No. 2 Well.

A Yes, sir.

Q Wouldn't this lower pressure indicate a possible depletion of the reservoir from the north, the lower gas/oil ratio in the No. 1?

A You're saying the lower gas/oil ratio in the No. 1 would mean the pressure was lower? It's to the contrary. In the No. 1 the pressure is actually higher.

Q In the No. 1 the pressure is higher? Doesn't this indicate less depletion of the reservoir --

A It would be less --

Q -- from the north?

A As I explained awhile ago, I think a lot of it has to do with the fact, I'm not saying depletion, it had more interference, less interference in that part of the reservoir than there is to the south.

Q Couldn't it also show drainage from the north?

A As I explained awhile ago, I believe the structure plays a part in it. I think that the Tipperary 4-2, being higher, I think there is some gravity segregation. I think the gas moving up-structure is causing the 4 No. 2 and the Shipp No. 1 to produce more volume of oil and gas; therefor creating a pressure sink from what it is to the north.

Q And isn't this pressure, the higher pressure in the well to the north, though, also couldn't this be evidence of drainage from the north? Isn't that something else it could show?

A Drainage from the north?

Q Yes.

A You mean if you have a higher pressure in the north is that due to the drainage from --

Q That you have reserves being drained from the north would tend to keep your pressure up?

A I don't think it says what direction its coming from. It means that there's oil coming in, yeah. When you say north, I mean it may be east or west or --

Q Let's go to your Exhibit Number Seven. On your Exhibit Number Seven you talk about the productive acre feet, I believe, correct me, I'm not trying to --

A Yeah. Okay, Number Seven or Number Eight?

Q Number Seven, the reservoir parameters.

A Okay.

Q And you're working into Exhibit Number Eight and that's --

A I got you.

Q -- where you computed, I think, (unclear).

A Yes, sir.

Q The first entry, total acres, 281 acres planimetered. That is from the geological work of Mr. McDonald.

A Yes, sir.

Q Now, the total acre feet, is that also planimetered from the geological interpretation?

A Exactly.

Q So the entire calculation -- the entire second approach to the imposition of a penalty is based on the geological interpretation.

A Yeah, that's right, that's based on the volumetrics of -- in fact, the first one is based on geology, too, because it's got area, and the second one has acre feet. I've added no more parameters there.

Q Based on your work and planimetering the reservoir, you have come up with a total, I believe, of 281 acres for the reservoir.

A Yes, sir.

Q If I understood your testimony, the volumes of oil that you estimated to be in the reservoir could comfortably fit within that 281 acres.

A Yes, sir.

Q Now Mr. Hair's interpretation came out with something more in the neighborhood of 130 acres. In your opinion could the volume of oil that you're talking about fit comfortably in 130 acres?

A Well, the parameters that we've used, I think what we'd have to do is go through the list of parameters. You're saying that he has a smaller number of area,

a smaller area, so that means that what we'd need to do is to increase the porosity from 10 percent to some other number. You could very well, reasonably do this. This is the best data that we have. I feel comfortable with 10 percent.

Another thing you could do is to change the water saturation and I guess those other factors, the primary factors.

The recovery factor could be changed very -- from 25 percent to 50 percent, that might do that, you know, but I don't believe it's within the realm to me. My experience says that the 25 percent recovery factor is a very reasonable number for a solution gas drive reservoir. In fact, if anything, it may be on the high side, but I'm going on the high side due to excellent rock characteristics.

Q In your review of the Tidewater Well, the State No. 1-U --

A Yes, sir.

Q -- you discovered evidence of mechanical problems with the well.

A Yes, sir.

Q Did you find anything in there that would conclusively show you that this was part of the same reservoir as opposed to a separate pod?

A Mr. Carr, I didn't find a thing. I

looked strictly through the well file, didn't look at any logs. I think the geologist may be able to answer your question. No, I did not.

Q You can still have mechanical problems in a separate pod. All those things could still occur in a separate pod as opposed to --

A Yes, that's right.

Q Now I think you also testified that Wells Tipperary 1 and 2 initially produced at a high rate and then dropped down to level off at a lower production -- I'm sorry, it was Tipperary 2 that you said that on. Do you see any similar performance in the Tidewater No. 1-U?

A Like I say, there was a very limited amount. That well only made 19,000 and my testimony says I think it's a tight well. I did see some mechanical problems and I think all I'm really saying is it made 19,000. It could have very well been a 50,000 barrel well.

MR. CARR: That's all I have of Mr. Younger.

MR. LEMAY: Additional questions of the witness?

MR. BROSTUEN: I've got a question or two.

QUESTIONS BY MR. BROSTUEN:

Q Earlier today someone, and I forget which person was testifying, said something about the virgin pressures being in the area of 4000 pounds. Is that correct or did I misunderstand that?

A That -- that is correct. That was mentioned.

Q And that the initial pressures here were in the neighborhood of 2600 pounds?

A Yes, sir, that's correct.

Q And the reason for the difference is that there's communication between various pods.

A Yeah. I didn't testify to that but I agree with what --

Q You do agree with that.

A Yes, sir.

Q Would the difference in pressures between 4000 and 2600 pounds, could that be attributable to the production from the Tidewater Well?

A You know, there's more than one Tidewater Well there.

Q I'm speaking of the Tidewater 1 State U.

A I'd say definitely no. No. It could not be -- I don't think that's enough oil production to cause the bottom hole pressure in this big pod to decrease from

4000 down to -- to 2600.

Q But when we speak about the weak communication in the area, are we talking about the various pods we have reviewed on the various exhibits today or are you talking about a larger area?

A Yeah, like I say, I didn't bring it up but I think I'm in tune with what was brought up, and I think that it's probably -- I'll give you my own thought, and I'm not a geologist, but is maybe all of these pods are connected together by some large aquifer down underneath and there may be spill points. You can have a pod and then it can be another pod here, each of them having different spill points, and that if this pod way over here is produced land depleted, it may have some effect on the pressure in the aquifer, and that could have happened, I don't know, over years, or how many years, that's my -- just my opinion.

Q Well, you think, then, that we have, in view of the possibility of this aquifer, that we have somewhat of a water drive as well as a solution gas drive?

A I don't believe that we have an active water drive. I know that the wells make water the higher they get on this Lovington high, you know, but where we are they are performing exactly like solution gas drive but there could be, sir, there could be a partial water drive, but there is definitely no active water drive.

Q Thank you.

MR. BROSTUEN: That's all I have.

QUESTIONS BY MR. LEMAY:

Q Just an understanding here, Mr. Younger, if I could of trying to get a regional picture.

You mentioned the Viersen 1 and it's been mentioned before, my recollection was that was a monster when it came in, something like 1300 barrels a day, and --

A Yes, sir.

Q -- got a lot of publicity.

A Uh-huh.

Q Also you testified the maps we've seen have definitely not connected that well with any other wells in the area.

A Right.

Q And you would agree, I guess, with that interpretation from the pressure data you've looked at or --

A Yes, sir, I do agree with that and the latest that's a Pennzoil Well, the lastest pressure I heard from Pennzoil was something like 900 pounds, so they are -- and the well has been down around 100 barrels a day for some six months and you can see how well our pressure is tracking, I would say that it's not.

Q So basically, with good communication, would say that the ultimate recovery of that well would reflect the recovery of the pod? In other words, working backwards --

A Yeah.

Q -- projecting the pressure to a cum --

A Right.

Q -- and then working back with an Isopach to reconstruct the size of that pod, that well is the only one draining the pool.

A That you could sort of go by as a go by, is that what you're asking me?

Q Yeah, I'm trying to coordinate in my own mind the various pressures we're seeing, the interrelationship, although -- although they haven't given, I"m assuming the Viersen's pressure is quite a bit different than the pressures in the Tipperary pod.

A I can give you an example without having any specifics, but say, six months ago when our pressures were running 1600 pounds --

Q Yes.

A -- I called Pennzoil to get their version, theirs would be something like 1000. So you've got a pretty good spread there, that in my mind makes me think it's a different pod.

Q And that, from an engineering point of view, is the -- what the operators in the field use to really differentiate the pods. Once you've drilled into them you have a pressure, you can associate that pressure possibly with various pressures in other pods?

A Yes, sir. I think I can go back one spot to if we go back to the Viersen No. 1, that was the discovery well, and I can't quote the pressure for sure, but they had something like a discovery pressure of 2800 pounds.

And then when we came in and drilled our Tipperry No. 1, we had 2600 pounds and the pressure, that was a different pressure than what we had in the Viersen.

Q Would you want to hazard a guess in this area as to if you were to run pressure interference tests, what kind of horizontal permeability would you encounter? Would you -- you say excellent, you used 26 millidarcies, was it, or something?

A I think we quoted 40, something like 40.

Q 40-some, 46 millidarcies?

A Uh-huh.

Q You would expect a presure interference test to show that pressure is communicated rapidly through at least the pod that's being developed?

A Yes, sir. Now Pennzoil did run extensive interference tests and I haven't -- I'm not privy to all of

their information but I know their conclusions. I think Mr. Hair can testify, he was with Pennzoil at the time, that they had, definitely, that they were (unclear) pods for pressure interference tests.

Q Going back to that 4000 pound bottom hole pressure initially, again it's not on here. We don't see all the fields. Going back to my memory now, the Montieth, top of the Strawn Montieth, that must reflect -- there's an old Getty Well in there that made over a million barrels of oil, I think it was the Getty Montieth.

A Okay.

Q Are you familiar with that well at all?

A Not as much as Mr. Thornton or Mr. McDonald. I mean I've heard them talk about it but I --

Q Well, I just wondered if that was where the use of 4000 pounds might have come in, or what evidence there was to an initial 4000 pounds bottom hole pressure in the field.

A I can't answer that.

Q Okay. I don't have anything else.

MR. KELLAHIN: Two questions, Mr. Chairman.

MR. LEMAY: Yes, sir.

REDIRECT EXAMINATION

BY MR. KELLAHIN:

Q I'm not certain you've done the calculation, Mr. Younger, but let me ask you a question.

When we look at the Amerind tract and that portion of it that is assigned some fraction of the reservoir, do you have an opinion as to whether or not there is sufficient recoverable oil reserves underneath that portion of that spacing unit to support the drilling of a Strawn well without draining the offset owners oil?

A Would you mind repeating that? I'm sorry.

Q Yes, sir. Now that we're in tune to where I'm going, can you tell us, or can you calculate what you think to be the recoverable oil in place undereneath the Amerind tract and whether that volume of oil is sufficient to support the drilling of --

A Okay.

Q -- a well on that tract.

A I ran through some calculations, if you'll refer to Exhibit Number Nine, showing the 80-acre proration units.

It shows 321 acre feet for the proposed Amerind well and I calculated the oil in place using the parameters that I've given you earlier, the porosities, the

water saturations, B sub O and everything, that there would be an oil in place, 321 acre feet of 131,000 barrels of oil, with a recoverable, using a 25 percent recovery factor would give you recoverable reserves of 33,000 barrels of oil.

I believe Mr. Leibrock said that maybe 40,000 barrel is what it would take to pay out a well.

Q So based upon your conclusion, there is insufficient oil underneath the Amerind tract to support and justify the drilling of a well to recover its own share of that oil.

A Yeah, based on those curves, that's correct.

Q In order to make that well profitable it's going to have to produce oil off an adjoining tract?

A That's true.

Q Let me ask you, my second question is in relation to the Exhibit Six double circle condemned acreage calculations --

A Okay.

Q -- when we look at the 16.1 acre feet in the condemned acreage factor at the bottom?

A 16.1 acres, excuse me.

Q I'm sorry, yes, 16.1 acres, it's not acre feet, that is taken from a planimetering of Mr. McDonald's Isopach?

A Now, let me think of my exhibit. I've just got double circle -- no, that's just strictly just double circles.

Q Yes, sir, but when we get down to --

A Oh, I'm sorry, we're on condemned acreage.

Q Yes, sir.

A I didn't answer -- it is based on Mr. McDonald's Isopach.

Q Okay. If the Commission should want to adopt Mr. Hair's Isopach, he testified that he has 26 productive acres.

A Yes, sir.

Q To apply that testimony to the calculation, then, you would simply remove and substitute 16.1 and replace it with 26 acres.

A That's correct.

Q And that would incorporate Mr. Hair's Isopach into the calculation and then you'd run through the rest of them, I believe.

A That's correct.

MR. KELLAHIN: Nothing further.

MR. LEMAY: Any additional questions of the witness? Yes, sir.

RECROSS EXAMINATION

BY MR. CARR:

Q You simply, you were talking about calculating recoverable reserves under Amerind's tract --

A Yes, sir.

Q -- whether there were reserves there to pay for a well. You were basing that again on the geological interpretation of Mr. McDonald, were you not?

A Yes, sir. I was.

MR. CARR: Nothing further.

MR. LEMAY: Additional questions?

If not, he may be excused.

Thank you, Mr. Younger.

A Yes, sir.

DEWEY THORNTON,

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

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q Mr. Thornton, for the record would you please state your name, sir?

A Dewey Thornton.

Q Mr. Thornton, by whom are you employed and in what capacity?

A W. A. Moncrief, Junior. It's a family-owned oil company out of Ft. Worth, Texas.

Q And what is it that you do for them?

A Well, I'm a geologist and also exploration manager for Mr. Moncrief in Midland.

Q Mr. Thornton, have you previously testified before the Commission as a petroleum geologist?

A Yes, sir.

Q I'm not going to ask you a great many questions about the details of the geology but I would like for you to begin, sir, by describing what interest Mr. Moncrief and his family have in the Shipp Strawn area that's in question today.

A We have a 50 percent working interest in the Tipperary lease.

Q Would you summarize and describe for us what has been your specific involvement and experience in the Shipp Strawn Field?

A I've been working the Strawn algal mound productive area for about five years.

Q While Moncrief is not the operator of any of the Shipp Strawn wells, do you take an active interest in planning for those wells and reviewing the geology that's

available?

A Yes, sir, I do.

Q Can you express an opinion for us, Mr. Thornton, with regards to your geologic opinion of the area in dispute, contrasting Mr. Hair's position and Mr. McDonald's? Where do you stand, sir?

A I'd just like to say that I've been working this area for about five years now and I've studied the entire productive area, and in every productive area out there there is a direct relationship between the total amount of mound thickness and having porosity present or not. You've got to have a certain amount of total mound thickness before you're going to have any porosity, and that will vary from mound to mound.

We're just concerned about the Tipperary pod today.

Q When we look at the Tipperary pod today, do you have an opinion as to which of the geologic presentations you have confidence in?

A Yes, sir, I have more confidence in Mr. McDonald's interpretation.

Q And why is that, sir?

A I feel like he's honored all the subsurface information that we have, including the dipmeters and I think he's been very generous even showing the possibility

that they might have any porosity at the proposed location.

Q Do you have an opinion or a recommendation to the Commission with regards to a penalty for Amerind's proposed unorthodox location?

A In my opinion Mr. McDonald's interpretation is more believable and I feel very strongly that the Amerind proposed location should be severely penalized.

MR. KELLAHIN: Thank you, Mr. Chairman.

MR. LEMAY: Mr. Carr?

MR. CARR: No questions.

MR. LEMAY: Additional questions of Mr. Thornton?

You may be excused. Thank you.

MR. KELLAHIN: That concludes our direct case, Mr. Chairman.

MR. LEMAY: You gentlemen have closing arguments? You want to take a break here for some closing arguments or are you ready to wrap it up?

MR. CARR: Let's go.

MR. LEMAY: At this point I just might, before we start closing arguments, ask if there is anyone present who would like to make a statement in the case?

Yes, sir.

MR. SMITH: My name is Curtis Smith. I'm with Texaco out of Midland.

MR. LEMAY: Yes, sir.

MR. SMITH: And Texaco has a 30 percent working interest in the Amerind Meyers No. 3.

Texaco is a majority leasehold owner in the southeast quarter of Section 33. We also have a small interest in the northeast quarter of Section 4, and I'm here to make a statement that Texaco is in support of the unorthodox location planned by Amerind.

MR. LEMAY: I thank you, Mr. Smith.

Are there additional statement in the case?

If not, we'll conclude with the closing arguments.

MR. KELLAHIN: Mr. Carr and I have done these kinds of cases before various commissions of the Oil Conservation Division, the staff and the commission for years and years.

The reason we asked that this case be placed before you is it is an opportunity for you to hear firsthand what I could characterize as a very typical unorthodox location case. This is a garden variety dispute Mr. Carr and I have done on both sides of this problem for

years before your examiners.

We wanted to give you an opportunity to see this case before it was heard by an examiner. It is not an examiner case. It came directly to the Commission.

We wanted to give you an opportunity to perhaps accomplish several things.

One would be to re-examine the method by which the Commission has dealt with this kind of problem in the past. This is one of the most common cases presented to your examiners.

We have over the course of the years invented every conceivable way to handle these kinds of situations. My recollection is that I do not believe an unorthodox location case has ever been denied. You may decide that this is an appropriate case where you deny them. The evidence shows you, and Mr. Hair, has displayed on his Isopach, that he has a standard location within the rule that gives him 80 feet of net thickness. That's a marvelous thickness in this reservoir. You may want to send a signal to people looking for unorthodox locations that they'd better be concerned about the fact that they're going to get denied on occasion for a reason. We've not done that in the past. This is a case where the facts may speak to that question.

Historically the Commission has done several things with these kinds of cases and that is in order to balance the equity, they give the operator looking for the unorthodox location the chance to drill the location where it is and they say the way I'm going to protect everyone else is I'm going to require him to take a longer period of time to recover his share of the oil so that he is not taking unfair advantage of the offsetting operators who already have wellbores in the ground or physically committed to a standard location and can't move it.

We have seen historically that when cases are not opposed there may be a compromise among operators where a well is placed at an unorthodox location without penalty.

Mr. Carr suggests that the unorthodox location for the Tipperary well somehow sets a precedent for his client. That's not the case. It is unorthodox only to the Pennzoil acreage and there was no dispute about that. Those two operators decided it was okay to put that well there.

What is different about this is Tipperary's wellbore is 660 from the common line with Amerind. Dispite their own geology, they want to move closer. They want to play closeology to us and there's nothing we can do about it except to rely upon you to impose some pen-

alty or deny the well location.

The Commission has wrestled with this for years. It's not a new problem. They -- one of the things they have selected as a way to solve it would be to use the double circle formula. It's not the first case by which this was done but I would invite your attention to perhaps read that order because I think it's a helpful order in that it sets forth in the findings the kinds of information the Commission was looking at when they wrestled with well location penalty cases. I would invite you to a de novo case, it's a Yates case, decided on February 26th of '86. It's Order No. R-8025-A. In that case the Commission does in fact use the double circle penalty.

One of the inherent difficulties with the double circle penalty is that it is not a one-to-one relationship in terms of the penalty and the location. For example, you can move 50 percent closer on the surface and by running through the calculation, simply get a 20 or 30 percent penalty. You might want to determine for the Division staff to what extent you want to penalize these. The two extremes of the argument are that at the common section line between the two areas, between Section 33 and 4, if the unorthodox location was right on the line one school of thought is that that well ought to have no allowable at all. That's the maximum distance it could go and

ought to have no allowable. From there you step it back and reduce or increase the allowable.

The other school of thought is that at that same point scribing a circle and assuming radial drainage you at least have an opportunity to drain some portion of your own spacing unit and so you're caught with that as being the other extreme. Is it fair to have a 100 percent penalty?

One of the ways the prior commissions have attempte to refine the double circle penalty is they often recognized that that penalty is not appropriate where it's admitted by the applicant that his own spacing unit is less than 100 percent productive.

This is the case here and in every past case like this, even in this very pool, the Commission has applied an additional factor normally based upon the applicant's own Isopach. They take his own evidence and when he says I only have 26 acres productive in my unit, they say, fine, that's what you get, and they plug it into the formula not unlike what Mr. Younger did.

Some of the prior orders in this pool that we have talked around and about today, and there are two of them specifically that deal with this situation, one was the Phillips case. It's Order No. R-8389.

The other one involved the Penn-

zoil case in the Viersen No. 3 Well. That's Order No. R-8366, and as a further example, Mr. Leibrock discussed with us the Texaco case in the Northeast Lovington Penn Pool and that is a similar penalty and it is Order No. R-8393.

Apart from the double circle and the condemned acreage formula, the Commission has been presented on a number of cases with the concept that Mr. Younger has presented to you and that is a net productive acreage type hearing, where you attempt to allocate the net productive acres among the wells in the spacing unit. We did this for you today because you can see how complex it can be even with the abundant well control we have. This is not the first time this is done. It's often done, I've seen it frequently. I've been on both sides of that question, and if you determine that's a waste of time for us, we need a signal from you that it's a waste of time and we'll stop doing it.

The point is, as best I can recall, a net productive type allocation has only been made by this commission one time before and that occurred in a Western Oil Company case. That was some time ago. The Western Oil Producers case was an unorthodox location. It was heard in April of '84. The order number is R-7448-A. I invite your attention to that order. It's an interesting case. The reason it's interesting is that penalty was adjusted on

net productive acres only after both wellbores were in the ground. Unlike our situation where the Amerind well is not in the formation yet, the only other time the Commission has done this is in the Western case in which there were two wellbores in that pool and they had a very specific way that they could give you comfort, you could do a net productive acreage map and allocate the pool allowable among the two wells.

My point is that we need a signal from you about how to do these kinds of cases. I would like to invite to exercise this as an opportunity to perhaps come up with a better system if there is one. We've struggled for years over the double circle and (unclear) maybe that's the best we can do.

But we would invite you to take this opportunity to give us an indication of how you would like us to handle such cases.

Specifically on the facts that you've heard today, they're not particularly difficult. There are some conflicts in the presentation, but I think it's very important to understand the context of Mr. Hair's testimony.

He has made a practice of appearing before you and presenting evidence with regards to these pods. I believe he is foremost in his belief that

seismic information is a valuable and useful tool. I would invite you to look to see how many times that seismic information has caused Pennzoil and others to drill dry holes in this reservoir. It is not a useful technique and yet it is one that Mr. Leibrock wants to utilize in order to stretch this pod up into Section 33.

I think the evidence is replete the seismic information is no longer reliable and no useful purpose can be served by using it.

Our testimony was that at 11,000 feet there's enough error in seismic information to give you an error that exceeds the relief of the mounds themselves, and you're not going to find that to be a useful indication and in fact the practice has been that it is not.

Mr. Hair says they utilized the seismic information and they drilled a terrible dry hole. That Waldron well is as concrete an example of how bad you can err with the use of that information.

There are two points I'd like to direct your attention to about Mr. Hair's Ispach in December of '86, and the first one is look at the Exxon pod. Mr. Hair came before this Commission in December and told that commission that in his opinion the Viersen No. 3 Well was going to have 70, 75 feet, perhaps 80 feet, of thickness in that Exxon pod and if they didn't get an unorthodox well

location that Exxon was going to drain that pod.

The commission entered the order approving it. Pennzoil drilled the well. They did't get 80 feet. They didn't get 60. They didn't get 40. They didn't get 20. Mr. Hair, God love him, was wrong.

I will tell you what else is interesting about that exhibit is that that exhibit was presented for the Exxon pod but he also included the Tipperary pod and I will invite you to know that I think the orientation of the pod that he has made on that exhibit represents his best objective judgment about how to place that pod. There was no influence or factors or anything else involved in that Exxon case that would cause anyone to adjust, recontour, that Tipperary pod, and you'll find that he did not extend it into Section 33.

He says he's made that adjustment since then because Mr. Leibrock now has another seismic run and he believes that because of some pressure gradient we've got to move the reservoir up, up into Section 33.

That's absolutely wrong. I think if there is an engineering witness to believe, that's done his homework in this pool, it is Mr. Younger. He has told you he has confidence in the engineering information confirming Mr. McDonald's analysis of the Isopach and he has asked you for a penalty on this well that allow the well

to be drilled notwithstanding the fact it doesn't have its own reserves sufficient enough to support the well itself, but still drill the well, reduce its allowable, so that it doesn't compete unfairly with the Tipperary well.

When we look at that penalty, their allowable is still going to be 90-someting barrels a day. To recover that 40,000 barrels for Mr. Leibrock, he says he needs a payout of five months. Under that penalty he's got a payout in fourteen months. It sounds fair to me. I think that's equitable. There's not enough oil reserves underneath that tract so that he has any correlative rights to protect. It's simply an opportunity and it should not be used as an excuse to snuggle up against someobdy else's oil reserves and make a profit off of somebody else's oil.

It's the only way we can protect ourselves and that is to ask you to deny the location. I think that's justified. They certainly could move back to a standard location, drill a well. If you give them this location, however, we would ask for a penalty as Mr. Younger has calculated on Exhibit Number Six. We think that's fair, appropriate, it fits the evidence presented to you and it's well justified.

In the absence of such a penalty our correlative rights cannot be protected.

Thank you.

MR. LEMAY: Thank you, Mr. Kellahin.

Mr. Carr.

MR. CARR: May it please the Commission, I would concur in certain statements made by Mr. kellahin. Those statements that some signal from the Commission as to how you would like cases of this nature to be handled would be helpful and would be appreciated.

And I want it understood that I didn't come here today to present an academic situation to you. I came here today because my client is convinced they have reserves in the Strawn Pool, a pool that is in -- a tract that is in communication with the rest of the pool but there is no well and the reserves from under that tract are being drained.

We came directly to the Commission because we though it unwise to do this twice, because everyday we delay drilling a well the reserves are being drained away. That is why we came directly to you.

Mr. Kellahin suggests that maybe this is the case in which an application should be denied.

I think he's right. I can't remember an unorthodox location ever being denied. I remember one where someone intentionally deviated a well to five

feet out of the corner of a tract offsetting the South Empire Abo Unit. It was permitted to produce that well with .002 over something authorization.

But I think the reason for that is that correlative rights are defined as affording to an interest owner the opportunity to produce his just and fair share of the reserves in the pool. It gives him the opportunity to be permitted to drill and to get his fair share swith penalties imposed.

I suggest it may not be wise to outright deny when there is a backdoor way to accomplish the same end that I submit is consistent with the statute.

A simple solution would be wonderful. That's what was tried with the two circle approach. We didn't propose it to you today because it simply does not work. The reason it doesn't work is perhaps as much as it would be nice to have a simple solution, there isn't one. There isn't one because each case has to stand on its merits. We have to have people like you, this Commission, to evaluate the witnesses' presentations, their demeanors, (unclear) in coming before you.

To the extent we can get some direction from you it would be helpful, but I think it's unfair to you for us to stand before you and say, this is something else we think you now should resolve.

Net productive acres has been used the one time Tom cited to you. It's also been used, I believe in a case involving ARCO and Continental about 10 years ago. But it has not been universally employed and the reason, I submit, is to go that route you have to have a geological interpretation (not clearly understood). You have to know what's going on 11,000 feet below the surface of the ground.

I purported to do that once before the Supreme Court of New Mexico when I represented this Commission. The Supreme Court ruled that they wouldn't traverse that bog and I don't intend now to renew it today.

And I think what we have is a situation where you've got to look at each case and let that case stand or fall on the evidence.

The evidence we're presented here today I think shows not only particular facts as we can best determine them in this reservoir but also you can see how we got to this hearing.

Amerind has an interest in the Pennzoil B. E. Shipp No. 1 Well and also an interest in properties to the north in Section 33.

In this property and other Strawn property in which they're involved, they continually property evaluate the reservoir and the reservoir in this

situation has grown in the past and Mr. Leibrock got some pressure information, which suggested to him that the reservoir was actually larger than anticipated. There were dry holes or old producing pods, completed pods, to the east, the west, and the south, and he employed Greg Hair, who for Pennzoil had spent a substantial portion of his professional career evaluating this particular area, and he asked him to re-evaluate, to take another look at the reservoir, and he did it, and he confirmed it with seismic data.

Now we can stand back and say seismic data isn't worth anything. It's fraught with error. If that's the case, it's remained curious to me throughout the years that it is such a highly guarded, proprietary interest in every company who decides to buy it.

Pennzoil has it; they've used it. Nobody in any of these cases involving Shipp Strawn would even suggest that they shouldn't use it, and no one really has pursued whether or not Amerind should, because it's highly proprietary; it costs a lot of money; and it is continually done because it has value, and because it is used and it used by engineers who use 1980 technology in defining what a reservoir actually looks like, and it was used in this case, and it confirmed the presentation of the data, the direct physical properties that we knew about the reservoir and the wellbore data that we have.

And Amerind believes that their interpretation is correct; that there are substantial reserves under 33, Section 33, and they are here seeking approval of an unorthodox location so that they can go ahead and produce these reserves.

We've had vastly differing geologic interpretations. Tipperary is talking about a 281 acre reservoir and we're talking about 124. We've got all sorts of factors we can manipulate to get the oil within the much acreage, but we submit to you the presentation we've put forward is a presentation by the most knowledgeable man in the area, using absolutely the best data available.

We're seeking approval without a penalty. Mr. Kellahin would like to lead you into the situation where you would say well, let's just take old Greg Hair's estimation of 26 acres under his property and crank it into Tipperary's formula. That will take care of Hair and that will take care of Tipperary at the same time.

Well, if you want to use our interpretation, we suggest you use all of it or use none of it at all, because that interpretation not only shows 26 productive acres under the Amerind property, it shows 25 under Tipperary, and we believe when you look at that, they counterbalance, but you have to look at something else in reaching a decision in this case. We submit throughout

there's been concern that the rules in the area do not provide sufficient flexibility for effeciently developing the properties.

Tipperary drilled in a window, time window from September -- between September and November of 1985. They could drill 330 feet from Pennzoil's property without a penalty.

Today they're concerned that we would like to drill 330 feet from them and I understand their concern but I submit to you that without a well at this location no well will be drilled and there will be reserves left in Section 33. Correlative rights of Amerind will be impaired or I submit they will, by imposition of a penalty, be denied the right to produce their reserves.

We submit that once that well is down we believe it will confirm Mr. Hair's geologic position and it will once and for all be put to rest.

I think this is a geological case. I'm glad we're trying it to the two of you, but I think if you take a look at the two geological interpretations there are certain things that are -- that have to weigh in favor of Amerind.

The Tipperary presentation extends to the west. It picks up a well, the Tidewater State 1-U Well, which produced only 19,000 barrels of oil. We can

speculate it was a casing problem, what all of this means, but it doesn't perform like the wells in the basic, primary pod we're talking about, and you have to extend far to the west to pick it up.

If it was in this pod from their own testimony it only produced a very small percentage, it produced 19,000 barrels, and yet they compare by their interpretation, Amerind's location virtually is on the same contour, and you'd expect a similar producing capability. If that's the case, if you accept their interpretation as you do the Tidewater, we submit the Amerind well will pose no problem whatsoever.

They've even presented testimony which I believe is inconsistent with their own testimony. They talk about thickness relating in a positive way to porosity, and yet if you look at their net porosity map and you compare the wells on the zero contour and you relate it back to the preceding Exhibit Number Two, where they show the thickness of the interval, they have intervals that are 122 feet thick and 165 feet thick, they treat them exactly the same.

I submit they have pulled their contours to the north and to the west and it isn't supported with the standards they have testified to.

We submit the penalties they

propose are outrageous. To penalize a well 83 percent on an 80-acre unit which encroaches 8 acres farther than it would in a standard location, and of that 8 acres probably half of it is either on property which they own or property which Pennzoil owns, I think it's an unreasonable penalty and I think any penalty ought to be based on the bottom hole location, not the surface location, and we're prepared to run a survey to provide you with the actual bottom hole location of the well. That would put their concerns to rest about our moving on them, and will give you better information to work upon.

It's also a consistent position with the Supreme Court's directive in Continental, that you do certain things so far as it practicable for you to do so, and I think when we can provide this bottom hole location that is the information that you should use. We'll provide you that and we submit that the application should be granted, that no penalty should be posed when it is and it should be based on the percentage of encroachment towards the offsetting property, especially in this situation where there is such tremendous variation in the testimony that they've presented to you.

And we believe if that is done, our correlative rights will be protected, reserves will be produced from 33 that won't otherwise be produced, and the

correlative rights of the other interest owners in the pool will not be impaired.

Thank you.

MR. LEMAY: Thank you, Mr. Carr.

Is there anything additional in this case?

If not, the case will be taken under advisement.

(Hearing concluded.)

C E R T I F I C A T E

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

Sally W. Boyd CSR