BEFORE THE
NEW MEXICO OIL CONSERVATION COMMISSION
Santa Fe, New Mexico

February 23, 1971

REGULAR HEARING

IN THE MATTER OF:

Application of Tenneco Oil Company for the creation of a new pool, assignment of discovery allowable, and promulgation of special pool rules, McKinley County, New Mexico.

Case No. 4457
(De Novo)

BEFORE: Mr. A. L. "Pete" Porter
Mr. Alex J. Armijo

TRANSCRIPT OF HEARING

MR. PORTER: We'll take up, next, Case 4457.

MR. HATCH: Case 4457, continued from the February 17th, 1971 hearing. Application of Tenneco Oil Company for the creation of a new pool, assignment of discovery allowable, and promulgation of special pool rules, McKinley County, New Mexico.

(Whereupon, Applicant's Exhibits Numbers 1 through 17, inclusive, were duly marked for identification.)

MR. PORTER: Mr. Bateman, Mr. Hatch will swear your witnesses.

(Witnesses sworn.)

MR. BATEMAN: If the Commission please, I have a brief statement to read into the record before we begin.

MR. PORTER: You may proceed, Mr. Bateman.

MR. BATEMAN: Thank you. Tenneco Oil Company, by its application in this case, seeks primarily to create a new oil pool in a designated area, McKinley County, New Mexico. In addition to the application, it concerns the assignment of an oil discovery allowable, Tenneco's discovery well, the Don-ne-pah well number 1 located in the northwest of the Northwest Quarter, Section 18, Township 17 North, Range 8 West, of course, in McKinley County.

In conjunction with the creation of a new pool, special rules for the regulation of the pool are requested. These proposed rules principally provide for the development

of the pool on 80-acre spacing in proration units.

Before proceeding with the testimony, however, it should be pointed out that there has been a change in circumstances that has occurred since the application in this case was originally filed. The application was filed in October of 1970. Considerable development has taken place in the pool since that time, and the original application contained provisions for fixed locations for wells drilled on the 80-acre proration units.

Those locations were designated to be in the northwest and the southeast quarter of each quarter section.

In the ensuing period of time, however, two wells have been drilled in off-pattern locations, and the third is being drilled in at the present time. Since off-pattern wells have been drilled in the pool, correlative rights are definitely affected.

We feel that it would not be equitable to exempt these off-pattern wells from the requirements of fixed locations and proceed to impose a rigid standard and outline for future wells to be drilled in the pool. Tenneco therefore is waiving its request for fixed locations.

MR. PORTER: All right.

MR. HATCH: May I say something here. You're not wanting to foreclose the Commission if --

MR. BATEMAN: No.

MR. HATCH: If they wish to have fixed locations?

MR. BATEMAN: That's correct, Mr. Hatch. That's correct.

MR. HATCH: And you're not suggesting, or are you, that the Commission would have to grant 80-acre spacing on those wells that are not on --

MR. BATEMAN: No, I'm not suggesting that at all, sir. I'm just pointing out that there has been, in fact, the change of circumstances that significantly affect the question of fixed locations; that is, the drilling of off-pattern wells.

Since the application in this case was originally filed in October of 1970, we feel that we should point this out to the Commission before proceeding. Does that clarify it?

MR. HATCH: I think so.

MR. PORTER: I believe what you are saying now, is, actually, you are revising your application to make it flexible because of the fact that three wells are drilled off pattern. Now, as I understand it, if the Commission should desire to grant the 80-acre spacing and retain the fixed pattern, then the Commission itself will determine what they'll do with four of the wells that are off pattern.

MR. BATEMAN: That's correct.

MR. PORTER: Okay.

MR. BATEMAN: The first witness is Mr. Dean Rial.

DEAN RIAL

called as a witness, having been first duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. BATEMAN:

Q Mr. Rial, have you previously testified before the Commission?

A Yes, I have.

Q Have you stated your qualifications into the record?

A Yes, I have.

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

MR. PORTER: Yes, they are.

Q Mr. Rial, would you refer to your Exhibit Number 1 and tell the Commission what is reflected in that exhibit.

A Exhibit Number 1 is a data map and shown on here by the red arrow is the location of the Don-ne-pah Number 1, the discovery well for the proposed Lone Pine Pool located in the Northwest Northwest of Section 18 of 17 North and 8 West in McKinley County, New Mexico.

Shown within a radius of the circle here, a radius of two miles, are the locations of all wells drilled and all locations of record within this two-mile area.

We also show here the producing oil and gas wells and the formation from which each well is presently

producing. The formation code is located in the legend at the bottom of the map.

We've shown here all locations and total depth of all dry holes in the area. All wells completed in the Dakota "D" Zone are identified by the green dots, and all wells completed in the other Dakota Zone, the Dakota "A" or "B," are shown by the red dots.

Shown here in the proposed pool is the outline of the Lone Pine Pool as reflected by Commission Order R-4084 dated December the 22nd, 1970.

We show here the names of all lessees of record and all operators within this area. The most that should be noted here I believe is that the land is composed of Indian allotted lands leased from the federal government and the fee lands leased from Santa Fe Pacific Railroad.

Q Mr. Rial, continue to Exhibit Number 2. It appears to be a log of Don-ne-pah Number 1, and tell the Commission what relevance Exhibit Number 2 has to the application.

A Exhibit Number 2 is a copy of a dual induction log, lateral log of the discovery well, the Don-ne-pah Number 1. This log was measured to a total depth of 2946 feet.

Now, noted here are the vertical limits of what we define as the Dakota "D" Zone. This is the zone from 2792 to 2834. Now, this is the zone of question and

the zone of reference in our related testimony in our application today.

Also shown here are the vertical limits of what we've classified the Dakota "A" and the Dakota "B" and, also, upwards 1738 feet, we see the other producing zones in the immediate area, the Upper Hospah Zone and the Lower Hospah Zone.

Also shown are the initial perforated intervals in the Dakota "D" Zone of 2802 to -21, and 2827 to -29. This is the first oil production in the "D" Zone in this immediate area and is the deepest oil production in McKinley County.

As we have noted here, the Dakota "A" and the "B" and the "D" are all distinct sand intervals. They are separated by more or less a shale zone. This defines that throughout the area, that there's no vertical communication or coalescence of the sands, that they are distinct and separate intervals that can be correlated across the area.

We are therefore defining the vertical limits of the Dakota "D" Zone as they are shown on this log in the Don-ne-pah Number 1 from 2792 to 2834.

Q The gray area on Exhibit Number 2 then indicates impermeable shale units, is that correct?

A Yes. This shows the separation between the distinct sand

units.

Q Continue then to Exhibit Number 3 which is a structure map and indicate its significance to the application.

A Exhibit Number 3 is a structure map drawn on the top of the Dakota "B" Zone as defined in Exhibit 2. This map is primarily presented to exhibit the separation, the structural configuration and separation of the proposed Lone Pine Pool from the existing Hospah Pool located up in Section 1 of 17 North and 9 West, and the South Hospah Pool essentially located in Section 12 of 17 North, 9 West.

Shown on here is Fault B which is a normal down to the north fault. That fully separates the production from the Hospah Pool in Section 1 and the South Hospah Pool in Section 12.

Shown here also is Fault A which is a normal down to the south fault which separates the proposed Lone Pine Pool and the South Hospah Pool. Fault A is identified in actually five wells.

Now, these wells are located or identified by the orange notations just to the north along the northeast portion of Fault A.

What we see here is that the fault has a throw of a hundred and, about, seventy-five feet and then followed by that is the subsea depth at which the fault

was identified in each specific well. The fault has a displacement as can be seen here about 120 to 175 feet in the northeast portion.

As you will notice in the southwest portion of the fault, across our contour lines, that the fault only has a displacement of about 50 feet at that point. To understand this, let's look at Fault C. This fault is a normal down to the north fault that acts as a relief fault to Fault A. It's identified in the subsurface in Tenneco's Santa Fe Pacific Railroad Well Number 10 located in the northwest of the northeast of Section 13 of 17 North and 9 West. Shown there in orange is the fault at a plus 6041 having a throw of about 110 feet.

The net result of this fault is to reduce the throw of the Fault A in the southwest portion to approximately in the neighborhood of 50 feet. The wells presently producing from the Dakota "D" Zone are noted again in green; the Don-ne-pah Number 1 which is located in the northwest northwest of Section 18 is the first well that was drilled in this pool.

Three gas wells located north of Faults A and C were completed in the Dakota "D" Zone prior to the drilling and completion of the Don-ne-pah Number 1.

These are the Tesoro, Santa Fe Pacific Railroad Number 17 in the southeast of the northwest of Section 11,

17 North and 8 West, and Tenneco's Hospah Number 10 and, also, the 23 identified by the red dots in Section 12 of 17 North and 9 West.

It should be noted that the gas production in the Hospah 23 and 10 are commingled with the Dakota "A" and the "B" Zones, and oil production occurs in the Dakota "D" Zone north of Fault A. Also shown here, and that would set a reference as far as the productive limits within the testimony, shown here is the limits of the Dakota "D" Zone and oil-water contact shown at a subsea datum of plus 4212.

This oil-water contact is based on the perforations in the Kagosa Number 1. That's located in the northwest of the southeast of Section 18, and Gulf's Connely Federal Number 1 which is in the northwest southwest of Section 17, 17 North and 8 West.

The Gulf's well was a dry hole and has been plugged and abandoned.

Also shown here is a transition zone that exists between the oil-water contact and the free-oil producing areas. Now, this is designated in the cross hatched areas.

A gas cap is also present, the contact is shown at a subsea datum of plus 4260. This is based on core analysis and completion data from Santa Fe Pacific

Railroad Number 6 in the southeast northeast of Section 13, 17 North and 9 West. We feel that this is a separate and distinct pool, accumulation of oil, and that Faults A and C are both sealing faults and separates any production from the north fault in the Faults A and C in the South Hospah.

To show the existence of the sealing fault between the proposed Lone Pine Pool and the South Hospah Pool, I'd like to show you two cross-sections. The lines shown here are A to A prime and B to B prime. These will be discussed in Exhibits 4 and 5.

Q Let's continue then to Exhibits 4 and 5.

A Exhibit A is a cross-section from Tenneco's Wiggam Number 3 to Tenneco's Don-ne-pah Number 1.

Q That's Exhibit 4.

MR. PORTER: I believe he meant Exhibit 4, AA prime.

THE WITNESS: Right. Exhibit 4, AA prime. This shows Fault B and also the location of Fault A and the subsurface location of Fault C. Shown in crossover column here are the gas-producing zones colored in yellow and the oil colored in green. The producing zones are colored, but the nonproducing are not colored.

The Exhibit Number 5 cross-section, BB prime is a north-south cross-section connecting the Santa Fe Pacific Railroad, Tesoro Oil Company, Santa Fe Pacific Railroad

Number 17 which was completed as a gas well in the Dakota "D" Zone to the Don-ne-pah Number 1 which was completed as an oil well in the "D" Zone.

Here, we show the subsurface positions of Fault A and Fault C and again showing the separation of production.

Q To re-emphasize, Mr. Rail, I believe Exhibits 4 and 5 indicate you have a separate source of supply here.

A Yes, they do.

Q All right. Continue to Exhibit Number 6 which is completion data on the Dakota "D" Zone, please. Explain these data to the Commission.

A Exhibit Number 6 is a tabulation of the completion data of the Don-ne-pah Number 1, and the other three existing Dakota "D" producing wells in this two-mile radius.

These three wells were completed prior to the drilling of the Don-ne-pah Number 1. It is of importance to note that all three wells are located north of Fault A and C and are all gas producing wells. The Don-ne-pah Number 1 is an oil well.

Exhibit Number 7 is a tabulation of the reservoir data, the Dakota "D" Zone in the Lone Pine Pool. This was taken as representative of the reservoir properties, and is taken from a core analysis, bottom-hole pressure build ups and crude oil samples and PVT data.

Q As I understand it, the next witness will have more to

say about Exhibit 7, is that correct?

A Yes. He will go into the reservoir properties in more detail.

Q All right. Would you summarize your testimony, so far.

A We have shown, identified the vertical limits of the Dakota "D" Zone. We have shown that there's vertical separation between the "A" and the "B" Zones and we have established that the Don-ne-pah Number 1 is the first and deepest oil production in McKinley County.

Q Were Exhibits 1 through 7 prepared by you or under your direction?

A Yes, they were.

MR. BATEMAN: All right. This concludes Mr. Rial's direct testimony and we'll give the Commission an opportunity to cross examine.

MR. PORTER: You will submit all your exhibits, I assume, at the same time?

MR. BATEMAN: Yes.

MR. PORTER: Any questions?

CROSS EXAMINATION

BY MR. NUTTER:

Q Mr. Rial, up here in the north fault of Fault A, you mentioned that you had three wells that produced gas from the "D" Zone. Is this correct?

A That's correct.

Q The one green one to the east and then these two that are colored in red, and the reason of them being colored in red is because they are commingled in the well bore with the Gallup, is that it?

A No. They are commingled with the Dakota "A" and "B" Zone and they are all gas. There's no oil being produced in the commingled wells.

Q Was there created a gas-oil pool for the "A" and "B" up there?

A No, not to my knowledge.

MR. PORTER: Mr. Kendrick, would you shed some light on that point?

MR. KENDRICK: We created an oil pool; that was the oil pool created last week by the "A" and "B" Zones and the Marsh's Zone. There's an oil well in Section 7 of 17/8, Tesoro's Santa Fe Number 16 in Unit C. There's an oil well in Unit P of Section 11, 17/9 being Texaco's Wiggam Number 2 which produced oil downdip from this gas in other zones than the "D" Zone, but as an overall picture, I considered all this gas cap for oil lying downdip. I have not yet found downdip oil wells in the "D" Zone to the east or to the southwest, but the current use of the gas of the area is below what the gas would be as an oil pool.

MR. PORTER: Thank you.

MR. NUTTER: So you don't feel that there's any high withdrawals then from the gas zone than there should be --

MR. KENDRICK: No. No, there are no gas pool facilities in the area so the only gas that's used is lease-used gas within the pools, so their own use at this time is not being curtailed by this being an oil pool.

MR. NUTTER: Okay.

Q (Mr. Nutter continuing) Now, I have just one other short question, Mr. Rial. Is there any production at all between the fault of Fault C and A, or --

A No. No production.

MR. NUTTER: That's all. Thank you.

MR. PORTER: Does anyone else have a question of Mr. Rial? You may be excused.

MR. BATEMAN: The next witness of Tenneco is Mr. Bill Melnar.

WILLIAM C. MELNAR

called as a witness, having been previously duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. BATEMAN:

Q Mr. Melnar, will you state your full name and occupation and place of residence.

A My name is William C. Melnar. I'm the District Petroleum Engineer in Denver for Tenneco Oil Company.

I live at 7908 West Harvard Drive in Denver.

Q Have you previously testified before the Commission?

A No, I haven't.

Q Would you state briefly into the record your educational background and work experience.

A I graduated from the University of Texas, Bachelor of Science degree in petroleum engineering on January, 1958.

Since graduation or for the past 13 years, I have worked for Tenneco Oil Company as a petroleum engineer; the majority of this experience has been in reservoir engineering.

Q Are you familiar with the area in question in the application today?

A Yes, I am. I have been involved with this field since its discovery.

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

MR. PORTER: Yes, they are.

Q All right, Mr. Melnar. Would you refer to Exhibit Number 8 and identify it and state what relevance it has.

A Exhibit Number 8 is a core analysis report on the Dakota "D" Zone in Santa Fe Pacific Railroad Number 6. Based on all the available data, I believe this report represents typical rock properties for the reservoir.

As described, the rock is a white to gray, very fine,

medium silty sandstone. The porosity is very good, and averaging 21.7 percent. The permeability is also very good and averages 243 millidarcies.

As you can see, it generally ranges from about 50 to 600 millidarcies, and the rock is not fractured. In summary, it's a very excellent rock.

Q How does the porosity and the permeability in the Hospah and South Hospah Pool compare with the proposed Lone Pine Pool?

A Exhibit 9 shows this comparison real well. As you can see, the porosity for the deep D zone in the Hospah Pool and South Hospah Pool is about 20 percent and similar to the Lone Pine field.

However, the permeability ranges only from one to two millidarcies, whereas, in the Lone Pine Pool, permeability ranges from 67 to 221 millidarcies.

Q Would you refer again to Exhibit Number 7 that was discussed and discuss the reservoir oil properties.

A As shown on Exhibit 7, the reservoir temperature is 108 degrees Fahrenheit. The original reservoir pressure is 1010 psig. This pressure is also the bubble point pressure.

The oil has an API gravity point of 54 degrees and contains 970 standard cubic feet of gas in solution per barrel at above the 1010 psig bubble point.

The reservoir viscosity is a very favorable .25 centipores. This low viscosity results in the Dakota "D" oil being a very mobile oil.

For comparison, the reservoir viscosity of the Lower Hospah oil in the South Hospah field just north of the Lone Pine field is 55 centipores or, in other words, 220 times more viscous than the Dakota "D" oil.

Q All right. Now, Mr. Melnar, let's move on to Exhibits 10 and 11 and, first, identify both of these exhibits.

A Exhibit Number 10 is a well location map of the Lone Pine field shown by the circled numbers above the well, the order in which the wells were completed, and below the well are initial well bottom-hole pressure and this pressure is at a plus 4250 datum. It's located on the top left, the date of the pressure, below the line, and the cumulative oil production from the reservoir at the time of the pressure survey in the top right portion.

Exhibit 11 is a pressure production history of the Lone Pine field. The curve that is declining is a plot of reservoir pressure at a datum of plus 4250 versus time and the curve that is inclining is a plot of cumulative oil production versus time.

Can I go on back to Exhibit Number 10? Okay. Going on back to Exhibit Number 10, you can note that the first well completed, the Don-ne-pah Number 1 which

is indicated by the red circle with the number one in it, had an initial pressure of 1010 psig on June the 2nd, 1970.

The second well completed, the Kagoso Number 1 located 3700 feet to the southeast of the Don-ne-pah Number 1, or on 160-acre spacing, had initial pressure of 980 psi on July the 21st, 1970, at which time the cumulative oil recovery from the reservoir was 5000 barrels of oil.

Now, this shows that 5000 barrels of oil production from the Don-ne-pah Number 1 lowered the reservoir pressure 30 psi over a distance of 3700 feet. Now, I say that this is excellent pressure communication.

Now, the third well, the Santa Fe Pacific Railroad Number 1 was then completed 3500 feet southwest of the Don-ne-pah Number 1 and approximately one mile west of the Kagoso Number 1. Its pressure on August the 12th, 1970, was 949 psi, or a decrease of another 31 psi. Cumulative recovery at this time was 9100 barrels of oil. This, too, shows drainage over areas of at least equivalent to 160-acre spacing.

Now, let's refer to Exhibit Number 11. Let's refer to the curve that is declining. The pressures for the Don-ne-pah Number 1, the Kagoso Number 1 and the Santa Fe Pacific Railroad Number 1 which we just discussed

are shown on the curve as a square, triangle, and circle. This is in the months of June, July and August.

Now, the next point on the curve which is colored green is an average pressure taken from a fieldwide shut-in on October 27th, 1970. This pressure is 926 psig.

Then on November the 9th, 1970, we completed the Santa Fe Pacific Railroad Number 5 as a diagonal 80-acre offset to the Number 1. We'll refer to Exhibit 10 and see the relationship.

Number 5 is indicated with a green dot, and the pressure for Number 5 was 930 psi or almost the same as the fieldwide pressure taken a few days earlier. This is another example of excellent drainage on a spacing greater than 40 acres.

Q Mr. Melnar, please continue to Exhibit Number 12 and identify that and discuss its relevance.

A Exhibit 12 shows the results of a fieldwide pressure survey taken December the 31st, 1970. The letter, or the circled letter above each well designates the type of survey. The B for subsurface pressure taken with a bomb, and FL for a fluid level measurement with a sonometer (son-o-log) device.

MR. PORTER: What was the date of this survey?

THE WITNESS: December 31, 1970.

The number to the right of the well is the pressure,

reservoir pressure at a datum of plus 4250. The numbers below the well are, from left to right, the cumulative oil, cumulative water, and cumulative gas production as of December 31st, 1970.

Now, in this survey, all the wells were shut-in, all the wells in the reservoir were shut-in at the same time for a minimum of 48 hours. We know from experience, with pressure buildups in this field that the reservoir static pressure is reached in four to twenty -- from four to twenty-four hours. Therefore, the 48 hour shut-in was more than sufficient to reach a static pressure.

Now, analysis of this pressure survey again indicates the reservoir to be acting as a unit. The individual pressures in the productive area only range from 900 to 926 psig and average 915 psig. I believe a big portion of this 26 psig range is probably due to pressure measurement accuracy.

Two other points I would like to make in this exhibit are, one, Santa Fe Pacific Railroad Number 9 which is located in the Southeast of the Northwest of Section 13, without any production, had a pressure similar to its offsets. Its pressure was 906 and its offsets all in production had pressures ranging from 900, 922.

Secondly, the Bah-E Wells located in the Southwest Section or Southwest Quarter of Section 18, with only 300 to 400 barrels of oil production prior to the survey, also had pressures similar to their offsets. The fact that Well Number 1 is essentially offset on 80-acre spacing units and Well Number 2 is offset on 40-acre spacing did not affect their pressures.

To further illustrate the fact that the reservoir is acting as a unit, that it can be drained on 80-acre spacing, let's refer to Exhibit Number 11 again.

The average pressure on December 31, 1970, was 915 psi as denoted by the green triangle-shaped figure.

The initial pressure from the two Bah-E Wells completed just prior to the survey are described by the red circle and the red square-shaped symbols. Their initial pressures are simply the average reservoir pressure.

Q What is the significance of this excellent pressure communication?

A It means we have a good reservoir rock with uniform permeability.

If any of these wells had encountered lower permeabilities, their initial pressures would have been much higher than their offset wells and could have even approached the original pressure.

Secondly, I believe the significance of the good rock and fluid properties and the excellent pressure communication means we can efficiently drain 80 acres with one well.

Q Mr. Melnar, let's continue to the next three exhibits which would be Exhibits 13, 14 and 15. Please identify those and state their relevance to the application.

A Exhibits 13, 14 and 15 are graphical presentations of the results of the study to determine the effect of 40-acre development with 100 barrels of oil per day per well allowable versus 80-acre development and 200 barrels of oil per day per well allowable on production performance and ultimate recoveries.

To perform this study, we analyzed a typical 160-acre section of the reservoir, using a two dimensional three-phase reservoir model computer program. The data required to make this analysis was PVT data, porosity, permeability, net pay, saturations, et cetera. All of this data was measured, was obtained by actual measurements on reservoir rock and fluid properties.

Now, Exhibit 13 shows the pressure and cumulative productive performance versus time. The 80-acre development and 200 barrels of oil per day per well allowable case is shown by a solid line.

The 40-acre spacing case is shown by a dashed line,

and this same nomenclature is used for these next three exhibits.

Referring to the bottom-hole pressure curves, the lower curves, you will note that for the first one and one-half years, the bottom-hole pressures are approximately the same for both cases. Thereafter, they begin to diverge. The middle curves are plots of cumulative oil production versus time. Again, we see that the performance on either spacing is the same for the first one and one-half years.

These curves also show that at depletion, the 160-acre tract on 40-acre development would recover 266,000 barrels of oil. Cumulative oil recovery on the 80-acre spacing is approximately the same or 260,000 barrels of oil.

The upper set of curves are a plot of cumulative gas performance versus time. Again, we see that the performance on either spacing is the same for the first one and one-half years, and ultimately, is a slightly high recovery for the 40-acre case.

The next exhibit, Exhibit 14 shows the gas-oil ratio and pressure as a function of time. The lower curves are a plot of pressure versus time and are the same as shown on the previous exhibit.

The upper set of curves are a plot of gas-oil ratio

for the two cases. For both the 40-acre and 80-acre case, gas-oil ratios are approximately the same for the first one year and eight months.

During this time, the gas-oil ratios increased from 1000 cubic feet per barrel to 2700 cubic feet per barrel.

The curves also show that it will take one year and five months for the gas-oil ratio for either case to reach 2001.

At depletion, ratio for both cases is approximately 7000 cubic feet per barrel.

The next exhibit, Exhibit 15, shows bottom-hole pressure and gas-oil ratio as a function of cumulative oil recovery. As would be expected from analyzing the past two exhibits, the bottom-hole pressure and gas-oil ratio performance versus cumulative oil recovery are approximately the same for both the 40-acre and 80-acre development.

Q Mr. Melnar, would you please summarize then the significance of the last three exhibits.

A The model study has shown that for a 40-acre, 100 barrels of oil per day per well development, versus 80-acre, 200 barrels of oil per day per well development, the performance for the first one and one-half years is almost identical.

Also, as would be expected from this type of reservoir, the ultimate recoveries are almost identical.

The actual numbers show the 40-acre case recovering one-half of one percent more of the oil in place or 6000 barrels of oil in the 80-acre case. This is on 160 acres.

Q How many additional wells do you require for 40-acre development?

A 17.

Q You testified that an additional recovery of one-half of one percent would result from a 40-acre development. What would be the economic consequences of this additional drilling?

A The economic significance of the additional development is shown as Exhibit 16. You can say it would take 17 additional wells. These wells would have a total primary oil recovery of 51,000 barrels of oil or a net, after royalty, of 41,820 barrels, for an investment of $858,900.

This is a cost of $20.50 per barrel.

The net income before federal income tax would be at $112,000 for a net loss of $746,900.

Q Do you believe that the development on 40-acre spacing would result in economic waste?

A Yes. It is economic waste because it requires the drilling of unnecessary wells and diverts funds which

otherwise could be invested in finding and developing additional reserves which are needed to meet future energy requirements.

For example, Tenneco has under lease in the immediate area, over 600,000 acres in which these funds could be utilized for exploratory drilling.

Q And all the wells in the field produce, of course, an allowable of 200 barrels of oil a day per 80 acres?

A Yes. All except Santa Fe Number 9 which is on the edge of the field and it is limited in capacity.

Q Please identify Exhibit 17 and explain its significance.

A Exhibit 17 shows the productivity index; that is, two barrels of production per day per psi drawdown for six wells that geographically cover the Lone Pine field. As you can see, the psi's are all greater than one, and range from 1.07 barrels per day per psi on the Don-ne-pah Number 2, to 2.45 barrels per day per psi in the Kagoso Number 1.

This means that for a well to produce at 200 barrels of oil per day allowable, the pressure drawdown will range from only 82 psi to 187 psi, and this is not an excessive drawdown.

Q How much gas, at present, is produced per day?

A Approximately one and one-half million cubic feet per day.

Q How much gas would be produced if the field were

entirely developed on 80-acre spacing with double allowable?

A Approximately three million cubic feet per day.

Q Well then, how much gas would be produced if it were developed on 40-acre spacing?

A Based on past testimony, it would be approximately the same or three million cubic feet per day.

MR. PORTER: That's for the pool?

THE WITNESS: For the pool, yes, sir.

Q Now, there's no market for the gas, is that correct?

A No, sir. No market.

Q How far away is the nearest pipeline?

A The nearest pipeline is approximately 22 miles from the field.

Q Does Tenneco have any plans for the beneficial use of this gas?

A Yes, we do. Our plans are to unitize the pools as soon as possible and initiate pressure maintenance operations. Based on our studies to date, it appears that gas reinjection will result in the highest ultimate recovery.

We plan to call a meeting of the working interest owners in the pool within 30 days to discuss unitization and pressure maintenance.

We plan to unitize and initiate gas reinjection before the end of the year. In addition, we are

investigating the economic feasibility of a gasoline plant and a gas line from the area. We are presently negotiating with a potential gas purchaser on possible rates of take.

Q What pool rules do you propose?

A One, provision for 80-acre spacing units consisting of two contiguous governmental quarter quarter sections, with no more than two spacing units per governmental quarter section, with provision for nonstandard proration units where the unorthodox size or shape of tract is due to variation in the legal subdivision of the United States Public Land Survey.

Two, each well will be located within 330 feet of the exterior line of the quarter quarter section.

Three, a standard 80-acre proration unit shall be assigned a 200 percent allowable factor with provision that the allowable assigned to a nonstandard proration unit shall bear the same ratio to the standard allowable as the acreage in such nonstandard unit bears to the 80-acre unit.

Four, limiting gas-oil ratio of 2000 to one.

Five, rules and regulations to be effective for a period of one year from date of order.

Q Do you believe that the development of the pool on the basis recommended by Tenneco will prevent waste and

protect correlative rights of all the parties involved?

A Yes, I do.

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

A No.

Q Were Exhibits 8 through 17 prepared by you or under your direction?

A Yes, they were.

MR. BATEMAN: If the Commission please, I offer at this time Exhibits 1 through 17.

MR. PORTER: Exhibits 1 through 17 will be admitted.

(Whereupon, Applicant's Exhibits 1 through 17 were duly admitted into evidence.)

MR. PORTER: At this time, I'd like to ask, does anyone else desire to present testimony in this case today?

We'll take a very short recess.

(Whereupon, the hearing stood in a brief recess.)

MR. PORTER: The hearing will come to order, please. The witness is now available for cross examination, if anyone has anything. Mr. Utz.

Oh, did you have a question?

MR. COOLEY: I'll accede to Mr. Utz. I do have some questions, Mr. Commissioner.

MR. PORTER: Since I called Mr. Utz, I'll start

with him.

CROSS EXAMINATION

BY MR. UTZ:

Q Mr. Melnar, your Exhibit Number 7, I gather, is the result of several cores in the field.

A Yes. That's based on three or four cores, three or four wells which we have cored.

Q You did core three or four wells?

A Yes, we did.

Q How many? Three, or four?

A I think it's shown on Exhibit Number 9. We cored one, two, three, four wells.

MR. UTZ: Well, that answers my question. That's all the questions I have.

MR. PORTER: Mr. Cooley.

MR. COOLEY: May it please the Commission, I'm appearing in this case on behalf of Beard Oil Company and Gilbert S. Maxwell, both operators in this pool. I would request permission to cross examine this witness.

MR. PORTER: Yes, sir. You may proceed.

CROSS EXAMINATION

BY MR. COOLEY:

Q Mr. Melnar, at the opening of this case, some opening remarks were made by your counsel wherein reference was made to off-pattern well locations. Would you identify

those locations on one of your exhibits, say, possibly your Exhibit Number 10.

A Okay. These off-pattern wells would be Maxwell's Bah-E Number 2, Beard's Desh-E-P-Henio Number 2, and Beard's Toledo Number 1.

Q By referring to these wells as off-pattern wells, what was your understanding of this nomenclature by reference? Was this simply that they were contrary to the fixed pattern that was proposed by the original application?

A Yes, sir.

Q At the time they were drilled, however, they were drilled in accordance with the then existing regulations of the Oil Conservation Commission, were they not?

A Yes, sir.

Q Would you state the name or names of the offset operators to these wells.

A The offset operator of all these wells is Tenneco Oil Company.

Q In your opinion --

A And, let's see -- that would be all. Just Tenneco. Just Tenneco Oil Company, yes, sir.

Q Just Tenneco. In your opinion, would the fact that these wells were drilled in a different pattern than those drilled by Tenneco in any way adversely affect the correlative rights of Tenneco Oil Company?

A I wouldn't think so.
Q In your opinion, will the 80-acre tracts which are dedicated to these wells be efficiently and effectively drained by these wells?
A I think they will.
Q In your opinion, is there any reason for purposes of correlative rights to restrict or otherwise penalize these wells because of their locations?
A As long as they're just -- as long as there's only one well per 80 acres, I wouldn't think so.
Q Then your answer to that question is "No"?
A Yes, is "No," that's right.

MR. COOLEY: No further questions.

MR. PORTER: Does anyone else have a question? Mr. Kendrick, I believe you had some information to make a statement, but you were not going to ask any further questions of the witness?

MR. KENDRICK: No.

MR. PORTER: Then the witness may be excused and we'll recognize Mr. Kendrick. As I indicated, he's about to make a statement.

MR. KENDRICK: Mr. Arnold at the Aztec office and I have discussed this at length. We have no objection to the 80-acre spacing.

We do object to the allowables being increased from

100 barrels per day up to 200 barrels per day until such time as gas going back to the ground or secondary recovery or maintenance program is initiated because at the current rate of gas production as testified here, approximately one billion feet of gas would be lost in the period of a year. And we'd like to call the Commission's attention to the fact that along the east side of Sections 31 and 24 in Township 17 North, Range 9 West, there's a series of ten or eleven acre lots which would be added to the 80-acre tracts in those sections along the east side.

MR. PORTER: What size lots are those?

MR. KENDRICK: Ten and eleven acres, each.

MR. PORTER: So you'd have about 90 to 91 acres?

MR. KENDRICK: Providing the dedication was the north half or the south half of the quarter section because the east section would be two forty plus two lots, which would approximate a hundred acres.

MR. PORTER: I see. Is there any reaction from anyone here to this statement of Mr. Kendrick's, as far as restriction of allowables until such time as pressure maintenance might be instituted?

MR. MORRIS: Mr. Porter.

MR. PORTER: Mr. Morris.

MR. MORRIS: I'm Richard Morris of Montgomery, Federici, Andrews, Hannahs & Morris, Santa Fe, appearing

on behalf of Tesoro Petroleum Corporation. We support the application of Tenneco Oil Company for 80-acre proration units and for flexible well location requirements.

I would like to inquire what type of restriction Mr. Kendrick had in mind with respect to the allowables.

MR. KENDRICK: We'd like to maintain the present rate at 100 barrels per day until such time as the unitization can be accomplished and the injection wells either converted or drilled and injection started on it so that the gas can be recycled rather than lose a billion feet of gas and, if it takes a year, we'll still lose a half billion feet according to the testimony in this case.

MR. PORTER: Now, we'll put Mr. Kendrick on the stand and swear him in if some of you would like to cross examine him as to how he arrived at that.

MR. BATEMAN: If the Commission please, Mr. Wayne Nance would like to make a statement in reply.

MR. NANCE: I'm Wayne Nance, Production Superintendent for Tenneco in Denver. I'd like to comment on Mr. Kendrick's suggestion as to the restricted allowable for 80-acre spacing.

Tenneco has no serious objections to this, although we feel like the testimony that was entered in the case here today shows that there will be no appreciable damage to the reservoir for a period of one year which is the time we have requested temporary spacing order, and we also believe that

this is probably premature and not necessary at this time, that we could take this step at such time as the field gas production might increase to a rate which would be excessive, and we could curtail at whatever rate, to conserve the reserves, both oil and gas. The value of the gas, at the rate that Mr. Kendrick indicated, would be approximately $200,000, and this is not sufficient to build a gas line --

MR. PORTER: Twenty-seven --

MR. NANCE: -- in this area at this time.

MR. PORTER: 27, 22 miles?

MR. NANCE: 27 miles.

MR. PORTER: I'd like to ask Mr. Kendrick, how did you arrive at this figure of a billion cubic feet loss and over what period of time are you talking about?

MR. KENDRICK: Mr. Melnar testified that the current rate of production at approximately one and a half million feet per day was being vented at this time. If we double the allowable, three million feet per day would be vented, and over a period of a little over 300 days, this amounts to a billion feet of gas.

MR. PORTER: You're talking about helium?

MR. KENDRICK: Yes. It's not that we wish to curtail production here. What we wish to do is expedite time or cause Tenneco to expedite time in getting the unit started.

MR. PORTER: In other words, you were using the figures he gave to arrive at your total, what you thought might be wasted?

MR. KENDRICK: Yes, according to the testimony.

MR. PORTER: Mr. Cooley, I believe you have a comment.

MR. COOLEY: May it please the Commission, both Beard Oil Company and Gilbert S. Maxwell fully support the application of Tenneco in this case for 80-acre spacing with flexible wells locations. Furthermore, we have no serious objection if the Commission finds that it will be wasteful to increase the allowable to 200 barrels at this time to restrict the allowable as suggested by Mr. Arnold and Mr. Kendrick.

MR. PORTER: May I ask Mr. Nance -- well, does that conclude your statement?

MR. COOLEY: Yes, sir.

MR. PORTER: How long do you anticipate it might take you to communitize and start your injection program?

MR. NANCE: We feel like this can be accomplished in eight months to a year, given the concerted all-out effort and cooperation of all of the bodies that -- well, operators and regulatory bodies that would be affected by the unitization in the field.

MR. PORTER: Thank you. Mr. Utz.

MR. UTZ: Well, I think, Mr. Porter, we should determine whether or not they intend to reinject some of this gas before they can unitize. Can you answer that question, Mr. Nance?

MR. NANCE: Before unitization?

MR. UTZ: Yes.

MR. NANCE: I can only state that we have looked into it, or are considering the possibility of storage of gas in some of the gas zones. If it becomes excessive during the period of time in which were awaiting a formal approval of the unit --

MR. UTZ: Do you --

MR. NANCE: -- put it back into the reservoir.

MR. UTZ: Do you know at this time whether or not you have some storage area in this vicinity?

MR. NANCE: Well, there's a storage area in the A Zone in the Lone Pine Dakota area.

MR. UTZ: How long would it take you to inject from this well?

MR. NANCE: Well, it would probably take, depending on delivery of compressors and working out satisfactory agreements of gathering the gas and putting it back in, I would say it would take four to six months.

MR. PORTER: Is there anything further that anyone would like to offer in the case?

MR. COOLEY: My only comment, Mr. Commissioner, was as far as Beard Oil Company and Gilbert S. Maxwell are concerned, I see no reason why the pool rules should be temporary.

MR. PORTER: For the one-year period?

MR. COOLEY: I see nothing to be gained by temporary rules in this particular pool, except as it would necessitate another hearing on the part of the Commission and the parties involved a year hence.

MR. PORTER: Of course, the Applicant has requested temporary rules in the case. I don't know whether the Applicant objects to temporary rules or not.

MR. NANCE: May it please the Commission, I might comment on this.

MR. PORTER: Yes, sir.

MR. NANCE: The purpose of requesting temporary rules is primarily to give the Commission a fixed review period in which to review the conservation of the resources that we have here and give all parties an opportunity to review it at a later date.

MR. PORTER: This has been done many times on other pools, as you know.

MR. NANCE: And not that the Commission needs temporary rules to do this, but that was the purpose, is just so that other operators would know that there would be an

opportunity to review the total field performance at the end of the year. Also, our unitization happens at that time.

MR. KENDRICK: Mr. Porter, may I ask Mr. Nance a question, please.

MR. PORTER: Yes.

MR. KENDRICK: Is it your intention, your requesting these pool rules that only one well be drilled on each 80-acre tract, that it be restricted to one well per tract?

MR. NANCE: That was indicated, I believe, in some of the testimony. I don't believe that was our official intent, to restrict the number of wells per 80 acres, but restrict the allowable.

MR. PORTER: In other words, as far as Tenneco is concerned, if you drilled two wells, you'd still be restricted to the one allowable from the 80 acres --

MR. NANCE: Yes, sir.

MR. PORTER: -- which, if it were restricted to 100 barrels for any reason for a temporary period, then they would get 50 barrels each?

MR. NANCE: Yes, sir.

MR. PORTER: That's the main idea?

MR. NANCE: Yes, sir.

MR. PORTER: Is there any other comments that anyone would like to make?

MR. BATEMAN: No further comment.

MR. PORTER: Gentlemen, since there's a quorum present, I'm going to depart from the usual custom of taking this entire matter under advisement which has been heard once before. It's announced that the quorum here has agreed that we will allow the 80-acre flexible spacing pattern for an indefinite period; if the Commission feels that the matter should be brought back if conditions indicate this, we can, at any time, as you know.

As to the matter of allowables, the Commission would like to give that some further consideration, and the reason I'm announcing this here now is so that all interested parties in this will know that the 80-acre pattern will exist from this day forward.

Is there any question about the ruling, the 80-acre flexible pattern?

MR. COOLEY: Flexible pattern is what?

MR. PORTER: Yes. There was one allowable to each 40 acres, whatever that allowable may be. We'd like to give some consideration to the matter that Mr. Kendrick has brought to our attention prior to issuing a formal order.

MR. COOLEY: May I ask the Commissioner, in light of Mr. Melnar's testimony that in his opinion the correlative rights of Tenneco Oil are not adversely affected by the particular wells that were brought to our attention and were offered the proposed fixed pattern, I would assume that

silence on the part of the Commission means that these wells will not be penalized.

MR. PORTER: There will not be restriction for allowables, or regardless of the storage unit to be drilled on.

If there's no further questions concerning the order or the ruling, the hearing is adjourned.

I N D E X

EXHIBIT	MARKED	OFFERED AND ADMITTED
Applicant's Exhibits 1 - 17	2	30

STATE OF NEW MEXICO)
) ss
COUNTY OF BERNALILLO)

I, CHARLOTTE J. MACIAS, Court Reporter in and for the County of Bernalillo, State of New Mexico, do hereby certify that the foregoing and attached Transcript of Hearing before the New Mexico Oil Conservation Commission was reported by me and that the same is a true and correct record of the said proceedings, to the best of my knowledge, skill and ability.

Court Reporter