BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
June 1, 1960

EXAMINER HEARING

IN THE MATTER OF:

Application of The Atlantic Refining Company for an order authorizing a water injection project in the Horseshoe-Gallup Oil Pool, San Juan County, New Mexico, Applicant, in the above-styled cause, seeks an order authorizing the injection of water, for purposes of pressure maintenance and/or secondary recovery, into the Horseshoe-Gallup Oil Pool through 15 wells located in Sections 19, 20, 29, 30 and 31, Township 31 North, Range 16 West, San Juan County, New Mexico. Applicant further requests that special rules and regulations be promulgated governing the operation of this water injection project including the assignment of a project allowable.

Case 1979

BEFORE: Elvis A. Utz, Examiner

TRANSCRIPT OF HEARING

MR. UTZ: Case 1979.

MR. PAYNE: Application of The Atlantic Refining Company for an order authorizing a water injection project in the Horseshoe-Gallup Oil Pool, San Juan County, New Mexico.

MR. HINKLE: I want to enter an appearance, Clarence Hinkle, Hervey, Dow and Hinkle on behalf of Atlantic Refining Company. I would like to have the witness sworn.

(Witness sworn.)

MR. UTZ: Any other appearances?

MR. DAVIS: The Humble has a statement they will make.

(Atlantic's Exhibits Nos. 1, 2 & 3 marked for identification.)

BRUCE VERNOR

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

DIRECT EXAMINATION

BY MR. HINKLE:

Q Your name is Bruce Vernor?

A That's correct.

Q Employed by The Atlantic Refining Company?

A Yes.

Q In what capacity?

A I am Area Reservoir Engineer in our Rocky Mountain Region.

Q Where is that located?

A Casper, Wyoming. The region covers the Four Corners in addition to Colorado, Wyoming, Montana, North and South Dakota.

Q It covers the San Juan area in the Gallup portion of the field, Horseshoe-Gallup Field?

A Yes.

Q Have you previously testified before the Commission?

A I have.

Q In several cases?

A In four that I can think of.

Q Have you made an independent study of the Horseshoe-Gallup Pool?

A Yes, I have.

Q How recent has that been?

A It was made in November and December of 1959.

Q Has that continued up-to-date?

A Yes, it has.

Q Are you familiar with the application which has been filed in this case by The Atlantic?

A Yes, I am.

Q Refer to Atlantic's Exhibit No. 1 and explain what it is, what it shows.

A Exhibit No. 1 is a plat of The Atlantic Refining Company's leases in the Horseshoe-Gallup Oil Pool and the two miles surrounding those leases. It shows the proposed project area, the proposed injection wells; those colored in green and circled are single zone injection wells, those with triangles are dual zone injection wells also colored red. It shows the wells drilled in the area. They are all completed, all producing wells or abandoned producers, are or were completed in the Lower Gallup. It also shows the offset operators and royalty owners in the area.

Q Is this substantially the same as the exhibit attached to the application as Exhibit A?

A Yes, it is. It's been revised to bring it up-to-date by addition of a few wells drilled since the application was filed. The only other change, the change in the title.

Q Does Atlantic own the leases which are shown in the outline as the project area?

A Yes, we do.

Q What is the character of the land involved, that is whether State or Indian?

A Oh, excuse me. It's Navajo Indian leases. We have two four-section blocks which we refer to as our Navajo and Navajo "B" leases,which are Navajo tribal leases.

Q How many acres are involved in the project area?

A 3,640 acres, approximately.

Q Can you give to the Commission a description of the acreage, a legal description?

A Yes, I can. It's all in Township 31 North, Range 36 West, NMPM; Section 18, the South Half of the Southwest Quarter; Section 19, all, except the Northeast Quarter of the Northeast Quarter; Section 20, the South Half, the South Half of the Northwest Quarter, and the Southwest Quarter of the Northeast Quarter; Sections 29 and 30, all; Section 31, all, except the Southwest Quarter of the Southwest Quarter; and all of Section 32.

Q I believe you have stated that you have made a study of the Horseshoe-Gallup Oil Pool. Have you prepared or compiled a

report covering the result of your study?

A Yes, I have.

Q Will you refer to Atlantic's Exhibit No. 2 and I'll ask you whether or not that is the report that you referred to?

A Yes, it is.

Q Would you explain briefly to the Commission what the report shows and the conclusions you have reached in the report?

A Some general discussion first. The Horseshoe-Gallup Oil Pool is located roughly twenty miles West and eight miles North of Farmington, New Mexico. The field is basically a stratigraphic trap, on all the defined edges of the field the pay or pays grade into shale, the only undefined areas in the Southeast end of the field, there has been no water found as yet and you can see by looking at Page 1 of the white section of the figures, which is a structure map, that the field is a long and narrow bar, and if there were any water discovered at the extreme Southeast end it would have essentially no effect on the producing characteristics of the field.

Page 2 is a longitudinal cross section which I'm sure you'll recognize. It was El Paso's Exhibit No. 5, El Paso Natural Gas Products Company Exhibit No. 5 in Case 1596 on February 18, 1959. I call your attention to it merely to show that it is in the report.

The average net pay of the zones combined is 17.8 feet and average porosity of 16.1 percent. There is a summary of the

reservoir properties for the field on Page 4 of the yellow section of the report. The liquid, average liquid permeability is 82 millidarcies; average connate water, 32.4 percent; initial pressure at plus 4175 datum is 215, also the saturation pressure is 215 pounds for Atlantic's portion of the reservoir. Reservoir temperature, 87 degrees. The developed area at the time of the report was about 10,200 acres. There were 234 wells in August of '59, which is the last count we had. We calculated the original oil in place as 770 barrels per acre foot.

Regarding the fluid properties, we obtained a bottom hole sample on the Atlantic Navajo No. 5 well. Figures 5, 6, 7, and 8 of the white section show the formation volume factor, the gas solubility and the gas conversion factor and the oil viscosity. Page 4 is a summary of some of these properties repeating the pressures and reservoir temperature, the solution gas-oil ratio is 147 standard cubic feet per stock tank barrel. The formation volume factor at 215 psig is 1.10 reservoir barrels per stock tank barrel; 42 gravity oil; 1.63 centerpoise oil viscosity at bubble point conditions; and the oil compressibility just above the bubble point, 7 barrels per million barrels per down change in pressure; and just below the bubble point it increases to 4.6 barrels per million barrels per pound change in pressure.

Page 18 of the white section of the report is the average relative permeability ratio curve which we use in our primary

recovery calculations. The following pages show the individual curves which went into this average curve. In our obtaining the average curve for the two zones, we found that they were so similar that we used a single curve. There was very little difference in the average for the two.

For primary performance we made a solution gas drive material balance calculation, since we have a stratigraphic trap here. The pressure and gas-oil ratio versus recovery are shown on Page 29 of the white section, and we see a recovery of about 12.3 percent to 35 pounds pressure which corresponds to an abandonment economic limit of about three barrels a day.

Our predicted rates for primary are shown on Page 30, and we predict a gradual decline in reservoir, in producing rate which we see today, to about the end of 1960 or early '61. We then anticipate a sharp decline in the overall producing rate for the field.

The water flood portion of the study was based on a modified style calculation, our flood pattern for our own leases includes a five spot type pattern on the edges of the lease where the permeabilities are lower. We found that in the areas of higher permeability we are limited by producing rate and not by injection capacity, so that a nine spot, or three producing wells per injection well, was quite adequate.

It's even quite possible that the five spots around the edge of our leases will be sufficient to give a peripheral drive to the center. Page 33 gives the average performance of what we would

call a typical five spot. It's based on the average properties, we show on that gas production, cumulative water injection, cumulative water production and cumulative oil production . This average five spot produced about 490,000 stock tank barrels of oil over a fifteen year period, requiring 2.3 million barrels of water injection, and there would be about 1.6 million barrels produced.

Our primary recovery, as I mentioned, we calculate as 12.3 percent or 95 barrels of oil per acre foot, from water flood calculations we estimate a total recovery of 51 percent primary and secondary or 392 barrels of oil per acre foot.

Page 30, again, shows our predicted water flood performance, strictly speaking that's five spot performance for the entire field or five spot average applied to the whole field. This is not materially different than five spot and nine spot combined for the entire field. Excuse me, not quite for the entire field, this study was limited to the area South and East of the Humble Oil and Refining Company's lease or South of the area we considered as bounded by the North line of Sections 13, 14, 15 in 31 North, 17 West.

With an early start on water injection there's very little free gas saturation in the reservoir, in the order of four to five percent. We can obtain fillup quickly and be able to maintain or increase rates of production. The time of this study we estimated about 400,000 barrels per month allowable. The current allowable

is that high, but the unit allowable wasn't 60 barrels a day when the study was made nor were there quite as many wells in the field.

We calculate this 400,000 barrel a month rate can be maintained for about nine years, with the decline thereafter in total life in about fifteen years. The field allowable, at the time of the study, was about 328,000 barrels. Page 1 of the report shows our conclusions. We concluded first that the primary recovery will be small, the order of 12.3 percent, that the rates are declining in the field today, that they will decline more sharply around the end of 1960 or early 1961, that water flooding or, well, I should say pressure maintenance in this case, will increase ultimate recovery to 51 percent of the oil in place, and we feel the proper time to install this pressure maintenance project to forestall the abrupt decline is mid-1960.

Q Do you have any figures on the production to date in this area on the Atlantic leases?

A I have one item I would like to go through first. Atlantic recommended, as a result of the study, that an engineering committee be formed to consider and design a satisfactory water flood. That committee has met since November 8 in that connection and it is progressing nicely. Its work should lead to unification.

Q Do you have any figures on the production history up to date?

A The Atlantic Navajo Lease, through April, 1960, produced

1,312,732 barrels and the Navajo "B" Lease, 191,596 barrels.

Q What is the state of depletion, or approximately so at the present time?

A It's quite early in the life of the reservoir. It has been roughly three or four percent of the original oil in place produced. The rates, however, are less than top allowable now and for Atlantic's lease they are dropping. The Atlantic Navajo Lease had an allowable of 3,100, excuse me, production of 3,155 barrels a day in April, 1960, and allowable was 3160. If every well had top allowable, which in April was 60 barrels a day, that would be 3600 barrels a day.

The Navajo "B" Lease produced 411 barrels a day in April with a 506 barrel a day allowable, its top at 60 barrels a day per well would be 960 barrels. The allowable on the "B" Lease has been as high as 814 barrels a day, in September, 1959, so we have substantial decline already on the "B" Lease and we are declining, our rates are declining on the edges of our Navajo Lease.

Q Do you have any particular reasons for the desirability of inaugurating the water flood at this time?

A We wish to maintain or increase our producing rates and starting the project now will give us a quick fillup because of a low gas saturation required less excess capacity on the injection equipment.

Q Can you give in any more detail to the Commission your

proposed plan in connection with this project?

A Well, our present or initial proposal is for 15 injection wells, six of them dual, nine of them single. On Exhibit 1, the single injection wells are colored in green, the dual injection wells are colored in red, and are triangles. Where there are two zones present, for control of the frontal advance we have used dual injection wells, where there are not we have used single injection wells.

Our plan is to expand the flood to cover the entire lease up to the lease boundaries at such time as a unit is effective in the field. In expanding the lease we would add the following wells on the "B" Lease. We would add the Navajo "B" 6 as a single injector, the "B" 2 as a dual, on the Navajo Lease we would add the 8, 19, 30, 6, 11, 4, 3, 2, 14 and 27 as dual injection wells and 15 and 25 and a proposed number 67 which would be located in the Northwest of the Southwest of Section 28, or just East of our Navajo 34. That would be on a strip along the Navajo Ute Reservation boundary on the East side of our leases.

Just East of our Navajo 34 we also have two more wells on that strip, the 65 and 67, which would be dual injection wells under that plan. This would give us a total of 18 duals, 14 singles or 32 injection wells under full development.

Q This plan, of course, that you have mentioned, there, would be subject to change if you found conditions different?

A Yes, we would like --

Q And would be subject to administrative approval?

A We would like to ask administrative approval for conversion of additional injection wells in the project area if it becomes necessary.

Q Have you filed with the application logs of all of the initial injection wells?

A Yes, we have. They were Exhibit B attached to the application.

Q Do you have any further comment with respect to those logs?

A No, I don't.

Q Did you file, in connection with the application, your casing program that is as used in the injection wells?

A We have the casing program, including the size of the casing and the setting depth and the number of sacks of cement, included as Exhibit C.

Q Do you have anything to add to the exhibit which has been filed?

A No, I do not.

Q What is your proposed source of water supply for this project?

A We propose to use the Morrison formation. We have drilled a water source well to test the Morrison, the Navajo "B"

No. 1-W which is in the Southeast Quarter of Section 19 in the project area. The Morrison is perforated in the interval 2,220 feet to 2,752. There are a number of smaller zones perforated within that approximately 530 foot interval.

We have requested permission from the Navajo tribe to use this water for injection purposes. We do not have a reply from them now. However, in talking to them last week they told us we should have an answer in about two weeks.

Q Have you had an analysis made of the water, the Morrison water?

A Yes, we have. It was filed, I believe, as part of the Exhibit D with our application, including a copy of the letter to the State Engineer.

Q You have then complied with the Oil Conservation Commission memo 558, January 31, 1958?

A Yes, we have.

Q Do you have any comments with respect to the proposed water supply as to it being adequate or anything of that kind?

A We have not fully tested our water supply. We have not installed a turbine type pump to be able to test it at high rates. We do have a small pumping unit on it for the testing purposes of the type we have elsewhere in the field with the capacity of about 120 barrels a day. The well was capable of producing this rate with no apparent drawdown. The Humble well in the, also completed

in the Morrison, potential for 922 barrels of water per day. We see no reason why our well shouldn't be as good.

Q Is the Morrison formation a thick formation?

A Yes, it is 5,000 feet thick.

Q And apt to carry a good source of water?

A Yes. It is my understanding that the Morrison is a blanket sand over the area and in communication with the outcrop.

Q Is The Atlantic requesting a project allowable in connection with this case?

A Yes, we are.

Q Can you state to the Commission what you are requesting?

A I'll read Section 6-B of our application. "Applicant therefore requests that the area hereinabove described be designated as the project area and that an allowable formula be fixed therefor and in connection therewith recommends the adoption of special field rules governing the injection of water into that portion of the Horseshoe-Gallup Oil Pool above described covering the following: (b) is transfer of allowables from injection wells to producing wells within the project area and transfer of allowable for producing wells which, for more efficient operation of the project, are shut-in or curtailed because of high gas-oil ratio, or shut-in for any of the following reasons: Pressure regulation, control of pattern or sweep efficiencies, or to observe changes in pressures or progress of the flood fronts."

Q Is that all you are requesting?

A We also have a request for an overall project allowable which may be produced from any well or wells in the project area in any proportion, the project allowable to be calculated each month by multiplying the current normal unit allowable for a 40 acre proration unit times the number of 40 acre proration units in the project area having located thereon either producing wells or wells used for injection purposes or wells which are shut-in or curtailed for conservation purposes. Provided, however --

Q Well, now, that that you read is in the application?

A Yes.

Q That's what you are requesting?

A Yes.

Q At this time do you desire to present any modification of that?

A I would like to add another section to Section 6.

Q Or proviso to it?

A Yes. Provided, however, that the project allowable shall be effective when it has been shown administratively that there has been a sufficient response from water injection to justify the increased allowable, such administrative approval to be considered after due notice to lease owners within two miles of the project area. In the event of objection or protest, a hearing will be held.

Q That is what you are requesting at the present time?

A Yes.

Q Are there any special field rules that you would like to propose to the Commission in connection with this matter?

A Before we cover that I would like to make a few comments about our proposal for project allowable. I believe that any lesser treatment would be discriminatory against pressure maintenance projects. Depleted water floods are given this sort of treatment under Rule 701. We believe the Commission should be encouraging pressure maintenance projects. In many fields the pressure will recover substantially more oil due to shrinkage. In other words, field waste can occur if water flooding is delayed to primary depletion.

Gas producing rates would usually be stabilized and producing life lengthened allowing smaller gas plants and better gas plant economics;that is in many cases, or some cases, gas plants could be economically constructed that otherwise would not be built and gas would be flared.

Q Do you have any other suggested rules to propose?

A Yes, we do. They are Section 6 (e) and, (d), rather, of our application. "Gas equivalent credit for water injected to be applied to any well producing with gas-oil ratio greater than 2000 cubic feet per barrel." The formula for this is Exhibit 3 and it is substantially --

Q That's Atlantic Exhibit 3?

A Atlantic 3, which is attached to Exhibit 1, and it's substantially identical to the rule in Bisti. In fact, we were real careless and it even says Rule 7 at the top of it. It's changed only to give the calculated "Z" factors for the gas in Horseshoe-Gallup and the factors look a little bit unusual in the higher pressure ranges. This is due to the low reduced temperature we are operating. That's a portion of the "Z" curve which comes almost straight down and gives quite extreme super-compressibility factors.

MR. UTZ: These were arrived at by test?

A They were arrived at by calculation from a gas analysis, using a, calculating from the "Z" factor or rather the critical pressure and temperature for each component, arriving at a critical suitable temperature and pressure to get the "Z" factors.

Q Do you have any further comment with respect to the adoption of rules by the Commission, special field rules?

A Of course we are advocating other rules and regulations which the Commission feels to be necessary.

Q I believe that you have stated that an engineering committee has been formed and has been active in studying the Horseshoe-Gallup area. What progress has been made, if any?

A Well, this engineering subcommittee of the Horseshoe-Gallup operators' committee was formed in January of 1960 and it

has met for about eight weeks. Since that time we have excellent progress, and I think its work will result in the unitization. We have seen nothing so far to be a major deterrent to unitization.

Q I believe in your application there you asked for administrative approval to include this in a unit if it should be formed?

A Actually what we asked for is permission to expand our limited water flood to the entire lease on the effective date of a unit agreement covering all or a substantial portion of the Horseshoe-Gallup Pool.

This would allow us to put about a third of the area we have considered under flood, the date a unit is effective, and then concentrate on putting the rest of the area under water flood if we should be designated as operator.

Q Going back to your study, has The Atlantic taken an active part in connection with the study?

A Yes, we have. I am chairman of the engineering subcommittee and we contemplated committing our acreage to this unit when it's formed.

Q State whether or not in your opinion the inauguration of water injection at this time would be in the interest of conservation and prevention of waste.

A I do believe it very definitely would be in the interest of conservation and prevention of waste.

Q Is it your opinion that water injection along the lines

proposed will promote the greatest ultimate recovery from this area?

A I do. I believe that it will. There are other injection methods which can be contemplated. The known missible processes are not practical in this particular reservoir because the pressure required for missibility between propane and gas is higher than the pressure we think we can tolerate in this reservoir.

Q That's due to shallow depth?

A Yes.

MR. HINKLE: That's all. I would like to offer in evidence Exhibits 1, 2 and 3 of Atlantic.

MR. UTZ: Without objection Exhibits 1, 2 and 3 will be entered into the record.

MR. HINKLE: That's all I have.

CROSS EXAMINATION

BY MR. UTZ:

Q I note that your injection well pattern has left you open at both ends, so to speak, up and down the trend. Do you have any particular reason for this?

A Well, we aren't able to carry that pattern all the way to lease lines at this time since we won't have immediately injection on the offset leases. This pattern is designed to allow us to operate for a period of time that will allow unitization to occur so we can expand the entire flood. Under a unitized operation

the open ended aspect of it wouldn't make any difference. The center portion of the lease is the area that we would put nine spot injection wells in, or possibly we might not even need all the injection wells we have designed. It's quite possible that we may be able to flood it peripherally from the five spot injection wells.

Our proposed ultimate pattern does fill out the center section with injection wells too. Every other well on the West lease line would be an injection well and every other well along the East lease line, well, every one of our wells on the East lease line would be with the particular arrangement there that we contemplate that probably the whole row of wells would be injection wells.

MR. UTZ: Any other questions?

MR. PAYNE: Yes, sir.

BY MR. PAYNE:

Q Mr. Vernor, how many wells are on the two leases involved there, both injection and producing?

A Seventy-six, sixteen in the Navajo "B" and sixty on the Navajo Lease.

Q Do you propose, in the near future, to convert at least 15 to injection?

A Yes, sir.

Q I believe your proposal is, as modified, is to give top unit allowable to all injection wells and all producing wells

which have received a response, is that right?

A That's essentially it. That's after --

MR. HINKLE: It would be approved administratively.

A That's right. We wouldn't ask for it initially.

Q What do you have in mind as to what is a response?

A We believe that we should be able to show that a substantial number of the wells on the lease have received a production increase from water injection operations.

Q Well, let me put it this way, take the well in the Southeast corner of the Southeast Quarter of the Section 31 which is considerably removed from the nearest injection well.

A Southeast, Southeast of 31?

Q Yes, sir.

A That would be No. 27.

Q Well, take No. 1 clear down there in the lower right-hand corner of your exhibit.

A Well, under our ultimate plan we have injection wells down in that portion of the lease too.

Q Yes, but what do you propose as the allowable for this well in the meantime?

A Well, I admit it would be difficult to have a response of No. 1 from the injection wells as set out. However, No. 1 is top allowable right now.

Q How many of these wells are top allowable, Mr. Vernor?

A I don't have that number at my fingertips. However, we have an allowable of about 3150 out of 3600 which we have if all the wells were top. Let me see.

Q You are talking about this lease?

A No, that's just the Navajo Lease. The Navajo "B" Lease is only three wells with top allowable. Just a minute and I'll answer the other question too. There are 11 wells on the Navajo Lease which do not have top allowable which means,60 wells in the lease would be 49 which do have top allowable.

Q Now, of those 11, how many of them do you propose to convert to injection wells?

A Well, let's see, 9, 24, two of those 11 would be initially converted to injection wells and four or five, that would be injection wells under the expanded flood.

Q Now, assuming that your project allowable, not looking at leases, that your project allowable was top unit allowable times the number of 40 acre tracts with a well on them, that would be 4560 barrels, right?

A Yes. I believe that's correct. This is -- yes.

Q If this project were in operation right now just as outlined here and was a water flood, rather than a pressure maintenance project, what would be its computed allowable?

A I haven't done that particular calculation. If you are referring to Section 701 that defines --

Q How many wells do you have that are either injection wells or directly or diagonally offsetting, offsets of an injection well?

A We have 15 injection wells and we have 15 wells on injection and 24 wells , 34 which are diagonal or direct offsets.

Q I counted 45 total.

A I got 49, we aren't far apart.

Q Let's take the higher figure.

A All right.

Q And multiply it by 52, what do you get?

A About 2808.

Q So that this project allowable, as proposed, would be almost double the allowable that would be allowed if this were a water flood?

A The other wells remaining on the lease also would have to have their allowables added to that I believe. They already have allowables.

Q Yes, that's right, some of which are top?

A Yes.

Q Now, assuming this were a water flood project and it was completely in operation, in other words, you had half injection wells and half producing wells, then your allowable would still be less than the allowable proposed here, wouldn't it, because you would be using 52 as a base figure rather than the 60 which is normal unit allowable that we are assuming.

A That's true. However, we're also open to it being 35 barrels a day or even less. We aren't asking for exemption from market demand prorationing.

Q It has been some time since the allowable in the Northwest has declined substantially, hasn't it?

A Yes, it has.

Q Now, in your opinion, is there more risk in a water flood operation or in pressure maintenance operation?

A I don't believe I can give you a blanket answer to that question.

Q Well, let's say the pressure maintenance project which is using water injection rather than gas or LPG.

A Well, I wasn't even thinking about that aspect of it. Just solely water injection projects. I think it would depend on the field involved. For instance here I would give a high chance factor of success. I could see a similar project where the operators hadn't done as much coring and gathered as much dataas the operators in the Horseshoe have done. That might be a higher risk solely because they wouldn't know too much about it. I'm not trying to evade your question, I really don't know.

Q You feel that the project will result in a greater recovery of oil from this pool than will be achieved otherwise?

A Yes.

Q Do you feel that the difference would be sufficient to

pay for the cost of converting the wells to injection and operating the project?

A Yes.

Q You also feel, do you not, that the Commission should give some incentive to an operator in order to initiate a pressure maintenance project?

A Yes.

Q Some incentive other than the allowable that the wells would normally get?

A Yes, I believe they should.

Q Now, do you believe that an order which would give only the injection well top unit allowable for each and every one, and the producing well, the allowable which it's capable of making up to top unit allowable, is a sufficient incentive to initiate a pressure maintenance project?

A I believe in many cases it would be sufficient incentive. However, it seems to me that it would be, a more appropriate allowable would be the one which we proposed.

Q Which would, assuming that the allowable stayed relatively constant or go up, which would be considerably more than a water flood project would get?

A Yes, so long as the Northwest unit allowable stays above 52.

Q Yes. A Yes.

Q Assuming that you got only top unit allowable for the injection well, it would encourage the operator to put additional wells on injection, would it not, and get a very efficient sweep of the oil?

A Yes, it would.

Q Why do you believe, Mr. Vernor, that a producing well should get top unit allowable even though it can't produce it?

A Well, I look at it rather from the individual well standpoint, the reservoir standpoint, and I think that that is an appropriate allowable treatment for the reservoir.

Q You do believe in the transfer of allowables from well to well in the project?

A Yes, sir.

Q And if each producing well had top unit allowable that would give you a larger amount to transfer around as you saw fit?

A That's right.

Q How deep are these wells, Mr. Vernor?

A They range from about 1200 feet to 15, 1600 feet.

Q Are you familiar with the orders that the Commission recently entered relative to the Sunray-MidContinent project in the Bisti?

A Well, are you referring to the one as the result of a hearing last week?

Q Yes, sir.

A No, I'm not familiar with it.

Q Well, it provided, Mr. Vernor, that each injection well would receive top unit allowable regardless of its ability to produce prior to conversion and that each producing well would receive what it could produce up to top unit allowable. I take it that you feel that sort of an allowable provision is what you might call then unduly restrictive?

A I feel it's much less restrictive than the allowable formula in the previous order in the Sunray's case which I'm familiar with. I think it approaches what we're asking for.

Q There has been some improvement then?

A Substantially. Before, you were fixed on injection wells, if it had five barrel a day capacity beforehand, you had no way ever to give it any additional credit.

Q Which might in turn lead to an inefficient pattern because an operator would be hesitant to convert a low producing well to injection or might have?

A It might. It might.

MR. PAYNE: I believe that's all. Thank you.

MR. UTZ: Are there other questions?

BY MR. UTZ:

Q Mr. Vernor, this is a very low gas-oil ratio pool then?

A Our wells produce with a fairly low gas-oil ratio. I believe there are wells elsewhere in the pool that have high ratios.

Q How high, do you know?

A I believe that some of Pan American's wells have ratios above the 2,000. I think they are high enough that they are penalized in their allowable.

Q In your particular part of the pool this Rule 7 wouldn't be of any particular benefit to you, would it?

A No, I put it in because this is something that might occur. We could have some high ratios on some areas of the lease prior to full effect of the water flood. It's added flexibility. I can't foresee immediately that we'll need it, but I see one ratio of Pan American's of 4418. The highest one I see of Atlantic's is about 508, so this is no immediate problem.

MR. UTZ: Are there other questions? If there are none the witness may be excused.

(Witness excused.)

MR. UTZ: Other statements in this case?

MR. DAVIS: William S. Davis, Humble Oil and Refining Company, a Delaware Corporation, Midland, Texas, as an operator in the Horseshoe-Gallup Pool, believes that the proposed water injection project is in the best interest of conservation and urges its approval. We would like to endorse a project allowable equal to the top unit allowable to all injection wells and to producing wells after it has been demonstrated that response has been obtained throughout the project area as a result of the injection program.

MR. SPANN: Charlie Spann of Grantham, Spann and Sanchez, Albuquerque, New Mexico, appearing for El Paso Natural Gas Products Company. I would like to state on behalf of El Paso, for the record, that we do not desire to protest this application in view of the amendment or proviso made to proposed Rule C in the application. Assuming that that provision or one of similar import is included in the rules as finally adopted, we have no objection or protest to the application.

MR. UTZ: Any other statements? Do you have anything further?

MR. HINKLE: No.

MR. UTZ: The case will be taken under advisement.

STATE OF NEW MEXICO)
: SS
COUNTY OF BERNALILLO)

I, ADA DEARNLEY, Court Reporter, do hereby certify that the foregoing and attached transcript of proceedings before the New Mexico Oil Conservation Commission at Santa Fe, New Mexico, is a true and correct record to the best of my knowledge, skill and ability.

IN WITNESS WHEREOF I have affixed my hand and notarial seal this 10th day of June, 1960.

Ada Dearnley
Notary Public-Court Reporter

My commission expires:
June 19, 1963.

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 1979, heard by me on June, 1960.

....., Examiner
New Mexico Oil Conservation Commission