BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico

February 7, 1962

EXAMINER HEARING

IN THE MATTER OF:

Application of Western Development Company and Yates Petroleum Corporation for a waterflood in the Artesia Pool, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks permission to institute a waterflood project in the Artesia Pool on the State 648 Lease located in Section 10, Township 19 South, Range 28 East, Eddy County, New Mexico, the injection of water into the Grayburg formation initially will be through six wells located on said lease, said project to be governed by the provisions of Rule 701.

CASE NO. 2492

BEFORE: Daniel S. Nutter, Examiner

TRANSCRIPT OF HEARING

MR. NUTTER: We call next Case No. 2492.

MR. MORRIS: Case No. 2492, application of Western Development Company and Yates Petroleum Corporation for a waterflood in the Artesia Pool, Eddy County, New Mexico.

MR. NUTTER: Who appears for the applicant?

MR. LOSEE: A. R. Losee, appearing on behalf of the applicant, Artesia, New Mexico. We have one witness, Mr. Dick Davenport.

(Witness sworn.)

R. J. DAVENPORT,

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

DIRECT EXAMINATION

BY MR. LOSEE:

Q State your name, please.

A Richard J. Davenport.

Q Where do you live, Mr. Davenport?

A Artesia, New Mexico.

Q What is your occupation?

A I am production superintendent of Western Development Company..

Q Have you previously testified before this Commission?

A No, sir.

Q Would you please tell the Examiner your educational background, your occupational experience, and any engineering or geological or petroleum societies that you are a member of?

A I graduated from the University of Kansas with a Bachelors Degree in Engineering in August of 1957. I went to work for Continental as an oil engineer in September of 1957. I worked for them, during which time -- on the training program, I was acquainted with two waterfloods in Texas. In August of 1960, I left Continental's employment and went to work for Western Development Company as production superintendent, where I am still in the position. I am a member of the Artesia Waterflood

Association.

MR. LOSEE: Mr. Examiner, are Mr. Davenport's qualifications acceptable?

MR. NUTTER: Yes, sir.

Q (by Mr. Losee) Western Development Company and Yates Petroleum Corporation have filed an application, Mr. Davenport, to waterflood certain locations in Section 10, Township 19 South, Range 28 East, Eddy County, New Mexico. Would you please tell the Examiner the brief history of this field?

A The oil well discovery was the Well No. 62, which was spudded November 11, 1931, and completed July 31, 1932. This well was drilled with a cable tool as were the eight wells to follow, and the development, one well completed in '32, one in '33, and two in 1935, and one in 1936. There were three wells drilled through the horizon not completed as producing wells. Their records show the presence of oil in the driller's logs; however, without present-day fracture, these particular wells were considered to be non-commercial at that time. One well, the State 648, however, has not been completed. However, completion practices in the original nine wells was set and 6¼-inch casing run. Nitroglycerine was used in the Grayburg formation. The pay interval consists throughout the ten wells producing in the area.

Q I will ask you to examine what has been marked as Exhibit 1.

A Exhibit No. 1 is an area map showing the Section 10

area outlined in red on the southern flank of the Artesia Pool.

Q Does this area map also show the names of the lessees within a two-mile radius?

A Right, it does show the lessees and the producing wells within a two-mile radius of the subject area.

Q Are these wells within this two-mile area producing from the same section as the wells in Section 10, proposed to be included in the waterflood project?

A Yes, sir, some of them are. Some of them to the southeast are producing in the same horizon. Some wells a mile and a half away are producing from the same horizon.

Q This area, how far is it from your production in Section 10?

A Approximately a half a mile away.

Q I will ask you to refer to what has been marked as Exhibit No. 2 and explain to the Examiner what it purports to reflect.

A Exhibit No. 2 is a project plat showing the proposed injection wells in a red triangle with the project area outlined in red. The proposed type of flood pattern is peripheral, the location and number of wells would make a five-spot or any other type pattern uneconomical in that the maximum volume of oil would not be recovered. A peripheral pattern will allow backup on all sides. Upon the pproval of this application, Western Development Company plans to go in this State 648 No. 5 well and initially

run 4½-inch casing to start injecting water, also, to run some injectivity tests into this sand. Upon completion of those tests, they plan to start reworking all the wells marked as injection wells here. To continue the flood pattern, this formation is being flooded in the Grayridge formation, test flood No. 2 and 3 to the north, four and five miles, and also in the Loco Hills flood. Therefore, it is presumed to be floodable as evidenced by these two other successful waterfloods.

Q How many wells do you propose to have as producing and how many as injection wells?

A There would be six injection wells in the outside area, with four producing wells in the center.

Q Are all these wells located on the same lease?

A Yes, sir.

Q Is it a state lease?

A Yes, State 648.

Q Mr. Davenport, would it be economical to go in outside the injection wells and drill some backup wells to establish a five-spot pattern?

A No, sir, it wouldn't be. We drilled this State 648 No. 174 well, thinking it might be a good primary producing well. However, it has not proven to be so. It will make a good injection well and give us backup for peripheral-type flood pattern. However, the volume of recovery being such as it is, we could not economically justify additional backup wells.

Q Is there any design that you have been able to discover for a five-spot pattern for this small field?

A No, sir, it doesn't lend itself to a five-spot pattern because of no backup wells.

Q In your opinion, would this peripheral-type flood satisfactorily make a secondary recovery of the oil in this reservoir?

A Yes, sir. I feel it would be the most economical and best pattern here and would recover the largest volume of oil.

Q I will ask you now to refer to what has been marked as Exhibit No. 3 and explain what this exhibit portrays?

A Exhibit No. 3 is a production decline curve. It has only been drawn since 1947 up to the present date. The production history prior to 1947 was similar to this, only it did increase in the 1930's when -- during the flood production period. At the present time, you can see our producing rate is down to 50 to 60 barrels per month.

Q Per well?

A No, that's the entire field.

Q How many wells are now producing in this Section 10?

A There are now five wells producing.

Q I will ask you now to refer to Exhibit No. 4 and explain what it portrays.

A Exhibit No. 4 is just a listing of the oil production history since 1947 and the listing of the accumulated production.

The accumulated production, up to January 1 of 1947, was 135,000 barrels of oil. The accumulated production up to 1962 was 177,514 barrels, or approximately 42,000 barrels produced during the last fourteen years. The present rate of production for those five wells, in December of '61 was 55 barrels per month or an average of 11 barrels per month per well, which definitely indicates that the wells are in the advanced stage of depletion.

Q Is the same reason that you gave for Exhibit 3 not showing that production history prior to '47 applicable also to this Exhibit 4?

A Right. It is practically a continuation of these last fourteen years.

Q Most of the primary production was recovered prior to 1947?

A Yes, sir.

Q I will ask you now to refer to what has been marked Exhibit No. 5 and explain what that portrays.

A Exhibit No. 5 is a well completion data sheet showing the number of each well, the completion dates, elevation, total depth, the casing program, within a perforated interval, the open hole intervals. It should be noted on this exhibit, Wells No. 62 and 64, the casing program is unknown. It is not in our files. We know there is casing there, because there is a casing head. However, we do not know the depth or what exactly is in the hole. When we do get ready to go into those two wells by running our

survey wells tests, we will be able to determine just exactly what is there, and either at that time, run casing or go ahead and leave it as it is. I assume that it has the same casing program as the rest of the wells, since they were drilled about the same time. However, at this time we do not know.

Q If I understood you right, the first nine wells shown on this exhibit, with the exception of two, 62 and 64, show no record of any cement on this casing and actually the casing was set below the salt. Was this the completion practice when these wells were drilled?

A Yes, to set it in this manner. We have drilled several wells there and we do know that these areas there where there is a great deal of sloughing and caving in. There was no water volume at all recorded on the driller's logs in this area, and I assume the casing was set, because of the sloughing and caving, but was not cemented as shown on the exhibit.

Q I will ask you now to refer to what has been marked Exhibit No. 6A and ask you to explain what it portrays.

A Exhibit 6A is a cross section of new locations. This shows that even the three wells, No. 67, 69, and 75, that were not completed as commercial producers, do have the shows present. We feel that we can inject into these wells. The driller's logs on all of these indicate shows of oil through this interval, but they were not completed as commercial producers.

Q This only shows nine of the ten wells; why did you not

show the 174 well on this exhibit?

A The 174, we drilled last year and we have the radioactivity log on this, which is Exhibit 6A. Therefore, I didn't include it in this cross section.

Q Actually, your wells that are not producing are Nos. 67, 69 and 75?

A Yes, they were never completed as producers.

Q Did all of those wells on the driller's logs record shows of oil?

A Yes, they did.

Q I will ask you now to refer to Exhibit 6A and explain it, please?

A Exhibit 6A is a gamma ray neutron log run on State 648, No. 174 well, the perforations are marked on the log and the two middle sets of perforations are believed to be those producing areas that are consistent throughout the ten-well area.

Q What is the depth below the surface, approximately, of those perforations?

A They are, the center of the perforation is from 2,078 and 2,082 to 92.

Q Why do you believe that these are the same intervals producing in your older wells?

A According to the strip logs available, this area is approximately the same depth below the top of the Grayburg. This indicates it is the same producing horizon as the older wells.

Q Is this the only well that you have any log on?

A Yes, it is.

MR. LOSEE: At this point, Mr. Examiner, I am referring to our exhibits marked 7 and 7A. They actually portray the casing programs for the injection wells. Exhibit 7 shows the production string and new production string, cemented to 1750 with the tubing and packer. This is the exhibit that was earlier submitted to the Commission and also submitted to Mr. Irby with the State Engineers office. In his letter directed to the Commission, in which he furnished us a copy, he stated that his office would have no objection if the injection was made through tubing and a packer. We did, in his exhibit, have an error in the depth of the cement. It showed 1950 and this has been corrected to 1750. After his evaluation of it, we would like to offer some testimony to support a less expensive program of injection, which would be through the producing string without the tubing and packer. We realize the State Engineer should be able to object and say what is necessary with respect to this alternative program.

However, Mr. Irby is in court in Carlsbad and he could not be here. We would like to submit evidence to support this. We would prefer this type, but if he desires, of course, we will set the tubing and packer. We would like to submit this again to the State Engineer and ask him to direct a letter to the Commcommission as to how he feels on it.

MR. NUTTER: Ver good. We will withhold any order on this until we have had Mr. Irby's letter expressing his consent or disagreement.

MR. MORRIS: If the Examiner please, I believe Mr. Irby's original letter will be read into the record at a later time.

Q (by Mr. Losee) Mr. Davenport, will you refer to what has been marked Exhibit No. 7 and explain what it portrays?

A Exhibit No. 7 is a drawing of the proposed casing program. In this particular well, there were two strings of surface casing set at 10 3/4-inch at 346 feet and 1¼-inch at 579 feet. Presently there is an open hole interval from 579 feet to 2,238. We propose to go into this well and clean it out and run 4½-inch casing to a total depth of 2,238 feet and being able to calculate the volume of cement required to bring the cement back to approximately 1750 feet on the 4½-inch casing.

Q You said, "proposed casing program." Do you mean the casing program shown by this exhibit which is one of the alternative programs you have proposed?

A This will be followed upon the approval of this application to go in and set this 4½-inch through the pay section and perforate it to inject water.

Q Does this one also show your packer set?

A Yes, sir, I have shown the packer there because it was-- I understood that the State Engineer did desire that we inject

through tubing and packer. However, we are going to be running 4½-inch casing and cementing it, so I do not feel it is actually necessary that we inject through tubing. I feel that we would have a safe injection program without casing.

Q Mr. Davenport, before you go further into another alternative, at this time; you have suggested that there are two wells, as shown by an earlier exhibit, that you do not have any record on. Would you explain what you will do if there is no casing in those wells?

A If there is -- I know there is at least a part of a joint. If there is surface casing there, we will run 7-inch surface casing to approximately 500 feet and cement it.

MR. NUTTER: Then, proceed with standard 4½-inch program?

A Yes, sir.

Q (by Mr. Losee) Will the 4½-inch casing be new casing?

A Yes, sir.

Q I will ask you now to turn to Exhibit 7A, which is the alternative.

A In 7A, the packer is left out. As I stated, it will be new 4½-inch casing. We feel we will have a safe injection program, down casing. Surface casing has been in the area for some twenty-five or thirty years and drillers logs did not report any surface water. I feel if there was surface water there, we would have had water production in these wells before now, which we have

not had. Also, in the area, Pan American drilled a deep well. They drilled a shallow water well to furnish water for this drilling rig, and they were unable to get enough water from this shallow well, which is located in the Northeast quarter of the Northwest quarter of Section 10, to furnish water for this drilling rig. The cost of running tubing with the packer for injection of water, initially, is around $1,700 or $1,800. We feel like that this is not a justifiable cost, because of our safety injection program with 4½-inch casing.

Q One of these wells, No. 174, that you recently drilled and logged, was there any evidence of water in that well?

A No, sir, that was drilled with a rotary rig and we were unable to tell if there was any surface water there.

Q This Pan American well that you mentioned that was drilled, is it a producer?

A It has been plugged and abandoned. It was in the Pennsylvania as a gas well, but it was plugged.

MR. NUTTER: Is that the well that is shown on your Exhibit as the Northeast of the Northwest quarter, Section 10?

A Yes, sir. It should be as plugged and abandoned. It was an error in making the map.

Q (by Mr. Losee) How long ago was it, do you know, when it was plugged and abandoned?

A No, sir, I don't.

Q Would it be more expensive to inject with water through

tubing than it would be through the casing and if so, would you explain why?

A Yes, sir, it would be more expensive. The initial cost, as I mentioned, would be $1,700 or $1,800 plus your operations. All cost would be greater going through tubing, and each time you had to rework the well or anything, you would be forced to pull your tubing with the packer.. So, your initial cost would be considerably greater, and also your operational costs would be greater.

Q Does it take more horsepower to get the water down the tubing?

A Your friction loss would be less in casing than it is in tubing.

Q Your $1,700 or $1,800 figure, is that on the entire field or on the per well basis?

A That is on a per well basis.

Q It would be five wells in this category, which would amount to some $8,000, approximately, initially?

A Yes.

Q How far away, if you know, was water in any quantity encountered in any of the wells drilled in this area?

A We have encountered water to the southeast in the McMillan Pool in several of the wells, the closest being approximately a half mile.

Q Would you, in this program, leave the annulus open to

the surface?

A Right. The annulus, between $4\frac{1}{2}$ inches and $8\frac{1}{4}$ casing, would be open. I feel like if there was any leaks developed in the $4\frac{1}{2}$-inch, we would certainly know and it would come to the surface right away.

Q If you are allowed to commence this flood with this type of water injection casing program, would you have an opportunity to test this $4\frac{1}{2}$-inch casing under high pressure?

A Yes, we use $4\frac{1}{2}$-inch for the perforating. We have to treat the formation, at that time. We will probably reach pressures up to 3500 to 4000 pounds at that time, before we perforate. We could test the casing to be sure there was no leaks in the new casing.

Q How much do you anticipate your maximum injection pressure would be with the water?

A That is real difficult to tell because we have no reservoir data, but we are anticipating approximately 150 barrels per day per well, initially.

Q What pressure would that be injecting?

A Looking at the other floods through the area that injected into the same formation, we feel the injection pressure would be around 1100 or 1200 pounds.

Q In your opinion, would this alternative program protect any unseen difficulties that you might encounter in your life of the flood?

A I feel it would. If any leaks developed in our 4½-inch, we would know immediately through the annulus of the two casing strings.

Q What would you do if a leak developed?

A If a leak developed, we would, of course, have to seal it with cement and inject with tubing under packer.

Q Would it be economical for you to continue if your casing was leaking, your program without correcting the defect?

A No, we couldn't economically inject water that was not going into the producing reservoir.

Q I will ask you now to refer to your Exhibit 8A.

A Exhibit 8A is a map showing the location of a water well that was drilled in 1960. This water well is drilled to the total depth of 235 feet. There is water sand from 205 to 235 feet. Seven-inch casing was set to a total depth with a solid liner from 205 to 235. This is the closest volume of water that we have encountered in drilling wells in the East Neuman area. It is the closest good source to our project.

Q Your company drilled the nearest well in the East McMillan-Queen field to these in Section 10, did they not?

A Yes, sir,

Q This was the closest source of water to Section 10, proposed for the flood area?

A Right.

Q Is this water well on a different oil and gas lease or

is it on the same oil and gas lease?

A It is on the same oil and gas lease, State 648.

Q If you would, please, refer to Exhibit 8A.

A Exhibit 8A is a test on the water well conducted by Smith Machinery Company. They pumped it for twelve hours with the initial grade of 58 gallons per minute and a subsequent rate of 46. This recommendation was theirs, that we pump from the level of 190 feet at a rate of 50-55 gallons per minute, which is approximately 1700 barrels of water per day. This would be more water than would be required by this flood on any given day. If we reached a 150-barrel per well injection well for six wells, that would be 900 barrels per day. Also, this water well has never been treated, either by chemicals or fractured, and we feel that if this were done, the capacity of the well could be increased considerably.

Q After fillup, what do you expect your injection rate to be?

A After fillup, we expect our injection rate to drop to a figure just over withdrawals or approximately 80 barrels of water per day.

Q If this water well should, during the life of the flood, not prove sufficient, would you have other sources in the area and if so, what would they be?

A In drilling wells south of the oil wells or south of the water well, we have encountered a great deal more water and a

better source of water. I feel that there is a good water reservoir there, and I feel like this well will hold up through the life of the flood. However, if it doesn't, we have a source of water farther to the south.

Q Has your company notified the State Engineer's Office and the State Land Office of this application?

A Yes, sir. Exhibit Nos. 9 and 10 are copies of letters to the State Land Office and State Engineer's Office notifying them of this application.

Q Realizing that there is not a great deal of reservoir data available to you, in your opinion, could you estimate the recovery of oil that you would anticipate from this project that would not otherwise be recovered under primary methods?

A For working out our own economics, we have assumed a rough figure for secondary recovery, equal to primary, which would mean that by waterflooding this area we would recover 180,000 barrels of oil which would not otherwise be recovered by primary production.

Q Would this proposed waterflood program, in your opinion, promote conservation of a natural resource and prevent their waste?

A It would, in that it would recover oil that was otherwise unobtainable by primary production methods.

Q Were these exhibits which have been marked, 1 through 10, with several A's and B's, 6A and 6B and 8A and 8B, prepared

by you or under your supervision and direction?

A Yes, sir.

MR. LOSEE: At this time, we would like to move for the introduction of the exhibits.

MR. NUTTER: Western's Exhibits 1 through 10 will be admitted in evidence.

Q (by Mr. Losee) Under this proposal, if your application is granted, Western will comply with the Commission's rule 701, with respect to the allowable to this project, will they not?

A Yes, sir.

MR. LOSEE: I believe that is all of applicant's case, Mr. Examiner.

MR. NUTTER: Does anyone have any questions of this witness?

MR. MORRIS: I have a few questions.

CROSS EXAMINATION

BY MR. MORRIS:

Q Mr. Davenport, just on your Exhibits Nos. 4 and 5, I believe you gave some production data on the wells in this area. What is the highest rate of production on any well at the present time?

A At the present time?

Q Yes.

A Well, sir, I am unable to answer that. We haven't

tested each well individually. They are all on an underlying rod-pulling central power system right now. We start that power up twice a week but we haven't tested any of the wells.

Q In your opinion, no one well would be capable to produce anywhere near the top allowable?

A No, sir.

Q Mr. Davenport, I show you a document and ask if that is a copy of the letter that Western Development Company received from Mr. Irby, that Mr. Losee referred to a moment ago?

A Yes.

Q Rather than read that into the record, Mr. Losee, do you have any objections of making this a part of the record in this case?

MR. LOSEE: I have no objections at all.

MR. MORRIS: I have no further questions.

MR. NUTTER: Are there any other questions?

CROSS EXAMINATION

BY MR. NUTTER:

Q Mr. Davenport, this casing program as shown on Exhibits 7 and 7A is fairly typical of all the wells in the pool, is that correct?

A Yes, sir. In this particular well, No. ~~75~~ 67, there was a 10 3/4-inch string of casing set that was not set in the other wells. However, the $8\frac{1}{4}$-inch casing is typical string in the other wells.

Q So, it is probably the only one that has this surface pipe?

A Yes, sir.

Q The program, as shown on Exhibits 7 and 7A, that you plan to complete the producing wells and the injection wells, do you have any program for the producing wells, as far as reworking them?

A No, sir. We feel they have been produced since the '30s. We feel like we will have to go in and clean them out to the total depth. However, by running tubing and putting them on individual pumping units, we will be able to keep the reservoir pumped off and do not plan any casing program for those.

Q Are you presently producing them through tubing?

A Yes, sir.

Q Do you use any packers on these?

A No, sir.

Q You will put individual pumps on these and keep the wells pumped off?

A Yes, sir.

Q In the case of the six injection wells, you will run a calibre survey on each of those?

A All of the wells were shot with nitroglycerine. I feel we will have to run a calibre test to calculate our cement for the volume to require it to back up.

Q The injection intervals in each of the six wells will be

fairly

~~bar~~ely similar to 1930 to 50 feet?

A Well, sir, this cross section I had here is taken from the driller's logs and we don't feel we will be able to tell what our injection or what the perforations is until we have run a radioactivity log on each well.

Q It will be similar zones to the one you have shown here on 75?

A That is actually a schematic diagram for Well No. 75. We are unable to tell exactly where the shows of oil were.

Q Which interval on Exhibit No. 6B is the radioactivity log?

A The two middle sections, 2,284 to 92.

Q That is going to be your injection zone in all of your wells?

A Yes.

Q You will log all of the locations prior to running that?

A We will log them after the 4½-inch.

Q After taking calibre surveys, you will cement with your surface, to come back to 200 feet above the upper perforations?

A Yes, sir.

Q It would appear that Mr. Irby's objection in his letter regarding this was based primarily upon the top of the cement being so low, but that was an error on the schematic diagram.

MR. PORTER: It actually is 200 feet higher then, is that right?

A Yes, sir.

Q (by Mr. Nutter) Does your water source ~~11e~~ 11ℓ in Section 14 within the declared basin of the State Engineers?

A No, sir, it is not.

Q No permission to withdraw from this will be necessary?

A No, sir.

Q You feel that you have another source of water farther south in the event that this water should not be or could not be obtained in sufficient quantities?

A Yes.

MR. NUTTER: Are there any further questions?

MR. PORTER: Mr. Davenport, this appears to be a rather isolated producing section here, although it is fairly a part of the older Artesia pool. You did not anticipate any wells outside of Section 10 might be effected?

A No, sir.

MR. LOSEE: I have one further statement. Mr. Examiner, the State Lease 648, which was originally issued in 1924 by the Commission for Public Lands, contains some unusual language in that it contains a specific grant to use water and I would ask that the Examiner take notice of the Land Office record of that Lease 648.

MR. NUTTER: 648 covers Section 10?

A Yes, sir.

Q (by Mr. Nutter) So, the water will be ~~leased~~ used on the

lease?

A Yes, sir.

MR. NUTTER: Are there any further questions?

Mr. Davenport, you may be excused.

(Witness excused.)

Does anyone have anything to offer in Case 2492?

We will take the case under advisement and take up the next case.

* * * *

STATE OF NEW MEXICO)
) ss.
COUNTY OF BERNALILLO)

I, CECIL LANGFORD, NOTARY PUBLIC in and for the County of Bernalillo, State of New Mexico, do hereby certify that the foregoing and attached transcript of hearing was reported by me in stenotype and that the same was reduced to typewritten transcript under my personal supervision and contains a true and correct record of said proceedings, to the best of my knowledge, skill and ability.

NOTARY PUBLIC

My Commission Expires:

_____