BEFORE THE
NEW MEXICO OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
November 24, 1968

EXAMINER HEARING

IN THE MATTER OF:

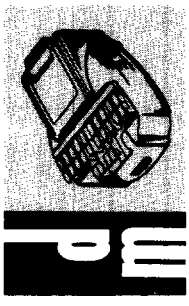
APPLICATION OF CONTINENTAL OIL COMPANY FOR A WATERFLOOD EXPANSION AND AN ADMINISTRATIVE PROCEDURE, EDDY COUNTY, NEW MEXICO

Case No. 3162

BEFORE:

DANIEL NUTTER

TRANSCRIPT OF HEARING



MR. NUTTER: We will take Case Number 3156 under advisement, and call Case Number 3162.

MR. DURRETT: Application of Continental Oil Company for a waterflood expansion and an administrative prccedure, Eddy County, New Mexico.

MR. KELLAHIN: Kellahin & Fox, representing the applicant. I have one witness I would like to have sworn.

Robert D. Riley thereupon was sworn and testified as follows:

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q Please state your name.

A Robert Daniel Riley.

Q By whom are you employed and in what position?

A I am employed by Continental Oil Company; I am a production engineer in the Hobbs District office, working in the reservoir engineering section, and have been working with the waterflood section of this department for the past year.

Q Have you ever testified before the Oil Conservation Commission?

A No, sir.

Q For the benefit of the Examiner would you briefly outline your education and your experience as an engineer.

A I received a BS degree in petroleum engineering in

May of 1959 from Texas A&M University. I have been employed by Continental Oil Company for the past five years following graduation. Four of these were on active employment as an engineer. The one year intervening I was taking graduate courses at Texas A&M University.

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

MR. NUTTER: Yes, sir.

Q (MR. KELLAHIN) Mr. Riley, are you familiar with the application of Continental Oil Company in Case Number 3162?

A Yes, sir.

Q Would you state briefly what is proposed by Continental in this application.

A Case Number 3162 is the application of Continental Oil Company for amendment of R-2385 for authority to convert two additional wells for injection purposes in the Cave Pool Unit, and to provide administrative procedures for making future changes or additions of injection wells.

Q Referring to what has been marked Exhibit 1, would you describe what is shown on this exhibit.

A Exhibit 1 is a plat showing the Cave Pool Unit and the immediately surrounding area. The unit outline is shown by the dashed line. Producing wells within the unit are shown by the small dot and the injection wells are shown by dots and the

circumscribed triangle. The injection wells which are not colored are injection wells now in service. The two wells which have been colored red are the two wells which we are seeking approval to convert to injection. The two wells that we are considering are General American's Green B Number 4, located in Unit H of Section 7, and General American't Green B Number 7, located in Unit L, Section 5, both in Township 17S, Range 29 East, Eddy County, New Mexico.

Q Have there been any changes in the unit area since the effective date of Order Number R-2385?

A Yes, sir. The unit area has been enlarged effective November 1, 1964, to include the west half of the southwest quarter of Section 5, and the northeast quarter of Section 7, both of these being in Township 17 South, Range 29 East, Eddy County, New Mexico.

Q And that is shown on the present Exhibit 1?

A Yes, sir, the boundary on Exhibit 1 includes the enlarged unit area.

Q Referring to what has been marked Exhibit 2A, would you identify that and discuss what is shown on it; and also Exhibit 2B.

A Exhibit 2A is a schematic diagram of the proposed water injection well. This exhibit shows the total depth of the well, the size and depth of the casing strings, and the amount

of cement used. We have not shown the tops of the cement; we have shown the amount based on the records or our conversation with General American--they did not have a temperature survey on the production string, and based on the calculated fill-up we estimate 200 sacks, which would bring our cement back up to approximately 600 feet above the casing shoe. Exhibit 2B is likewise a schematic drawing of Green B Number 7. If I failed to mention it, Exhibit 2A was for Green B 4. Again, this exhibit gives the same basic casing and cementing program used on this well during its primary completion. This well was cemented 100 sacks on the production string, which would estimate the top of the cement 300 feet above the shoe.

Q Did Continental Oil Company drill the wells, or they were drilled by General American; is that correct?

A That's correct.

Q How do you propose to make this completion, and what tests will be made?

A We propose to make completion by injecting down the casing as shown by Exhibits 2A and B. We will install approximately 90 feet of tubing to inject into the casing. Prior to any injection, and as has been the practice under Order Number 2385, we will pressure-test each well to 2,000 pounds, prior to injection. If the wells fail to withstand the test we will either perform remedial work or will inject through tubing under a packer. If the well does successfully withstand the pressure

test we plan to inject water into the casing.

Q Is this the type of completion that has been performed for other injection wells in this waterflood project?

A Yes, sir, on the other injection wells shown on Exhibit 1 this is the type of completion, I believe, with the exception of one well which was a dry hole and the casing had been pulled, so we cemented a casing on that to TD. However, we are injecting a casing in that well.

Q Referring to what has been marked Exhibit 3 for identification, would you describe what is shown on there.

A Exhibit 3 is a tracing of a gamma-neutron log and a general data sheet for the Green B Number 4. The gamma-neutron log shows the top of the Premier Sand, which was the pay interval of the Cave Pool in the zone which we are flooding, and which was the casing set of the well. Other pertinent data is the completion dates, initial potentials, cumulative production and intervals open for completion.

Q Referring to what has been marked Exhibit 4 for identification, will you discuss that.

A Exhibit 4 is a general data sheet for General American Green B Number 7. There was no logs available on this well; however, the log would be comparable to that shown in Exhibit 3. This exhibit is submitted to furnish the completion data for the well.

Q Can you explain why these two wells were not included in the original application for the Cave Pool waterflood?

A At the time of formation of the Cave Pool unit it was General American's intent to cooperate in the waterflood project rather than to commit their acreage to the unit. However, their position has changed, and at their request we have expanded the unit to include their acreage. The portion of their lease now committed to the unit is designated as Tract 17 of the KP unit, and the wells located on this tract, two of which we have discussed in this case, will have--the names will be changed; the Green B Number 4 will become Cave Pool Unit Number 53; the Green B 5 will become Cave Pool Unit 52, and 7 will become Cave Pool Unit 51; and for clarification of the Green B 5 well, if you will notice on Exhibit 1, this will be a producing well within the waterflood pattern.

Q The application requests establishment of an administrative procedure for approval of additional injection wells. Does Continental Oil at this time contemplate adding or substituting injection wells in this project?

A No, sir, we don't. However, it's always a possibility that such changes may become necessary as the flood progresses; and this is the second hearing the Commission has had to hold as a result of our failure to request administrative procedures for securing permission to add injection wells at the original hearing

of the Cave Pool Unit Waterflood. In the interest of avoiding future hearings, it is recommended that the Commission incorporate such procedures into the amended order.

Q What sources of water will you use for injection purposes?

A Water which has been used to date, and which we will continue to use in the two new injection wells, is from the Poga Loga formation, and we are purchasing this water from the Caprock Water Company.

Q That is fresh water?

A Yes, sir.

Q Will you re-inject produced water?

A Yes, sir, it is our plan.

Q Are you doing so now?

A No, sir, to this time we have not. Our water production has not been great enough to set up facilities to accomplish this.

Q Were Exhibits 1 through 4 prepared by you or under your supervision?

A Yes, sir.

MR. KELLAHIN: At this time I'd like to offer Exhibits 1 through 4, inclusive.

MR. NUTTER: Continental Oil Company Exhibits 1 through 4 will be admitted.

MR. KELLAHIN: That's all I have on direct.

MR. NUTTER: Are there any questions of this witness?

MR. IRBY: In what formation is the surface casing set?

A Sir, at the moment I cannot give you a specific answer on that. It is the standard depth which has been used for setting surface casing in this area--I believe it is the depth that has been used for all producing wells in this area on primary completion, and I assumed this depth as satisfactorily detected on surface waters as were seen at the time the wells were drilled.

Q What was the condition of the casing in each of the two wells at the time of completion?

A This information is not available to us at this time. We have just taken over operation of these wells, I believe effective today, and have not received full well files from General American. The data on these plats were obtained by telephone conversation, and at my disposal at this time I have no record of the type of casing that was set, other than the size of them.

Q Do you propose any tests on these wells subsequent to the 2,000 PSI test at the time of conversion to water injection?

A You mean tests following completion of this well?

Q Yes.

A No, sir, we have not set up a program for testing the wells. We have found that some of these wells initially took the

approximate injection volume of around 150 to 210 barrels per day. Initially on a few wells this was accomplished with zero surface pressure. However, as you begin to attain fill-up this pressure has climbed, and in most portions of our waterflood it is up to five and 600 pounds, and we do check the pressures once each month, and record them, and if we develop a leak in the casing it would show up by reduced surface projections, and likewise the projection rate would climb exceptionally high; and I feel that any such thing would be realized within a short period of time...the maximum of one month, and we have not run into a problem of corrosion at this time and are not expecting it; and we feel we should not have a problem of corrosion that would cause a casing leak.

Q What tests have been made with respect to corrosion in the other injection wells in this project?

A There have been tests made. I cannot give you specific details; I have talked with engineers who have obtained these tests and the information I received from them is that we have--is that corrosion is not taking place there, or we haven't found it at an alarming rate. I don't think I can say specifically there is no corrosion, but we have been injecting for a little over a year now, and have had no indication of corrosion with any of our surface equipment, or in any other wells to this date, and that has been a year of injection.

Q Have any coupons or anything of that nature been used for these tests?

A I really don't know, sir.

Q All you know is that they have taken observations on the surface equipment?

A I believe they have checked for corrosion as well as for--we checked for corrosion and bacteria for plugging of the wells, and the details I can't say, but I believe they have made checks other than just visual inspections of our surface equipment.

Q I believe you said the maximum injection pressures to date are on the order of 500 PSI?

A No, sir, 500 PSI has been indicated as for the better producers. I made the statement that we do expect pressure on all wells so that we could distinguish a leak. However, on some wells which are located along the parameter of the flood, which would be edged wells of reduced pay thickness and quality, we have observed pressures of approximately 1450 PSI. Our maximum plant pressure is 1500 pounds, and we have observed--well, perhaps 1450, in a few isolated wells.

Q You are taking tests monthly to determine injection pressures and volume of water injected?

A Yes, sir.

Q And by this means you expect to determine if a leak

occurs in the casing?

A I think that this would definitely show a leak in the casing, by your pressure and rate behavior. I believe these are recorded on one of the Commission forms which are submitted each month; and we also have company records on which these are recorded.

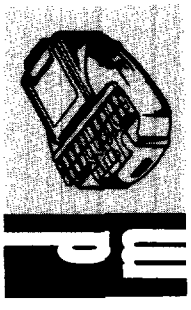
Q Will you be willing to furnish me information immediately if your injection pressures drop or your volumes increase?

A Yes, sir, I feel that Continental would certainly be willing to furnish the information required on that. It's difficult to--what I want to say, is there any distinction you might have on our rates? Of course, pressure varies to some extent.

Q I realize there would be a significant increase in the volume of water accepted by the well, or a significant decrease in the injection pressure.

A Yes, sir. I think Continental would certainly be willing to do that. I might point out that we are interested in water-floating our pay section, and we are losing money by losing water, and we are just as interested as you are that we don't lose our water by some type of casing leak, and we would submit any records you require.

Q Not to be argumentative with you, but I will not agree that you are as interested in this water as I am. I think some of the leaky wells in Lea County prove this--with certain other



oil companies; not nec3ssarily Continental. That's all I have.

MR. NUTTER: You have computed here that top cement above the shoe would be 600 feet on one well and 300 on the other. Were you taking this volume of cement and going to the tables and using size of hole and size of casing?

A Yes, sir, using what would be the casing and bore hole anulus, and assuming that it was a neat cement which had a volume of 1.1 cubic feet per sack, and estimating the approximate height.

Q And this is on actual fill-up and no consideration given to wash-outs or large holes?

A That is correct.

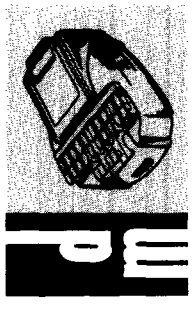
Q Is there any way--I realize when you test the casing you probably go down with a packer and pressure up the casing, and put the packer just above the shoe?

A Yes, sir

Q Is there any way of testing to find out, when you pull that packer and start going in with pressure, that you don't have a break-through of water up around the cement?

A Sir, we will test the wells to 2,000 pounds or maximum plant pressure. We can inject 1500 pounds, and we feel that if we did not break the cement around the shoe on test, prior to putting the well on injection, the 500 lesser pounds should not--

Q You're not going to be testing that shoe on the pressure test, and the cement around the shoe.



A I'm sorry, sir--I was slightly confused there. This is--let me back up and say yes, sir, you are correct. We have run surveys on, I believe it was four wells, in the portions of the pool which are now developed to waterflood, to check this, and in no instance did we find we were losing water behind the casing, and this is open hole wells. However, the alternate to injecting down the casing, accomplished by running a tube and packer, would not answer the question you have asked; because here again you would be injecting water into an open hole, subjecting the cement around the casing shoe to the same pressure, and a tube and packer would not eliminate this possibility.

Q I realize this; but is the amount of cement used on these wells comparable with the amount of cement used by other companies in developing this Cave Pool? These people used 100 sacks on one and 200 on another well. Is that a comparable amount to the other wells?

A This is a comparison I cannot give you a definite answer on, but in my opinion I think we would find that it is a comparable amount.

Q This bradenhead--is that open, or what is the status between the 8-7/8 inch casing?

A It would be my opinion that it is open from the top of the cement to the surface. Is that your question?

Q I meant if it was open at the top, or if it is sealed

off. If a man would have either a break-through of water around the shoe, or if he had a leak and there was no porocity, water would build up in that casing?

A Yes, sir, and there would show an indication by pressure on the surface.

Q Yes, either on a guage, or if it was open, by a flow of water?

A The condition of these wells are not known to me today. These were not Continental wells, and since we have just assumed operation of them we have not examined them, and I really could not answer the question whether they are open. Most of them, I think you will find, the bradenhead is acceptable, but on these I could not say.

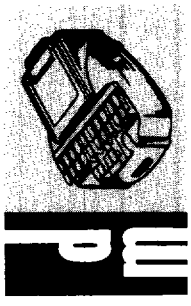
MR. NUTTER: Do you know, Vic?

MR. LYON: No, I don't. We can investigate and let you know, if you would like, but I don't know what the condition of the bradenhead is.

MR. NUTTER: If the bradenhead were open and you had a flow of water or break-through, you would sometimes get an indication?

A (WITNESS) Yes.

Q If you had a very permeable, porous zone down in the hole that would take the water faster than the hydrostatic head could build up in the well, you might never have an indication at the



surface. Vic, if you would check on the bradenheads, I would be interested in knowing--maybe just a quarter-inch tap left open would let a flow of water out of the bradenhead.

MR. LYON: Continental as a standard practice does have fittings available. I'll check the installed pressure guages or valves where we can check where there's pressure, but as far as the General American's practice, I can't say.

MR. NUTTER: Are there any further questions of this witness?

MR. IRBY: I have a statement I'd like to make. No further questions of this witness.

MR. NUTTER: If there are no further questions the witness may be excused. Do you have anything further, Mr. Kellahin?

MR. KELLAHIN: No.

MR. NUTTER: Does anyone have anything further?

MR. IRBY: I would recommend, Mr. Examiner, that Continental be required to furnish the information which is mentioned in your statement to Mr. Lyon, and that a copy of this information be furnished me; and that if the Examiner feels it is significant, that his recommended procedure with regard to the bradenhead be made a part of the order.

MR. DURRETT: If the Examiner please, I'd like to state for the record that I received a letter from Mr. Irby of the State Engineer's Office stating that he objected to

this application as he did not have a copy. Now that he has heard the case here today, I thought he might want to modify this objection.

MR. IRBY: I withdraw the effect of my letter dated November 24, 1964, with regard to the Oil Commission Case Number 3162.

MR. NUTTER: If there is nothing further in Case Number 3162, we will take the case under advisement. The hearing is adjourned.

(The hearing thereupon adjourned, at 5:50 o'clock P.M., November 24, 1964.)

* * *

STATE OF NEW MEXICO)
) ss
COUNTY OF BERNALILLO)

I, ELIZABETH K. HALE, Notary Public and Court Reporter, do hereby certify that the foregoing and attached transcript of hearing in Case Number 3162 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.

Witness my hand and seal this 6th day of December, 1964.

Notary Public

My commission expires

May 23, 1968.

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 3162, heard by me on 11/24, 1964.

, Examiner
New Mexico Oil Conservation Commission