

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

EXAMINER HEARING

IN THE MATTER OF:)

Application of Humble Oil & Refining Com-)
pany for a waterflood project, Lea County,)
New Mexico. Applicant, in the above-styled)
cause, seeks authority to institute a)
waterflood project on its State "M" lease)
in Sections 19, 20, 29, 30 and 31, Township)
22 South, Range 37 East, Lea County, New)
Mexico, by the initial injection of water)
into the Queen formation of the Langlie)
Mattix and Eumont Pools through six wells)
located in Sections 20, 29 and 30.)

Case No. 2879

BEFORE: Elvis A. Utz, Examiner.

TRANSCRIPT OF HEARING

August 7, 1963

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LARRY E. GLASGOW

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

DIRECT EXAMINATIONBY MR. BRATTON:

Q State your name, by whom you are employed and what capacity.

A I'm Larry E. Glasgow, Humble Oil & Refining Company, and an associate petroleum engineer in Hobbs, New Mexico.

Q Are you familiar with the matters under consideration in this application?

A Yes, sir.

Q State briefly your professional and educational background, Mr. Glasgow.

A I have a Bachelor of Science degree from the University of Oklahoma, I have attended Humble's Reservoir Engineering School, in the last fourteen months I have been employed in the reservoir section in the Hobbs District in Hobbs, New Mexico.

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

MR. UTZ: Yes, sir, they are.

Q What is Humble seeking in this application?

A Humble is seeking permission to institute a pilot water-



flood and also contraction of part of the Eumont Pool and extension of the Langlie-Mattix in its place.

Q The reason for that is that the flood area, the Humble State "M" lease covers wells that are classified in both pools?

A Right.

Q But they will be operated in the one flood, is that correct?

A Yes, sir, that's correct.

(Whereupon, Applicant's Exhibit No. 1 was marked for identification.)

Q Refer then to your Exhibit No. 1, Mr. Glasgow. Does this show in yellow the area of the State "M" lease?

A Yes, sir.

Q And what are the various wells and what's the legend there?

A This is an area plat of approximately two mile radius of our injection wells. The different colored circles, the legend tells what particular pool they have produced from or are currently producing from. The outer ring is the current production or producing horizon. Inside the yellow tape is the New Mexico State "M" lease and the little triangles around those six wells in the middle are the proposed injection wells.

Q The one well circled, is that the water source well?



A Yes, sir, it is.

Q And this shows that some of the wells are, even in the pilot, are in the Langlie-Mattix and some are in the Eumont?

A Right.

Q This is the Queen formation, is that correct?

A Yes, sir.

Q Where is this area with relation to the pool as a whole?

A This area is approximately 25 miles southwest of Hobbs, or about five miles southwest of Eunice. It's the northernmost part of the Langlie-Mattix Pool and the southernmost part of the Eumont Pool, right on the edge.

Q Is there anything else you care to point out with reference to Exhibit No. 1?

A I don't believe so.

(Whereupon, Applicant's Exhibit No. 2 was marked for identification.)

Q Turn to your Exhibit No. 2 then. I believe that's a structure map of the area, is that correct?

A Yes, sir.

Q What does it show as to the area of the State "M" lease?

A It's a structure on top of the Queen formation and it shows the continuity from the Langlie-Mattix into the Eumont Pools in this particular area.



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Q Now, does Ambassador have a pilot flood going in this same general area?

A Yes, sir, they do.

Q Where is that?

A It's easier to see, well, it's underneath my legend block on Appendix 1. It's a pilot in which Humble is cooperating by injecting water into one well.

Q So it's about two miles south and east of this area?

A Here it is, I was mistaken.

Q About a mile and a half to the east of it, and it will tie into this area eventually?

A Right, sir, in Section 27.

Q Does your structure map indicate the continuity of the formation throughout the entire proposed project area?

A Yes, sir. It also indicates that we're pretty much right on the edge of both pools.

Q Is there anything else you care to point out in connection with Exhibit 2?

A No, sir.

(Whereupon, Applicant's Exhibit No. 3 was marked for identification.)

Q Turn then to your Exhibit No. 3. What is your Exhibit No. 3?



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A It's a core analysis and a log analysis comparison of the Queen formation of Well No. 43 on the New Mexico State "M" lease. It shows how the permeability has decreased from the main part of the Langlie-Mattix Pool, showing that we're right on the edge as far as the permeability, it shows the lenses that are prevalent in our lease and because of these lenses Humble proposes to install pilot initially to determine injection rates and injection profiles.

Q That's the reason you are proposing the six-well pilot?

A Right, to evaluate those.

Q To see how it operates in this edge area?

A Yes.

Q And this lenticular portion of the pool. Turn to your Exhibit No. 4. Is this a map of the pilot area showing the injection wells and the two enclosed producing wells?

A Yes, sir, it is.

(Whereupon, Applicant's Exhibit No. 4 was marked for identification.)

Q Once again, talking about the Ambassador flood to the east, is this designed so that you can tie in on the edge of this at a future date?

A Yes, sir. We specifically made allowance so we can make our pattern match up with Ambassador so we could fully



cooperate with them when they met us. Also I would like to point out there that that Well 37 is up in the Eumont Pool and the other five are in the Langlie-Mattix.

Q Of your injection well?

A Yes.

Q You would propose, depending on the reaction, to use the standard administrative procedures of Rule 701, is that correct?

A Right.

(Whereupon, Applicant's Exhibit No. 5 was marked for identification.)

Q Turn to your Exhibit No. 5, Mr. Glasgow. What is that, sir?

A This is a lease performance data and the green is our daily oil production. It shows the beginning in 1959 when it started developing the lease. It reached its maximum in '61 and has since fallen off and as Humble feels, is in the stripper stage of production, approximately 258 barrels of oil a day.

Q Is your current production down from approximately what, a thousand?

A Yes, sir, 900.

(Whereupon, Applicant's Exhibit No. 6 was marked for identification.)



Q Turn to your Exhibit No. 6 then, Mr. Glasgow. How many wells are on this lease?

A Thirty-five. We propose to recomplete one and drill another one, make thirty-seven in all.

Q Your average production per well per day on the lease is about seven barrels now, is that correct?

A That's right.

Q Continuing this decline curve on your total production from the lease, Mr. Glasgow, by the time you get this flood into operation your daily production will be considerably below seven, won't it?

A Yes, sir. We anticipate it will be considerably below.

Q Turn to your Exhibit No. 6. What is it?

A This is an exhibit of our lease individual well data. It gives the specific information about each individual well that's going to be on the New Mexico State "M" lease project, and it gives original potential tests which are interesting to see what tremendous potentials they had of coming in up to 900 barrels a day, and then they've fallen off now. I have the May allowable over here on the right. This particular well, 949 barrels of oil original potential is now 14 barrels of oil per day.

Q The great bulk of this was developed from 59 through



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61, is that correct?

A Yes, sir.

Q And, of course, the figures speak for themselves, but most of them came in potentialized at several hundred barrels per day and they're now down to two, three, seven, ten, thirteen barrels a day, is that right?

A Yes, sir.

Q And they have not flattened off anywhere along the line?

A No, sir, they sure haven't.

Q Is there anything else you care to point out in connection with that exhibit?

A No, sir.

(Whereupon, Applicant's Exhibit No. 7 was marked for identification.)

Q Turn to your Exhibit No. 7, Mr. Glasgow. Are these the six proposed injection wells and the casing program?

A Yes, sir, they are.

Q What do they reflect now?

A They show that our surface casing we circulated cement so we feel that cement is to the surface, and on the oil string we've calculated that it came up to 2600 feet, the top.

Q Are there any fresh waters in this area, and if so, what and where are they?



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A Yes, sir, we feel that probably the Santa Rosa is a fresh water and the base of the Santa Rosa is about 1120.

Q What do you feel, your casing is safe that you are going to be able to protect all fresh water sources?

A Yes, sir.

(Whereupon, Applicant's Exhibit No. 8 was marked for identification.)

Q Exhibit No. 8 A through G are the logs of these various wells, is that correct?

A Yes, sir.

Q The water source well and the various injection wells?

A Yes, sir.

Q And I believe you've actually already turned those in in connection with the application, is that correct?

A Yes, sir.

Q And have furnished a copy to the engineer?

A Yes, sir.

(Whereupon, Applicant's Exhibit No. 9 was marked for identification.)

Q Turn to your Exhibit No. 9 now, Mr. Glasgow. Is that your water analysis of your source water that you are going to use for the flood, the pilot flood?

A Yes, sir, the water analysis of the source water and



also of the Queen which is the produced water, and also the compatibility of the two is mixed.

Q You have shown your source well on your Exhibit No. 1. As I understand, you are going to use how much water in your pilot flood?

A Approximately 2,000 barrels a day.

Q And that will be from this well and from the water as analyzed here, is that correct?

A Right.

Q Will it produce the 2,000 barrels a day?

A Yes, sir.

Q In layman's language, is this potable water?

A No, sir, it is not.

Q What is it?

A It's highly corrosive, contains a lot of hydrogen sulphite and is a highly salty water.

Q It would be fit for almost no other use, is that correct?

A Yes, sir.

Q What steps do you intend to take, Mr. Glasgow, in connection with the corrosive element of the water?

A Well, as far as above surface, Humble is going to considerable expense in getting different metals that will with-



stand the different corrosion properties of the water, and we'll propose some kind of inhibitor system in the source well itself.

Q In the source well itself?

A Right.

Q Are you satisfied that you will be able to inhibit any corrosive action of this salt water?

A Yes, sir, to the best of my knowledge.

Q Your proposal is to inject approximately 2,000 barrels a day into the six injection wells?

A Right.

Q As the flood reacts, you will seek administrative approval to expand, depending upon your results of your pilot?

A Yes, sir.

Q At that time will you have another source well for water?

A Yes, sir. We have to drill another San Andres source well to provide the water.

Q It will be the same water from the same formation?

A Yes, sir.

Q Have you made any calculations as to what you might hope out of this pilot flood by way of reaction, if it were to work successfully, Mr. Glasgow, by way of additional recovery?

A Well, we make calculations to hope what we would get

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out of it, but the reason for the pilot is to see how good our calculations are.

Q If it were to work to the best possible reaction, could you recover an additional hundred per cent over primary recovery?

A Well, we figure it is probably about two-thirds of what the primary was.

(Whereupon, Applicant's Exhibit No. 10 was marked for identification.)

Q Go to your Exhibit No. 10, please. Does this reflect the pool boundaries of the Langlie-Mattix and the Eumont Pool?

A Yes, sir, it does.

Q Showing how it cuts right through this lease, and the proposed flood area? The fact that it is classified in the two pools, you feel it would be difficult administratively, it would be easier to go ahead and combine this area into the one pool for the purposes of administering this flood?

A Yes, we felt like it would be a convenience not only to Humble, but to the Commission, to have it all in one pool, and we have shown that it's a continuous structure there so the Wells 19 and 20, the No. 37, they are in the same formation.

Q Do you propose to operate this flood under the provisions of Rule 701 as a waterflood project?

A Yes.

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Q Subject to all the provisions of that rule?

A Yes.

Q Is there anything further you care to state in connection with this application?

A No, sir, I don't believe there is.

Q In your opinion will the granting of the application result in conservation and the prevention of waste?

A Yes, sir.

Q Were Exhibits 1 through 10 prepared by you or under your supervision?

A Yes, sir.

MR. BRATTON: We would offer in evidence Applicant's Exhibits 1 through 10.

MR. UTZ: Without objection, Exhibits 1 through 10 will be entered into the record.

(Whereupon, Applicant's Exhibits 1 through 10 were offered and admitted in evidence.)

MR. BRATTON: We have nothing further at this time.

CROSS EXAMINATION

BY MR. UTZ:

Q Are all the wells in this unit completed in the Queen?

A Yes, sir, they sure are, except for No. 6 up there, which is an Arrowhead-Grayburg well, the No. 19, Section 19.



It's in Unit B in Section 19.

Q That is Arrowhead what?

A Arrowhead.

Q What formation?

A Grayburg.

Q All the wells that are now in the Eumont are now completed in the Queen zone?

A Yes, sir.

Q They are not completed in the Seven Rivers at all?

A No, sir, it's all Queen.

Q Are there any Eumont gas wells in the area that you request for Eumont?

A No, sir.

Q What is the depth of your San Andres water well?

A 4300 feet. That's about the mean perforation or top perforations at 4170 and the bottom perforations at 4556.

Q And you tested that well?

A Yes, sir.

Q You know that it will furnish you enough whater?

A Right.

Q Most of these wells were drilled in '59 and '60 and '61, were they not?

A Yes, sir.

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Q How do you account for the rapid depletion?

A Well, there could be several reasons in that maybe it's just the tight permeability, we just didn't provide for the successful flow of oil to the well bore, or it could have been just pressure depleted when we drilled.

Q Were your pressures pretty well down when you completed these wells initially?

A We don't have any pressure data at all on the wells.

Q You didn't take bottom hole pressures or shut-in pressures when you completed them?

A No, sir.

Q Do you have the foot locations of the six injection wells that you are requesting?

A Yes, sir. You mean the footages in the section?

Q The footages from the section lines.

A I don't have them with me. It would be on the logs.

Q Could you vouch for the accuracy of the foot locations on the logs?

A Yes, sir. They would be reasonably accurate. I could give you more exact location later.

MR. BRATTON: We'll verify that information of the logs and write you a confirmation letter if we could.

MR. UTZ: I wish you would.



Q I note the first log I pulled out you changed the foot location on it.

MR. BRATTON: We had better confirm those.

Q I'm going to expose my ignorance, but I would like to know what turbidity is on No. 9.

A Suspended solids in a water sample. Like on that third page of the appendage you have compatibility test where you mix various percentages of the water together, and that's a precipitant in that particular test.

MR. BRATTON: What do you conclude as a result of that?

A We conclude that mixing the Queen and the San Andres, we estimate it won't deplete the flooding of the reservoir because of the precipitation.

MR. UTZ: Any other questions?

MR. IRBY: Yes, sir. Frank Irby, State Engineer's Office.

BY MR. IRBY:

Q Mr. Glasgow, on page 2 of your application near the bottom it says "there is also filed herewith and made a part hereof Exhibit H, giving a description of the proposed injection well's casing program." Is that what you have now marked Exhibit 9?

MR. BRATTON: It's 7, I believe.

Q Exhibit 7, yes.



A The earlier program that we presented was the casing program of all the wells we had anticipated as injection wells. Since that might be subject to change after the pilot, we subsequently submitted just these six wells here. These six wells are included in that other list.

Q Everybody else exposing their ignorance, I'll expose mine. How did you manage to get the top of your cement to exactly 2600 feet in every case?

A Well, it's kind of theoretical, but in each case we drilled the same size hole so we found out what volume we had and we cemented with the same number of sacks of cement and arrived, well, by calculation it would be the same.

Q On your Exhibit No. 5, your daily oil production is indicated by green?

A Right.

Q And your percentage of water by blue?

A Right.

Q Is this water included in this daily oil production or is this oil production exclusive with water?

A Oil exclusive.

Q Then what is the water a per cent of?

A Per cent of the total liquid produced.

Q Does this exhibit show the total liquid produced?



A No, sir.

Q Isn't that percentage a little bit meaningless?

A Well, it would be other than say if you took what our production was for July and figured what percentage water we had. What we looked at mostly was to see if we had enough produced water to fulfill the requirements for the pilot rather than to have additional source water.

Q I still don't understand, is the oil, daily oil produced a certain per cent of the total fluids which includes water, oil and nothing else?

A Well, say take number 1962, for example, the average water production during that year was approximately, was it 28%?

MR. UTZ: Yes, sir.

A 28% of all the fluid we got out of the ground was water.

Q How can you convert this per cent to volume?

MR. UTZ: Because the volume of oil produced, Mr. Irby, would be 100% less 28%, so the volume of oil produced that month would be 72%. I believe that's correct, isn't it, as I understand it?

A I guess it is. I never had looked at it this way before.

MR. UTZ: I believe your statement was that the 28% water was 28% of total fluid?

A Right. That's right, then, the way you said.



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MR. UTZ: That the oil was exclusive of the total fluids?

A That's right.

MR. UTZ: So the oil would represent 72% of your total fluids?

A Yes, sir, for '62.

Q (By Mr. Irby) Did you get into the record what your injection pressure is going to be?

A No, sir, we surely didn't. We have prior pressures from Ambassador's pilot to the south and east, but it would be just a guess at what our pressures would be because of the differences in permeability in our lease and what Ambassador says theirs is.

Q Then you have no idea what they might be?

A No, sir, but we're anticipating probably the maximum about 1700 pounds, the top of the ground.

Q Is injection going to be through tubing?

A I believe it is, yes, sir.

Q Do you know?

A I don't recall what it is.

MR. BRATTON: We will furnish that to you.

MR. IRBY: I submit to the Commission through the Examiner that the casing program is not sufficient to protect the fresh waters in the Santa Rosa unless injection is made through



tubing and under a packer.

MR. UTZ: Let's see, you are referring to Exhibit No. 7, Mr. Irby?

MR. IRBY: Yes, sir.

MR. UTZ: As I understand Exhibit No. 7, 7 inch which is set anywhere from 3-3/8 surface casing is circulated?

MR. IRBY: Yes, sir.

MR. UTZ: The oil string is 2-7/8 tubing and that is cemented below the 7 inch surface, is that correct, Mr. Glasgow?

A To go through it like you said, surface casing is set like the 300 feet and it's circulated, would be totally encased in cement and oil string, this is how much higher it is, the top of the cement in the hole.

MR. UTZ: So that you have open hole behind the two 7 inch between the bottom of the surface casing and the 2600 feet?

A Yes, sir.

MR. UTZ: And in that interval is the Santa Rosa --

A Yes, sir.

MR. UTZ: -- water-bearing formation?

MR. BRATTON: We'll submit that information to you, Mr. Irby, I'm sure we can work that out. I would imagine that is in the scheduled program, I just don't know. If it isn't we'll certainly explain it, what we think about it. If it is, I assume



that will be satisfactory to you.

MR. IRBY: The thing that disturbs me is that your oil string is 2-7/8ths and it looks to me like it would be pretty hard to run something inside there where you'd have any protection through the Santa Rosa other than just this tubing or casing wall.

A If we ran the thin wall tubing down this well like we have in our pumping wells, now assuming that we got a hole in it, we would realize that we had the hole if we had the packer down at the bottom. Then you would have to get two holes simultaneously to affect anything outside the casing in that case.

Q (By Mr. Irby) That's true if you run another string of tubing inside there?

A Right.

MR. BRATTON: I think that's what you wanted.

MR. IRBY: That's what I want, the thing that is disturbing me is that you don't know whether it's part of your plan or not.

A Yes, sir.

BY MR. UTZ:

Q What size hole are you drilling below the surface casing?

A I believe it's about a six-inch hole.

Q Then you would have adequate space for cement then?



A Yes, sir.

MR. IRBY: May I ask another question?

MR. UTZ: Yes, sir.

BY MR. IRBY:

Q These wells are already drilled, aren't they?

A Right.

MR. UTZ: And cemented?

A Yes, sir.

MR. IRBY: That's all I have.

MR. UTZ: You can perforate inside 2-7/8ths, can't you?

A Let me go back. I have been searching through my memory and in cost calculations of our particular waterflood here we did take into account putting tubing into the wells, and we were going to cement line them or plastic line them, one of the two. It's a thin wall tubing with some type of epoxy or cement lining with a packer. I'm sorry I didn't remember.

MR. BRATTON: We'll furnish you a full letter on it and furnish Mr. Utz, with a copy to you, Mr. Irby.

MR. IRBY: May I ask one more question?

MR. UTZ: Yes.

Q (By Mr. Irby) Will these wells be so equipped that if a leak occurs in this tubing that it will show in the annulus between the tubing and the 2-7/8ths at the surface?



A Yes, sir, I'm sure that allowance will be made for that.

Q A pressure gauge or something of that sort?

A Yes, sir.

MR. IRBY: Then I would state to the Examiner that if the wells are equipped with plastic-lined tubing injected under a packer, the State Engineer would offer no objection to the granting of the application.

MR. UTZ: If the annulus is filled with inert fluid with a pressure gauge on the surface?

MR. IRBY: Yes, sir.

A I'll reiterate again, I'm sorry I forgot.

MR. BRATTON: Mr. Irby, the plastic lining isn't essentially --

A Some type of lining.

MR. BRATTON: Some type of lining.

MR. IRBY: Yes.

Q (By Mr. Utz) How much water did you say that you were going to inject down these wells?

A Well, it's 2,000 barrels total.

Q Divided by six would be something like 330 barrels a day?

A Yes, sir.

Q What size tubing can you put inside of 2-7/8ths?



A I'm really not sure about the production part of it. It's a thin-walled tubing, they call it, but I really don't know the dimension.

Q It would seem to me it might be a tight squeeze with the size of tubing you can get in 2-7/8ths total 330 barrels of water down it a day?

A Yes, sir. That's the purpose of the pilot is to find out what the injection rates are, not only into the formation, but down the tubing also.

MR. UTZ: Are there other questions of the witness?

MR. DURRETT: Yes, sir, I have a question.

BY MR. DURRETT:

Q Did you state where the proposed water well would be drilled, or is it drilled now?

A It's already drilled. It's M-20 which is approximately in the center of Section 29 there. It's indicated as a Drinkard discovery dual. What we've done is plug back the Drinkard side to the San Andres.

Q When you complete your pilot, if you find that it's feasible to go ahead with the flood, where do you propose to drill the next water well?

A It will be in the approximate vicinity of our water injection plan.



Q Where is that?

A It probably will be in the center of the pilot.

MR. DURRETT: Thank you.

MR. UTZ: Any other questions? The witness may be excused.

(Witness excused.)

MR. UTZ: Any statements in this case? It's my understanding that you will confirm the fact in writing as to the plan for the completing inside the 2-7/8ths inch?

MR. GLASGOW: Yes.

MR. BRATTON: We'll send you that and the exact footage on those injection wells.

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

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