

BEFORE THE
NEW MEXICO OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
December 11, 1968

EXAMINER HEARING

IN THE MATTER OF:

Application of Anadarko
Production Company for a
unit agreement, Eddy
County, New Mexico.

CASE NUMBER
3988

IN THE MATTER OF:

Application of Anadarko
Production Company for a
waterflood project, Eddy
County, New Mexico.

CASE NUMBER
3989
(Consolidated)

BEFORE:

ELVIS A. UTZ, Examiner

TRANSCRIPT OF HEARING

MR. UTZ: Case 3988.

MR. HATCH: Application of Anadarko Production Company for a unit agreement, Eddy County, New Mexico.

MR. TOWNSEND: John D. Townsend, Fort Worth, Texas, appearing for the applicant, Anadarko. If it please the Examiner, I would move to consolidate for hearing purposes this case with the one following, which is Case 3989. They apply to the same basic area and formation unit, and waterflood unit.

MR. UTZ: Case 3988 is a unit agreement, and 3989 is a waterflood for that unit agreement?

MR. TOWNSEND: Yes, sir.

MR. UTZ: The two cases will be consolidated for purposes of testimony. Separate orders will be written on each case.

MR. TOWNSEND: If it please the Examiner, we have some amendments to our application in this thing. On Page 2 of the application --

MR. UTZ: Which application, 3988 or --

MR. TOWNSEND: This is the same application in both dockets.

MR. UTZ: I see.

MR. TOWNSEND: At Page 2 in Subparagraph B in the

middle of the page we stated the parties who had not yet ratified, and in B we stated that W. D. Brookover, Senior, had not ratified. He has ratified now, so we would move to strike B.

And with respect to Subparagraph C immediately below, we would add two more names of royalty owners who have not yet ratified on Tract 11. One is Robert Wadley, and the other is Jack Wadley.

Then we have some amendments on Page 4 of the application. We will go through these with our testimony, but we figured that we should formally amend them. At the top of the page, this states the wells that would be injection wells. May we strike the fourth line, which is Well 6-2, and the location described thereon, 1310 south of the north line and ten feet west of the east line of Section 16; strike that line and add a line, being Well No. 4-1, with the location 1,650 feet south of the north line and 2,310 feet east of the west line of Section 16.

Then in the sentence immediately following this, instead of saying five of the proposed injection wells, it should be four of the proposed injection wells.

Delete 6-2. In the third line on down, again delete 6-2. In Paragraph 10 below, the fourth line, delete Well

Number 6-2. This completes our proposed amendments.

MR. UTZ: Are there any other appearances in this case? You may proceed.

(Whereupon, Applicant's Exhibits 1 through 8 were marked for identification.)

(Witness sworn.)

C. W. STUMHOFFER

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

DIRECT EXAMINATION

BY MR. TOWNSEND:

Q Would you state your name and address, please?

A My name is C. W. Stumhoffer. I reside in Fort Worth, Texas.

Q By whom are you employed and in what capacity?

A I am employed by Anadarko Production Company as Superintendent of the Secondary Recovery Division.

Q Mr. Stumhoffer, what is your professional persuasion?

A I am a graduate petroleum engineer.

Q Have you previously qualified to testify before the New Mexico Oil Conservation Commission in the capacity of an expert witness in petroleum engineering?

A Yes, I have.

MR. TOWNSEND: Do you wish me to further qualify this witness?

MR. UTZ: No, he has qualified previously.

Q (By Mr. Townsend) Are you familiar with the application in these dockets 3988 and 3989?

A Yes, I am.

Q Basically, what is requested?

A In Case 3988, Anadarko has proposed a unit plat of the Far West Loco Hills Sand Unit Area, and seek approval of the unit agreement. And in Case Number 3989, we seek approval for the secondary recovery operation by waterflooding of the Zone 4 of the Grayburg of the proposed unit area. This unit area is located on the western extremity of the Loco Hills Sand Field, Eddy County, New Mexico.

Q Mr. Stumhoffer, let's define some terms here. When you say the Loco Hills Sand, what is that also known as?

A It is also known as Zone 4 of the Grayburg formation.

Q Mr. Stumhoffer, have you prepared some exhibits for use in your testimony before the Commission?

A Yes, I have.

Q Handing you what the Reporter has marked for identification as Exhibit 1, would you state what it is?

A Exhibit 1 is the unit agreement and unit operating

agreement for the Far West Loco Hills Sand Unit.

Q Mr. Stumhoffer, is this unit agreement and the unit operating agreement in the form, and does it contain the provisions that are normally used in the waterflooding formation of units, formation of the waterflooding units in New Mexico?

A The agreements have the preliminary approval of the Commissioner of Public Lands, and the USGS, and meets their requirements.

Q Have all the working interest owners underneath it involved in this area signed?

A Yes.

Q Have all of the royalty owners signed?

A All royalty owners have ratified the unit agreement except a few in Tract 11 that we have been unable to locate. In those cases we have a few that indicate they will ratify, and we have not received them, but the Tract is qualified under provisions of the unit agreement.

Q The unit agreement requires what percentage?

A Eighty-five per cent of the tract signed.

Q And the unsigned portion is far less than fifteen per cent?

A Yes.

Q Is there anything else you wish to testify with

respect to the unit agreement and the unit operating agreement?

A No.

Q Handing you what the Reporter has marked for identification as Exhibit 2, will you state what it is?

A Exhibit 2 is an engineering appraisal of the waterflood potential of Zone 4 of the Grayburg underlying the western extremity of the Loco Hills Field. This study was prepared by an engineering subcommittee appointed by the operators of the leases in this area, to study the feasibility of waterflooding the Zone 4 of the Grayburg.

Q Mr. Stumhoffer, there is a great deal of information contained in this engineering study. Would you go into it in a little more detail than you have? I would like to find out, number one, does the engineering appraisal indicate that the proposed waterflood is technically feasible from an engineering standpoint?

A The engineering subcommittee found that it was feasible to initiate a waterflood program on this area of the Loco Hills Field in Zone 4 of the Grayburg, in view of the success of the offsetting waterflood in the same zone by Newmont Oil Company under their West Loco Hills Grayburg Number 4 Sand Unit, and by the fact that this area is depleted by primary production drive.

Q Did the engineering committee find that the proposed waterflood was economically feasible?

A Yes.

Q Did the engineering committee find that the field had advanced to what is commonly known as as "stripper" stage?

A Yes, present production from the producing wells in the unit area, proposed unit area, is approximately twelve barrels of oil per day.

Q Did the engineering committee find that the use of the waterflood technique would result in the increased recovery of oil?

A Yes, we estimate additional recovery of approximately 850,000 barrels of oil.

Q From these leases alone?

A From these leases in the unit area.

Q Mr. Stumhoffer, would you just briefly explain the contents of this exhibit?

A The exhibit consists of a purpose of the report, in which we have itemized the reason for preparation of the report to meet the charges placed upon the committee, engineering committee by the operators. And we have reached a conclusion in the report that the waterflood operation in the Zone 4 of the Grayburg is feasible, and that the most efficient manner to

handle this would be on a unitized basis, and the recommendation that the area be unitized as soon as possible for secondary recovery operations. There is also a discussion of the geology of the reservoir, the production history, which is in great detail, and would be too detailed to go into at great detail.

And then we have a discussion of the reservoir characteristics of the Zone 4 of the Grayburg, and the fluid properties of the produced oil, calculation of estimated secondary reserves, and exhibits to support the discussion presented in the report. The exhibits include a map of the unit area, proposed unit area, a structural map, tabulation of the wells, and production histories, individual curves, and a supplement to the original engineering report that was prepared sometime ago to support the unitization of Zone 4 of the Grayburg only under the proposed unit area.

Q When was the supplement prepared?

A The supplement was prepared during February of 1968.

Q That commences at what page of the exhibit?

A Page 22 of the engineering report.

Q And then the remainder of the report is actual data backing up the conclusions that were presented?

A Yes.

Q Is there anything else that you wish to testify as to

with respect to this exhibit?

A The supplement report to the engineering report was prepared to show why we had prepared unitization of the Zone 4 only, in view of the fact that there are other productive zones, producing zones present under the unit area. For the following reasons, we decided to recommend that only Zone 4 be unitized:

No. 1 was lack of continuity of the other productive zones in wells located in the proposed unit area. No. 2 was the active flood to the east was only in the Loco Hills Sand or Zone 4 of the Grayburg. The formation of the proposed unit will develop Zone 4 for waterflood on a cooperative basis with the Newmont operated unit. And thirdly, the other productive zones on the west edge of the western extremity of Loco Hills will be developed for waterflood in another unit.

Q Is there anything further you have with respect to this exhibit?

A No.

Q Mr. Stumhoffer, would you direct your attention to what the reporter has marked for identification as Exhibit 3, and state what it is?

A Exhibit 3 is a completed waterflood application data sheet in which we present the reservoir and flood characteristics

of the Loco Hills Sand, the primary production history, the results to be expected from the waterflood operation on the unit, and the type of injection water that we plan to utilize in our waterflood operation. It will be fresh water to be purchased from a commercial water company. This will be covered in more detail on a later exhibit.

Q What is on the second page directly behind that?

A On the back side of Exhibit 3, we have a list of the proposed injection well completions, of the initial stage of injection wells, which will be covered in more detail. And Page 2 --

Q Before you go on to Page 2, I note that on the right-hand side of this you refer to Well Number 6-2.

A This well will be deleted from our application as previously indicated by the fact that this was a line well to be drilled between the two units, the Newmont Unit and the Anadarko Unit, and the well will be drilled on the Newmont Unit, and it was filed for approval at a previous hearing by Newmont.

Q Then there are two other pages on this exhibit.

A These two pages merely indicate the present status of the wells in the proposed unit area.

Q The information contained in Exhibit 3 was intended to fulfill the requirements of the 701-B-4, was it not?

A Yes.

Q Is there anything else you wish to testify to with respect to Exhibit 3?

A No.

Q Mr. Stumhoffer, would you direct your attention to what the Reporter has marked for identification as Exhibit 4, and state what it is?

A Exhibit 4 is a Lane Wells radio activity log of Anadarko Well Number 2, H. G. Watson, which is to be known as Far West Loco Hills Sand Unit 8-7. On this log, we have indicated the Loco Hills Sand in yellow, with a notation on the log of the unitized formation, which is to be 100 feet. The Loco Hills Sand is defined on this log from 2,482 to 2,496. The unitized formation will be 100 feet above the top of this zone, and fifty feet below the base of this zone.

Q Mr. Stumhoffer, this log then shows the stratigraphic position of the unitized formation?

A Yes.

Q Is this a typical log in this immediate area for these wells?

A Yes, it is.

Q You stated earlier that there was additional zones of production in this area. Are they above or below this?

A They are below.

Q All of them?

A All of them. There are two zones in the Grayburg Zone 5 commonly referred to as the Metex, and Zone 6 of the Grayburg commonly referred to as the Premier, that are productive in this area, but will not be unitized in this unit. They will be taken care of in another unit.

Q This exhibit was intended to fulfill the requirements of the Commission's Rule 701-B-2?

A Yes.

Q Is there anything else that you wish to testify to with respect to this exhibit?

A No.

Q Would you direct your attention to what the Reporter has marked for identification as Exhibit 5, and state what it is?

A Exhibit 5 is a diagrammatic sketch of a typical water injection well to be converted from producing status. In this we show our prepared completion program prior to producing water injection. As mentioned earlier, we will inject fresh water down plastic-coated tubing set on a packer in the bottom of the long string of casing. In the case of wells converted from producing status, the injection will be into the open-hole

under the packer.

Q In other words, this is an open-hole completion?

A This is an open-hole completion, and this will be a typical diagrammatic sketch of a well of this type to be utilized for injection.

Q Is the total depth of the well sufficient so there could be any communication with injected water into the deeper producing horizons?

A No, we will plug back, if deeper producing rights were penetrated, the wells will be plugged back to the base of the Loco Hills Sand, the unitized formation.

Q Would you direct your attention to what the Reporter has marked for identification as Exhibit 6, and state what it is?

A Exhibit 6 is also a diagrammatic sketch of a typical water injection well that is to be drilled. In this we show our proposed TD's, and casing program, and tubing program. As is the case of wells to be converted, we will inject water down two-and-three-eighths inch OD tubing that has been plastic-coated into the unitized formation through perforations.

Q Exhibits 5 and 6 are intended to fulfill the Commission's requirements of the Rule 701-B-3. Is

this correct?

A Yes.

Q Would you direct your attention to what the Reporter has marked for identification as Exhibit 7, and state what it is?

A Exhibit 7 is a map with an attachment of the proposed waterflood development of the Far West Loco Hills and Sand Unit.

Q You have only shown the Zone 4 of the Grayburg completed wells here?

A Yes. I might point out at this time that the supplement to the engineering report goes into detail as to how we determine the productive limits of the Loco Hills Sand.

Q In other words, you feel that this area that you are asking to be unitized and waterflooded is at the extreme western edge of the Zone 4 of the Grayburg?

A Yes. From the information available, there is no indicated productive sand in the area to the west of the proposed unit in Zone 4 of the Grayburg.

Q I believe you previously testified that there was an existing waterflood in this zone to the east?

A That is correct.

Q Is this reflected on this exhibit?

A Yes, it is.

Q Would you explain your proposed waterflood plan in

some detail, using this exhibit?

A We propose to initiate waterflood operation on this unit upon approval by the Commission, by the initiation of injection along the common boundary between the Newmont West Loco Hills Unit and the proposed Far West Loco Hills Sand Unit. Newmont has applied for their proposed injection wells along this boundary at a previous hearing, December 2, 1968, in their application; and Anadarko seeks approval to convert or drill injections wells to fulfill its part of the obligation of this cooperative waterflood development.

Q That is one part of what this application is for?

A Right. This will be done immediately upon effective date of this application. In this, we plan to re-enter and complete for injection Unit Well Number 1-1, located 2,310 feet south of the north line and 330 west of the east line of Section 4. We also plan to drill a well at an unorthodox location, Unit Well Number 8-8, to be located ten feet north of the south line and 2,630 feet west of the east line of Section 4. We plan to convert Unit Well Number 10-2, located 1,650 feet north of the south line and 2,310 feet east of the west line of Section 9. The fourth well of this initial waterflood development will be a well to be drilled, Number 2-3, Unit Well Number 2-3, located 330 feet south of the north line and 1,980 feet west of the east

line of Section 16.

This will comprise our initial phase of development for waterflood on this unit. We request Commission approval to initiate the second stage of --

Q Excuse me. Before you start on that. There is a dark blot down at the east side of the northeast quarter of Section 16.

A This is due to the amendment to the application, in which Well Number 6-2, that would be located on Tract 6 of the proposed unit, is to be deleted, and a well is to be drilled on the Newmont Unit twenty feet to the east of the proposed location on the Newmont Unit.

Q What you have just described is your proposed first stage of the waterflood, is that correct?

A Yes.

Q You plan to waterflood this area in two stages, is that correct?

A We plan to develop the unit for waterflood in two stages.

Q Would you describe the second stage in some detail, please?

A The second stage will consist of wells to be converted as follows: Well Number 8-1, located 2,310 feet north of the

south line and 1,650 feet east of the west line of Section 4, is to be a re-entry and completion for injection in the Loco Hills Sand.

Well Number 8-9 will be a new well to be drilled and completed for water injection at an unorthodox location as follows: 1,330 feet north of the south line, and 2,630 feet west of the east line of Section 4.

Well Number 9-5 will be the conversion of an existing producing well for water injection in the Loco Hills Sand. It is located 1,650 feet south of the north line, and 330 feet east of the west line of Section 9.

Well Number 10-3 is to be drilled at an unorthodox location for water injection as follows: 1,330 feet north of the south line, and ten feet east of the west line of Section 9.

Well Number 5-1 is to be a conversion of an existing producing well to water injection. Location of this well is 660 south of the north line, and 660 feet east of the west line of Section 16.

Q That was a conversion?

A That is a conversion. Well Number 4-1 will also be a conversion to injection status. Its location is 1,650 feet south of the north line, and 2,310 feet east of the west line of Section 16.

This gives us a total of ten water injection wells on the proposed unit. We propose, as originally set out, four in the initial stage, and six injection wells in the second or last stage. We would like to request that we be allowed to place the second stage on injection nine months after initiation of the first stage, without waiting on the response of offsetting producing wells as required by Rule 701.

Q Mr. Stumhoffer, I would like to explore that just a little more with you. If you can characterize your waterflood development, it would appear that your first stage is in conjunction with Newmont on the east, and will serve to push the oil generally to the west, is that correct?

A That's right.

Q And the second stage, again, if I am correct, generally the water injection wells are on the extreme westernmost edge of the field as it exists?

A Yes.

Q And should tend to push the oil to the east?

A To the west.

Q You mean to the east?

A Back into the unit area, right.

Q Back into the unit area. Why is it that you are requesting the Commission to waive their requirement that the

wells experience an increase in production before you put in the second stage?

A We are requesting a waiver of this requirement, number one, because of the fact that in the event that we did miss some productive Loco Hills Sand outside the unit area, we would want to prevent migrating from the unit area to protect correlative rights. And number two, our normal response occurs nine to twelve months after initiation of an injection and we would like to make our plans accordingly in view of this anticipated response.

Q So you feel that this would protect correlative rights by tending to prevent oil being pushed off the unit, if there were any other areas that had not been developed?

A Yes.

Q And thus would prevent the oil from being never recovered, and would also provide a more orderly development of this unit?

A Yes.

Q In this application, you are requesting the approval for the drilling of the unorthodox locations, and for the injection of water as described, is that correct?

A What was the question?

Q In this application, with respect to this waterflood,

you are requesting the approval of the drilling at unorthodox locations, and the injection of water as described, and the waiver of the Commission's requirement of experiencing a response in offsetting wells?

A That is correct.

Q And the reason for the latter part is that if you experience a response, you are afraid you may already be too late to prevent from being driven off the unit?

A Yes.

Q Is there anything else you wish to testify with respect to Exhibit 7?

A No.

Q Mr. Stumhoffer, would you direct your attention to what the Reporter has marked for identification as Exhibit 8, and state what it is?

A Exhibit 8 is a map of the proposed unit and the surrounding area covering a two-mile radius, showing offset operators and other producing wells.

I would like to point out that on this map the wells that are shown on this map to the west of the proposed unit do not produce from Zone 4 of the Grayburg.

Q Exhibit 8 was prepared to the satisfaction of the Commission's requirement of Rule 701-B-1, was it not?

A Yes.

Q Is there anything else you wish to testify to with respect to Exhibit 8?

A No.

Q Do you have any other testimony with respect to these dockets?

A I do not.

MR. TOWNSEND: We move that admission into evidence of Exhibits 1 through 8.

MR. UTZ: Without objection, Exhibits 1 through 8 will be entered into the record.

(Whereupon, Applicant's Exhibits 1 through 8 were admitted in evidence.)

MR. TOWNSEND: I have nothing further of this witness.

CROSS EXAMINATION

BY MR. UTZ:

Q Mr. Stumhoffer, let's review the wells that you want for injection. At the present time, now, your first-stage well is a new location. Your 2-3 is a first-stage well, and is a conversion?

A No, sir. It is a new well. There are two new wells we will drill in the first stage. Of the four wells in the

first stage, two will be new wells, one will be a re-entry and completion for injection, and one will be a conversion of an existing well.

The re-entry well is Number 1-1. The two new wells are 2-3 and 8-8. And the conversion of a producing well is Number 10-2.

Q Now, I think I have all the others except the 8-1. What was that?

A It is a re-entry of a plugged and abandoned well.

Q It is a standard location, however?

A Yes.

Q So you have three nonstandard locations?

A Four. In the second stage we have two nonstandard locations to be drilled, Well Number 8-9, located in the center of Tract 8, and Number 10-3, located in the southwest corner of Tract 10. We have four nonstandard water injection locations.

Q What is the second one in the first stage?

A I'm sorry, there is one, 8-8 is the only nonstandard location in the first stage, and two in the second stage.

Q Three altogether?

A Yes.

Q And the locations shown on your application are correct, to the best of your knowledge?

A Yes.

Q What do you intend to do with the annulus in these wells? Are you going to fill them with inert fluid?

A We will fill them with inert fluid, and maintain the casing heads with a valve on the outlet to check for pressure build-up.

Q The reason you submitted only two diagrammatics is that one represents your conversion wells or re-entry, and the others are your new wells?

A That's right. Exhibit 5 was for the conversion or re-entries, and Exhibit 6 is for the new wells to be drilled, as a typical example.

MR. UTZ: Any other questions of the witness?

MR. TOWNEND: Mr. Examiner, Newmont has written a letter, of which we received a copy, directed to the Commission supporting this application.

MR. HATCH: The Commission has received a letter from Newmont Oil Company in support of the application.

MR. UTZ: If there are no further questions, you may be excused.

(Witness excused.)

MR. UTZ: Any further statements in this case?

The case will be taken under advisement.

I N D E X

<u>WITNESS</u>	<u>PAGE</u>
C. W. STUMHOFFER	
Direct Examination by Mr. Townsend	4
Cross Examination by Mr. Utz	22

E X H I B I T S

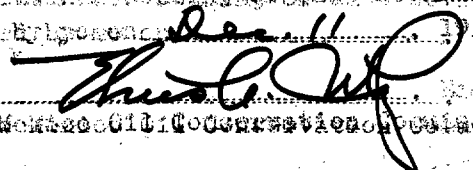
<u>NUMBER</u>	<u>MARKED FOR IDENTIFICATION</u>	<u>OFFERED AND ADMITTED IN EVIDENCE</u>
Exhibits 1-8	4	22

STATE OF NEW MEXICO)
) ss
 COUNTY OF BERNALILLO)

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

Witness my Hand and Seal this 30th day of December, 1968.


 NOTARY PUBLIC

I do hereby certify that the foregoing is a true and correct copy of the proceedings of the New Mexico Oil Conservation Commission held on Dec. 11, 1968. 3988289

 Notary Public for the State of New Mexico