

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE APPLICATION
OF AMERADA PETROLEUM CORPORATION
FOR THE ESTABLISHMENT OF PRORATION
UNITS AND UNIFORM SPACING OF WELLS
IN THE KNOWLES POOL IN LEA COUNTY,
NEW MEXICO.

CASE NO. 204

STATEMENT OF FACTS

September 9, 1948, Amerada commenced drilling the Hamilton #1 Well located in the NE/4 SW/4 Section 35-16S-38E. (Exhibit #1 is a map of the Knowles pool.) When the well reached the depth of about 6800 feet a show of oil was encountered, and a drillstem test was made indicating oil production from the Paddock zone at that depth. Amerada then continued with the drilling.

While still drilling the Hamilton well before it was subsequently completed in the Devonian formation, Amerada commenced the Stella Rose #1 Well to the North. (SE/4 NW/4 Sec. 35-16S-38E). This well was projected to the Paddock formation which had been discovered on the drillstem test of the Hamilton well. It was then the intention to develop the Paddock Zone on 40-acre spacing. However, when the Paddock Zone was reached it was found dry or absent, and the Stella Rose well was temporarily abandoned.

Then the Hamilton well was completed on May 4, 1949 in the Devonian formation at a plugged-back depth of 12,600 feet. It was a good well, flowing 935 barrels in 24 hours through a 1/2-inch choke. Amerada then determined that the Devonian formation should be developed on 80-acre spacing.

We were then faced with a dilemma. If we deepened the Stella Rose well to the Devonian, it would mean that either that well or the Hamilton well would have to be an exception on an 80-acre pattern. If we did not deepen the Stella

Rose well, but commenced a new well on the 80-acre pattern, then we would have to throw away 6800 feet of hole worth about \$70,000.00. We elected to deepen the Stella Rose well and make the Hamilton well the exception. Then we commenced the Eaves #1 well to the south (SE/4 SW/4 Sec. 35-16S-38E) on the regular 80-acre pattern location. All three of these wells were completed in the Devonian.

Then on November 4, 1949, we started drilling the fourth well, the Eaves A (NW/4 NE/4 Sec. 2-17S-38E).

Shortly after the commencement of the fourth well in November, 1949, Amerada filed its application for 80-acre proration units and uniform spacing of wells. The spacing pattern called for a well in the southwest and northeast quarters of each Governmental Quarter Section, with the Hamilton well as an exception.

The 80-acre units proposed were the south half and north half of each Governmental Quarter Section, with a few exceptions to avoid pooling of separately owned tracts, but did not change the proposed location of any wells.

1. FIRST HEARING

The case was first tried on November 22, 1949. No one opposed the application. Magnolia Petroleum Company stated that it concurred.

Amerada presented the testimony of its geologist, Mr. John A. Veeder, and its engineer, Mr. R. S. Christie. There was also introduced into evidence the Schlumberger logs of

all wells drilled in the pool and a map showing the location of the proration units and spacing pattern requested.

Mr. Veeder testified that this pool had good vugular and vein porosity comparable to the Jones Ranch Field approximately 12 miles away which is being satisfactorily developed on 80 acres.

Mr. Christie testified that in his opinion this pool has an effective water drive, and that the productivity index indicates good permeability and good productivity.

Both the geologist and the engineer testified that in their opinion one well in this pool would effectively drain an area of at least 80 acres.

It was further shown that the discovery well cost \$351,000 and future wells were estimated to cost approximately \$260,000 to \$270,000.

On January 11, 1950, the Commission entered its order R-3 finding Amerada's evidence insufficient, and denied the application. Exhibit 2 is a copy of Order R-3.

2. REHEARING

Amerada thereupon filed its application for rehearing and was joined in amicus curiae by Magnolia, Gulf, Sinclair and F. J. Dangle, being all of the lessees in the field.

The rehearing was granted and the case was set for trial again on February 21, 1950, but was continued to March 21, 1950.

A number of royalty owners in the area represented by their attorney, Mr. Rose of Hobbs, filed a protest stating:

"Whereas, the undersigned owners of mineral rights affected did not appear to resist said application for the reason that they had been under the belief that wells drilled in said area would be allotted a double allowable, which now appears to them not to be true." At the hearing Mr. Rose, attorney for the royalty owners, stated:

"At the time the original hearing was held on the Knowles Field application, no royalty owner appeared to resist the same. Now it is the assertion of certain royalty owners who have signed the exhibit which I will hereafter seek to introduce into evidence to the effect that they did not appear for the reason they were under the impression that Amerada would be given double allowable on this proposed 80-acre spacing. The royalty owners did not know until the transcript came that Amerada was not seeking more than top unit allowable. Then the royalty owners came. That is why they were not here heretofore, at least not here to testify."

Also in this connection at the hearing Governor Mabry stated:

"This is under the protest of royalty holders who claim that they did not know that double allowable was not being sought at that first hearing. The protest will be considered for what it is worth--not too important." All previous testimony and exhibits were again introduced

into evidence. At this time there were three producing wells and one drilling well in the field.

Mr. C. V. Millikan, Chief Engineer for Merads, testified that in his opinion one well would drain an area of at least 80 acres. In justification of this conclusion he pointed to the evidence indicating an active water drive and open type porosity.

The geometry of spacing was explained with appropriate exhibits. It was pointed out that geometrically 80-acre spacing is in the form of a square in the same manner as is 40-acre spacing, where the wells are located in the center of the 40-acre tract. It was further pointed out that since the statewide 40-acre spacing rules permit off-center locations that they permit and recognize that one well will drain an area of 90 acres. This situation exists in about 75% of the wells in the Hobbs Pool and in about 30% at Monument.

The royalty owners offered the evidence of a petroleum engineer, Mr. Ralph Fitting. He did not deny that one well would drain 80 acres. On the contrary, he stated that it was reasonable to expect a water drive in the Knowles Pool. His testimony was, in substance, that the bypassing of oil in a water-drive pool and also coning would be aggravated on 80-acre spacing. He admitted on cross-examination that this situation would exist under any spacing and also regardless of spacing it would be affected by the rate of production.

At the time of this hearing the Elves A Well was being drilled. We then advised the Commission that we were coring

that well and would furnish the Commission with a copy of the core analysis as soon as it was available. This was done.

3. TEMPORARY ORDER (R-23)

On June 14, 1950, the Commission entered Order No. R-23 establishing temporary 80-acre units. In the Order the Commission found:

"Due to the relatively short history of the wells in the Knowles Pool and the lack of adequate geological and engineering data, it is impossible for the Commission to determine at this time if a spacing pattern of one well to an 80-acre tract will economically drain the oil within the common reservoir. It is in the interests of conservation that a drilling pattern of one well to an 80-acre tract be adhered to temporarily and until other wells are completed which will furnish more complete data on the characteristics of the common reservoir."

The allowable for each 80-acre unit was left at the regular 40-acre allowable for wells of that depth.

It was then ordered that the case be continued until December 20, 1950, when it would again be heard and a permanent spacing pattern then determined. Exhibit 3 is a copy of Order R-23.

4. PERMANENT ORDER (R-40)

On December 20, 1950, the case again came on for hearing before the Commission.

On December 20, 1950, the Commission entered its Order R-40 making 80-acre spacing permanent. In the Order the Commission found:

"That it is in the interests of conservation that a drilling pattern of one well to an 80-acre tract be established."

The Order also provided for double allowable. Exhibit 4 is a copy of Order R-40.

5. EXCEPTION ORDER (R-52)

After the completion of the Eaves "A" Well Amerada drilled another well known as Cooper #1. (NW/4 NW/4 Sec. 2-17S-38E). This, however, resulted in a dry hole and the well was plugged and abandoned on October 16, 1950.

Amerada also drilled another dry hole known as Eaves #2 (SE/4 SE/4 Sec. 35-16S-38E) which was plugged and abandoned on January 25, 1951.

In December, 1950 Amerada filed its application for an exception to drill another well (Cooper #2, NE/4 NW/4 Sec. 2-17S-38E) in the same 80-acre unit in which the dry hole was located. This well was asked to be drilled on the other 40-acre tract. Amerada asked that the Commission set the allowable for the exception well.

On January 29, 1951, the Commission entered Order R-52 authorizing the drilling of the exception well known as Cooper #2. The evidence at the hearing disclosed that about 60% of the 80-acre unit was productive. The Commission set the

allowable for the exception well to be the normal 40-acre unit allowable with deep well adaptation. Exhibit 5 is a copy of Order R-52.

6. ISSUES INVOLVED IN PRESENT HEARING

The Commission has now, on its own motion, requested that Amerada show cause why the 80-acre spacing order now in effect for the Knowles Pool should be continued. Exhibit 6 is a copy of the notice of the present hearing.

In all of the previous hearings of this case, the conclusion that one well will adequately drain 80 acres remains undenied. The most that can be said against this conclusion is the testimony of Mr. Fitting to the effect that the bypassing of oil by water and coning around the well bores is aggravated by 80-acre spacing. But Mr. Fitting admitted that the same situation existed on 40-acre spacing and that, regardless of spacing, it was affected by the rate of production.

It has been established by competent, uncontradicted evidence in the many hearings of this case that one well will efficiently and economically drain 80 acres. It has also been established by competent uncontradicted evidence that the uniform spacing pattern proposed by Amerada protects the correlative rights of all interested parties.

The Commission can make exceptions and adjust the allowable to protect the equities in any situation where a disturbance of correlative rights is threatened. This was done in connection with the two Cooper wells.

The protest by the royalty owners was that not enough allowable had been authorized. The question of allowable for the Knowles Pool has at all times been left to the discretion of the Commission.

69-213, New Mexico Statutes 1941 provides:

"No owner of a property in a pool shall be required by the Commission, directly or indirectly, to drill more wells than are reasonably necessary to secure his proportionate part of the production. To avoid the drilling of unnecessary wells a proration unit for each well may be fixed, such being the area which may be efficiently and economically drained and developed by one well. The drilling of unnecessary wells creates fire and other hazards conducive to waste, and unnecessarily increases the production costs of oil or gas, or both, to the operator, and thus also unnecessarily increases the cost of the products to the ultimate consumer." (As amended by Section 13(b), Chap. 168, 1949 Session Laws.)

Where one well will drain 80 acres, the drilling of extra wells is unnecessary and under the Statute constitutes waste. On the testimony heretofore presented, the Commission properly followed the law in entering the 80-acre spacing order. The Commission having entered such order "in the interests of conservation" and the order having become final, the question now presented is upon what basis can such order be revoked and what evidence should be required to set it aside.

In Oklahoma the Supreme Court held that the Corporation

Commission has no authority to modify a spacing order which has become final unless there is presented some competent evidence showing a change in conditions or that waste is being committed. Application of Continental 178 Pac. (2d) 880, Carter Oil Company vs. State 238 P (2d) 300; Wood Oil Company vs. Corporation Commission 239 P. (2d) 1021.

In Mississippi the Supreme Court held that the Oil and Gas Board correctly dismissed an application to modify a spacing order where no new developments or change of condition was shown. State vs. Superior Oil Company 30 So. (2d) 589, The Court said:

"Most assuredly, the statute does not contemplate that two hearings shall be had upon the same issue between the same parties and on the same evidence."

Therefore the question now before the Commission is whether any waste is now being committed and whether there has been any change in condition since the entry of the last order which authorizes or justifies the revocation of 80-acre spacing for the Knowles Pool.

There is the further question of whether the order should be amended to provide for a different allowable for the Knowles Pool.

Also, there is before the Commission the question of whether a pressure maintenance program is feasible at this time.

7. TESTIMONY OF JOHN A. VEEDER, GEOLOGIST

Mr. John A. Veeder is a Geologist for Amerada Petroleum Corporation and is qualified to testify as an expert witness. The substance of his testimony is as follows:

(1) At the time of the rehearing three producing wells had been drilled and one well was then being drilled.

(2) Exhibits 7, 8, 9 and 10, respectively, are Schlumberger logs of Eaves "A", Eaves #2, Cooper #1 and Cooper #2, being all of the wells drilled in the pool at the Devonian formation since the rehearing as follows:

7 - Eaves "A" #1
8 - Eaves #2
9 - Cooper #1
10 - Cooper #2

(3) Exhibit 11 is a tabulation of the pertinent drilling data for all wells in the Knowles Pool.

(4) Exhibit 12 is a structure map of the Knowles-Devonian Pool.

(5) The Eaves "A" well was cored, but at the time of the last hearing the core analyses had not yet been prepared. A copy was subsequently filed with the Commission. Exhibit 13 is the core analyses.

(6) I previously testified that the Knowles pool has vugular and good vein porosity. Additional geological information obtained from the drilling of Cooper #2 and the study of the core analyses confirms that opinion.

(7) It is now my opinion from a study of all presently existing geological information and by comparison with other

similar Devonian limestone reservoirs that this pool has good vugular and vein porosity.

(8) It is now my opinion that the porosity is continuous and connected throughout the reservoir.

(9) There has been no change of condition since the entry of the permanent 80-acre spacing order from a geological viewpoint that would justify a revocation of the order. On the contrary, the additional information confirms my previous opinions.

8. TESTIMONY OF R. S. CHRISTIE, PETROLEUM ENGINEER

Mr. R. S. Christie is a Petroleum Engineer for Amerada Petroleum Corporation and is qualified to testify as an expert witness. The substance of his testimony is as follows:

(1) The average gas-oil ratio of all wells in the Knowles Pool is 150 cu. ft.

(2) The gravity of the oil is 48° API.

(3) The P.I. test on Eaves "A" well was 3.0.

(4) The P.I. test on Cooper #2 was 2.3.

(5) Exhibit 14 is a graph showing the oil and water production by months, cumulative production and bottom hole pressure at Knowles to March 1, 1952.

(6) Exhibit 15 is a graph showing the monthly oil and water production by wells to March 1, 1952.

(7) The small decline in pressure for the amount of oil produced with a low gas-oil ratio confirms my previous opinion that this pool is under an effective water drive and that one well will effectively drain an area of eighty acres.

(8) The core analyses, the production history and all additional information obtained since the last hearing confirms my previous opinion that the Knowles pool has good permeability conducive to wide drainage.

(9) It is now my opinion that one well will efficiently and economically drain and develop an area of 80 acres.

(10) The average cost of Devonian producing wells at Knowles has been approximately \$310,000 per well.

(11) The increase in water production is due to the fact that the initial completions were near the water table and because of the high permeability the water encroached rapidly with oil withdrawals.

(12) The decrease in oil production is due to the decrease in relative permeability caused by plugging of the pores by some foreign material. There is a black residue in the formation that appears to plug up the pores as fluids move toward the well bore.

(13) The increase in water production and the decrease in oil production is not caused by its wide spacing of wells and will not be corrected by revoking the 80-acre spacing order and changing the spacing to 40 acres. It is my opinion that the same result would have occurred for the same amount of production had the wells been located on 40-acre spacing.

(14) The allowable for each 80-acre proration unit in the Knowles Pool should be one top unit allowable for regular 40-acre unit with deep well adaptation.

(15) It is my opinion that no waste is now being com-

mitted. Therefore, no waste will be prevented by reducing the spacing from 80 acres to 40 acres.

(16) There has been no change of condition since the entry of the 80-acre spacing order, from the standpoint of reservoir performance, that would justify a revocation of the order. On the contrary, the additional information obtained by subsequent drilling and tests made establishes that this pool can be properly developed without waste on 80-acre spacing.

(17) It is my opinion that the correlative rights of all parties are being protected under the existing order and there is no unequal net drainage between tracts.

(18) In view of the natural effective water drive which is maintaining the reservoir pressure at a constant high level, it is my opinion that artificial pressure maintenance by water flooding would serve no useful purpose at this time, but would entail unnecessary expense without increasing the ultimate production.

9. CONCLUSION

The permanent 80-acre spacing order heretofore entered was fully justified by the evidence and the law. There has been no change in condition since the entry of that order which requires the revocation of that order. On the contrary, all of the new information obtained by additional drilling and additional testing confirms the correctness of the existing 80-acre spacing order.

The evidence at this time is sufficient to justify the entry of an 80-acre spacing order even if one had not been

heretofore entered.

There is no waste now being committed that could in any manner be corrected by the revocation of 80-acre spacing.

The allowable provisions of the existing order should be amended to provide for a regular 40-acre unit allowable with deep well adaptation for each 80-acre proration unit.

The natural effective water drive which is maintaining the reservoir pressure at a constant high level renders unnecessary any artificial pressure maintenance program at this time.

Respectfully submitted

BETH & MONTGOMERY

By _____

Harry D. Page

Booth Kellough

ATTORNEYS FOR AMERADA
PETROLEUM CORPORATION

BEFORE THE
OIL CONSERVATION COMMISSION

STATE OF NEW MEXICO

TRANSCRIPT OF HEARING

Case No. 314
317

November 20, 1951

E. E. GREESON
ADA DEARNLEY
COURT REPORTERS
BOX 1302
PHONES 5-9422 AND 5-9546
ALBUQUERQUE, NEW MEXICO

BEFORE THE
OIL CONSERVATION COMMISSION
STATE OF NEW MEXICO

In Re:

Cases concerned with the Knowles
(Devonian) pool and the Hightower
(Devonian) pool, Lea County, re-
spectively. In both the Commission
is considering advisability of pres-
sure maintenance or other secondary
recovery methods, or advisability of
40-acre spacing for the prevention
of waste and the protection of correl-
ative rights. In both cases, Amerada
Petroleum Corporation is principal
operator.)

Case No. 314 and 319

TRANSCRIPT OF HEARING

November 20, 1951

(Notices of publication read by Mr. Kellahin.)

MR. SETH: If the Commission please, on behalf of the Amerada we request that the cases be continued until the January hearing. The Knowles case, I don't know what the number is, while pressures are continuing there is a decline in production and they are doing remedio work on Well No. 2 and it will take 30 to 60 days. In the High-towers they are drilling a well and it will be completed in 30 or 60 days and may furnish further information in the matter.

CHAIRMAN SPURRIER: Thank you. Does anyone have any comment or testimony to present in these two cases? If not, without objection, they will be continued to the regular hearing, which date has not yet been definitely set. The next case and the final case is Case No. 254.

STATE OF NEW MEXICO)
COUNTY OF BERNALILLO) ss

I HEREBY CERTIFY that the foregoing and attached Transcript of Proceedings in Case No. 314 and 319, before the Oil Conservation Commission, taken on November 20, 1951, is a true and correct record of the same to the best of my knowledge, skill and ability.

DATED at Albuquerque, New Mexico, Dec. 21,
1951.

Ada Dearnley
REPORTER

OIL CONSERVATION COMMISSION

STATE OF NEW MEXICO

Transcript of Hearing

CASES 314 AND 319

January 22, 1952

Henrickson's Reporting Service
2324 - 47th Street
Los Alamos, New Mexico

BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO

January 22, 1952

Case 314 and 319: If the Commission please, cases 314 and 319 have been continued. Case 314 refers to spacing in the Knowles Pool in Lea County and Case 319 to the Hightower (Devonian) Pool in Lea County.

MR. SHEPARD: I'd like the record to show that the advertisement has been read.

VOICE: Mr. Oliver Seth representing Seth and Montgomery, appearing for Amerada. We would like, if the Commission please, to continue these two cases until sometime after February 27th or 28th.

MR. SHEPARD: Would you like to have them continued until the March hearing?

VOICE: That would be satisfactory.

MR. SHEPARD: Are there any objections? Without objection, cases 314 and 319 will be continued until the regular March hearing.

STATE OF NEW MEXICO)
) ss.
COUNTY OF LOS ALAMOS)

I hereby certify that the foregoing and attached transcript of hearing in Cases 314 and 319 before the Oil Conservation Commission on January 22, 1952, at Santa Fe is a true record of the same to the best of my knowledge, skill and ability.

DATED at Los Alamos, this 28th day of January, 1952.

Audrey M. Henriksen

My commission expires September 20, 1955.

BEFORE THE
OIL CONSERVATION COMMISSION
STATE OF NEW MEXICO

In the Matter of spacing in
the Knowles (Devonian) and
Hightower (Devonian) pools,
the cases having been suc-
cessively continued since their
initiation at the October 23,
1951, hearing.

Nos. 314 and 319

TRANSCRIPT OF HEARING

March 20, 1952

E. E. GREESON
ADA DEARNLEY
COURT REPORTERS
BOX 1302
PHONES 5-9422 AND 5-9546
ALBUQUERQUE, NEW MEXICO

(Mr. Graham reads the notice of publication.)

MR. KELLOUGH: The case 314 is the 80-acre spacing case for Knowles, and 319 is the 80-acre spacing case for Hightower-Devonian. I would like to request both cases be continued until the next hearing in April. There has been already set the 80-acre spacing case for Bagley, and it is our view we can better present these to the Commission all at the same time since they do, although separate, involve the same basic issue of -- effective to each different pool.

MR. SPURRIER: Is there objection to Amerada's motion to continue the cases to April 15? If not, the cases will be continued to April 15.

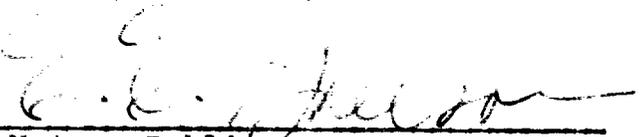
STATE OF NEW MEXICO

ss

COUNTY OF BERNALILLO

I HEREBY CERTIFY That the foregoing transcript is a true record of the matters therein contained.

DONE at Albuquerque, N. M., March 21, 1952



Notary Public

My Commission Expires: 8-4-52

BEFORE THE
OIL CONSERVATION COMMISSION

STATE OF NEW MEXICO

Santa Fe, New Mexico

TRANSCRIPT OF PROCEEDINGS

Regular Hearing

April 15, 1952

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

April 15, 1952

MORNING SESSION

IN THE MATTER OF:

The application of Amerada
Petroleum Corporation of
proration units and uniform
spacing of wells in the
Knowles Pool in Lea County,
New Mexico.

CASE NO. 314 &
319

* * * * *

MR. KELLOUGH: The Knowles Pool 80 acre spacing case we have carried as No. 204, I believe that is probably the initial number which was given to it. The Hightower 80 acre spacing case, the original number was 198. Those are Cases 314 and 319. Those numbers I understand are numbers given to the motion of the Commission in connection with these two pools.

We have in Knowles and also the Hightower prepared a statement with Exhibits to be presented in the same manner that we presented our case at Bagley, in order that the record may be kept straight in these two pools.

ADA DEARNLEY & ASSOCIATES
COURT REPORTERS
ROOM 12, CROMWELL BLDG.
PHONES 7-9645 AND 5-9546
ALBUQUERQUE, NEW MEXICO

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Then on November 4, 1949, we started drilling the fourth well, the Eaves A (NW/4 NE/4 Sec. 2-173-38E).

Shortly after the commencement of the fourth well in November, 1949, Amerada filed its application for 80-acre pro-ration units and uniform spacing of wells. The spacing pattern called for a well in the southwest and northeast quarters of each Governmental Quarter Section, with the Hamilton well as an exception.

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"At the time the original hearing was held on the Knowles Field application, no royalty owner appeared to resist the same. Now it is the assertion of certain royalty owners who have signed the exhibit which I will hereafter seek to introduce into evidence to the effect that they did not appear for the reason they were under the impression that Amerada would be given double allowable on this proposed 80-acre spacing. The royalty owners did not know until the transcript came that Amerada was not seeking more than top unit allowable. Then the royalty owners came. That is why they were not here heretofore, at least not here to testify."

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The geometry of spacing was explained with appropriate exhibits. It was pointed out that geometrically 80-acre spacing is in the form of a square in the same manner as is 40-acre spacing, where the wells are located in the center of the 40-acre tract. It was further pointed out that since the statewide 40-acre spacing rules permit off-center locations that they permit and recognize that one well will drain an area of 90 acres. This situation exists in about 75% of the wells in the Hobbs Pool and in about 30% at Monument.

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"Due to the relatively short history of the wells in the Knowles Pool and the lack of adequate geological and engineering data, it is impossible for the Commission to determine at this time if a spacing pattern of one well to an 80-acre tract will economically drain the oil within the common reservoir. It is in the interests of conservation that a drilling pattern of one well to an 80-acre tract be adhered to temporarily and until other wells are completed which will furnish more complete data on the characteristics of the common reservoir."

The allowable for each 80-acre unit was left at the regular 40-acre allowable for wells of that depth.

It was then ordered that the case be continued until December 20, 1950, when it would again be heard and a permanent spacing pattern then determined. Exhibit 3 is a copy of Order R-23.

4. PERMANENT ORDER (R-40)

On December 20, 1950, the case again came on for hearing before the Commission.

On December 20, 1950, the Commission entered its Order R-40 making 80-acre spacing permanent. In the Order the Commission found:

"That it is in the interests of conservation that a drilling pattern of one well to an 80-acre tract be established."

The Order also provided for double allowable. Exhibit 4 is a copy of Order R-40.

5. EXCEPTION ORDER (R-52)

After the completion of the Eaves "A" Well Amerada drilled another well known as Cooper #1. (NW/4 NW/4 Sec. 2-17S-38E). This, however, resulted in a dry hole and the well was plugged and abandoned on October 16, 1950.

Amerada also drilled another dry hole known as Eaves #2 (SE/4 SE/4 Sec. 35-16S-38E) which was plugged and abandoned on January 25, 1951.

In December, 1950 Amerada filed its application for an

exception to drill another well (Copper #2, NE/4 NW/4 Sec. 2-17S-38E) in the same 80-acre unit in which the dry hole was located. This well was asked to be drilled on the other 40-acre tract. Amerada asked that the Commission set the allowable for the exception well.

On January 29, 1951, the Commission entered Order R-52 authorizing the drilling of the exception well known as Cooper #2. The evidence at the hearing disclosed that about 60% of the 80-acre unit was productive. The Commission set the allowable for the exception well to be the normal 40-acre unit allowable with deep well adaptation. Exhibit 5 is a copy of Order R-52.

6. ISSUES INVOLVED IN PRESENT HEARING

The Commission has now, on its own motion, requested that Amerada show cause why the 80-acre spacing order now in effect for the Knowles Pool should be continued. Exhibit 6 is a copy of the notice of the present hearing.

In all of the previous hearings of this case, the conclusion that one well will adequately drain 80 acres remains undenied. The most that can be said against this conclusion is the testimony of Mr. Fitting to the effect that the by-passing of oil by water and coning around the well bores is aggravated by 80-acre spacing. But Mr. Fitting admitted that the same situation existed on 40-acre spacing and that, regardless of spacing, it was affected by the rate of production.

It has been established by competent, uncontradicted evidence in the many hearings of this case that one well will efficiently and economically drain 80 acres. It has also been established by competent uncontradicted evidence that the uniform spacing pattern proposed by Amerada protects the correlative rights of all interested parties.

The Commission can make exceptions and adjust the allowable to protect the equities in any situation where a disturbance of correlative rights is threatened. This was done in connection with the two Cooper wells.

The protest by the royalty owners was that not enough allowable had been authorized. The question of allowable for the Knowles Pool has at all times been left to the discretion of the Commission.

69-213, New Mexico Statute 1941 provides:

"No owner of a property in a pool shall be required by the Commission, directly or indirectly, to drill more wells than are reasonably necessary to secure his proportionate part of the production. To avoid drilling of unnecessary wells a proration unit for each well may be fixed, such being the area which may be efficiently and economically drained and developed by one well. The drilling of unnecessary wells creates fire and other hazards conducive to waste, and unnecessarily increases the pro-

duction costs of oil or gas, or both, to the operator, and thus also unnecessarily increases the cost of the products to the ultimate consumer." (As amended by Section 13(b), Chap. 168, 1949 Session Laws.)

Where one well will drain 80 acres, the drilling of extra wells is unnecessary and under the Statute constitutes waste. On the testimony heretofore presented, the Commission properly followed the law in entering the 80-acre spacing order. The Commission having entered such order "in the interests of conservation" and the order having become final, the question now presented is upon what basis can such order be revoked and what evidence should be required to set it aside.

In Oklahoma the Supreme Court held that the Corporation Commission has no authority to modify a spacing order which has become final unless there is presented some competent evidence showing a change in conditions or that waste is being committed. Application of Continental 178 Pac. (2d) 880, Carter Oil Company vs. State 238 P (2d) 300; Wood Oil Company vs. Corporation Commission 239 P. (2d) 1021.

In Mississippi the Supreme Court held that the Oil and Gas Board correctly dismissed an application to modify a spacing order where no new developments or change of condition was shown. State vs. Superior Oil Company 30 So. (2d) 589, The Court said:

"Most assuredly, the statute does not contemplate that

two hearings shall be had upon the same issue between the same parties and on the same evidence."

Therefore the question now before the Commission is whether any waste is now being committed and whether there has been any change in condition since the entry of the last order which authorizes or justifies the revocation of 80-acre spacing for the Knowles Pool.

There is the further question of whether the order should be amended to provide for a different allowable for the Knowles Pool.

Also, there is before the Commission the question of whether a pressure maintenance program is feasible at this time.

I now offer in evidence Exhibit No. 1 being the map of the Knowles Pool, Exhibit No. 2 being Order No. R-3, Exhibit No. 3 being Order No. R-23, Exhibit No. 4 being Order No. R-40, Exhibit No. 5 being Order R-52, Exhibit No. 6 being a notice of this hearing. These were referred to in the statement I just made.

MR. SPURRIER: Without objection they will be received.

JOHN A. VEEDER,

having been first duly sworn, testified as follows:

DIRECT EXAMINATION

By MR. KELLOUGH:

Q You are Mr. John A. Veeder, geologist for Amerada Petroleum Corporation?

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A That is right.

Q You are the same Mr. Veeder that testified today in connection with the Bagley Case?

A That is right.

Q Are the qualifications of this witness acceptable?

MR. SPURRIER: Certainly.

MR. KELLOUGH: He testified he was the same Mr. Veeder who testified awhile ago.

Q At the time of the re-hearing in Knowles case, how many wells were drilled and drilling in the Knowles Pool?

A There were three completed producers and one drilling well.

Q I hand you Exhibit No. 7 and ask you to state what that is?

A Schlumberger electrical log on the Amerada No. 1 Rose Eaves No. 1, Rose Eaves "A" No. 1.

Q That is the well which is commonly referred to as Eaves "A" No. 1?

A That is right.

Q I hand you Exhibit 8. What is that?

A This is a Schlumberger on Amerada No. 2 Rose Eaves.

Q I hand you Exhibit No. 9 and ask you to state what that is?

A Schlumberger on Amerada No. 1 Cooper.

Q Exhibit No. 10?

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A Schlumberger on the Amerada No. 2 Cooper.

MR. KELLOUGH: We offer in evidence Exhibits No's. 7 to 10, inclusive.

Q With these Exhibits has there been presented Schlumberger electrical logs on all the wells in Knowles Pool?

A That is right.

Q I hand you Exhibit No. 11 and ask you to state what that instrument is and please state what it shows?

A Exhibit 11 is a tabulation of pertinent drilling data for all wells in the Knowles Pool. The data sheets show the well number, the list name, showing the top of the Devonian and its datum, the top of the Devonian pay with the datum, the Devonian cap, and the Devonian production completion history showing total depth, casing treatment, IP, gas oil ratio, gravity, spud-in date, and completed date.

Q That is for all wells at Knowles?

A That is right.

Q Devonian?

A That is right.

MR. KELLOUGH: We offer in evidence Exhibit No. 11.

Q I hand you Exhibit No. 12 and ask you to state what that exhibit is?

A Exhibit No. 12 is a structural map of the Devonian pay. This is contoured with an interval of 50 feet. This is a sample

map that has been previously submitted and the Amerada No. 2 Cooper has been placed on this map which is not on the previous map.

Q That was previously submitted in connection with the exemption hearing when Amerada requested permission to drill the Cooper 2?

A That is right.

MR. KELLOUGH: We offer into evidence Exhibit No. 12.

Q The Eaves "A" Well has been cored, is that right?

A That is right.

MR. KELLOUGH: I wish to state to the Commission that at the time of the last hearing in this case the Eaves "A" Well was cored but at that time core analyses had not been received and had not been introduced in evidence in any one of these cases.

Q I hand you Exhibit No. 13 and ask you if that does not constitute the core analyses on the Eaves "A" Well?

A That is right.

MR. KELLOUGH: We offer into evidence Exhibit No. 13.

Q Mr. Veeder, you originally testified at the initial hearing in this Knowles Case, did you not?

A I did.

Q Your testimony at that time was that the Knowles Pool had vugular and good vein porosity?

A That is right.

Q Q What does the additional geological information which has been obtained from the drilling of the Cooper 2, the additional oil well, the study of the core analyses and other data since the last hearing indicate to you with reference to your previous opinion?

A Additional information confirms the previous opinion.

Q What is your present opinion with respect to the porosity?

A The Knowles Pool has good vein and vugular porosity in the Devonian pay section.

Q Is it your opinion that it is continuous or connected throughout this pay section of the Devonian formation at Knowles?

A That is right.

Q In your opinion has there been any change in condition from the geological point of view which would justify the revocation of the presently existing 80-acre spacing order at Knowles?

A There has been no changed additional information confirming previous opinions.

Q You have read the prepared statement of the Knowles Case?

A That is right.

Q And are the statements of facts which are set forth in that statement true and correct to the best of your information and knowledge?

A Yes.

MR. KELLOUGH: That is all the questions for this witness.

MR. SPURRIER: Anyone have a question of the witness? If not the witness may be excused.

(Witness excused.)

R. S. CHRISTIE,

having first been duly sworn, testified as follows:

DIRECT EXAMINATION

By MR. KELLOUGH:

MR. SPURRIER: Have you offered all your exhibits?

MR. KELLOUGH: Up to now we have offered 1 through 13.

MR. SPURRIER: Without objection they will be received.

Q Have you been sworn, Mr. Christie?

A Yes, sir.

Q You are R. S. Christie, Petroleum Engineer for Amerada?

A Yes.

Q The same Mr. Christie that testified in the Bagley Case this morning?

A Yes.

MR. KELLOUGH: Qualifications accepted?

MR. SPURRIER: They are.

Q What is the average gas oil ratio of all wells in the Knowles Pool?

A Approximately 150 cubic feet per barrel.

Q What is the gravity of the oil?

A Approximately 48° API.

Q A P. I. test was taken on the Eaves "A" well, was it not?

A Yes, sir.

Q What did it show?

A Approximately 3.0.

Q P. I. test was taken on Cooper No. 2?

A Yes, sir.

Q What did it show?

A Approximately 2.3.

Q Those are the only two additional oil wells which have been completed since the last hearing in this case?

A That is correct.

Q I hand you Exhibit 14 and ask you to please state what this exhibit is and what it shows?

A Exhibit 14 shows the monthly water production, the number of wells completed, monthly oil production and the bottom hole pressure history of the Knowles Pool. From the beginning to March 1, 1952.

Q I hand you Exhibit 15 and ask you to state what that is and what it shows?

A Exhibit No. 15 shows the, is a graph of the monthly production of individual wells in the Knowles Pool.

Q What does the information which is reflected on these two graphs, Exhibit 14 and 15, indicate to you as a petroleum

engineer with respect to the energy, type of energy which exists at Knowles?

A Exhibit 14 indicates the bottom hole pressures are reflected by the rate of production. During the first part of 1951 when the allowable was increased by 100 percent, bottom hole pressure ~~dropped~~ rather rapidly until the well started falling off in production at which time the bottom hole pressure started increasing again. On March 1, 1952 the bottom hole pressure was 5,066 pounds which is a decline from the original of 5,130 pounds.

Q Does this information confirm your previous opinion that this is a water drive pool?

A Yes, it does.

Q Is it your opinion now that it is?

A Yes, sir.

Q Does it indicate anything to you with reference to the ability of one well to drain a large area?

A I believe it indicates that one well will drain an area in excess of 80-acres.

Q That was your previous testimony?

A Yes, sir.

Q Does this information confirm that?

A It does.

Q Is that now your opinion?

A It is, yes, sir. I might point out here that Exhibit No. 15 shows the rather rapid decline in production of all wells in the Knowles Pool. That is evident of a declining productivity of the wells, to date we have been unable to determine what has caused that decline in productivity. We doubt whether it is the rate of production. We question whether it is caused by the influction of water because in examining the graphs it can be noted that the drop in production is not necessarily related to the first appearance of water or any increase in the water rate. In examining the cores and various analyses of material taken from the tank batteries there seems to be a residue that is clogging up the pores of the formation; what that residue is we have been unable to determine to date.

Q Were the wells initially completed near the water table?

A Majority of cases they were, yes, sir.

Q Is this reservoir one of high permeability?

A Yes, it is.

Q In your opinion could that be an explanation or is that a reason for the encroachment of water with the oil withdrawals?

A Yes, sir, in my opinion that would be an explanation for it.

Q The oil production has also decreased?

A Very materially, yes, sir. The allowable at the present time is approximately 718, 16 or 18 barrels top allowable for

this pool which is double the nominal allowable with deep well adaptations.

Q Is the decrease in oil production in your opinion caused by the plugging of the pores near the well bore with this foreign black substance that you spoke of, residue?

A That is the only explanation we have for it at the present time and we are not sure whether it is around the well bore or whether it is in the formation as well.

Q In your opinion does the increase in the water and the decrease in production caused because the wells are too widely spaced at Knowles?

A No, sir, I don't believe the spacing has any bearing on the declining production.

Q Then would this condition be corrected by revoking the 80-acre order and authorizing wells to drill on 40-acres?

A In my opinion it would not.

Q In your opinion would the same condition in the reservoir exist if wells were drilled on 40-acre spacing?

A I think they would, yes, sir.. At the present time the highest production on any one well is 212 barrels which is well below the top unit allowable. The total production from the pool is only 781 barrels for all five producers.

Q In other words it is your opinion that spacing doesn't have anything to do with this problem?

A I don't think so, no sir.

Q What is the average well cost, let me put it this way, you originally estimated that wells would cost between \$260,000 and \$270,000 at Knowles. What has been the average cost of the completed wells at Knowles-Devonian Pool?

A The average producing well is \$310,000, average cost.

Q What is your opinion as to what the allowable should be for this pool if the 80-acre order is continued?

A Well, inasmuch as the production declines rather rapidly, it is evident that the wells that will not make the present allowable of twice the normal allowable, I would recommend that in all future wells drilled the allowable be the regular normal 40 acre allowable with deep pool adaptation.

Q Do you think any waste is now being committed?

A No, sir, I do not.

Q There is no waste that could be prevented by revoking the 80-acre and authorizing the wells on 40, is there?

A No, sir, not in my opinion.

Q In your opinion as a petroleum engineer, Mr. Christie, has there been any change in condition since the entry of the 80-acre spacing order which from the standpoint of reservoir performance would justify the revocation of that order?

A No, sir.

Q Is it your opinion that the correlative rights of all

parties in the pool, lessees, royalty owners, in different tracts is being maintained?

A Yes, sir.

Q Has the advisability of a pressure maintenance program been considered at Knowles?

A It has and at this time we do not think that pressure maintenance or any type of secondary recovery would be beneficial or increase the element of recovery.

MR. KELLOUGH: That is all the questions I have of this witness, except that I wish to offer into evidence the last two exhibits which are Nos. 14 and 15.

MR. SPURRIER: Without objection they will be received. Is there any further questions of this witness? If not the witness may be excused.

(Witness excused.)

MR. KELLOUGH: Again I wish to offer into evidence all statements of facts which are contained in the prepared statement at Knowles and submit the argument as memorandum brief.

MR. SPURRIER: Without objection they will be received.

MR. KELLOUGH: By way of conclusion the permanent 80-acre spacing order heretofore entered was fully justified by the evidence and the law. There has been no change in the condition since the entry of that order which requires the revocation of

that order. On the contrary, witnesses testified that all new information obtained by additional drilling and additional testing confirms the correctness of the existing 80-acre spacing order.

The evidence at this time is sufficient to justify the entry of an 80-acre spacing order if one had not heretofore been entered.

There is no evidence that waste is now being committed in any manner could be corrected or changed by the revocation of the 80-acre spacing order.

The allowable provision of the existing order should be amended to provide for regular 40-acre unit allowable with deep well adaptation for each 80-acre proration unit.

The natural effective water drive is maintaining the water drive pressure at a constant high level renders unnecessary any artificial pressure maintenance program at this time.

That is the recommendations of Amerada and we submit that in support of our request that the 80-acre order be continued in effect and not be revoked upon the motion of the Commission.

MR. SPURRIER: I would like to ask Mr. Christie one question. I forgot. Mr. Christie, isn't it possible that you could have a chemical analysis made of this black substance which effectively reduces permeability?

A We have had an analysis made of that that we could recover, such amount of it that we could recover, and there seems to be no remedy for that particular substance, that is in getting rid of it in the formation. We don't know how far back in the formation this substance is affected or whether the production effects the formation back from the well bore or not.

MR. SPURRIER: What is the material?

A I might state also that we collected a sample from the producing, from the tanks which showed a black residue along with the water, we dissolved most of the black residue by using carbon-tet and at the bottom of the sample was a rather viscose material that we haven't had analyzed. That might be the material that is clogging up the pores. Apparently the analysis that was run by Dow Incorporated on this viscose material showed very little. I will read part of the report. This is a report by Dow Incorporated. These samples were run in their laboratory, and part No. 2 of their letter of October 22, 1951, reads as follows:

"Analysis of the viscose material in the oil showed it to be a water and oil emulsion; the emulsion was broken by heating.

It was examined for solids but only a trace of solid materials could be found. Insufficient material was present to allow an X-ray chemical analysis to be made.

However the material was probably a small amount of silt or sand from the formation. Xray analysis was made on the portion of the black areas of the core. Some amorphous material was found to be present which chemical analysis indicates to be organic material, apparently the black coloration in the core sample is due to carbonaceous material similar to coal. The result, dolomite 95% and this amorphous or organic carbonaceous material 5%. " That is about all they could tell us.

MR. SPURRIER: That is all. Any further testimony in this case?

MR. KELLOUGH: No, nothing further in this case.

MR. SPURRIER: Mr. MacPherson, you have a statement?

MR. MACPHERSON: No.

MR. SPURRIER: We will recess until 1 o'clock.

(Recess.)

STATE OF NEW MEXICO)
 : SS
COUNTY OF BERNALILLO)

I, ADA DEARNLEY, hereby certify that the foregoing and attached Transcript of Proceedings in Case Nos. 314 & 319, before the Oil Conservation Commission, State of New Mexico at Santa Fe, is a true and correct record to the best of my knowledge skill and ability.

DATED at Albuquerque, New Mexico, this 22nd day of April, 1952.


REPORTER

My Commission Expires:
June 19, 1955

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