STATE OF NEW MEXICO
ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT
OIL CONSERVATION DIVISION
STATE LAND OFFICE BUILDING
SANTA FE, NEW MEXICO

17 August 1988

EXAMINER HEARING

IN THE MATTER OF:

Application of Exxon Company, U.S.A. for an unorthodox oil well location and simultaneous dedication, Lea County, New Mexico, and — CASE 9459

Application of Exxon Company, U.S.A. for an unorthodox oil well location, directional drilling, and simultaneous dedication, Lea County, New Mexico. — 9460

BEFORE: David R. Catanach, Examiner

TRANSCRIPT OF HEARING

A P P E A R A N C E S

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I N D E X

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E X H I B I T S

MR. CATANACH: Call next Case Number 9459.

MR. STOVALL: Application of Exxon Company, U.S.A. for an unorthodox oil well location and simultaneous dedication, Lea County, New Mexico.

MR. CATANACH: Are there appearances in this case?

MR. BRUCE: Yes, Mr. Examiner. I'm Jim Bruce with the Hinkle Law Firm in Santa Fe, New Mexico, appearing on behalf of Exxon, U.S.A. in this case.

MR. CATANACH: Are there any other appearances?

MR. KELLAHIN: Yes, Mr. Examiner. I'm Tom Kellahin of the Santa Fe law firm of Kellahin, Kellahin and Aubrey. We represent Phillips Petroleum Company in this matter.

MR. CATANACH: Are there any other appearances?

MR. BRUCE: Mr. Examiner, we would request that Case Number 9460 be consolidated with Case 9450 for the purposes of hearing.

MR. CATANACH: Call Case 9460.

MR. STOVALL: Application of Exxon, U.S.A, for an unorthodox oil well location, directional drilling, and simultaneous dedication, Lea County,

New Mexico.

MR. CATANACH: Mr. Bruce, how many witnesses do you have?

MR. BRUCE: I have three witnesses.

MR. CATANACH: Mr. Kellahin?

MR. KELLAHIN: We do not intend at this time to call a witness.

MR. CATANACH; Will the witnesses please stand to be sworn?

(Witnesses sworn.)

W. T. (BILL) DUNCAN, JR.,

being called as a witness and being duly sworn upon his oath, testified as follows, to-wit:

DIRECT EXAMINATION

BY MR. BRUCE:

Q Please state your full name and city of residence.

A William Thomas Duncan, Junior, Midland, Texas.

Q What is your occupation?

A I'm a petroleum engineer and I'm Senior

Engineer with Exxon Company, U.S.A., involved with regulatory affairs.

Q Have you previously testified before the OCD as an engineer?

A Yes, I have.

Q And are you familiar with the matters concerning Cases 9459 and 9460?

A Yes, sir, I am.

MR. BRUCE: Mr. Examiner, is the witness considered qualified?

MR. CATANACH: He is.

Q Mr. Duncan, would you please refer to Exhibit Number One and describe it briefly?

A Yes. Exhibit Number One is a map which locates Exxon's New Mexico K State Lease within the north central portion of Lea County, New Mexico. The lease is approximately two miles east of Buckeye and consists of two half sections, the east half of Section 32 and the diagonally adjacent south half of Section 28.

Exxon's proposed Vacuum Glorieta wells are both locations in the south half of Section 28.

Also shown on this map is a shaded area which is mapped on some of our later exhibits.

Q Would you please now refer to Exhibit Number Two, describe its contents, and would you please

summarize what Exxon seeks in these two cases?

A Exhibit Number Two is an enlarged map of the south half of Section 28. As you can see from this -- well, on this exhibit I'd like to point out some of our offset operators.

To the north of Exxon's proposed proration units is Phillips. To the northwest is Phillips. To the west and southwest is Shell. To the south is Texaco. Other offsets are Exxon tracts.

This exhibit shows the proposed surface and bottom hole locations of Exxon's two proposed wells.

Case Number 9459 is the case in which Exxon seeks to drill Well No. 35 from a surface location 1195 feet from the south line and 2518 feet from the east line to a bottom hole location within a 240-foot square window 10 feet from the north and west lines of Unit O.

This location is unorthodox due to the proximity to interior quarter quarter sections lines. The location is toward the interior of the lease.

We also seek simultaneous dedication of Unit O to Well No. 35 and existing Well No. 21 and propose that the 107-barrel of oil per day Vacuum-Glorieta top allowable be shared in equal portions between the two wells.

In Case Number 9460 Exxon seeks to drill

Well No. 34 from a surface location 1286 feet from the south line and 1333 feet from the west line to a bottom hole location within the 140-foot square window 10 feet from the south and east lines of Unit L.

Again the location is unorthodox due to interior quarter quarter section lines.

The surface location is spotted outside Unit L to avoid surface obstructions; therefore we request directional drilling authority. We wish to simultaneously dedicate Unit L to both Well 34 and existing Well 31, with the 40-acre allowable shared in any proportion between the two.

In both cases Exxon is requesting bottom hole location windows to decrease the expense of directional control. Larry Sohaney will testify more on this and the surface evidence later.

Q Thank you. Has Exxon notified offset operators of these two applications?

A Yes, we have, and Exxon's Exhibit Three is a copy of the return receipts for that notification.

Q And were Exhibits One through Three prepared by you or under your direction?

A Yes, they were.

MR. BRUCE: Mr. Examiner, at this time I move the admission of Exhibits One through

Three.

MR. CATANACH: Exhibits One through Three will be admitted as evidence.

MR. BRUCE: I have no further questions of the witness at this time.

CROSS EXAMINATION

BY MR. CATANACH:

Q Mr. Duncan, let's go over your offset operators one more time.

To the north is Phillips.

A That's correct.

Q Northwest is Phillips.

A Yes. To the west is Shell in Section 32. To the southwest is Exxon.

Q Okay.

A Directly to the south of Units M and N is Texaco and to the south of Units O and P is Phillips.

Then also to the north of Units J and I is Shell.

Q And these wells are going to be located in the Vacuum Glorieta Pool, is that correct?

A That's correct. All the wells shown on this exhibit are Glorieta field wells, Pool wells.

Q And why does Exxon want to drill these

additional wells on these proration units?

A Basically because the existing wells on the proration units are watering out and these wells will be eventual replacements for those two wells. They are in an area which we will show is very unlikely to be high water cut and will effectively be top allowable longer than the other location on the proration units.

MR. CATANACH: I have no further questions of the witness. He may be excused.

ROBERT C. ASREEN, JR.,

being called as a witness and being duly sworn upon his oath, testified as follows, to-wit:

DIRECT EXAMINATION

BY MR. BRUCE:

Q Would you please state your name and residence?

A Robert Charles Asreen, Junior. I'm a resident of Midland, Texas.

Q And what is your occupation and who are you employed by?

A I am a Senior Geologist employed by Exxon Company, U.S.A, in Midland, Texas.

Q And have you previously testified before

the OCD as a geologist?

A Yes, I have.

Q And are you familiar with the geologic matters affecting these two applications?

A Yes, I am.

MR. BRUCE: Mr. Examiner, are the witness' credentials acceptable?

MR. CATANACH: They are.

Q Mr. Asreen, would you please refer to Exhibit Number Four and discuss its contents?

A Okay. Exhibit Number Four is a type log for the New Mexico K State Lease. This log shows the vertical interval from the New Mexico K State Lease wells produce.

The log is an open hole simultaneous acoustic log for the New Mexico K State No. 21 located in proration Unit O, as shown in Exhibit Number Two.

The gamma ray and caliper curves are shown on the lefthand side of the log, the depth track in the middle, and specific acoustic time is shown on the right.

The vertical scale is one inch equals 20 feet.

The top of the Glorieta Pool is shown in bold print along the far lefthand side of the log at 5932.

The top of the Paddock zone is shown in lower case print at 6082 and the top of the original oil-water transition zone is shown in lower case print at 6165.

Shown with shading is porosity greater than 6 percent, which defines the net pay within the Paddock zone. The Paddock zone is the most productive of the intervals within the Vacuum Glorieta Pool.

Q Thank you. Would you please move on to Exhibit Number Five?

A Exhibit Number Five is a map which shows structure on top of the Paddock zone.

Posted below the wellbores are the subsea depths to the top of the Paddock.

The map area covers the Vacuum Glorieta Pool in Township 17 to 18 South, and Ranges 34 to 35 East.

The horizontal map scale is one inch to 1000 feet and the contour interval is 20 feet.

Shown on the map are the New Mexico K State Leases in the south half of Section 28 and the east half of Section 32, the surface and bottom hole locations of the proposed New Mexico K State Wells and their respective proration units. This map shows the structure to be an anticline with the structural axis oriented northeast to southwest and the lens dipping towards the southeast and the north northwest.

This reservoir produces by a combination solution gas and moderate flank water drive mechanism, with the water drive being the prevalent drive mechanism on the east half of the field.

The waterflood front is now encroaching on the K State Lease from the northwest and also from the southeast.

Q Please now describe Exhibit Six for the Examiner.

A Okay. Exhibit Number Six is a structural cross section through the New Mexico K State Lease.

The cross section shows the structural position of the proposed New Mexico K State Nos. 34 and 35 Wells with respect to surrounding wells.

The wells on the cross section are shown in the index map on the far righthand side of the exhibit. The line of section is oriented from northwest to southeast through the proposed locations. It is also perpendicular to the axis of the structure.

The vertical scale for the log trace is shown. It's one inch equals 20 feet. The horizontal scale is one inch equals 200 feet.

Both the top of the Paddock zone and the top of the original oil/water transition zone are shown in lower case print along the log.

The operator, lease, and well numbers of different log traces shown on the cross section are located at the top in bold print.

Shown with shading is the gamma ray, greater than 50 percent of the maximum gamma ray deflection and porosity greater than 6 percent.

The New Mexico K State 34 and 35 Wells are shown by dashed lines and these wells will be structurally higher than existing wells in their respective proration units.

Q In your opinion will the granting of these two applications be in the interest of conservation, the prevention of waste and protection of correlative rights?

A Yes.

Q And were Exhibits Four through Six prepared by you or under your direction?

A Yes, they were.

MR. BRUCE: Mr. Examiner, I move the admission of Exhibits Four through Six.

MR. CATANACH: Exhibits Four through Six will be admitted into evidence.

MR. BRUCE: I have nothing further of the witness at this time.

CROSS EXAMINATION

BY MR. CATANACH:

Q Mr. Asreen, you said something about two waterfloods. There is a waterflood in this area?

A Well, this is a natural water drive. That's what I was referring to, sir.

Q You said the water drive was approaching from what directions?

A Roughly in the same directions as the ends of the structure, from the north and northwest towards the K State Lease shown in Section 28, and from the south-east in Section -- and also from the southeast direction, too.

So it's roughly mimicking the structure.

Q Has your -- your water production has increased in the No. 21 and 31 Wells?

A Yes, it has. The No. 21, well, those questions will be addressed by Mr. Sohaney.

Q Okay.

MR. CATANACH: Anything further? I don't have any other questions.

Mr. Kellahin, do you have any questions?

MR. KELLAHIN: No, sir.

LAWRENCE JOHN SOHANEY,

being called as a witness and being duly sworn upon his oath, testified as follows, to-wit:

DIRECT EXAMINATION

BY MR. BRUCE:

Q Mr. Sohaney, would you please state your full name and where you reside?

A My name is Lawrence John Sohaney. I reside in Midland, Texas.

Q And by who are you employed and in what capacity?

A I'm employed by Exxon Corporation as a Staff Reservoir Engineer.

Q And have you previously testified before the OCD?

A Yes, I have.

Q And are you familiar with the engineering matters related to Case Numbers 9459 and 9460?

A Yes, I am.

MR. BRUCE: Mr. Examiner, is the witness considered qualified?

MR. CATANACH: He is.

Q Mr. Sohaney, would you please refer to Exhibit Number Seven and describe its contents?

A Exhibit Seven is a cumulative water production map on the Vacuum Glorieta Pool. We've posted on this map the cumulative water production on each well that was active in 1987 in the Vacuum Glorieta Pool.

The contour intervals are intervals of 50,000 barrels of water.

Looking at the east half of the field we can see how the flank water drive, the natural flank water drive, is progressing over time.

On the north, to the north of the Exxon K State Lease, the flank water drive is progressing from the north direction towards the south to the southeast.

And from the east side of the Exxon K State Lease the flank water drive is progressing in the westerly or northwesterly direction.

Looking at the proration unit that contains Well No. 21, which will be Unit Number O, the direction that the flank water drive is taking suggests that the last portion of this proration unit to water out will be in the northwest corner, which is where we propose to drill Well No. 35.

Looking at Unit L, which contains Well

No. 31, the water drive in that proration unit is progressing from the northwest in a southeasterly direction and so the last portion of that proration unit that will water out is expected to be the southeast corner, which is where we propose to drill Well No. 34.

As mentioned earlier, Well No. 21 and Well No. 31 are currently watering out.

Also shown on this map is a gray shaded area and a large portion of that shaded area overlies the Exxon K State Lease. This is what we refer to as our top allowable area. This area contains the 12 remaining top allowable wells in the pool. Basically all these wells except for one have been top allowable since drilling in 1964 and the reason that these wells are still top allowable is because they have not watered out.

Q Thank you. Would you please now move on to Exhibit Number Eight?

A Exhibit Eight is very similar to Exhibit Number Seven. Exhibit Eight is a current water cut map for all the producers in the Vacuum Glorieta Pool that were active during the year 1987. Again, this serves to show the advancement of the flank water drive which shows the advancement to be basically the same as shown on the prior exhibit.

Looking at Well No. 21, that well in 1987 produced at about an 80 percent water cut. In looking at the water cut lines it can be seen that the projected last area to be productive on that proration unit would be again the northwest corner where we propose to drill Well No. 35.

Looking at Unit L, which contains Well No. 31, that well was producing at a 58 percent average water cut in 1987, and the last portion of that proration unit to water out is projected to be the southeast corner where we propose to drill Well No. 34.

Q And are the wells in the gray area producing at relatively low water cuts?

A Yes, that's correct. For the most part all of the top allowable wells in the top allowable gray area are producing at very low water cuts.

Q Would you please now refer to Exhibits Nine-A and Nine-B and describe them?

A Exhibit Nine-A is a production plot on the New Mexico K State No. 21 Well. The green color is barrels of oil per day (unclear) and the blue color is water/oil ratio, barrels of water per barrel of oil.

This well as top allowable from 1964 until about the end of 1977, at which point it went on decline. Beginning in about 1983 the water production became

significant on this well. As you can see, the water/oil ratio has been rising quite steadily. Currently this well averages about a water/oil ratio of 4, which equates to an 80 percent water cut.

Exhibit Nine-B is similar to Nine-A except it's a production plot on Well No. 31. Again the behavior of Well No. 31 has been very similar to No. 21.

Well No.31 was top allowable from 1964 until about the beginning of 1977 at which point it went on the pump.

Significant water production began in 1981 but by hindsight most of that water production from 1981 through about the middle of 1985 was due to a casing leak in that well. The casing leak was repaired in 1985 and since 1985 the formation water cut has been increasing steadily.

This well is watering out and the current water/oil ratio averages approximately 1.6, which equates to about a 60 percent water cut.

Q Would you now discuss Exhibit Ten and describe the additional oil which could be recovered by your two proposed wells?

A Exhibit Ten is entitled Recoverable Oil on Proration Unit which cannot be captured by existing wells on that proration unit.

One can calculate the recoverable oil using the volumetric equation shown, where the current average gas saturation in the top allowable area is 12.4 percent; the average current water saturation in the top allowable area is 18 percent; the oil saturation in the swept reservoir after the water drive is 36.4 percent; the volumetric sweep efficiency of the water drive is about 88-1/2 percent; and the current oil formation volume factor is 1.172; Ah phi is the pore volume in acre pore feet in the top allowable area on each of the proration units.

Looking at Unit L, Ah phi, the pore volume in acre pore feet is 51.2 and one would calculate approximately 100,000 barrels of oil that could be produced by Well No. 34 but which cannot be produced by well Number 31.

Looking at Unit O, the pore volume in acre pore feet is 100.2, which calculates approximately 195,000 stock tank barrels of oil which could be recovered by Well No. 35 that cannot be recovered by Well No. 21.

Q Please move on to Exhibit Eleven.

A Exhibit Eleven shows a possible northwest/southeast line drive injection pattern for the east half of the Vacuum Glorieta Field. The intent of this exhibit is to show how the drilling of these two wells will fit into possible future operations of this pool. Current

ly unitization is being studied for this pool and it's quite probable at some point in the future that this pool will be CO_2 flooded. Wells Nos. 34 and 35 are highlighted on this exhibit with arrows.

What is show here is an injection and production pattern based on nominal 20-acre spacing. The small black circles represent current and future oil producers. The open circle represents a future drilled well for oil. The black triangles represent future conversions of existing wells to injection. And the open triangles represent future injection drilled wells.

As you can see, the proposed locations of the two wells fit in quite nicely with a possible northwest/southeast line drive injection pattern on 20-acre nominal spacing, and, in fact, the two locations occupied by the two wells are almost perfect 20-acre infill locations as compared to the offset four wells.

Q Would you please refer to Exhibit Number Twelve and discuss other potential injection patterns?

A Exhibit Twelve is similar to Exhibit Eleven and Exhibit Twelve shows a possible 5-spot injection pattern for the field. Again the intent of this exhibit is the same, is to show that with this injection pattern the two proposed wells also fit in quite nicely with 20-acre well spacing.

In fact, there are many other injection patterns that can be drawn on paper but if you draw these injection patterns, it will still be quite obvious that going to 20-acre well spacing will necessitate at some point the drilling of Wells No. 34 and No. 35 at locations we've proposed.

Q Please move on to Exhibit Number Thirteen and discuss well deviations, please.

A Exhibit Thirteen shows wellbore inclinations and the maximum horizontal or straight holes on the Exxon K State Lease.

The purpose of this exhibit is to show the reasons for Exxon's bottom hole location windows as shown on our application and as shown on Exhibit Number Two.

What's listed on this exhibit are the eight Exxon K State Wells on Section 28 and the two northernmost wells on Section 32.

In the worst case, which would be K State No. 25, the maximum possible horizontal deviation is 147 feet.

In the best case the maximum possible horizontal deviation was 64 feet in the K State No. 19.

Based on these calculations we believe that the 240 foot by 240 foot box, bottom hole location

window for Well No. 35 is a reasonable bottom hole location window and one that we can attain by drilling that well non- directionally.

Q Would you discuss the surface locations, and I refer you to Exhibit Fourteen.

A Exhibit Fourteen is a surface hazards map on a scale of one inch to 250 foot. It shows the south half of Section 28.

To this point we've been referring to this south half as the Exxon K State Lease but it also happens to be Tract Number 2801 of the East Vacuum Grayburg San Andres Unit, which is operated by Phillips Petroleum Company.

The wells with the three digits next to them are wells operated by Phillips Petroleum in the East Vacuum Grayburg San Andres Unit. The wells with the two digits next to them are the Vacuum Glorieta Wells operated by Exxon.

The two red areas show the size and location of the drilling pad that would be necessary to drill the two wells, Well No. 34 and Well No. 35. Incidentally, the dark triangles are CO_2 injection wells in the East Vacuum Grayburg-San Andres Unit.

Looking at Well No. 34, the surface location of that well had to be located in Unit N. The

reason for that is we wanted originally to put the surface location of Well No. 34 in the southeast corner of Unit L, but there is a high pressure water injection pipeline operated by Phillips that would necessitate moving the surface location at least 330 feet to the west. That high pressure water injection pipeline runs from the northwest to the southeast and has a lateral off it that runs from the northeast to the southwest.

Well No. 34 then will be spudded on Unit N and directionally controlled to bottom in the Unit L in the 140 foot by 140 foot bottom hole location window.

Looking at Well No. 35 in Unit O, the intended surface and bottom hole locations are identical for that well. That well will be drilled as a straight hole and unless the deviation becomes severe, no downhole motors will be used to control the direction; however, if in drilling that well the deviation does become severe and it appears that the well might possibly leave the bottom hole location window, then it will be directionally controlled back toward the vertical to bottom within the bottom hole location window.

Q Mr. Sohaney, why was Well 34 not located to the west of the high pressure water pipeline you discussed?

A Well, it could be located 330 foot west.

That would be bad for two reasons. First of all, it would be very off-pattern as a 20-acre infill well. The location that you would want a 20-acre infill well in between Wells No. 31, 29, 27 and 32 would be at the intersection of those 4 proration units.

330 foot to the west is a very long pattern.

Second of all, in moving in a westerly direction we are moving more towards the water drive front and so the reserves to be captured by that well would be nowhere near as high as they could be if the well was in the southeast corner.

Q In your opinion are the granting of these applications in the interest of conservation, the prevention of waste and are they necessary for Exxon to recover the reserves under its acreage and protect its correlative rights?

A Yes, they are.

Q And were Exhibits Seven through Fourteen prepared by you or under your direction?

A Yes, they were.

MR. BRUCE: Mr. Examiner, I move the admission of Exhibits Seven through Fourteen.

MR. CATANACH: Exhibits Seven through Fourteen will be admitted into evidence.

MR. BRUCE: And I pass the witness.

CROSS EXAMINATION

BY MR. CATANACH:

Q Mr. Sohaney, when do you anticipate that you will have to plug the 21 and 31 Wells?

A It appears that Wells 31 and 21 could probably produce at least ten more years at higher and higher water cuts.

Well 31, as I mentioned, has had a history of casing leaks. A leak was repaired in 1980 and again in 1985. Whether or not that well will last ten more years is hard to say.

Q Do you know what they're currently producing at?

A Yes. If you turn back to Exhibits Nine-A and Nine-B, Well No. 21, the last rate I had for it was 71 barrels of oil per day.

Well No. 31, it was 59 barrels of oil per day.

Both of these wells were worked over early in this year in which we added a fair amount of pay; we stimulated the wells; we treated for scale; we treated for paraffin; and we put larger pumping units in the two

wells.

Q Do you know what the top allowable is for this pool?

A It's 107.

Q How would Exxon propose to split the production between the two, each two wells in the proration unit?

A The two wells would share the 107. What we would propose to do is to continue to produce Well No. 21 and Well No. 31, and to make up the balance between 107 and the capability of the existing wells with the two new wells.

MR. CATANACH: I have no further questions of the witness. Any other questions?

MR. BRUCE: Mr. Examiner, Case Numbers 9459 and 9460 were advertised in the name of Exxon Company, U.S.A, although the applications were made in the name of Exxon Corporation, and we would prefer that any orders issued in these cases be in the name of Exxon Corporation.

MR. CATANACH: Okay, thank you, Mr. Bruce.

I have one more question, Mr. Bruce.

When was the notification sent

to the offset operators?

MR. BRUCE: They were sent on July 25, 1988. It doesn't show that on Exhibit Three. We can -- we would ask permission to submit these after the hearing.

MR. CATANACH: That would be fine. I was just curious as to why the delivery dates were so far (unclear).

But you've had no response from any offset operators?

MR. BRUCE: Mr. Sohaney, I believe, has had discussion with Phillips on this matter.

MR. CATANACH: Okay, is there anything further in Case 9459 or 9460?

If not, they will be taken under advisement.

Hearing concluded.)

CERTIFICATE

I, SALLY W. BOYD, C. S. R. DO HEREBY CERTIFY that the foregoing Transcript of Hearing before the Oil Conservation Division (Commission) was reported by me; that the said transcript is a full, true and correct record of the hearing, prepared by me to the best of my ability.

Sally W. Boyd CSR

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 9459, 9460 heard by me on August 17 1988.

David R. Catanach, Examiner
Oil Conservation Division