BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
January 24, 1962
EXAMINER HEARING

IN THE MATTER OF: Application of Aztec Oil & Gas Company for a pressure maintenance project, San Juan County, New Mexico. Applicant, in the above-styled cause, seeks permission to institute the Aztec Totah Pressure Maintenance Project in Sections 18, 19, 20, 29, 30 and 34, Township 29 North, Range 13 West, San Juan County, New Mexico, in the Totah-Gallup Oil Pool with water injection initially to be through seven wells located in said project area, and requests adoption of special rules to govern the operation of said project	Case 2483

BEFORE:

ELVIS UTZ, EXAMINER

TRANSCRIPT OF HEARING

MR. UTZ: Case 2483.

MR. MORRIS: Application of Aztec Oil & Gas Company for a Pressure Maintenance Project, San Juan County, New Mexico.

MR. SWANSON: I am Kenneth A. Swanson, representing the Applicant associated with the firm of Gilbert, White & Gilbert. We have one witness to testify in this case.

MR. UTZ: Are there any other appearances?

MR. VERITY: I am George L. Verity of Verity, Burr & Cooley. We represent Southwest Production Company.

MR. MORRIS: Will you stand and raise your right hand,

please? (Witness complies.) Do you solemnly swear that the testimony you are about to give will be the truth, the whole truth, and nothing but the truth, so help you God?

MR. BURROWS: I do.

JIM F. BURROWS,

called as a witness herein, having been first duly sworn on oath, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. SWANSON:

Q Will you please state your name and occupation and in what capacity you are employed with Aztec Oil and Gas Company?

A My name is Jim F. Burrows, and I am employed with Aztec Oil & Gas Company as a Staff Petroleum Engineer in Dallas, Texas.

Q Would you briefly review your educational and professional background?

A I graduated from the University of Oklahoma in 1957 with a B. S. Degree in Petroleum Engineering. Since that time I worked approximately two and a half years for Standard Oil Company of Texas in various capacities as Petroleum Engineer and then I have been employed by Aztec Oil & Gas Company for the past two and a half years as Petroleum Engineer.

MR. SWANSON: Are the witness's qualifications acceptible?

MR. UTZ: Yes, sir, they are.

Q (By Mr. Swanson) Mr. Burrows, are you in general familiar with the subject matter of this Application?

A Yes.

Q Have you prepared a series of Exhibits to be presented at this time?

(Aztec Oil and Gas Company's Exhibit 1 thru 8 inclusive marked for identification)

A Yes, sir, I have.

Q Will you please refer to your first Exhibit and explain it?

A Exhibit No. 1 is a base map showing the lease ownership and well locations in the vicinity of the Totah-Gallup Pool in San Juan County, New Mexico. The dash lines have been constructed along the northeast and southwest flags of the pool and labeled approximate productive limit generally to define the area in which this pool is located. Two areas have been colored and are outlined by hatch lines. These areas represent the areas for which our Application has been entered. The northwest area is designated Project Area No. 1. The acreage colored in yellow in this area is acreage leased and operated by Aztec Oil & Gas Company. The acreage colored in light blue is operated by Elliott, Inc. We have included this acreage in our Application because tentative agreement has been reached concerning unit participation and it is anticipated that this area will be unitized with the other acreage in Project Area 1. The 40 acre tract colored in brown is leased by Texaco, Inc. and Aztec has approached Texaco concerning unitizing this tract with the Aztec acreage in this area and there has

been no indication that an agreement cannot be reached.

MR. UTZ: Has there been any indication it can be reached?

MR. SWANSON: Yes, sir, there has. If you will allow me to answer, since my department has been working on it more than Jim's has, as a matter of fact we have executed communication agreement with Texaco designating 80 acre prorated of 40 acres and south of that Aztec owns, and we contemplate drilling a well. The reason I think Mr. Burrows statement was stated that way is because we have proposed participation to Texaco and the people with whom we have talked have no objection to that participation but they did state it would have to be with the management's approval. We are not in a position to say unequivalent.

MR. UTZ: You may proceed.

A The area to the southeast has been designated Project Area 2 and this entire area is lease and operated by Aztec Oil & Gas Company. It is anticipated that this area will be unitized with the Tenneco Oil Company acreage to the north and east and tentative agreement has been reached concerning unit participation and we anticipate that this will be unitized.

Returning to Project Area 1, five producing wells have been circled and colored in red. Aztec proposes to convert these five wells for injection into the "A" sand of the lower Gallup formation. The two rows of wells represented by these five wells represent a transverse line drive back maintenance project. The larger circled one colored in green is the approximate location of a proposed

Morrison Battery source well, which is to furnish water for the injection wells in this area. In the Project Area No. 2, two producing wells have also been circled and colored in red, and these are the wells which we propose to convert for injection in this area. It is noticed that no additional wells have been proposed for injection wells and no source well has been included for this area, since we strongly anticipate this area will be unitized with the Tennaco acreage and we believe that the injection wells proposed by Tennaco and their source wellswill complete the pressure maintenance picture in this area. The final item on this Exhibit is a trace of cross section A prime which is colored in orange.

Q Have you prepared an Exhibit showing that cross section, Mr. Burrows?

A Yes, sir I have. That is Exhibit No. 2.

Q Let's refer to it, please.

A This is a cross section drawn down the access of the field northwest to southeast of the Gallup formation. This cross section was presented primarily to define the interval into which we propose to inject water. This interval is designated the Gallup A sand and has been colored in red. This Exhibit also illustrates the continuity of this sand throughout both project areas and in the interval between the project areas and indicates that this zone is subject to pressure maintenance.

Q Are there any faults or present mobility barriers present within these areas which might prevent the success of the pressure

maintenance project?

A There are none to my knowledge.

Q Let's proceed to your next Exhibit.

A Exhibit No. 3 is a proposed drill and completion program for the Morrison water supply well located in Project area No. 1. We proposed to set approximately 200 feet of 13 3/8 inch casing and cement this casing to the surface. We then propose to drill approximately 6600 feet and set 8 and 5/8 inch casing on the bottom and cement it in two stages as indicated on this Exhibit. We then propose to perforate the Morrison water zone to treat, if necessary, and place the well on production as a water source. We anticipate a productivity of approximately eight thousand barrels of water per day.

Q Let's proceed to what has been marked Exhibit 4.

A Exhibit No. 4 is a casing program, casing and cementing program, which was utilized on the seven producing wells which we propose to convert for injection. We believe that these casing and cementing programs present in these wells will be satisfactory for injection wells, also, where only the Gallup A sand has been perforated, while other zones in the lower Gallup formation might responed to water injection. We propose initially to take proper steps to insure the water selectivity injected into the "A" Sand. We propose further to protect the casing by injecting through tubing and below a packer. We propose also to fill the angler space between the casing and tubing with water and treat this water to

prevent corrosion of the casing and tubing.

Q There are some wells that are planned to be converted to injection wells that have perforations in zones other than the "A" sand?

A Yes.

Q Would you enumerate where those perforations are?

A In one well C No. 1, two additional intervals have been perforated. The one interval "A" is approximately 34 feet below the "A" sand and the other interval is approximately 42 above the "A" sand, And two additional wells in the upper zone has been perforated approximately 30 above the "A" sand.

Q What are the present plans for perforation in the well that lies below the A sand?

A For the lower perforations, we propose to plug the well back to point "A" above these perforations to prevent injection into that zone and the upper intervals which are perforated, we initially plan to set a packer below these perforations to inject into only the "A" sand.

Q Will you refer to your next Exhibit and explain that, please?

A Exhibit No. 5 is a date sheet which gives the pertinent reservoir rock and crude property. This sheet is fairly self-explanatory but we will mention a few of the most important items. We believe this to be a sand bar type stratigraphic trap and that the reservoir mechanism is a solution gas drive. The average porosity is approximately 14.1 per cent. The average permeability is approximately 121 millidarcies. The average water satur-

ation is approximately 20 per cent. The average net pay thickness in Area 1 is approximately 6.2 feet, and Area 2,9.7 feet. I believe this covers most of it.

Q Will you refer to what has been marked Exhibit 6 and explain it, please?

A Exhibit No. 6 is past and predicted future performance curves for Project Area No. 1. These curves indicate a primary recovery of approximately 985,000 barrels and ultimate recovery of approximately 3, 185,000 barrels, subtracting these results in a recovery of approximately 2,200,00 due to pressure maintenance operation. It is noted that our date to start injection has been shown as being in June of 1962. This is the latest date at which we anticipate we will start watering the ground and it will be that late only if bad weather conditions prevent our installation of the system.

Q What amount of time do you predict will be necessary to complete the pressure maintenance for this area?

A For this area we have estimated approximately nine and a half years from the inception of water injection.

Q Will you proceed to your next Exhibit and explain it, please?

A Exhibit No. 7 is past and predicted future performance in Project Area No. 2. These curves indicate a primary recovery of approximately 600,000 barrels and ultimate recovery of approximately 1,560,000 barrels. Subtracting these results in a recovery

due to pressure maintenance operation of 960,000 barrels.

Q Is it anticipated that water will be injected at approximately the same date in this area as in area No. 1?

A Yes, sir, they will probably be the same.

Q What would be the estimated life of this pressure maintenance project?

A I believe the configuration of the injection wells that we anticipate for this area will allow a life of about seven and a half years from the time we started water injection.

Q What is the significance of the flattening of the secondary curve that occurs in the middle of 1963 to the first of 1964?

A This indicates that during this period it is believed that the capacity of these wells will be in excess of the top allowable times the number of wells in the area.

Q In your opinion, Mr. Burrows, are these pressure maintenance programs in the interests of conservation and the prevention of waste?

A Very definitely so, due the additional recovery that I stated for Project Area No. 2 of 960,000 barrels and the additional recovery of 2,200,000 barrels in Area No. 1, due to the pressure maintenance.

Q In your judgment, could the present productive rate of wells within this area be classified as being what is sometimes called a stripper state?

A In my judgment, it is not.

Q Will you proceed to your next Exhibit and explain it, please?

A Exhibit No. 8 is a duplicate of the Commission's Order No. R2,026 authorizing Pan-American Petroleum Corporation to institute a Pressure Maintenance Project in the Horseshoe-Gallup Pool. We request that similar rules be provided for our Project Area in the Totah-Gallup Pool with the exceptions that we will note: first, we believe an obvious change should be made in places where reference is made to 40-acre proration unit and that 80-acre proration unti should be substituted. We have also presented the same gas compressibility versus reservoir curve which was presented by Pan-American Petroleum Corporation in their Application for a Pressure Maintenance Project in the Totah Pool and we have date which supports this curve, if necessary. The only additional comment I have is that we have no objection to allowing a producing well which is outisde of the Project Area and directly and diagonally offsets a well inside the Project Area also having a maximum allowable equivalent to twice the top unit allowable as has been provided for a lease line well inside the project, which diagonally or directly offsets the well.

Q Your feeling there is that the project of correlative rights might require some sort of rule to give equal treatment to wells both inside and outside that are directly opposite each other?

A Yes, sir.

Q In that regard if the Commission should make a rule

objecting to Project Area Pan-American, not Totah Pool, is it your feeling that they should be identical within the Totah Pool?

A Yes.

Q What is the estimated injection rate of water in these project areas?

A In Area 1 we anticipate a total injectivity of approximately 4,000 barrels per day. On four or five wells this would be an average of 800 barrels per day, per well. In Project Area 2, the anticipated injectivity of approximately 2500 barrels per day of which would be 1250 barrels per day, per well.

Q What would be the range of injection pressure necessary to obtain this?

A We anticipate a surface pressure which will range from approximately 1700 to 1950 pounds due to the wide range of difference in elevation in this area in order that the bottom hole pressure may be approximately the same in all injection wells.

Q Do you have any additional comments to make in regard to this application as a whole?

A I'd like to make one comment, that this injection pattern which we have proposed here within being primary that a unitization of the entire Totah-Gallup Pool and that if it should turn out that there are more than one pressure magnet projectors or pressure maintenance carried out on a lease basis some amount of casing could possibly be necessitated on lease line injection wells to provide equitable injection on the lease line.

Q Have all these Exhibits been prepared by you or under your supervision?

A Yes.

MR. SWANSON: At this time we would like to offer as Aztec's Exhibits, 1 through 8.

MR. UTZ: Without objection they will be admitted into the record.

(Whereupon Aztec's Exhibits 1 through 8 admitted in evidence)

MR. SWANSON: This concludes our presentation of evidence in this Application.

CROSS EXAMINATION

BY MR. UTZ:

Q Mr. Burrows, do you have a reservoir temperature for this Pool --

A Yes, sir.

Q -- or do you recommend to use the same one that Pan-American uses?

A In their Totah, I believe 155 degrees is listed on Exhibit 5.

Q And your atmospheric pressure would be twelve pounds?

A Yes, sir, 12.01.

Q What would be your recommendation as to datum?

A Plus 200 feet.

Q Identical to Pan-American datum?

A Yes, sir, I believe it is.

Q I believe you recommended the same factors be identical to Pan American?

A Yes, sir.

Q If I understand you correctly, you recommended that regardless of what the allowable situation was for each well, it would be identical to Pan-American's order entered in this Pool?

A Yes, sir.

MR. MORRIS: Along those lines, if I may interrupt Mr. Utz, Rule 10 as contained in the Horseshoe-Gallup Pool Rules do not correspond with the rules entered in the Pan-American case, in that each well within the project area which directly or diagonally offsets outside the project were limited to producing two times the top unit allowable and only that after they had experienced a substantial response to the water flooding. Now, is it still your proposal that the Rules to be adopted in this case for your area would be identical with those adopted in the Pan-American area?

A Yes, sir.

MR. SWANSON: Has an order been issued covering Pan American's Application?

MR. MORRIS: I believe that it has.

Q (By Mr. Utz) Mr. Burrows, referring to your Exhibit No. 6 and 7, particularly to the curves about 1961, I noticed that curve makes an upswing at that point, what is the reason for that?

A On December, this curve is dropped down, due to the no flare order and its installation of compression equipment.

Q After all casing head gas is taken, you feel that current will come back up to where you projected to?

A Yes, sir.

Q Did I understand you to indicate that the Tenneco area in between these two areas which we heard today in Case 2484, is there a possibility of unitization in both of these areas?

A I believe there is a strong possibility that Project Area 2 will be unitized with Tenneco Company acreage and there could be a possibility that the entire area between and including, and also Project Area 1 would be unitized or left, the whole pool would be unitized.

MR. SWANSON: If I might interject, it is Aztec's hope that all the productivity within the limit of the Totah Oil Pool can be placed in one unit for pressure maintenance purposes. We do have to recognize that it may not be possible. We designed our Application with the hope of covering any of the three situations that we contemplate as being; first, that the whole field will be unitized; second, that there will be pressure maintenance projects conducted by Pan-American covering the areas northwest and southeast in the Totah Pool and the unit comprised of the remaining area will be formed under one or more operators. That may not eventuate, in which case we are confident that there will be units as we designated here, that in consisting of Project Area 1 and another one

consisting of Project Area 2 and the remaining production acreage went to that area.

Q (By Mr. Utz) Mr. Burrows, in the event this unitization is not possible, you would use the injection plan as recommended here in this case?

A We anticipate using one very similar but that there are some modifications that may be necessary along these lines.

Q If it is unitized, would you change your injection program?

A If the entire area is unitized, we believe that this injection pattern here is the one that we anticipate.

Q Even if it is unitized, you would inject along these lines anyway?

A Yes, sir, this is congruous with the installation of the whole field and that in other patterns which are proposed by Pan-American.

Q Well, this injection pattern as proposed does leave some pretty big gaps particularly in your Area No. 1, does it not?

A Well, it covers as much area as possible.

MR. SWANSON: Mr. Burrows, perhaps it would help in explaining this point if you could show Mr. Utz what we understand of Tenneco's injection wells, then on a field well basis, we will see how they are spaced.

MR. UTZ: I have that information platted here as to Tenneco's proposals.

Q (By Mr. Utz) I notice that all these, yours and Tenneco's injection wells tend to try to protect loose lines in each case rather than using the so-called crystal pattern that Pan-American proposed on each end of the Pool?

A We believe this pattern, although it coincides with lease lines, is congruous with pressure maintenance operations of the whole field.

Q Would you add any injection wells, say, somewhere in the middle of Area 1 as proposed today?

A Possibly we would desire to convert additional wells in that area, yes, at a later date, after we determine our injectivity to a pretty good degree.

Q Do you think that you would have efficient sweep if you did not put these injection wells in the center of this area?

A Yes, we would believe that we would have an efficient sweep if we increase the life of the secondary lines.

Q If you don't put injection wells in the center of Area 1 then, you'd have to pump several locations until you reach the center wells, isn't that true?

A Yes, sir, as one row offsetting another row of producing wells next to the row of injection wells, high water shuts these in and continues to inject or convert these to injection wells

Q As the flood bank progressed then?

A Yes, sir.

MR. UTZ: Are there any other questions?

MR. VERITY: I have some questions.

CROSS EXAMINATION

BY MR. VERITY:

Q Do you have an opinion as to whether or not the injection of the water in the two project areas will damage production from any wells outside the project area or will it reduce production and ultimate recovery from any of the wells outside?

A We do not anticipate that it will damage.

Q You represent to the Commission that the wells of Southwest Production Company in the south half of Section north, 13 west will in no way be damaged by your injection of water into the formation?

A No, sir, we believe if there are flood built pressure maintenance programs, they probably will increase their production.

MR. VERITY: That is all.

CROSS EXAMINATION

BY MR. IRBY:

Q I didn't have a copy of your Exhibit 3, and I am interested in your water production well. What was the size of that surface casing you were to use there?

A 13 3/8 inch.

Q And what was the cement on that, circulation to the surface?

A Yes.

Q And 200 foot string?

A Yes, sir.

Q And on your water production string, what was the length of that?

A 6600 feet.

Q And the size?

A 8 and 5/8 inch.

Q And you said you were going to cement that in two stages, would you tell me what the final result will be?

A The final result will be that the first stage will be cemented a total depth to approximately the top of the Gallup formation, the second stage will be cemented to a stage collar approximately 100 feet below the Pictured Cliff to the surface.

Q Do you know what the static level of that water is?

A No, sir.

Q You don't know what your pumping level would be either?

A No, sir, we anticipate that it will be approximately 2500 feet.

Q Do you have an analysis of this water?

A Yes, sir, I believe an analysis that was run on water recovered from a drill stem test, I think it was 22 G, it was within this.

Q Would you send me a copy of that analysis if I give you my address?

A Yes, sir.

Q It is anticipated that any of these other proposed secondary recovery plans will use water from this well, for example

Tenneco, which would be in between?

A I believe there is a possibility that some of this water might be utilized on it in that area.

Q Do you anticipate the well will furnish sufficient water for your proposal and others?

A We anticipate that it will furnish the excess of quantity required by the wells we have proposed.

MR. IRBY: Thank you.

MR. UTZ: Are there any other questions?

MR. SWANSON: I have one point I would like to ask Mr. Burrows.

REDIRECT EXAMINATION

BY MR. SWANSON:

Q You said, I believe, that this pattern of injection wells has a transferred line pipe drive, did I understand you to testify that, in your opinion, probably ultimately more oil would be recovered in this area than if injection pattern utilizing injection to increase the wells only was used?

A Yes, sir, we believe this will spread out the pattern covered, flushed by water to some extent, and give some additional recovery, if possible.

MR. UTZ: Providing you follow up the, back up the structure?

A Yes.

MR. MORRIS: I have one question.

CROSS EXAMINATION

BY MR. MORRIS:

Q Mr. Burrows, in computing your primary recovery, what it would have been if the pressure maintenance project had not been instituted, what recovery factor did you use in this Pool?

A I believe it is approximately 12 1/2 per cent of the oil factor.

MR. MORRIS: Thank you.

MR. UTZ: Are there any other questions? The witness may be excused.

(Witness excused.)

MR. UTZ: Are there any statements in this case?

MR. VERITY: Southwest Production has no objection to the granting of the application particularly in lieu of their agreement to accept the same provisions with regard to lease line wells being limited to a top unit allowable.

MR. UTZ: Are there any other statements? The case will be taken under advisement.

The hearing will recess until 1:30 o'clock P.M.

STATE OF NEW MEXICO)
) ss
COUNTY OF BERNALILLO)

I, KATHERINE PETERSON, Court Reporter, do hereby certify that the foregoing and attached transcript of proceedings before the New Mexico Oil Conservation Commission at Santa Fe, New Mexico, is a true and correct record to the best of my knowledge, skill, and ability.

Katherine Peterson
Court Reporter

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 2483 heard by me on Jan. 24, 1962.

....., Examiner
New Mexico Oil Conservation Commission