

CASE 2317: Application of PAN AMER.  
for a pressure maintenance project  
— in the Horseshoe-Gallup Oil Pool.

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2317

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Application, Transcript,  
and Exhibits, Etc.

BEFORE THE  
OIL CONSERVATION COMMISSION  
SANTA FE, NEW MEXICO  
JUNE 28, 1961

EXAMINER HEARING

IN THE MATTER OF:

CASE 2317

Application of Pan American Petroleum Corporation for a pressure maintenance project in the Horseshoe-Gallup Oil Pool, San Juan County, New Mexico, and for special rules governing said project.

TRANSCRIPT OF HEARING

BEFORE THE  
OIL CONSERVATION COMMISSION  
SANTA FE, NEW MEXICO  
JUNE 28, 1961

EXAMINER HEARING

DEARNLEY-MEIER REPORTING SERVICE, Inc.

PHONE CH 3-6691

IN THE MATTER OF  
CASE 2317:

Application of Pan American Petroleum Corporation for a pressure maintenance project in the Horseshoe-Gallup Oil Pool, San Juan County, New Mexico, and for special rules governing said project. Applicant, in the above-styled cause, seeks permission to institute a pressure maintenance project in the Horseshoe-Gallup Oil Pool by the injection of water into certain Northeast Hogback Unit wells in Sections 10, 11, 13, 14, 15 and 24, all in Township 30 North, Range 16 West, San Juan County, New Mexico. Applicant further seeks special rules governing the operation of said project.

BEFORE:

Mr. Elvis A. Utz, Examiner.

T R A N S C R I P T    O F    P R O C E E D I N G S

MR. UTZ: The hearing will come to order, please. The next case will be 2317.

MR. MORRIS: Case 2317. Application of Pan American Petroleum Corporation for a pressure maintenance project in the Horseshoe-Gallup Oil Pool, San Juan County, New Mexico, and for



special rules governing said project.

MR. BUELL: For Pan American Petroleum Corporation, Guy Buell.

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

(Witness sworn)

GEORGE W. EATON, JR.,

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

DIRECT EXAMINATION

BY MR. BUELL:

Q Mr. Eaton, would you state your full name, by whom you are employed, in what capacity and at what location, please?

A George W. Eaton, Jr. Senior petroleum engineer for Pan American Petroleum Corporation in Farmington, New Mexico.

Q Mr. Eaton, you have testified at prior commission hearings, have you not?

A Yes, sir, I have.

Q Your qualifications, then, as a petroleum engineer are a matter of public record?

A Yes, sir, they are.

MR. BUELL: Any questions, Mr. Examiner?

MR. UTZ: No, sir. He's qualified.

(Whereupon, Pan American's Exhibits Nos. 1 through 10, were marked for identification).



Q (By Mr. Buell) Would you look, now, at what has been marked as Pan American's Exhibit No. 1, and state, for the record, what that Exhibit reflects?

A Exhibit No. 1 is a map of the horseshoe-Gallup Oil Pool in San Juan County, New Mexico. On that map is shown the wells which are completed from the Horseshoe-Gallup Pool. A copy of the Exhibit 1 is hanging on the wall.

Q What is the significance, Mr. Eaton, of the areas on that Exhibit, which are delineated with the red line?

A This Exhibit No. 1, I also shows the location of three pressure maintenance projects which have been granted under previous Commission orders, and the location of the proposed Pan American pressure maintenance project, all of them in the Horseshoe-Gallup Pool.

Q State, for the record, the three projects that have already received authority from the Commission.

A These three projects are shown on Exhibit No. 1, in the narrow red line. Two of them are in the extreme northwest portion of the pool. Those are the Honolulu project and the Humble project. Near the center of the Horseshoe-Gallup Pool, that project is the Atlantic pressure maintenance project. The Pan American proposed project is in the extreme southeastern portion of the Horseshoe-Gallup Pool, and is shown by the heavier red line.

Q Go, now, to what has been marked as our Exhibit No. 2, Mr. Eaton, and state briefly what that Exhibit reflects.



A Exhibit 2 is a map of a portion of the Horseshoe-Gallup Pool, showing more precisely the location of the Pan American's Northeast Hogback Unit, together with the red outlined area, which is the pressure maintenance project area, which also is the Northeast Hogback Unit Gallup participating area.

The heavy dashed line in blue is the outline of the Northeast Hogback Unit. All of the Northeast Hogback Unit and, therefore, all of the Gallup participating area or the pressure maintenance project area, which I may use interchangeably in this hearing, is located in Township 30 North, Range 16 West.

This Exhibit 2 also shows all of the wells which are completed within a two-mile radius of our proposed project area.

Q How have you designated the proposed injection wells on Exhibit 2, Mr. Eaton?

A The proposed water injection wells, which will be used in the Pan American pressure maintenance project, are colored in green.

Q Go, now, to what has been marked as Pan American's Exhibit No. 3.

A Pan American's Exhibit No. 3 is a cross-section drawn through the proposed project area. The trace of that cross-section is shown by the letter A., AA prime on Exhibit No. 2. The purpose of the cross-section is simply to illustrate that the Gallup is a continuous ~~formation~~ throughout the project area, and, therefore, might be susceptible to pressure maintenance.



Q Certainly from the standpoint of uniformity and continuity, you would consider the Gallup in this portion of the pool as a good pressure maintenance prospect?

A Yes.

Q Go, now, to Pan American's Exhibit 4. What does that Exhibit reflect?

A Exhibit No. 4 is another map of the proposed project area. This map is on a larger scale than the map shown in Exhibits 1 and 2. It also shows the proposed project area outlined by the heavy red line, the location of the proposed water injection wells which are colored in green, the location of a water supply well in the southwest quarter -- southeast quarter, excuse me, southwest quarter, northeast quarter, Section 10, and the proposed location of the water injection plant which will serve the project area.

Q Mr. Eaton, talking for a moment about the proposed injection wells, is your recommendation in that regard a firm recommendation for each of these injection wells you show in green, on Exhibit 4, as well as Exhibit 2?

A Our recommendation with regard to the use of these specific injection wells is firm with the exception of the three wells in the extreme northwest portion of the project area. As you can see, Well No. 30, Well No. 23, and Well No. 25 are immediately adjacent to the project boundary, and those wells are simply tentative, because some arrangement will have to be worked out with the





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adjacent operator before we can make a firm recommendation with regard to those three wells.

Q To your knowledge, Mr. Eaton, is there any activity northwest of our project area with respect to initiating a pressure maintenance project in the interim area between our area and the existing Atlantic area?

A Yes, sir, there is. Under the expediting of the Atlantic Refining, there's an effort on the part of the operators in that area to unitize and commence operation at an early date so that there will be in the very near future, I believe, a continuous project area joining the present Atlantic project with the proposed Pan American project.

Q Is it your understanding that the Atlantic would be the operator of this new area?

A Yes, sir, that is my understanding.

Q In that connection, then, have you discussed these proposed wells, these three that you mentioned, for the record, have you discussed the location of those wells with Atlantic reservoir engineering personnel?

A Yes, sir. As far as the engineering thinking and the engineering design of the project is concerned, both the Atlantic reservoir engineers are in accord with, both the Atlantic and Pan American reservoir engineers are in accord that this is a satisfactory pattern. Of course, the details of actually preparing and executing lease line and boundary line agreements will have to



come in the future, after the Atlantic unit is formed, and they're in a position to commence operations.

Q Now, later on, in your testimony, Mr. Eaton, you are going to recommend rules to govern this project. Let me anticipate that a little and ask you now, will your proposed rules cover administrative approval of future injection wells?

A Yes, sir, they will.

Q Such that if you have to make any change along your cooperative line there, it can be handled administratively under the rules you are recommending?

A Yes, sir. It would be my recommendation that these be set up, these three wells be set up along with all others as initial injection wells, because I'm fully confident that an agreement will be reached, and that they will ultimately be used for injection. In other words, it's less likelihood, that there will be a change if they are set up than if they are not set up initially.

Q Looking at your Exhibit 4, and your injection wells' dispersion flow, what type of pattern -- how would you describe this proposed flood?

A I believe I would term this flood a modified five-spot program. The reason that I believe that I would term it modified five-spot is because we actually thought initially of conducting a five-spot program, and because of the configuration of the pool limits in this extreme southeast portion an unduly large amount of injection wells were required to complete five-spot program through-



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out the entire project area.

Q A moment ago when you referred to the water supply well, did you locate it, for the record? I don't recall.

A Yes, sir, I believe I did.

Q Let's talk about it a moment, and in that connection, drawing your attention to what has been marked as our Exhibit 5, --

A All right.

Q -- what does that Exhibit reflect?

A Exhibit No. 5 is the drilling and completion program which we intend to use when drilling the water supply well to the Morrison formation. Among the pertinent points that Exhibit No. 5 shows is that the Morrison is expected to be found at a depth of about 2900 feet, that the well will be completed with casing set through to T.D. and will be cemented at that point, and selectively perforated for completion in the Morrison formation.

Q Mr. Eaton, is the Morrison formation noted in this area of the basin as being a prolific water formation?

A Yes, sir, it is a well-known water aquifer throughout the western portion of the San Juan Basin.

Q Do you happen to know what Atlantic and Humble, where their water source is for their flood?

A Yes, sir. Both the Atlantic flood and the Humble flood are using Morrison water.

Q Are you satisfied that this supply well will furnish us sufficient water for our proposed program?



A Yes, sir. I'm confident that there's adequate water supply in the Morrison, as well as adequate capacity of a supply well, to completely flood this project area, without any question.

Q Mr. Eaton, before we leave our injection wells, I'm going to refer to several Exhibits which are the logs of each of the proposed injection wells, and when I give the number of the Exhibit and the name of the well, it would probably be well if you would locate that injection well, for the record.

A All right.

MR. BUELL: Our Exhibit 6-A, Mr. Examiner, refers to a log on El Paso Natural Gas Products Company's William No. 2 well.

A That well is located in the southeast, southeast of Section 11. I might repeat here that this entire project area is in Township 30 North, Range 16 West, so I'll just mention the Section number and the Township and Range.

Q Exhibit 6-B is a copy of a log on El Paso Natural Gas Products Company's William No. 3.

A That well is located in the northwest quarter, southeast quarter of Section 11.

Q Exhibit No. 6-C is a Braumham's Federal No. 3.

A That well is located in the northwest quarter, northeast quarter of Section 14.

Q Exhibit 6-D is Pan American's Northeast Hogback Unit No. 4.



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A That well is located in the northwest quarter, southeast quarter of Section 14.

Q Exhibit 6-E is a copy of the log on Pan American's Northeast Hogback Unit Well No. 6.

A That well is located in the northwest quarter, northeast quarter, Section 15.

Q Exhibit 6-F is a copy of the log on Pan American's Northeast Hogback Unit No. 2.

A That well is located in the southwest quarter, northwest quarter, Section 14.

Q Exhibit 6-G is a copy of the log on Pan American's Northeast Hogback Unit No. 11.

A That well is located in the southeast quarter, northwest quarter of Section 14.

Q Exhibit 6-H is a log on Pan American's Northeast Hogback Unit No. 13. Can you find that one?

A Not yet.

Q Section 13?

A Yes. That well is located in the southwest, northwest quarter, Section 13.

Q Exhibit 6-I is Pan American's Northeast Hogback Unit No. 14.

A That well is located in the northeast quarter, southeast quarter, Section 14.

Q Exhibit 6-J is a log on Pan American's Northeast Hogback



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Unit No. 16.

A That well is located in the southeast quarter, southwest quarter, Section 13.

Q Exhibit 6-K, the log on Pan American's Northeast Hogback Unit No. 17.

A That well is located in the southwest quarter, southwest quarter, Section 13.

Q Exhibit 6-L is a copy of the log on Pan American's Northeast Hogback Unit No. 20.

A That well is located in the northwest quarter, northeast quarter, Section 24.

Q Exhibit 6-M, the log of Pan American's Northeast Hogback Unit No. 21, Section 15, Mr. Eaton.

A Yes, sir. That well is located in the northwest quarter, northwest quarter of Section 15.

Q Exhibit 6-N, log of Pan American's Northeast Hogback Unit No. 22.

A That well is located in the southwest quarter, northeast quarter, Section 15.

Q Exhibit 6-O, a log of Pan American's Northeast Hogback Unit No. 23.

A That well is located in the northwest quarter, northeast quarter, Section 10.

Q Exhibit 6-P, log of Pan American's Northeast Hogback Unit No. 25.



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A That well is located in the northwest quarter, northwest quarter, Section 11.

Q Exhibit 6-Q, a log of Pan American's Northeast Hogback No. 29.

A That well is located in the southeast quarter, northwest quarter of Section 11.

Q Exhibit 6-R, the log of Pan American's Northeast Hogback Unit No. 30.

A That well is located in the northwest quarter, southwest quarter of Section 10.

Q Exhibit 6-S, Pan American's Northeast Hogback Unit No. 32.

A That well is located in the northwest quarter, southwest quarter, Section 11.

Q And finally, concluding with Exhibit 6-T, which is a log of Pan American's Northeast Hogback Unit No. 37.

A That well is located in the southeast quarter, southeast quarter, Section 10.

Q Mr. Eaton, would you look, now, at what has been marked as our Exhibit No. 7, and state, for the record, what that Exhibit reflects?

A Yes, sir. Exhibit No. 7 is a list of the casing and cementing programs which were used in each of the proposed injection wells.

Q The data on Exhibit 7 are more or less self-explanatory,



are they not, Mr. Eaton?

A Yes, sir.

Q Let me just ask you this question in that regard, more or less by way of summary. Are you completely satisfied that the drilling and completion program outlined on Exhibit 7 will assure you that the injected water will go in the interval you want it to go in?

A Yes, sir, I am.

Q Look, now, at what has been marked as Pan American's Exhibit No. 8, and state, for the record, what that Exhibit reflects.

A Exhibit No. 8 is a tabulation showing pertinent reservoir data for the Horseshoe-Gallup Pool, in general, and the Northeast Hogback Unit Gallup participating area, in particular.

Q Mr. Eaton, these data are -- appear to be self-explanatory, but would you like to comment on some of the items that you feel are very pertinent?

A Yes, sir. I believe the first portion of the data sheet is self-explanatory, being principally factual data. I would like to comment briefly on that portion immediately following the heading "Pressure Maintenance Performance." The particular portion of that that is pertinent at this time is that the ultimate primary recovery extracted from the project area is 1,862,000 barrels. That amounts to 11.4 percent of the oil in place. Under pressure maintenance time operations, the ultimate recovery is expected to be increased to 4,235,000 barrels, which amounts to 25.8 percent





of the oil in place.

Q Certainly, Mr. Eaton, increasing ultimate recovery in that magnitude is a very good conservation effort, is it not?

A Yes, sir, it certainly is. The recovery from that project area, by institution of pressure maintenance, is expected to increase by an amount roughly a hundred fifty percent of that, which would have been obtained, had pressure maintenance not been instituted.

Q While we're speaking of the pressure maintenance program, I wish you would look, now, at what has been marked as our Exhibit No. 9, and briefly comment on that Exhibit, Mr. Eaton.

A Yes, sir. Exhibit No. 9 is simply a graphical illustration of the performance that we expect that this project area will have. The Exhibit is actually in two parts, consisting of two lines, which we would anticipate for performance. The lower line on Exhibit No. 9 represents what we think primary performance will be from this point forward. You will note that a peak production from the project area was reached about mid 1960. Since that time, production rate has actually declined, and we expect that it will continue to decline unless this pressure maintenance project is started.

That extrapolation of that predicted decline along the primary declining trend results in that ultimate primary from the project area, amounting to the 1,862,000 barrels, or 11 plus percent of the oil in place. Under pressure maintenance operation,

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which is for the purpose of the preparation of this gravity, we assumed would be commenced by September, 1961, is shown by the upper curve on Exhibit No. 9. That shows that with pressure maintenance operations, injection of water, commencing in September an increase in production or buss should be obtained by January 1st, 1962.

Following early 1962, production will continue to increase until the latter part of 1962, when it, too, will commence a declining rate. However, it is always well above the predicted primary rate. Projection of that curve results in an ultimate recovery of 4,235,000 barrels, or 25.8 percent of the oil in place, which is expected to occur in about eleven years of project life.

On the primary operation, I might point out that we expect only about four more years of primary life. We expect primary to end in 1965. We expect our pressure maintenance project to extend the life of this project area until nearly 1972.

Q Mr. Eaton, would you look, now, at what has been marked as Pan American's Exhibit No. 10, and state, for the record, what is contained on that Exhibit?

A Pan American's Exhibit No. 10 is simply a copy of New Mexico Oil Conservation Commission's Order R-15, which sets forth the applicable rules and regulations under which the Atlantic Refining Company pressure maintenance project is operating.

Q Are you recommending to the Commission that they adopt for our pressure maintenance project an Order identical to that



issued in the case of Atlantic?

A Yes, sir, that is my recommendation.

Q Why do you make that recommendation?

A First of all, I make that recommendation because I think it is a very pertinent order, and one under which maximum recovery from a project area might be obtained. Secondly, as I have mentioned before, there is in progress an effort to build a secondary recovery or pressure maintenance type unit, which would fill up that intervening area in the Horseshoe-Gallup Pool between the existing Atlantic project and the proposed Pan American project. It would be my anticipation that rules applicable to that enlarged project would be like the existing Atlantic project. Therefore, it seems only reasonable and logical, to me, that at that time when you would have two projects with a common boundary, that each one should be operating under the same rules.

Q Mr. Eaton, you have already testified as to the significant waste prevention measure this proposal is. Let me ask you this question. In your opinion, under the rules you are recommending, as well as the program you've recommended, do you feel that the correlative rights of all parties of interest will be protected?

A Yes, sir, I do. In that regard, I might reiterate that this injection line agreement along this northwest boundary will have to be worked out with the operator of that adjacent unit. With regard to the other injection wells, there are no questions,

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since all of the wells fall in the Northeast Hogback Unit Gallup participating area.

Q Do you have anything else, Mr. Eaton, that you would like to add?

A No, sir. I don't believe so.

MR. BUELL: That concludes our direct examination, Mr. Examiner, and may I at this time formally offer our Exhibits 1 through 10, inclusive?

MR. UTZ: Without objection, Exhibits 1 through 10 will be accepted.

(Whereupon, Pan American's Exhibits 1 through 10 were received in evidence).

CROSS-EXAMINATION

BY MR. UTZ:

Q Mr. Eaton, have you run any factor analyses on the gas down at this end of the Pool?

A No, sir, I haven't.

Q Do you feel that the gas analysis would be the same as that run in the Atlantic area?

A Yes, sir, I do. It should be very closely similar. It's solution gas.

MR. UTZ: Are there other questions?

MR. MORRIS: Yes, sir.

BY MR. MORRIS:

Q Mr. Eaton, do you propose any effective date for an Order,



if the Commission sees fit to enter it in this case?

A I would recommend that that date be as early as possible for this reason. We are moving forward with our initial expenditures on this project area in anticipation of an Order, those expenditures amounting principally to the drilling and testing of the Morrison supply well. I expect that that well will be commenced within the next week or so. Once the testing of the well is concluded, certain further arrangements can be commenced at that time that just can't be done before then. We can commence designing our system, and we can collect samples of the water, and determine for our own knowledge whether or not treatment is desirable, and, if so, what treatment, and design our facilities to do that with.

I would recommend an early date, because we're quite anxious to make our plans actually coincide with our predictions on that graph, and hope to get water to be injected by September 1st.

Q I didn't know whether you would need, say, a date of July 1st or not, whether you would need it by the 1st of this coming month.

A No, sir, I don't think so.

Q Mr. Eaton, you are proposing the same rules as set forth in Order No. R-1699. Now, that would include Rule 7 of that Order, which makes provision for credit for daily average gas injected. Now, is any gas being proposed as to be injected in here?

A No, sir. We do not propose to inject gas, although cer-

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tainly that might be a possibility. We don't plan to at this time.

Q Is Atlantic injecting gas up in their project under these rules?

A Not to my knowledge, no, sir.

Q But you think it would be a good idea to adopt these same rules just in the event your areas might merge?

A It could be possible that at some future time gas injection might be considered, although I think it's rather remote, but I do recommend adoption of the same rules for the reason that you mentioned. I fully expect that the Atlantic project will be enlarged to the extent that it completely fills up that intervening area, and will be immediately adjacent to the proposed Pan American project area.

Q And Rule 11 of these rules does make administrative provision for including injection wells, which is something you mentioned earlier?

A Yes, sir.

MR. MORRIS: Thank you, sir.

MR. UTZ: Any other questions? If not, the witness may be excused.

(Witness excused)

MR. UTZ: Any other statements to be made in this case? If not, the case will be taken under advisement.

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PHONE CH 3-6601

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STATE OF NEW MEXICO )  
COUNTY OF BERNALILLO ) ss

I, ADA DEARNLEY, Court Reporter, in and for the County of Bernalillo, State of New Mexico, do hereby certify that the foregoing and attached Transcript of Proceedings before the New Mexico Oil Conservation Commission was reported by me in machine shorthand and reduced to typewritten transcript under my personal supervision, and that the same is a true and correct record, to the best of my knowledge, skill and ability.

WITNESS my Hand and Seal this, the 3rd day of July, 1961, in the City of Albuquerque, County of Bernalillo, State of New Mexico.

*Ada Dearnley*  
NOTARY PUBLIC

My Commission expires:

June 19, 1963

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 2367, heard by me on June 28, 1961.

*Shirley M. [Signature]* Examiner  
New Mexico Oil Conservation Commission

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ALBUQUERQUE, NEW MEXICO



**ATWOOD & MALONE**  
LAWYERS

JEFF D. ATWOOD (1883-1960)  
ROSS L. MALONE  
CHARLES F. MALONE  
E. KIRK NEWMAN  
RUSSELL D. MANN  
PAUL A. COOTER  
BOB F. TURNER

TELEPHONE MAIN 2-6221  
ROSWELL PETROLEUM BUILDING  
ROSWELL, NEW MEXICO

June 26, 1961

Oil Conservation Commission  
Post Office Box 871  
Santa Fe, New Mexico

Re: Case No. 2317, Application of Pan American  
Petroleum Corporation for a pressure main-  
tenance project in Horseshoe-Gallup Oil Pool.

Gentlemen:

We are local counsel for Pan American Petroleum Corporation and as such wish to enter our appearance in the captioned case. Pan American will also be represented by Guy Buell, a member of the Texas Bar, and a company employee. The actual presentation for Pan American will be made by Mr. Buell.

Very truly yours,

ATWOOD & MALONE

By: *E. Kirk Newman*

EKN:ps  
cc/ Mr. J. K. Smith  
Mr. Guy Buell



GOVERNOR  
EDWIN L. MECHEM  
CHAIRMAN

State of New Mexico  
Oil Conservation Commission

LAND COMMISSIONER  
E. S. JOHNNY WALKER  
MEMBER



STATE GEOLOGIST  
A. L. PORTER, JR.  
SECRETARY - DIRECTOR

P. O. BOX 871  
SANTA FE

July 13, 1961

Re: CASE NO. 2316 & 2317

Mr. Guy Dwell  
Pan American Petroleum Corporation  
Box 1410  
Fort Worth, Texas

ORDER NO. R-2019 and R-2026

APPLICANT:

Pan American Petroleum Corp.

Dear Sir:

Enclosed herewith are two copies of the above-referenced  
Commission order recently entered in the subject case.

Very truly yours,

*A. L. Porter, Jr.*

A. L. PORTER, JR.  
Secretary-Director

ir/

Carbon copy of order also sent to:

Hobbs OCC x

Artesia OCC   

Aztec OCC x

OTHER Mr. Kirk Newman

**BEFORE THE OIL CONSERVATION COMMISSION  
OF THE STATE OF NEW MEXICO**

**IN THE MATTER OF THE HEARING  
CALLED BY THE OIL CONSERVATION  
COMMISSION OF NEW MEXICO FOR  
THE PURPOSE OF CONSIDERING:**

**CASE No. 2317  
Order No. R-2026**

**APPLICATION OF PAN AMERICAN PETROLEUM  
CORPORATION FOR A PRESSURE MAINTENANCE  
PROJECT IN THE HORSESHOE-GALLUP OIL  
POOL, SAN JUAN COUNTY, NEW MEXICO, AND  
FOR SPECIAL RULES GOVERNING THE OPERA-  
TION OF SAID PROJECT.**

**ORDER OF THE COMMISSION**

**BY THE COMMISSION:**

This cause came on for hearing at 9 o'clock a.m. on June 28, 1961, at Santa Fe, New Mexico, before Elvis A. Utz, Examiner duly appointed by the Oil Conservation Commission of New Mexico, hereinafter referred to as the "Commission," in accordance with Rule 1214 of the Commission Rules and Regulations.

NOW, on this 13th day of July, 1961, the Commission, a quorum being present, having considered the application, the evidence adduced, and the recommendations of the Examiner, Elvis A. Utz, and being fully advised in the premises,

**FINDS:**

- (1) That due public notice having been given as required by law, the Commission has jurisdiction of this cause and the subject matter thereof.
- (2) That the applicant, Pan American Petroleum Corporation, proposes to institute a pressure maintenance project in the Horseshoe-Gallup Oil Pool in Township 30 North, Range 16 West, San Juan County, New Mexico, by the injection of water into the Gallup formation through 20 wells initially, all of which wells are within the proposed project area.
- (3) That the proposed pressure maintenance project, to be known as the Northeast Hogback Pressure Maintenance Project, includes lands formerly designated by Order No. R-1494 as part of the Northeast Hogback Unit.
- (4) That the applicant proposes that the Special Rules and Regulations to be established for the Northeast Hogback Pressure Maintenance Project be identical with the rules established by Order No. R-1699 for The Atlantic Refining Company Horseshoe-Gallup Pressure Maintenance Project.

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CASE No. 2317  
Order No. R-2026

(5) That such identical rules should be established in order to prevent conflict in the event the two projects eventually merge.

**IT IS THEREFORE ORDERED:**

(1) That the applicant, Pan American Petroleum Corporation, is hereby authorized to institute a pressure maintenance project in the Horseshoe-Gallup Oil Pool, San Juan County, New Mexico, by the injection of water into the Gallup formation through the following-described wells in Township 36 North, Range 16 West:

**PAN AMERICAN PETROLEUM CORPORATION**

Northeast Hogback Unit Well No. 4, Unit J, Section 14  
Northeast Hogback Unit Well No. 6, Unit B, Section 15  
Northeast Hogback Unit Well No. 10, Unit E, Section 14  
Northeast Hogback Unit Well No. 11, Unit F, Section 14  
Northeast Hogback Unit Well No. 13, Unit E, Section 13  
Northeast Hogback Unit Well No. 14, Unit I, Section 14  
Northeast Hogback Unit Well No. 16, Unit K, Section 13  
Northeast Hogback Unit Well No. 17, Unit M, Section 13  
Northeast Hogback Unit Well No. 20, Unit B, Section 24  
Northeast Hogback Unit Well No. 21, Unit D, Section 15  
Northeast Hogback Unit Well No. 22, Unit G, Section 15  
Northeast Hogback Unit Well No. 23, Unit B, Section 10  
Northeast Hogback Unit Well No. 25, Unit D, Section 11  
Northeast Hogback Unit Well No. 29, Unit F, Section 11  
Northeast Hogback Unit Well No. 30, Unit L, Section 10  
Northeast Hogback Unit Well No. 32, Unit L, Section 11  
Northeast Hogback Unit Well No. 37, Unit P, Section 10

**EL PASO NATURAL GAS PRODUCTS COMPANY**

Williams Well No. 2, Unit P, Section 11  
Williams Well No. 3, Unit J, Section 11

**ABRAHAM**

Federal Well No. 3, Unit B, Section 14

(2) That Special Rules and Regulations governing the operation of the Northeast Hogback Pressure Maintenance Project, San Juan County, New Mexico, are hereby promulgated, as follows:

**SPECIAL RULES AND REGULATIONS  
FOR THE**

**NORTHEAST HOGBACK PRESSURE MAINTENANCE PROJECT**

**RULE 1.** The project area of the Northeast Hogback Pressure Maintenance Project, hereinafter referred to as the Project, shall

comprise the following-described acreage in San Juan County, New Mexico:

TOWNSHIP 30 NORTH, RANGE 16 WEST, N21PM

Section 10: E/2 and SW/4  
Section 11: SW/4 NE/4, W/2 and the SE/4  
Section 12: W/2 SW/4  
Section 13: SW/4, W/2 NW/4 and the W/2 SE/4  
Section 14: E/2, E/2 SW/4 and the SE/4  
Section 15: NE/4 and the N/2 NW/4  
Section 23: NE/4 NE/4  
Section 24: NW/4 NE/4 and the N/2 NW/4

RULE 2. The allowable for the Project shall be the sum of the allowables of the several wells within the project area, including those wells which are shut-in, curtailed, or used as injection wells. Allowables for all wells shall be determined in a manner hereinafter prescribed.

RULE 3. Allowables for injection wells may be transferred to producing wells within the project area, as may the allowables for producing wells which, in the interest of more efficient operation of the Project, are shut-in or curtailed because of high gas-oil ratio or are shut-in for any of the following reasons: pressure regulation, control of pattern or sweep efficiencies, or to observe changes in pressures or changes in characteristics of reservoir liquids or progress of sweep.

RULE 4. The allowable assigned to any well which is shut-in or which is curtailed in accordance with the provisions of Rule 3, which allowable is to be transferred to any well or wells in the project area for production, shall in no event be greater than its ability to produce during the test prescribed by Rule 6, below, or greater than the current top unit allowable for the pool during the month of transfer, whichever is less.

RULE 5. The allowable assigned to any injection well on a 40-acre proration unit shall be top unit allowable for the Horseshoe-Gallup Oil Pool.

RULE 6. The allowable assigned to any well which is shut-in or curtailed in accordance with Rule 3, shall be determined by a 24-hour test at a stabilized rate of production, which shall be the final 24-hour period of a 72-hour test throughout which the well should be produced in the same manner and at a constant rate. The daily tolerance limitation set forth in Commission Rule 502 I (a) and the limiting gas-oil ratio (2,000 to 1) for the Horseshoe-Gallup Oil Pool shall be waived during such tests. The project operator shall notify all operators offsetting the well, as well as the Commission, of the exact time such tests are to be conducted. Tests may be witnessed by representatives of the offsetting operators and the Commission, if they so desire.

**RULE 7.** The allowable assigned to each producing well in the Project shall be equal to the well's ability to produce or to top unit allowable for the Horseshoe-Gallup Oil Pool, whichever is less, provided that any producing well in the project area which directly or diagonally offsets a well outside the project area producing from the same common source of supply shall not produce in excess of two times top unit allowable for the pool. Each producing well shall be subject to the limiting gas-oil ratio (2,000 to 1) for the Horseshoe-Gallup Oil Pool, except that any well or wells within the project area producing with a gas-oil ratio in excess of 2,000 cubic feet of gas per barrel of oil may be produced on a "net" gas-oil ratio basis, which net gas-oil ratio shall be determined by applying credit for daily average gas injected, if any, into the Horseshoe-Gallup Oil Pool within the project area to such high gas-oil ratio well. The daily adjusted oil allowable for any well receiving gas injection credit shall be determined in accordance with the following formula:

$$A_{adj} = \frac{TUA \times F_a \times 2,000}{\frac{P_g - I_g}{P_o}}$$

where:

- $A_{adj}$  = the well's daily adjusted allowable
- $TUA$  = top unit allowable for the pool
- $F_a$  = the well's acreage factor
- $P_g$  = average daily volume of gas produced by the well during the preceding month, cubic feet
- $I_g$  = the well's allocated share of the daily average gas injected during the preceding month, cubic feet
- $P_o$  = average daily volume of oil produced by the well during the preceding month, barrels

In no event shall the amount of injected gas being credited to a well be such as to cause the net gas-oil ratio,  $\frac{P_g - I_g}{P_o}$ , to be less than 2,000 cubic feet of gas per barrel of oil produced.

**RULE 8.** Credit for daily average net water injected into the Horseshoe-Gallup Oil Pool through any injection well located within the project area may be converted to its gas equivalent and applied to any well producing with a gas-oil ratio in excess

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CASE No. 2317  
Order No. R-2026

of two thousand cubic feet of gas per barrel of oil. Total credit for net water injected in the project area shall be the gas equivalent volume of the daily average net water injected during a one-month period. The daily average gas equivalent of net water injected shall be computed in accordance with the following formula:

$$E_g = (V_w \text{ inj} - V_w \text{ prod}) \times 5.61 \times \frac{P_a}{15.025} \times \frac{520^\circ}{T_r} \times \frac{1}{Z}$$

where:

- $E_g$  - Average daily gas equivalent of net water injected, cubic feet
- $V_w \text{ inj}$  - Average daily volume of water injected, barrels
- $V_w \text{ prod}$  - Average daily volume of water produced, barrels
- 5.61 - Cubic feet equivalent of one barrel of water
- $P_a$  - Average reservoir pressure at mid-point of the pay-zones of Horseshoe-Gallup Oil Pool in project area, psig + 12.01, as determined from most recent survey
- 15.025 - Pressure base, psi
- $520^\circ$  - Temperature base of  $60^\circ\text{F}$  expressed as absolute temperature
- $T_r$  - Reservoir temperature of  $87^\circ\text{F}$  expressed as absolute temperature ( $547^\circ\text{R}$ )
- $Z$  - Compressibility factor from analysis of Horseshoe-Gallup gas at average reservoir pressure,  $P_a$ , interpolated from compressibility tabulation below:

Reservoir Pressure	Z	Reservoir Pressure	Z	Reservoir Pressure	Z
50	.9725	300	.8325	550	.6560
100	.9465	350	.8030	600	.6135
150	.9215	400	.7710	650	.5655
200	.8885	450	.7220	700	.5220
250	.8600	500	.6900	750	.4630
				800	.3935

**RULE 2.** Each month the project operator shall, within three days after the normal unit allowable for Northwest New Mexico has

-4-  
CASE No. 2317  
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been established, submit to the Commission a Pressure Maintenance Project Operator's Report, on a form prescribed by the Commission, outlining thereon the data required, and requesting allowables for each of the several wells in the Project as well as the total Project allowable. The aforesaid Pressure Maintenance Project Operator's Report shall be filed in lieu of Form C-120 for the Project.

**RULE 10.** The Commission shall, upon review of the report and after any adjustments deemed necessary, calculate the allowable for each well in the Project for the next succeeding month in accordance with these rules. The sum of the allowables so calculated shall be assigned to the Project and may be produced from the wells in the Project in any proportion except that no well in the Project which directly or diagonally offsets a well outside the Project producing from the same common source of supply shall produce in excess of two times top unit allowable for the Pool.

**RULE 11.** The conversion of producing wells to injection, the drilling of additional wells for injection, and expansion of the project area shall be accomplished only after approval of the same by the Secretary-Director of the Commission. To obtain such approval, the Project operator shall file proper application with the Commission, which application, if it seeks authorization to convert additional wells to injection or to drill additional injection wells shall include the following:

(1) A plat showing the location of proposed injection well, all wells within the project area, and offset operators, locating wells which offset the project area.

(2) A schematic drawing of the proposed injection well which fully describes the casing, tubing, perforated interval, and depth showing that the injection of gas or water will be confined to the Gallup formation.

(3) A letter stating that all offset operators to the proposed injection well have been furnished a complete copy of the application and the date of notification.

The Secretary-Director may approve the proposed injection well if, within 30 days after receiving the application, no objection to the proposal is received. The Secretary-Director may grant immediate approval, provided waivers of objection are received from all offset operators.

Expansion of the project area may be approved by the Secretary-Director of the Commission administratively when good cause is shown therefor.

(3) That jurisdiction of this cause is retained for the entry of such further orders as the Commission may deem necessary.

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CASE No. 1317  
Order No. R-2026

DONE at Santa Fe, New Mexico, on the day and year herein-  
above designated.

STATE OF NEW MEXICO  
OIL CONSERVATION COMMISSION



*E. L. Meehan*

EDWIN L. MEEHAN, Chairman

*E. S. Walker*

E. S. WALKER, Member

*A. L. Porter, Jr.*

A. L. PORTER, Jr., Member & Secretary

CSZ/



Case 2317  
Heard 6-28-61  
Rec. B-5-61

1. Grant Pan Am's request for an  
820 flood unit in Horseshoe Gulch  
pool.

2. Use the exact rules as granted.  
Atlantic in R-1699.

3. The Pressure Maintenance area  
includes the following acreage:

30 N-16 W

sec. 10, E 1/2, & SW 1/4,

sec. 11, SW 1/4 NE 1/4, N 1/2, & SE 1/4,

SW 1/4, W 1/2 NW 1/4, W 1/2 SE 1/4,

12, W 1/2 SW 1/4, ~~SW 1/4 NE 1/4, W 1/2 NE 1/4, W 1/2 SE 1/4, W 1/2 NW 1/4~~

13, ~~SW 1/4 NE 1/4, W 1/2 NE 1/4, W 1/2 SE 1/4, W 1/2 NW 1/4~~

14, N 1/2, N 1/2 SW 1/4, SE 1/4,

15, NE 1/4, N 1/2 NW 1/4,

23, NE 1/4 NE 1/4,

24 NW 1/4 NE 1/4, N 1/2 NW 1/4.

This Area is a part of the Northeast  
Horseshoe Unit as approved by R-  
1494.

4. Approve injection wells as shown  
on Exhibit X-7.

Thos. H.  
Unit should be known as The  
Northeast Horseshoe Pressure Maintenance  
Project.

Case 2317

## PAN AMERICAN PETROLEUM CORPORATION

P. O. Box 480, Farmington, New Mexico  
June 2, 1961

File: N-145-986.510.1

Subject: Application for Hearing to  
Consider Pressure Maintenance  
Program, Horseshoe Gallup Oil Pool  
San Juan County, New Mexico

Mr. A. L. Porter, Jr. (3)  
New Mexico Oil Conservation Commission  
P. O. Box 871  
Santa Fe, New Mexico

Dear Sir:

Pan American Petroleum Corporation respectfully requests that  
a hearing be scheduled for the June 28, 1961, examiner docket  
to consider its application for approval of a pressure mainten-  
ance program in the Horseshoe Gallup Oil Pool, San Juan County,  
New Mexico.

Initially water will be injected through Northeast Hogback  
Unit Well Nos. 13, 16, and 17, located in Section 13; Well No.  
14, located in Section 14; and Well No. 20, located in Section 24;  
plus approximately 15 additional water injection wells to be  
located in Sections 10, 11, 14, and 15, all sections being in  
T-30-N, R-16-W. Pan American will also request the adoption  
of special rules to govern the operation of this pressure  
maintenance proposal.

Yours very truly,

PAN AMERICAN PETROLEUM CORPORATION

*T. M. Curtis*  
T. M. Curtis  
District Superintendent

DJR:en

*Horseshoe  
Marked  
6-15-61  
JL*

CASE 2320:  
(Cont.)

Agreement, which unit embraces 1920 acres of State land in Township 11 South, Ranges 34 and 35 East, Lea County, New Mexico.

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The following cases will not be heard before 1:30 P.M.

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CASE 2321:

Application of Benson-Montin-Greer Drilling Corporation for an unorthodox oil well location, San Juan County, New Mexico. Applicant, in the above-styled cause, seeks approval of an unorthodox oil well location in the Cha Cha-Gallup Oil Pool for its Jones Well No. 7, located 1200 feet from the North line and 900 feet from the West line of Section 15, Township 28 North, Range 13 West, San Juan County, New Mexico.

CASE 2322:

Application of Southwest Production Company for an unorthodox oil well location, San Juan County, New Mexico. Applicant, in the above-styled cause, seeks approval of an unorthodox oil well location in the Cha Cha-Gallup Oil Pool for a well to be drilled 2260 feet from the North line and 330 feet from the West line of Section 16, Township 29 North, Range 14 West, San Juan County, New Mexico.

CASE 2323:

Application of Southwest Production Company for two non-standard oil proration units and for an unorthodox oil well location in the Cha Cha-Gallup Oil Pool, San Juan County, New Mexico. Applicant, in the above-styled cause, seeks the establishment of two non-standard oil proration units in the Cha Cha-Gallup Oil Pool, San Juan County, New Mexico, one unit consisting of the West 56.625 acres and one unit consisting of the East 56.625 acres of that portion of the SE/4 of Section 16, Township 29 North, Range 14 West, lying North of the mid-channel of the San Juan River; the West proration unit is to be dedicated to a well to be drilled at an unorthodox location 1912 feet from the South line and 2310 feet from the East line of said Section 16.

CASE 2324:

Application of Aztec Oil & Gas Company for an order force-pooling a standard 320-acre gas proration unit, San Juan County, New Mexico. Applicant, in the above-styled cause, seeks an order force-pooling all mineral interests in a standard 320-acre gas proration unit in the Basin-Dakota Gas Pool, consisting of the N/2 of Section 2, Township 29 North, Range 12 West, San Juan County, New Mexico.

CASE 2325:

Application of Aztec Oil & Gas Company for a non-standard oil proration unit in the Totah-Gallup Oil Pool, San Juan County, New Mexico. Applicant, in the above-styled cause,

CASE 2316:  
(Cont.)

cause, seeks permission to dispose of produced salt water into the Wolfcamp formation through its Lois Wingerd Well No. 8 located 660 feet from the South and East lines of Section 24, Township 12 South, Range 37 East, Gladiola-Wolfcamp Pool, Lea County, New Mexico.

CASE 2317:

Application of Pan American Petroleum Corporation for a pressure maintenance project in the Horseshoe-Gallup Oil Pool, San Juan County, New Mexico, and for special rules governing said project. Applicant, in the above-styled cause, seeks permission to institute a pressure maintenance project in the Horseshoe-Gallup Oil Pool by the injection of water into certain Northeast Hogback Unit wells in Sections 10, 11, 13, 14, 15 and 24, all in Township 30 North, Range 16 West, San Juan County, New Mexico. Applicant further seeks special rules governing the operation of said project.

CASE 2318:

Application of El Paso Natural Gas Products Company for an order force-pooling a non-standard oil proration unit in the Cha Cha-Gallup Oil Pool, San Juan County, New Mexico. Applicant, in the above-styled cause, seeks an order force-pooling all mineral interests in the Cha Cha-Gallup Oil Pool lying North of the mid-channel of the San Juan River in the SE/4 of Section 17, Township 29 North, Range 14 West, San Juan County, New Mexico. Interested parties include Humble Oil & Refining Company, Pan American Petroleum Corporation, and A. L. Duff.

CASE 2319:

Application of Tenneco Oil Company for a non-standard oil proration unit and for permission to commingle the production from separate leases, San Juan County, New Mexico. Applicant, in the above-styled cause, seeks the establishment of a 90.5-acre non-standard oil proration unit in the Cha Cha-Gallup Oil Pool consisting of lots 3 and 4 and the E/2 SW/4 of Section 31, Township 29 North, Range 13 West, San Juan County, New Mexico. Applicant further seeks permission to commingle the Gallup oil production from the subject unit with other Gallup oil production from the E/2 W/2 and from the E/2 of said Section 31 after separately metering the production from each area.

CASE 2320:

Application of R. C. Banks for approval of the High Point Unit Agreement, Lea County, New Mexico. Applicant, in the above-styled cause, seeks approval of the High Point Unit

No. 18-61

DOCKET: EXAMINER HEARING - WEDNESDAY, JUNE 28, 1961

9 A.M. - OIL CONSERVATION COMMISSION CONFERENCE ROOM  
STATE LAND OFFICE BUILDING, SANTA FE, NEW MEXICO

The following cases will be heard before Elvis A. Utz, Examiner or Daniel S. Nutter, as alternate Examiner:

CONTINUED CASE

CASE 2298: Application of Chambers & Kennedy for a gas-oil dual completion, Lea County, New Mexico. Applicant, in the above-styled cause, seeks an order authorizing the dual completion of its Monument State Well No. 1, located in Unit J, Section 34, Township 19 South, Range 37 East, Lea County, New Mexico, in such a manner as to permit the production of gas from the Eumont Gas Pool and the production of oil from the Eunice-Monument Pool through the 5½-inch by 2½-inch casing-tubing annulus and through 2½-inch tubing respectively.

NEW CASES

CASE 2309: Application of Texaco Inc. for an oil-oil-oil triple completion, Lea County, New Mexico. Applicant, in the above-styled cause, seeks permission to complete its C. P. Falby (a) Well No. 4, located in Unit E, Section 8, Township 22 South, Range 37 East, Lea County, New Mexico, as a triple completion (conventional) in the Eumont Gas Pool, the Penrose-Skelly Pool, and the Drinkard Pool, the production of oil from each pool to be through parallel strings of 2 3/8-inch tubing.

CASE 2310: Application of Standard Oil Company of Texas for permission to transfer allowables, Lea County, New Mexico. Applicant, in the above-styled cause, during vertical communication tests, seeks permission to transfer allowables in the Vacuum Abo Pool for a 120-day period from its Vac-Edge Unit Well No. 4, located in the NW/4 NE/4 of Section 4, Township 18 South, Range 35 East, Lea County, New Mexico, to its Vac-Edge Unit Wells Nos. 3 and 6, located in the NE/4 NW/4 of said Section 4 and in the NE/4 NE/4 of said Section 4, respectively.

CASE 2311: Application of Continental Oil Company for an oil-oil dual completion, Lea County, New Mexico. Applicant, in the above-styled cause, seeks permission to complete its Britt B-15 Well No. 10, located in Unit F, Section 15, Township 20 South, Range 37 East, Lea County, New Mexico, as a dual completion (conventional) in an undesignated Blinbry Pool and in the Monument-Tubb Pool, the production of oil from each pool to be through parallel strings of 2-inch tubing.

- CASE 2312: Application of Continental Oil Company for an exception to Rule 309 (a), Lea County, New Mexico. Applicant, in the above-styled cause, seeks an exception to Rule 309 (a) to permit the commingling, after separate measurement, of the Maljamar-Paddock Pool production from the William Mitchell "A" lease, consisting of the N/2 of Sections 19 and 20, and from the William Mitchell "B" lease, consisting of the W/2 and the W/2 E/2 of Section 17, the E/2 and the E/2 W/2 of Section 18, and the S/2 of Sections 19 and 20, all in Township 17 South, Range 32 East, Lea County, New Mexico.
- CASE 2313: Application of W. W. Holmes for an order fixing the spacing of wells, Sandoval County, New Mexico. Applicant, in the above-styled cause, seeks an order fixing the spacing of wells producing from the Mesaverde formation in the N/2 of Section 11, Township 18 North, Range 3 West, Sandoval County, New Mexico. Applicant recommends the establishment of two and one-half acre well spacing with no increase in the allowable to be assigned a basic 40-acre oil proration unit.
- CASE 2314: Application of Shell Oil Company for an exception to the gas-oil ratio provisions of Rule 26 (A), Order No. R-1670, Lea County, New Mexico. Applicant, in the above-styled cause, seeks an exception to the gas-oil ratio provisions of Rule 26 (A), Order No. R-1670, to permit its Shell State Well No. 1-A, located 380 feet from the North line and 380 feet from the West line of Section 36, Township 24 South, Range 36 East, Lea County, New Mexico, to remain classified as a gas well in the Jalmat Gas Pool, with a gas-oil ratio below 100,000: 1.
- CASE 2315: Application of Pan American Petroleum Corporation for a non-standard oil proration unit and for an unorthodox oil well location, San Juan County, New Mexico. Applicant, in the above-styled cause, seeks the establishment of an 86.62-acre non-standard oil proration unit in the Totah-Gallup Oil Pool consisting of Lots 2, 3 and 4 of Section 12, Township 28 North, Range 13 West, San Juan County, New Mexico, to be dedicated to the Gallegos Canyon Unit Well No. 100 at an unorthodox location 476 feet from the North line and 1980 feet from the West line of said Section 12.
- CASE 2316: Application of Pan American Petroleum Corporation for permission to dispose of salt water into the Wolfcamp formation, Lea County, New Mexico. Applicant, in the above-styled

CASE 2325:  
(Cont.)

seeks the establishment of an 86.13-acre non-standard oil proration unit in the Totah-Gallup Oil Pool, consisting of Lot 1, the NE/4 NW/4 and the NW/4 NE/4 of Section 30, Township 29 North, Range 13 West, San Juan County, New Mexico, to be dedicated to the Hagood Well No. 28-G located 765 feet from the North line and 3175 feet from the East line of said Section 30.

CASE 2326:

Application of David Fasken for permission to drill directionally, Roosevelt County, New Mexico. Applicant, in the above-styled cause, seeks permission to sidetrack and recomplete the David Fasken-King-Davis Well No. 2, located 1980 feet from the North line and 1980 feet from the West line of Section 27, Township 8 South, Range 37 East, Roosevelt County, New Mexico, in such a manner as to locate the bottom of the hole in the Bough "C" formation of the Bluit-Pennsylvanian Pool 300 feet West of said surface location.

CASE 2327:

Application of the Oil Conservation Commission on its own motion to consider the establishment of non-standard gas proration units for the Basin-Dakota Pool in Townships 29, 30, 31 and 32 North, Ranges 4, 5, 6, 7, 8, 9, 11, 12, 13 West, San Juan and Rio Arriba Counties, New Mexico. Said non-standard units are necessitated by irregular sections resulting from survey corrections in the United States Public Lands Survey.

DRILLING AND COMPLETION PROGRAM  
WATER WELL NO. 1  
NORTHEAST HOGBACK UNIT

Location: SW/4 NE/4 Section 10, T-30-N, R-16-W

Formation: Morrison

Total Depth: 2900 feet

Type Tools: Rotary

Logs: ES-Induction log from surface casing seat to total depth

Mud Program: Native mud and water

Casing Program: Surface - 200' of 16" casing  
Oil String - 2900' of 10-3/4" casing

Cementing Program: Surface String - Neat cement will be circulated.  
Oil String - Will be cemented by the two-stage method. First stage will be cemented with enough cement to bring top of cement to the top of the Dakota. Stage tool will be set at the top of the Greenhorn and enough cement will be placed to bring top of cement about 500 feet above the top of the Gallup formation.

Completion Program: Casing will be set at total depth and porous zones in the Morrison will be selectively perforated. A natural completion will be attempted, however, a sand-water fracture treatment will be used if necessary to obtain sufficient productivity.

Approximately 500 feet of Morrison sand is expected to be penetrated.

**BEFORE EXAMINER UTZ**

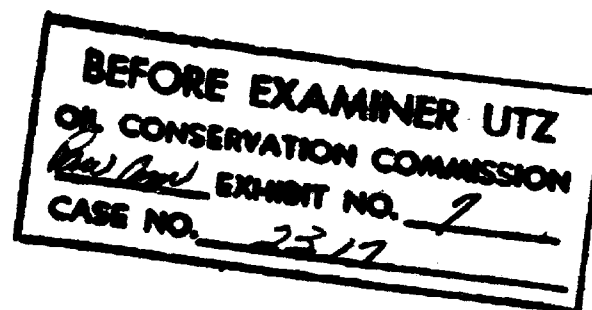
**OK CONSERVATION COMMISSION**

*Paulson* **EXHIBIT NO. 5**

**CASE NO. 2317**



CASING AND CEMENTING PROGRAM  
WATER INJECTION WELLS  
PRESSURE MAINTENANCE PROJECT  
NORTHEAST HOGBACK UNIT



PAN AMERICAN PETROLEUM CORPORATION

Northeast Hogback Unit No. 4

PB to 3206 with 275 sx. cmt. with 10% sn.  
8-5/8" CSA 207 with 160 sx. of 2% CaCl<sub>2</sub> cmt.  
5-1/2" CSA 3701 with 80 sx. 4% gel cmt. plus 50 sx. neat.

Northeast Hogback Unit No. 6

8-5/8" CSA 110 with 80 sx. of 2% CaCl<sub>2</sub> cmt.  
5-1/2" CSA 1748 with 80 sx. 6% gel cmt. plus 50 sx. neat.

Northeast Hogback Unit No. 10

8-5/8" CSA 98 with 80 sx. of 2% CaCl<sub>2</sub> cmt.  
5-1/2" CSA 2546 with 80 sx. of 6% gel cmt. plus 50 sx. neat.

Northeast Hogback Unit No. 11

8-5/8" CSA 210 with 160 sx. of 2% CaCl<sub>2</sub> cmt.  
5-1/2" CSA 3133 with 80 sx. 6% gel cmt. plus 50 sx. neat.

Northeast Hogback Unit No. 13

8-5/8" CSA 217 with 160 sx. of 2% CaCl<sub>2</sub> cmt.  
5-1/2" CSA 3813 with 80 sx. of 6% gel cmt. plus 50 sx. neat.

Northeast Hogback Unit No. 14

8-5/8" CSA 215 with 160 sx. 2% CaCl<sub>2</sub> Cmt.  
5-1/2" CSA 3847 with 90 sx. 6% gel cmt. plus 50 sx. neat.

Northeast Hogback Unit No. 16

8-5/8" CSA 212 with 160 sx. 2% CaCl<sub>2</sub> cmt.  
5-1/2" CSA 4004 with 80 sx. 6% gel cmt. plus 50 sx. neat.

Northeast Hogback Unit No. 17

8-5/8" CSA 211 with 160 sx. 2% CaCl<sub>2</sub> cmt.  
5-1/2" CSA 3928 with 80 sx. 6% gel cmt plus 50 sx. neat.

Northeast Hogback Unit No. 20

8-5/8" CSA 215 with 160 sx. 2% CaCl<sub>2</sub> cmt.  
5-1/2" CSA 4054 with 80 sx. 6% gel cmt. plus 50 sx. neat.

Northeast Hogback Unit No. 21

8-5/8" CSA 95 with 100 sx. of 1% CaCl<sub>2</sub> cmt.  
5-1/2" CSA 1535 with 80 sx. 6% gel cmt. plus 50 sx. neat.

Northeast Hogback Unit No. 22

8-5/8" CSA 94 with 80 sx. 2% CaCl<sub>2</sub> cmt.  
5-1/2" CSA 1867 with 80 sx. 6% gel cmt plus 50 sx. neat.

Northeast Hogback Unit No. 23

8-5/8" CSA 217 with 160 sx. neat.  
5-1/2" CSA 1685 with 100 sx. 6% gel cmt. plus 50 sx. neat.

Northeast Hogback Unit No. 25

8-5/8" CSA 215 with 160 sx. neat.  
4-1/2" CSA 1728 with 120 sx. 6% gel cmt. plus 50 sx. neat.

Northeast Hogback Unit No. 29

8-5/8" CSA 214 with 160 sx. neat.  
4-1/2" CSA 1980 with 120 sx. 6% gel cmt. plus 50 sx. neat.

Northeast Hogback Unit No. 30

8-5/8" CSA 95 with 80 sx. 2% CaCl<sub>2</sub> cmt.  
5-1/2" CSA 1602 with 80 sx. 6% gel cmt. plus 50 sx. neat.

Northeast Hogback Unit No. 32

8-5/8" CSA 211 with 135 sx. neat cmt.  
4-1/2" CSA 1978 with 120 sx. 6% gel cmt. plus 50 sx. neat.

Northeast Hogback Unit No. 37

8-5/8" CSA 212 with 160 sx. 2% CaCl<sub>2</sub> cmt.  
5-1/2" CSA 1882 with 80 sx. 6% gel cmt. plus 50 sx. neat.

EL PASO NATURAL GAS PRODUCTS COMPANY

Williams No. 2

8-5/8" CSA 120 with 125 sx.  
5-1/2" CSA 2645 with 100 sx.

Williams No. 3

9-5/8" CSA 183 with 100 sx.  
5-1/2" CSA 2166 with 100 sx.

ABRAHAM

Federal No. 3

10-3/4" CSA 115 with 75 sx.  
5-1/2" CSA 2942 with 225 sx.

BEFORE EXAMINER UTZ  
OIL CONSERVATION COMMISSION  
*Ben Am* EXHIBIT NO. 8  
CASE NO. 2317

PERTINENT DATA SHEET  
RESERVOIR ROCK AND RESERVOIR FLUID PROPERTIES

Original Reservoir Pressure, psig	215
Estimated Reservoir Pressure at Initial Injection, psig	40
Reservoir Temperature, °F	70-110
Saturation Pressure, psig	215
Solution Gas-Oil Ratio, ft <sup>3</sup> /Bbl.	147
Formation Volume Factor	1.07
Crude Viscosity, cp (87°F & 215 psig)	1.63
Water Viscosity, cp (87°F)	0.88
Crude Gravity, °API	41-42
Producing Mechanism	Solution Gas Drive
Average Porosity (Lower Zone), %	9.5
Average Porosity (Upper Zone), %	7.25
Permeability (Lower Zone), Md	0.25-105
Permeability (Upper Zone), Md	0.25-5.0
Average Water Saturation (Lower Zone), %	32.5
Average Water Saturation (Upper Zone), %	32.5
Average Pay Thickness (Lower), ft.	25
Average Pay Thickness (Upper), ft.	5

PRESSURE MAINTENANCE PERFORMANCE

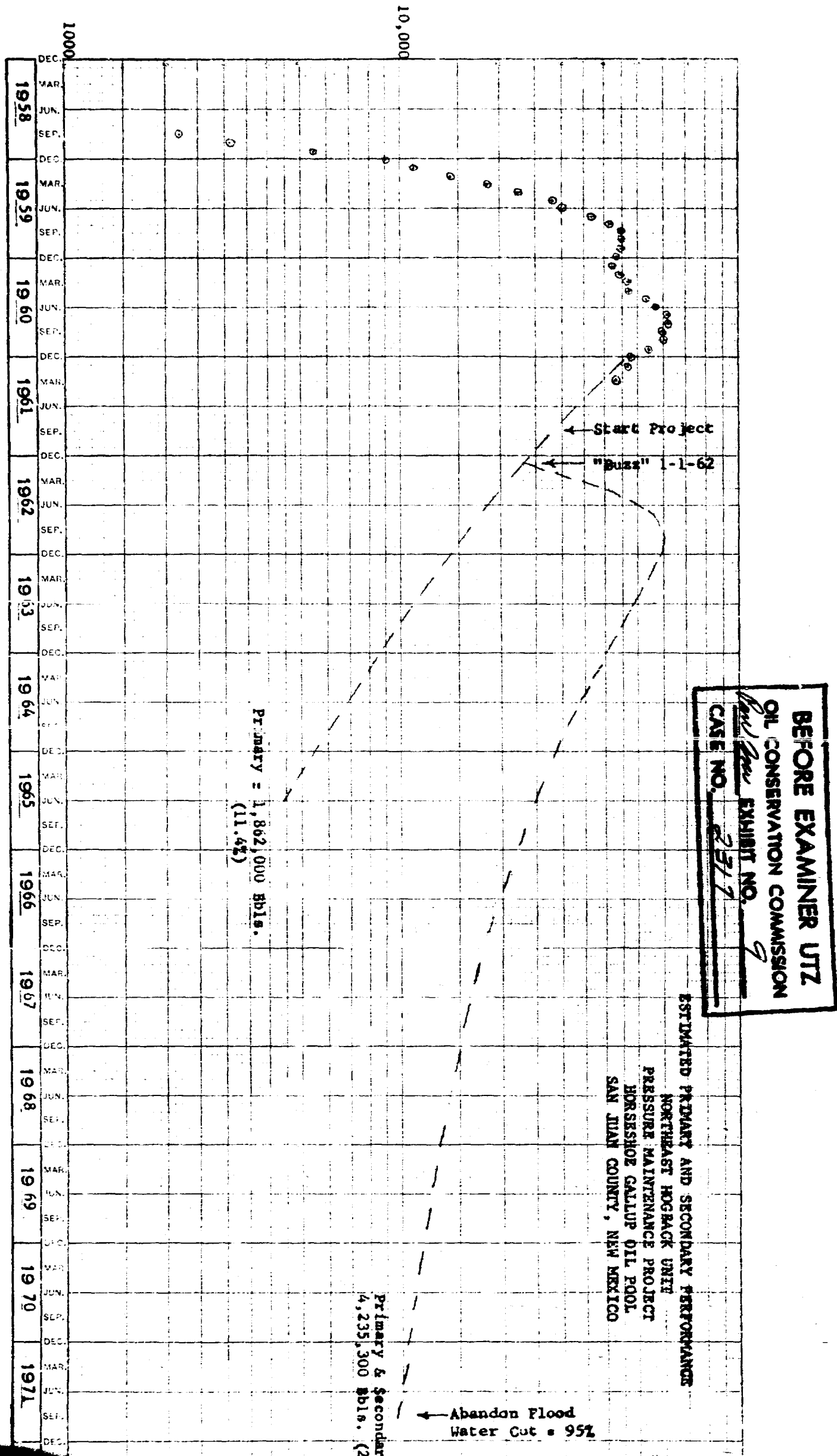
Ultimate Primary Recovery, Bbls.	1,862,000
Ultimate Primary Recovery, %	11.4
Ultimate Recovery (Primary & Secondary), Bbls.	4,235,300
Ultimate Recovery (Primary & Secondary), %	25.8
Peak Production Rate, Bbls. per month	60,000
Water Injectivity, BWPD/Well (Upper Zone)	100
Water Injectivity, BWPD/Well (Lower Zone)	500
Water Injection Pressure, psig	700
Time for "Buzz" to Occur, Months After Initial Injection	4
Time for Fill-Up, Months After Initial Injection	11
Life of Project, Years	10
Water Cut at Abandonment, %	95

WATER SUPPLY

Formation	Morrison
Depth, ft.	2900'
Estimated Production Rate, BWPD	8,000-9,000
Sulfate Content, ppm	2,000-5,000
Static Fluid Level, ft.	400
Working Fluid Level, ft.	1,000

One filter will be used to remove mill scale when the project is started.

MONTHLY OIL PRODUCTION, BBLs.



NO. 3197, TEN YEARS OF MONTHLY & QUARTERLY OIL PRODUCTION

UTZ OIL CONSERVATION COMPANY, INC. NEWBOLD, MASS. 01540

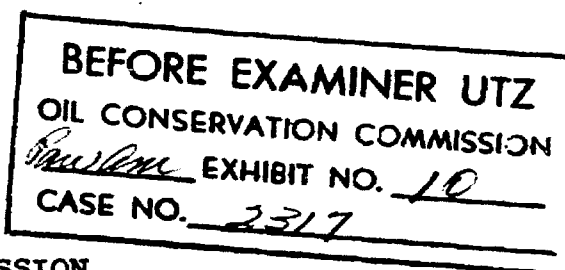
UTZ OIL CONSERVATION COMPANY, INC. NEWBOLD, MASS. 01540

BEFORE THE OIL CONSERVATION COMMISSION  
OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE HEARING  
CALLED BY THE OIL CONSERVATION  
COMMISSION OF NEW MEXICO FOR  
THE PURPOSE OF CONSIDERING:

CASE No. 1979  
Order No. R-1699

APPLICATION OF THE ATLANTIC REFINING  
COMPANY FOR A PRESSURE MAINTENANCE  
PROJECT IN THE HORSESHOE-GALLUP OIL  
POOL, SAN JUAN COUNTY, NEW MEXICO,  
AND FOR THE PROMULGATION OF SPECIAL  
RULES GOVERNING THE OPERATION OF  
SAID PROJECT.



ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 o'clock a.m. on June 1, 1960, at Santa Fe, New Mexico, before Elvis A. Utz, Examiner duly appointed by the Oil Conservation Commission of New Mexico, hereinafter referred to as the "Commission," in accordance with Rule 1214 of the Commission Rules and Regulations.

NOW, on this 10th day of June, 1960, the Commission, a quorum being present, having considered the application, the evidence adduced, and the recommendations of the Examiner, Elvis A. Utz, and being fully advised in the premises,

FINDS:

(1) That due public notice having been given as required by law, the Commission has jurisdiction of this cause and the subject matter thereof.

(2) That the applicant, The Atlantic Refining Company, proposes to institute a pressure maintenance project in the Horseshoe-Gallup Oil Pool, San Juan County, New Mexico, by the injection of water into the Gallup formation through 15 wells initially, all of which wells are within the proposed project area which consists of the following-described acreage:

TOWNSHIP 31 NORTH, RANGE 16 WEST, NMPM

Section 18: S/2 SW/4  
Section 19: W/2, W/2 E/2, SE/4 NE/4 and the  
E/2 SE/4  
Section 20: S/2, S/2 NW/4 and the SW/4 NE/4  
Section 29: All  
Section 30: All  
Section 31: E/2, E/2 W/2, NW/4 SW/4 and the W/2 NW/4  
Section 32: All

(3) That the applicant proposes that each month an allowable be established for the Horseshoe-Gallup Pressure Maintenance Project, said allowable to be determined by multiplying the current Northwest New Mexico normal unit allowable for a 40-acre proration unit times the number of 40-acre proration units in the project area on which an injection well is located, plus a normal unit allowable for each 40-acre proration unit on which is located a producing well which has received a response to the water injection, plus an amount for each 40-acre proration unit on which a producing well is located which has not received a response to water injection equal to the well's ability to produce up to normal unit allowable.

(4) That the "response" feature of the applicant's proposed project allowable formula would add considerably to the complexity of administering the project allowable, and it is not necessary from the standpoint of conservation or the protection of correlative rights, nor is it warranted on the basis of economics.

(5) That the necessary investment in order to develop a pressure maintenance project is based in large part on the total number of injection wells required for the efficient operation of the project, and the assignment of a top unit allowable to each injection well, together with the expected increased oil recovery, is an entirely adequate incentive for an operator to initiate a pressure maintenance project.

(6) That the allowable assigned to any producing well in the project area should be no greater than the demonstrated ability of the well to produce, subject to top unit allowable for the Pool. In the case of curtailed or shut-in producing wells, the allowable should be no greater than the demonstrated ability of such well to produce as reflected by a 24-hour test at a stabilized rate of production immediately prior to such shut-in or curtailment. In no event should such allowable be greater than the current normal unit allowable for the Horseshoe-Gallup Oil Pool during the month of transfer.

(7) That the applicant also proposes that an administrative procedure be established whereby the pressure maintenance project may be expanded for good cause shown, and whereby additional wells in the project area may be converted to water injection.

(8) That Special Rules and Regulations for the operation of the Horseshoe-Gallup Pressure Maintenance Project should be promulgated and, for operational convenience, such rules should provide certain flexibility in authorizing the production of the project allowable from any well or wells in the project in any proportion, provided that no well in the project area which directly or diagonally offsets a well outside the project area producing from the same common source of supply should be allowed

CASE No. 1979  
Order No. R-1699

to produce in excess of two times top unit allowable for the Horseshoe-Gallup Oil Pool.

IT IS THEREFORE ORDERED:

(1) That the applicant be and the same is hereby authorized to institute a Pressure Maintenance Project in the Horseshoe-Gallup Oil Pool, San Juan County, New Mexico, by the injection of water into the Gallup formation through the following-described wells in Township 31 North, Range 16 West:

Navajo "B" Well No. 1, Unit N, Section 19  
Navajo "B" Well No. 3, Unit P, Section 19  
Navajo "B" Well No. 4, Unit J, Section 19  
Navajo "B" Well No. 5, Unit F, Section 19  
Navajo "B" Well No. 7, Unit N, Section 20  
Navajo "B" Well No. 8, Unit L, Section 20  
Navajo "A" Well No. 22, Unit J, Section 29  
Navajo "A" Well No. 23, Unit F, Section 29  
Navajo "A" Well No. 24, Unit D, Section 29  
Navajo "A" Well No. 26, Unit B, Section 29  
Navajo "A" Well No. 9, Unit B, Section 30  
Navajo "A" Well No. 16, Unit H, Section 31  
Navajo "A" Well No. 17, Unit B, Section 31  
Navajo "A" Well No. 28, Unit J, Section 31  
Navajo "A" Well No. 29, Unit F, Section 31

(2) That Special Rules and Regulations governing the operation of The Atlantic Refining Company Horseshoe-Gallup Pressure Maintenance Project, San Juan County, New Mexico, be and the same are hereby promulgated as follows, effective July 1, 1960:

SPECIAL RULES AND REGULATIONS FOR THE ATLANTIC  
REFINING COMPANY HORSESHOE-GALLUP PRESSURE  
MAINTENANCE PROJECT

RULE 1. The project area of The Atlantic Refining Company Horseshoe-Gallup Pressure Maintenance Project, hereinafter referred to as the Project, San Juan County, New Mexico shall comprise that area described as follows:

TOWNSHIP 31 NORTH, RANGE 16 WEST, NMPM  
Section 18: S/2 of the SW/4  
Section 19: W/2, W/2 E/2, SE/4 NE/4 and the  
E/2 SE/4  
Section 20: S/2, S/2 NW/4, SW/4 NE/4  
Section 29: All  
Section 30: All  
Section 31: E/2, E/2 W/2, NW/4 SW/4 and  
the W/2 NW/4  
Section 32: All



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RULE 2. The allowable for the Project shall be the sum of the allowables of the several wells within the project area, including those wells which are shut-in, curtailed, or used as injection wells. Allowables for all wells shall be determined in a manner hereinafter prescribed.

RULE 3. Allowables for injection wells may be transferred to producing wells within the project area, as may the allowables for producing wells which, in the interest of more efficient operation of the Project, are shut-in or curtailed because of high gas-oil ratio or are shut-in for any of the following reasons: pressure regulation, control of pattern or sweep efficiencies, or to observe changes in pressures or changes in characteristics of reservoir liquids or progress of sweep.

RULE 4. The allowable assigned to any well which is shut-in or which is curtailed in accordance with the provisions of Rule 3, which allowable is to be transferred to any well or wells in the project area for production, shall in no event be greater than its ability to produce during the test prescribed by Rule 6, below, or greater than the current top unit allowable for the pool during the month of transfer, whichever is less.

RULE 5. The allowable assigned to any injection well on a 40-acre proration unit shall be top unit allowable for the Horseshoe-Gallup Oil Pool.

RULE 6. The allowable assigned to any well which is shut-in or curtailed in accordance with Rule 3, shall be determined by a 24-hour test at a stabilized rate of production, which shall be the final 24-hour period of a 72-hour test throughout which the well should be produced in the same manner and at a constant rate. The daily tolerance limitation set forth in Commission Rule 502 I (a) and the limiting gas-oil ratio (2,000 to 1) for the Horseshoe-Gallup Oil Pool shall be waived during such tests. The project operator shall notify all operators offsetting the well, as well as the Commission, of the exact time such tests are to be conducted. Tests may be witnessed by representatives of the offsetting operators and the Commission, if they so desire.

RULE 7. The allowable assigned to each producing well in the Project shall be equal to the well's ability to produce or to top unit allowable for the Horseshoe-Gallup Oil Pool, whichever is less, provided that any producing well in the project area which directly or diagonally offsets a well outside the project area producing from the same common source of supply shall not produce in excess of two times top unit allowable for the pool. Each producing well shall be subject to the limiting gas-oil ratio (2,000 to 1) for the Horseshoe-Gallup Oil Pool, except that any well or wells within the project area producing with a gas-oil ratio in excess of 2,000 cubic feet of gas per barrel of oil may be

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produced on a "net" gas-oil ratio basis, which net gas-oil ratio shall be determined by applying credit for daily average gas injected, if any, into the Horseshoe-Gallup Oil Pool within the project area to such high gas-oil ratio well. The daily adjusted oil allowable for any well receiving gas injection credit shall be determined in accordance with the following formula:

$$A_{adj} = \frac{TUA \times F_a \times 2,000}{\frac{P_g - I_g}{P_o}}$$

where:

- $A_{adj}$  = the well's daily adjusted allowable
- $TUA$  = top unit allowable for the pool
- $F_a$  = the well's acreage factor
- $P_g$  = average daily volume of gas produced by the well during the preceding month, cubic feet
- $I_g$  = the well's allocated share of the daily average gas injected during the preceding month, cubic feet
- $P_o$  = average daily volume of oil produced by the well during the preceding month, barrels

In no event shall the amount of injected gas being credited to a well be such as to cause the net gas-oil ratio,  $\frac{P_g - I_g}{P_o}$  to

be less than 2,000 cubic feet of gas per barrel of oil produced.

**RULE 8.** Credit for daily average net water injected into the Horseshoe-Gallup Oil Pool through any injection well located within the project area may be converted to its gas equivalent and applied to any well producing with a gas-oil ratio in excess of two thousand cubic feet of gas per barrel of oil. Total credit for net water injected in the project area shall be the gas equivalent volume of the daily average net water injected during a one-month period. The daily average gas equivalent of net water injected shall be computed in accordance with the following formula:

$$E_g = (V_{w \text{ inj}} - V_{w \text{ prod}}) \times 5.61 \times \frac{P_a}{15.025} \times \frac{520^C}{T_r} \times \frac{1}{Z}$$

where:

- $E_g$  = Average daily gas equivalent of net water injected, cubic feet
- $V_{w\ inj}$  = Average daily volume of water injected, barrels
- $V_{w\ prod}$  = Average daily volume of water produced, barrels
- 5.61 = Cubic foot equivalent of one barrel of water
- $P_a$  = Average reservoir pressure at mid-point of the pay-zones of Horseshoe-Gallup Oil Pool in project area, psig + 12.01, as determined from most recent survey
- 15.025 = Pressure base, psi
- 520° = Temperature base of 60°F expressed as absolute temperature
- $T_r$  = Reservoir temperature of 87°F expressed as absolute temperature (547°R)
- $Z$  = Compressibility factor from analysis of Horseshoe-Gallup gas at average reservoir pressure,  $P_a$ , interpolated from compressibility tabulation below:

Reservoir Pressure	Z	Reservoir Pressure	Z	Reservoir Pressure	Z
50	.9725	300	.8325	550	.6560
100	.9465	350	.8030	600	.6135
150	.9215	400	.7710	650	.5655
200	.8885	450	.7220	700	.5220
250	.8600	500	.6900	750	.4630
				800	.3935

**RULE 9.** Each month the project operator shall, within three days after the normal unit allowable for Northwest New Mexico has been established, submit to the Commission a Pressure Maintenance Project Operator's Report, on a form prescribed by the Commission, outlining thereon the data required, and requesting allowables for each of the several wells in the Project as well as the total Project allowable. The aforesaid Pressure Maintenance Project Operator's Report shall be filed in lieu of Form C-120 for the Project.

**RULE 10.** The Commission shall, upon review of the report and

after any adjustments deemed necessary, calculate the allowable for each well in the Project for the next succeeding month in accordance with these rules. The sum of the allowables so calculated shall be assigned to the Project and may be produced from the wells in the Project in any proportion except that no well in the Project which directly or diagonally offsets a well outside the Project producing from the same common source of supply shall produce in excess of two times top unit allowable for the Pool.

RULE 11. The conversion of producing wells to injection, the drilling of additional wells for injection, and expansion of the project area shall be accomplished only after approval of the same by the Secretary-Director of the Commission. To obtain such approval, the Project operator shall file proper application with the Commission, which application, if it seeks authorization to convert additional wells to injection or to drill additional injection wells shall include the following:

(1) A plat showing the location of proposed injection well, all wells within the project area, and offset operators, locating wells which offset the project area.

(2) A schematic drawing of the proposed injection well which fully describes the casing, tubing, perforated interval, and depth showing that the injection of gas or water will be confined to the Gallup formation.

(3) A letter stating that all offset operators to the proposed injection well have been furnished a complete copy of the application and the date of notification.

The Secretary-Director may approve the proposed injection well, if within 20 days after receiving the application, no objection to the proposal is received. The Secretary-Director may grant immediate approval, provided waivers of objection are received from all offset operators.

Expansion of the project area may be approved by the Secretary-Director of the Commission administratively when good cause is shown therefor.

DONE at Santa Fe, New Mexico, on the day and year hereinabove designated.

STATE OF NEW MEXICO  
OIL CONSERVATION COMMISSION

JOHN BURROUGHS, Chairman

MURRAY E. MORGAN, Member

S E A L

esr/

A. L. PORTER, Jr., Member & Secretary