CASE 1904: Application of SUNRAY to amend Order R-1414 as amended by Order R-1414-A and R-1414-B.

Case No.

1904

Application, Transcript,
Small Exhibits, Etc.

BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO

IN THE MATTER OF:

CASE 1904: Application of Sunray Mid-Continent Oil Company for an amendment of Order R-1414, as amended by R-1414-A and R-1414-B. Applicant, in the above-styled cause, seeks an order amending the provisions of Order R-1414 which relate to assignment and transfer of allowables in the Central Bisti LPG-Gas-Water Injection Project, Bisti-Lower Gallup Oil Pool, San Juan County, New Mexico.

State Corporation Commission
Hearing Room
Capitol Building
Santa Fe, New Mexico
February 25, 1960

BEFORE:

Elvia A. Utz, Examiner

TRANSCRIPT OF HEARING

MR. UTZ: Case 1904.

MR. FLINT: Case 1904. Application of Sunray Mid-Continent Oil Company for an amendment of Order R-1414, as amended by R-1414-A and R-1414-B.

MR. KELLY: William B. Kelly of Gilbert, White, and Gilbert, Sunray Mid-Continent, associated with Mr. Bill Loar, member of the Oklahoma bar, who will do the questioning. We

have one witness.

MR. UTZ: Any other appearances in this case?

(Witness sworn.)

THOMAS W. BRINKLEY

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

DIRECT EXAMINATION

BY MR. LOAR:

Q Will you please state your name and occupation?

A My name is Thomas W. Brinkley, chief reservoir engineer Sunray at Tulsa.

Q Have you testified before this Commission previously in that capacity?

A Yes, sir.

Q Were your qualifications accepted at that time?

A Yes.

MR. LOAR: Are Mr. Brinkley's qualifications acceptable?

MR. UTZ: Yes, sir.

Q (By Mr. Loar) Mr. Brinkley, throughout the history of the Bisti Pool, have you continued to make reservoir studies of this Pool?

A Yes, I have.

Q Have you watched carefully the progress of the L.P.G. gas, water injection project in the Central Bisti unit?

A Yes, I have.

Q Has it performed in the way you originally predicted?

A I'm pleased to say that the unit performance is excellent, and as we have expected.

Q Would you please refer to what has been marked Exhibit number 1 and discuss that briefly.

A Exhibit number 1 is entitled "1959 Reservoir Performance Data." You will notice on the bottom we have the time schedule for the year 1959, and on the vertical side, both left and right, we have various scales that correspond to the graphs on the Exhibit. You'll notice we have five graphs, two near the top and three near the bottom portion of the Exhibit. The upper graph represents the injected products per reservoir voidage ratio. Now, that, basically, is the ratio of injected reservoir volumes of gas L.P.G. and water divided by the reservoir production of gas, oil, and water, both units being on reservoir barrels. You'll notice that the first month of unit operation being July, that we had an injected production reservoir voidage reservoir ratio of approximately one, that first trial for the month of July with the scale on the right-hand side near the top. Notice for the month of August we had slightly exceeded the voidage with injected material. For the month of September and October, we approximated a replacement of reservoir voidage; however, for the month of November and December, we have ~~exceeded the withdrawals by over-injecting~~ material, as an example,

the month of December. The value of this ratio is 1.65, which means we have injected 1.65 reservoir barrels of material, gas, water, or L.P.G. per barrel of reservoir voidage.

The second curve from the top represents the volumetric average reservoir pressure in pounds per square inch gauge. You'll notice the first point which is eight hundred and fifteen pounds, have to refer to the scale on the left, eight hundred fifteen pounds represents the reservoir pressure before unit operations. You'll also notice for the months of October, November, and December we have experienced increase in reservoir pressure and the value for December is approximately nine hundred pounds. You'll notice a compatibility between the upper curve and the volumetric average bottom hole pressure. In the lower portion of your Exhibit, you'll notice a heavy line representing the monthly oil production rate. You'll notice, too, that just before unitization, we were averaging approximately eighty-five thousand barrels per month, refer to the scale on the left-hand side. Now, for the months July, August, September, October, November and December, representing the first six months of unit operation, we have averaged approximately forty thousand barrels per month. This value represents a self-imposed allowable at a reduced rate to permit the injection of L.P.G. with its accompanying increase in reservoir pressure.

The next important curve is the average gas-oil ratio. It, too, is a solid line in the lower portion of the Exhibit.

You'll notice in the month of January, we had initial ratio of approximately twelve hundred cubic feet per barrel. The scale is on your right near the base. And for each month thereafter, through the month of July, we noticed a continuously increasing trend in gas-oil ratio values reaching a maximum in July of twenty-eight hundred fifty cubic feet per barrel. Thereafter, ratios have consistently declined month after month, and the December value is just slightly over a thousand cubic feet per barrel.

The lasy curve is the monthly gas production, which is self-explanatory. It is sympathetic with the oil production and the gas-oil ratio.

In summary, these items, that is, rise in reservoir pressure and reduction in gas-oil ratio represent a conservation practice that has resulted in improved productivity from the unit wells and represent the expected early performance for this pressure maintenance project.

Q Now then, Mr. Brinkley, under the present Regulations and Rules now in effect for this project, is the operator required to test and establish a rate of production for each injection well prior to the transfer of allowable and use of that allowable transfer?

A That is correct.

Q What is the location of GI-18?

A The unit well GI-18 is an L.P.G. injection well, and

it is located in the Southwest of the Southwest Section 9, 25 North, and 12 West.

Q Was this well over-produced prior to its use as an injection well?

A No, it was not.

Q Why not?

A GI Number 18 was drilled for injection of L.P.G. and represents one of the ten L.P.G. injection patterns. The completion plan specified for no oil production, no fracturing, and injection was planned to start as soon as possible to maintain injection schedule for unit operations.

Q Then, you never got a test of this well which could be used for allowable transfer purposes?

A That is correct.

Q Have you checked the eight offsets to this well to determine the rate of production at the time GI-18 was completed?

A Yes, I have.

Q Would you give us the average of those eight wells at that time?

A The eight wells directly offsetting GI Number 18, and for the month of October, 1959, the same month that GI-18 was completed, revealed production rates varying from a minimum of fifteen barrels per day to a maximum of fifty-five barrels per day. Now, within this range, two wells--number 27 and 29--represent newly drilled wells completed also in the month of

October, and their respective producing rates on completion are twenty-seven and twenty-one barrels per day. With this data for the eight direct offset wells for GI Number 18, the average, the arithmetic producing average is twenty-eight barrels per well day.

Q Do you recommend that this twenty-eight barrels per day be the amount credited to GI-18 to be available for transfer under the present Rules?

A Yes, I feel that this value of twenty-eight barrels per day well is a representative and reasonably for transfer and is recommended.

Q Now then, Mr. Brinkley, during what period of time did Sunray Mid-Continent inject L.P.G.?

A Initial injection of L.P.G. began on June the 23rd, 1959, and continued to December 15, 1959, during which time we injected nine hundred thirty-seven thousand barrels of commercial L.P.G.

MR. UTZ: What date in December?

A 15.

Q (By Mr. Loar) Now then, what volume of gas has Sunray injected into the project?

A Since unitization began, we have injected a total of five hundred and sixty-five thousand seven hundred and nine m.c.f. to the end of January, 1960.

Q And what is the approximate rate of gas injection

now?

A Currently we are injecting at the rate of approximately eight million cubic feet per day.

Q And are we also, we are also injecting water here, aren't we?

A That is correct.

Q And do you have a figure of the rate of injection on that?

A For the month of January, we were injecting at the rate of approximately thirty-five hundred barrels of water per day.

Q Now then, has all of this injection under this Lower Gallup reservoir brought about an increase in productivity?

A Yes, it has.

Q Does Sunray as unit operator have a continual testing program going on in the Central Bisti unit?

A That is correct.

Q And do we find that the productivity increases and varies between these tests?

A We have detected a continuous increase in productivity from almost every well since we started unit operation.

Q Now then, in order to make this project work, are we attempting to keep the production from each individual injection pattern in balance?

A This is very true. I would like to supplement that

with this: That voidage replacement calculations are being performed every month or oftener since start of unit operations. These calculations are necessary to maintain more than minimum admissibility pressure, as well as balances between patterns, as well as for unit total area.

Q And within area in which we notice rapid changes of productivity and changes in gas-oil ratios, these calculations are made more often than once a month, are they not?

A That is correct.

Q As productivity and gas-oil ratios change, is it necessary to change the producing rate of the wells within the injection rate and between the injection patterns?

A It is. Yes, it is necessary to adjust individual producing rates to provide operating flexibility. This is vital to operating any pressure maintenance type of operation.

Q Under the Rules which we are operating with each individual well being given a specific allowable, is it difficult to maintain the necessary flexibility and to be able to change these rates as frequently as necessary?

A It will be rather accurate and, possibly, impossible to operate with the present field Rules.

Q Do you recommend that the present Rules be changed to give the necessary operating flexibility which you desire?

A Yes, I so.

Q Would you refer to what has been marked as Exhibit

Number 2, and briefly go through the Rules, or the suggested Rules, which we are requesting for this operation?

A Exhibit Number 2 is entitled, "Special Rules and Regulations for Sunray Mid-Continent Oil Company's Central Bisti L.P.G. Gas-Water Injection Project." This Exhibit sets forth a list of nine Rules that are proposed and would be adequate, say, for proper operation of the Central Bisti unit. The proposed Rule 1 describes the unit boundary, and it is the same Rule as currently recognized as the existing Rule Number 1.

Rule Number 2. The first sentence is identical to the existing Rule 2. We have added the second sentence which gives each forty acre and eighty acre tract its current normal unit allowable.

Rule 3 is identical to the existing Rule 3.

The proposed Rule 4 is identical to the existing Rule 4, except the limitation of twice the normal allowable was deleted.

Rule 5. The proposed Rule 5 is identical to the existing Rule 5, except the first sentence was deleted because we are requesting a current normal allowable for each proration unit.

And existing Rules 6, 7 and 8 we are deleting since we propose current unit allowable for each proration unit. The proposed Rule 6 is identical to existing Rule 9, except for minor changes in words in first sentence to reflect the total unit allowable.

Proposed Rule 7 is the same as existing Rule 10, except

it provides for unit allowable in conjunction with this proposed Rule 7.

Sunray does propose to submit an operator's monthly report for information showing results of tests such as gas-oil ratio, bottom hole pressure, and productivity of the wells.

Q At the present time, you are taking these tests, and this information is available on anywhere from monthly test to a weekly test, are they not?

A That is correct.

Q And for at least the initial stages of the project, you propose to continue to take this type of information on at least a monthly basis, do you not?

A That is correct.

Q All right, sir.

A The proposed Rule Number 8 is the same as existing Rule Number 11.

The proposed Rule Number 9, the last, is the same as existing Rule Number 12.

Q In your opinion, do the Rule changes as recommended by you in Exhibit Number 2, give the operator the necessary flexibility for an efficient operation during the pressure maintenance project?

A That is correct.

Q Were Exhibits 1 and 2 prepared by you or under your supervision?

A They were.

MR. LOAR: We move the admission of Exhibits 1, 2 and 3.

MR. UTZ: Without objection, they will be accepted.

MR. LOAR: That's all the direct testimony we have.

MR. UTZ: Any questions of the witness?

MR. NUTTER:: Yes, sir.

MR. UTZ: Mr. Nutter..

CROSS-EXAMINATION

BY MR. NUTTER::

Q Mr. Brinkley, your ratio on injection to production has varied considerably since July through December?

A Right.

Q From less than one to one point sixty-five?

A Right.

Q What do you consider is the ideal ratio?

A The ideal ratio, once we get the pressure in the reservoir above the minimum admissibility pressure, will be one.

Q What is the minimum admissibility pressure?

A Eleven hundred eighty pounds.

Q So, from this pressure you took in December, you still have two hundred eighty pounds to go before you reach that pressure?

A It's not that simple. This second curve on Exhibit 1 is the volumetric average reservoir pressure for the entire unit. Now, the admissibility pressure that we need to maintain

applies only within the ten five spots where we have injected L.P.G.

Q And the pressure in there is probably higher than this average of nine hundred?

A Oh, yes. Close to fourteen hundred pounds.

Q I see. So, do you believe that in some places, then, in the unit area that your injection ratio, after you've achieved these minimum admissibility pressures, your ratio of injection to voidage will be less than one, and in other places in the unit, it will still exceed one?

A It is conceivable that it will vary throughout the unit, but for a unit as a whole, it will be one, or slightly more than that.

Q Now, in order to bring this one point sixty-five to one, what do you expect to do? Reduce the amount of injection, or to increase the rate of production?

A Increase the rate of production.

Q Is that anticipated in the near future?

A Yes.

Q What will the ultimate rate of production be in order to maintain your current rate of injection, or do you intend to maintain the current rate of injection?

A I prefer to answer it this way: We anticipate producing five thousand barrels of stock tank oil per day along with its associated gas, and we will balance that voidage with

the necessary gas and water to maintain prudent operations.

Q In other words, your rate of production is fixed, and the rate of injection will be balanced against the rate of production?

A Correct.

Q To get your injection-production ratio?

A Right. I might state that in order to reach that balance, we buy extraneous gas to make up the difference between that gas that is available after processing so that we can maintain a, shall we say, a steady stabilization.

Q Well now, Mr. Brinkly, oh, first, getting to this GI Number 18 well--

A Yes.

Q --could you give me the individual offsetting wells production rates during October?

A Yes.

Q I think you stated that Number 27 had an initial rate of production during October of twenty-seven, and number twenty-nine, twenty-one barrels. What was 28?

A 28 was thirty-seven. 34 was twenty-two; 35 was twenty-eight; number 42 was eighteen; number 41 was fifteen; and number 40 was fifty-five. That's the total of two hundred twenty-three barrels per day with an arithmetic average of twenty-eight

Q Then you suggest that twenty-eight be the allowable for GI-18?

A That would be the transfer allowable, as accepted as being reasonable and representative at the date it was completed.

Q Well, now, do your proposed Rules contemplate to receive an allowable of eighteen?

A Our proposed Rules are in effect requesting a full forty acre normal current allowable for that well.

Q So, the twenty-eight that you've recommended would be the allowable under the existing Rules as they are today?

A Under the existing Rules, correct.

Q Now, Mr. Brinkley, you said that you felt that the amendment of the existing Rules to conform with your suggested Rules here today would afford you additional flexibility in the operation of this unit?

A Correct.

Q You've omitted Rule 6, Rule 7, and Rule 8 from the existing Rules. Would you tell us how you expect to achieve additional flexibility by the omission of those three Rules?

A Well, our Rule 6, 7---The existing Rule 6, 7, and 8, as I mentioned, were deleted since we propose and request a current unit allowable, normal unit allowable, for each proration unit. And with an allowable like that, then we are in a position to assign allowables, and withdraw from the oil wells surrounding these ten L.P.G. injection wells so that we can maintain a uniform movement of L.P.G. and accomplish the displacement consis-

tent with conservation practices for a pressure maintenance type unit such as we have here at Bisti.

Q Well now, Mr. Brinkley, Rule 6 and Rule 7 specifically apply to the manner in which the allowable is assigned to a well which is used for injection. How does the manner in which the well is used, the allowable of, and injection well affect the flexibility that you have to operate the project?

A It does not contribute to the flexibility of operation, but it does contribute to the total allowable by adding the allowable of the injection well. And, as I mentioned earlier, the five thousand barrels per day that we anticipate, we would have an allowable, if I can say that, much in excess of the five thousand barrels per day, but it does not affect flexibility, as I say, because we would have a greater allowable than we would produce.

Q Under the existing Rules, including Rules 6 and 7, what is the calculated allowable for this current month for this unit, assuming that we were to assign twenty-eight barrels to GI-18?

A Assuming that we have a forty acre proration unit allowable of sixty barrels, and hundred and twenty barrels per day for an eighty acre proration unit, we would have a total of sixty-five hundred and eleven barrels per day adding the transferred allowable.

MR. LOAR: Mr. Brinkley, I think there was some misunder-

standing. Are you asking under the existing Rules or proposed Rules?

MR. NUTTER: Under existing Rules, assuming a forty acre allowable of sixty barrels, and an injection allowable equal to the ability of the well to produce at the time of conversion.

MR. LOAR: I think Mr. Brinkley's answer is based on the proposed Rule rather than the existing Rule?

A This number sixty-five eleven would give us an allowable of sixty-five hundred and eleven, if we achieve the total proration unit allowable for each of the forty and eighty acre proration units. Now, let's see if I have a number for the existing Rules. I don't have that, Bill.

MR. PORTER: Mr. Brinkley, as I understand it, this sixty-five hundred and eleven would be under your proposed Rules?

A It would be under the proposed Rules with this exception, that we are taking credit for a transfer allowable under the existing rules.

MR. PORTER: I see.

Q (By Mr. Nutter) What do you mean there, Mr. Brinkley?

A The total unit allowable that I mentioned of sixty-five hundred eleven barrels per day is incorporating the proposed Rules allocating a full normal allowable for each proration unit, and adding to that the transfer allowable from the injection wells with the existing Rules.

Q I see. In other words, you are assuming a normal unit allowable for each producing tract?

A Right.

Q And, you are adding the injection wells' allowable which is computed under the existing Rule?

A Exactly.

Q And that comes to sixty-five hundred?

A Right.

Q Now, are you assuming twenty-eight barrels for the GI-18 in that, or did you assign any allowable for 18?

A I didn't assign anything for GI-18.

Q So it would be a total of sixty-five thirty-nine?

A That is correct.

Q Now, under your proposed Rules, how much allowable would you have assigned to the project, assuming your proposal that the injection well would receive a current normal unit allowable if located upon a normal eighty acre tract?

A Seventy-three hundred twenty barrels per day.

Q Which would appear to be considerably in excess of the desired rate of production for the unit at any time?

A It is in excess of our current thinking as far as the five thousand barrels per day is concerned, yes.

Q Mr. Brinkley, do you think that the existing Rule which provides that an injection well would receive its rate of production at the time it was converted over is an incentive to

an operator to convert a well early in its life more than to wait until the well is depleted and has a lesser allowable which could be transferred?

A No. I think that is a rather impracticable approach in my opinion. I say that using Bisti as an example. I see no opportunity of any prudent operator taking faster steps in developing field procedures leading to unitization than we have done in Bisti, and the record reflects that our injection wells that we have picked, very few of them are top allowable transfers and a great majority of them are only on fraction of the top allowable, and I think it is rather impracticable and unreasonable to expect an operator encouraged with such an argument.

Q You say you see no opportunity for an operator to take faster action;there is an opportunity for an operator to take slower action?

A Right.

Q Then, if the operator takes slower action and waits for a year or two years from now to institute a pressure maintenance in the Bisti Field, were to receive the same allowable as you would receive, then there is no incentive for you to proceed on a faster scale then he would, is there?

A Other than the fact that L.P.G. flooding requires fast action, and it was not the transfer of allowable per day that we were after, but the opportunity to apply an L.P.G. flood and adhere to the conservation practices. If we had waited

another year, we wouldn't have a project under my conditions.

Q For L.P.G.?

A For L.P.G, yes, and that's what is our driving force, to get an L.P.G. going here. If we waited another year, we wouldn't have an opportunity with any kind of an allowable on an input well.

Q Another year wouldn't be too late to institute the water pressure maintenance program?

A Right. Another year, two years, five years, that is correct.

Q Well, your proposal here is actually based on the premise that an injection tract would receive top unit allowable for the pool regardless of the ability of that tract to produce at any time during its life as a producing tract, is that correct? Even though the tract had been developed originally with a marginal well, if the marginal well were converted to injection later on in the life of the field, it would receive top unit allowable?

A That is correct.

Q Despite the fact that perhaps it never could produce top allowable?

A That is correct.

Q Mr. Brinkley, Rule 7 of the existing Rules provides that a well shall receive an allowable, this referring to transfer wells, a well shall receive an allowable equal to its ability

to produce on a specified test, but that in no event would the well receive an allowable greater than its ability to produce, or greater than top unit allowable for the pool at the time the test was conducted, or greater than the current top unit allowable for the pool during the month of transfer. Could the elimination of any one of those three items afford you greater opportunity to operate your pressure maintenance project?

A Not as far as flexibility is concerned; only an increased allowable.

Q Flexibility, in other words, is not a consideration here?

A No, sir.

Q Well, increased-- The question of increased allowable becomes mute, does it not, when you plan to produce five thousand barrels and your allowable, as calculated under this Rule, would come to seventy-five thirty-nine?

A That is true with the current situation that we have. We have no idea what the future situation might be. We also experience changes, and what not, and if the production demand for this part of the country increases, why, it would afford us an equitable position in the demand picture.

Q Production demand wouldn't have to increase for you to have a fair share of the existing market, would it, Mr. Brinkley?

A Not necessarily.

Q Under your proposed rate of production?

A That's right. That was one example that I gave you. Also, there are benefits, but they are not greater, spend as much money as we have at Bisti, that if proper and equitable credit is not given to an injection well, why, that minimizes, or tends to detract in the operator's eyes the advantages of spending this money toward secondary application. In other words, if the allowable is not given to an input well, the normal proration unit allowable is not given to an input well, and we have to adhere to the present Rules, which we can transfer consistent with its producing rate, then that injection well is penalized as the benefits occur.

Q This participation in total production is not penalized?

A It is penalized if the injection well is always depressed to a low producing capacity and it is never given an opportunity to be upgraded as the benefits accrue to pressure maintenance type operations. We have pointed out the increase in productivity of numerous oil wells, yet there is no benefit accruing by virtue of the injection wells.

Q Well now, in the participation formula for this unit, you don't consider what the allowable of an injection well is for the operator to share in the production from the unit, do you?

A We do to the extent that it fixes the top allowable.

Q In other words, it is the rate of return that affects various operators?

A That's right.

Q But the total production from the unit isn't affected, is it?

A The ultimate recovery isn't affected, but certainly the rate of recovery and the rate at which we pay out our investment and achieve an earning capacity on that investment is certainly affected by the unit allowable.

MR. UTZ: That is the reason you say that an injection well is penalized?

A Right.

MR. UTZ: It is not penalized from the fact that you change?

A It is not penalized in a change in ultimate recovery, but it is penalized in earning capacity.

Q (By Mr. Nutter) The earning capacity does not come from the injection well, from the producing well?

A The injection well is affected by the producing well.

Q Only by rate?

A Only by rate.

MR. NUTTER: That's all, Mr. Brinkley.

BY MR. UTZ:

Q Mr. Brinkley, under your proposed Rule, what do you

figure would be the maximum rate of production from any well?

A I don't know. I can't answer that at this time. I might state this: We are in the process of calculating optimum producing rates from each well making up a ten five spots where the L.P.G. flood is so that we can maintain uniform advancement of L.P.G. slug at all times, and maintain a balance between adjacent five spot patters. I will admit I have not answered your question. I don't know what that answer is yet, and I wouldn't know until we complete these calculations, and the calculations have not been needed until we increase the producing rate, and in the past we have maintained this self-imposed restricted rate and have not needed that information, but all this while, we are gaining more and more test data and continuing our calculations, and that data will be available at some time in the future.

Q What is the normal eighty acre allowable for this present month in the Bisti? One hundred twenty barrels?

A I've used one hundred twenty barrels per eighty acre proration unit.

MR. LOAR: That's the March figure.

Q (By Mr. Utz) Do you anticipate it will be necessary for you to produce at two hundred forty barrels from any well?

A That might be a very good figure. I would hesitate to be tied down to it at this time. I do know some of the wells will be producing less than the normal allowable, and some will

be producing more in respect of two hundred. Two hundred forty barrels might ultimately be a pretty good figure, but I will leave that open until we complete our calculation.

Q Let's assume it would be two hundred forty barrels that you would want to transfer to some wells on the edge of the unit. How would that affect--well, let's look at Sections 12 and 15, and I can't see the Section number on the Section in the middle. What would it be?

A Section 12.

MR. LOAR: 10 is the Section north of Section 15.

Q (By Mr. Utz) Yes, 10. Looking at that area specifically, if you were to transfer as much as two hundred forty barrels to some of those edge wells, how would the correlative rights be protected from your offset to the east?

A I'm not sure that I follow what area you are talking about.

Q Well, if you were to transfer and produce-- Well, let's pick out a well in Section 12. I believe it is your Well Number 2 in the Northeast.

A That's Well Number 12.

MR. LOAR: That's Section 12.

A In Section 12.

Q Section 3.

A Section 3, I beg your pardon.

Q If you were to transfer as much as two hundred and

forty barrels to Well Number 12, how would that affect the Murchison Well Number 3 insofar as recovering its reserve?

A Well, our transfer of allowable does not include using unit Well Number 12. If we could produce unit 12 at two hundred forty barrels a day, it would upset the correlative rights, of course.

Q But, your Rule gives you that opportunity, your proposed Rule, does not it?

A Right.

MR. PORTER: What does the existing Rule give you? How much allowable would it give you for that well?

A Let's see--

MR. LOAR: Rule 4, Mr. Brinkley.

A Gives it two times the normal allowable.

MR. PORTER: That would be the maximum?

A That would be the maximum, yes.

Q (By Mr. Utz) I don't believe that you ever did answer Mr. Nutter's question as to what the March current allowable would be for this unit, unit allowable?

A March current-- No, that was not answered.

Q Do you know what February's was?

A No, I don't.

MR. LOAR: We have not needed it, Mr. Utz, since we have been in January, twelve hundred fifty barrels, February we went to twenty-five hundred, and March we propose to go to thirty-

seven fifty, but we have not needed to calculate the top because we have not gotten approached to check it.

MR. PORTER: Mr. Brinkley, at one time in considering this, in a discussion, I believe, a figure was mentioned that approximated sixty-five hundred barrels with a fifty-three barrel allowable. Would you know whether or not that is approximately correct?

MR. UTZ: Are there any other questions of the witness?

MR. HUTTER: Yes, sir.

MR. PORTER: He is working on an answer, Mr. Utz.

MR. LOAR: Mr. Brinkley, it has to be done well by well. It can't be done.

A I appreciate that.

MR. PORTER: It won't be necessary to answer my question. I just thought you might have it in mind, Mr. Brinkley.

A Yes, I think as far as I can tell that is the order of magnitude.

MR. PORTER: Thank you.

MR. UTZ: Any other questions?

BY MR. PLINT:

Q Mr. Brinkley, do you have any knowledge as to the agreement of the pipline company serving this unit to taking the oil under your proposed Rule where there is no per well top? Would there be any problem as to their ascertaining whether they were taking--

more than one purchaser, the problems would be the same under the present Rules as they would be under your proposed Rules with one purchaser?

MR. LOAR: Yes, sir, because somebody would have to allocate to the individual pipline company the amount of oil that they were entitled to take under the present month's allowable, and each month would be a different figure, depending on the commitments that the pipeline company had for the individual oil.

Q (By Mr. Flint) Mr. Brinkley, there wouldn't be any possibility under the proposed Rule for an allowable getting assigned to undrilled acreage, would there?

A No, sir.

Q Back to a line of questions that Mr. Nutter proposed to you earlier, as to the incentive to initiate pressure maintenance early in the life of the pool, is it your opinion that the engineering requirements on a pressure maintenance project of this type would require an early start regarding less of transfer of allowable?

A It does not require early start, but certainly encourages it.

Q I think you stated that there is a point when it would be too late to initiate this type of project?

A That is correct.

Q And this diminishes the importance to have transferring the normal unit allowable rather than the actual ability

to produce?

A Right.

Q Your answer to that question would be true in case of water flood?

A To this extent: Water flood recovery is enhanced with early flooding, early in the life of the project as compared to waiting until you are in the final stages of the completion. It is a matter of degree, if I can make myself clear.

Q In other words, probably the only instance in which transferring normal unit allowable rather than the actual ability to produce would result in loss of ultimate recovery would be in the instance where an imprudent operator was operating in the field and was willing to delay initiating such a project?

A Are you speaking of water flooding?

Q No, I was thinking more in terms of the pressure maintenance project of the type that you are conducting.

A There would be no loss in ultimate recovery, but it would unfairly deprive the operation of the benefits that you would be entitled to by assigning a normal current allowable for the proration unit.

Q And under the proposed Rule, the unit, total unit allowable is tied to the current allowable at all times?

A Correct.

Q And, this would to some extent, compensate for the transferring of normal unit allowable rather than the actual

ability to produce?

A Correct.

MR. FLINT: That's all.

MR. UTZ: Mr. Brinkley, under the present Rules, you have all the unit allowable you need for this unit, do you not? Supposing that your desire was to produce five thousand barrels a day from the unit?

A That figure we searched for a minute ago.

MR. UTZ: Isn't this figure you gave us sixty-five thirty-nine calculated in accordance with the present Rules?

A No, sir, that's assigning a normal allowable for each proration unit, plus the transfer allowable from each injection well consistent with the present Rules. Now, the allowable on many of our wells is less than normal, so the sixty-five eleven that I gave you was assuming that each well had its normal allowable for each proration unit.

MR. NUTTER: I think I see what you mean, now, you were assigning top unit allowable to each producing well?

A For each proration well.

Q And assigning the allowable as calculated by the existing Rules for the transfer well?

A That's right.

Q And taking the sum of those two and come up with sixty-five thirty-nine?

A Right.

[illegible]

additional reason is that we need well hearings in probably 6, under the present rules, does your allowable increase? Is my question confusing to you?

A No, if I understand the rules properly, we would have to go back and re-test each well and apply for an allowable and get a benefit in allowable, but each well has to sustain or demonstrate its ability to produce in order to accrue that allowable, and that prevents the very thing we are trying to achieve which is the flexibility of operation which you need in order to achieve the conservation ideals that are set up.

MR. LOAR: Mr. Hutter, didn't we select four or five wells at random which would demonstrate this increase in productivity over approximately two months period?

MR. HUTTER: Yes.

MR. LOAR: That might help the Examiner, too, one of the reasons we have not bothered to calculate this figure.

A Yes. I think you want the record to reflect

that you asked me and not Mr. Nutter the question.

MR. LOAR: Did I ask Mr. Nutter the question?

MR. PORTER: Maybe you should let him answer it.

MR. NUTTER: I don't recall calculating

A Let's take Well 35. Now, Well 35 is one of the direct offsets to GI-18.

MR. LOAR: Would you give the location on the map?

A The Southeast of the Southwest, Section 9, 25 North, and 12 West. In October, '59, that well had a productivity of twenty-eight barrels per day, the same well in December, two months later, had a productivity of sixty-five barrels per day. And in January, the productivity, January of 1960, had a productivity of one hundred fifty-two barrels per day.

Let's take Well Number 1 which is in the Southwest Southwest Section 31, 26 North, 12 West. In July, 1959, it had a productivity of twenty-nine barrels per day. In December of 1959, the productivity continued to decline, reaching twenty-three barrels per day, and in January, 1960, the productivity improved, reaching forty-three barrels per day.

Well Number 9, located in the Northeast of the Southeast of Section 5, 25 North, 12 West, in June, 1959, had a productivity of seventy-five barrels per day, and in December of '59, the productivity improved to ninety-eight barrels a day, and then, in February, 1960, the productivity reached one hundred eleven barrels per day. This does not mean that we have reached the top

capacity of that well by any means.

MR. LOAR: You are getting credit for that volume of production under the present Rules, are you not?

A Yes, as long as it does not exceed the top allowable.

Well Number 26, which is located in the Northeast of the Southeast Section 9, 25 North, 12 West, in December had a productivity of twenty-three hundred seventy-six barrels per day, and in January, 1960, had a productivity of three hundred and forty-eight barrels per day.

Well Number 3, which is the last well that I have listed, which is Northeast Northeast Section 6, 25 North, and 12 West, in July of '59 had a productivity of twenty-eight barrels per day. In December, '59, productivity increased to thirty-two barrels per day, and in February, 1960, it had increased to forty-nine barrels per day.

But these figures that I have given you are, do not represent the balanced withdrawal figures that we need to produce from the wells to maintain uniform advancement of the L.P.G. slug achieving high displacement efficiency and adhering to our plan of operation and conversation practice. Each oil well will have to be produced at its own unique rate to maintain uniform advancement of the L.P.G. slug, otherwise, we will get bypassing in the reservoir and the slug will never sweep part of the pattern. So it is critical that we are permitted to have flexibility in producing the wells at a definite rate to control the

advancement of L.P.G.

MR. NUTTER: In other words, your Rule 4 as proposed here would provide that, would it not?

A Exactly.

MR. NUTTER: So the deletion of the limitation that is included in the present Rule 4 would eliminate that problem?

A Exactly. That is the most important part of our field rules.

Q Now, the well that came up from, I think it was the Number 3 well that came up from twenty-eight barrels in July to thirty-two barrels in December, and forty-nine barrels in February, you want to produce it more than forty-nine barrels anyway, wouldn't you?

A It might be that we don't want to produce that but twenty barrels a day. It depends on its location and what we want to accomplish in the area that this one well affects that area.

MR. UTZ: You think you want to produce the well that was capable of producing three hundred forty-eight barrels that much?

A No, sir. I might say that some wells are capable of producing one thousand barrels a day, but that does not mean that we want to produce one thousand barrels a day. We want to control the production rate so that we can maintain uniform advancement of the slug to insure the gravity sweep of that

slug and not bypass any of the oil.

MR. NUTTER: Now, the big problem that appears is the lack of flexibility in producing these wells?

A Exactly.

MR. NUTTER: If the wells are receiving credit for their ability to produce, then you can produce the total productivity of the unit in any manner that you see fit from any wells that you see fit. You have flexibility, have you not?

A Right.

MR. NUTTER: Now, do the present Rules as they are written affect your injection flexibility?

A They do not affect the injection flexibility.

MR. NUTTER: But they do affect your producing flexibility?

A Affect both the withdrawls and producing flexibility.

MR. NUTTER: Now, what does it require to produce the wells in a flexible manner as you would desire?

A It would require our Rule Number 4 as we have proposed also, I think it is Rule 2.

MR. NUTTER: I mean, under the existing Rules, Mr. Brinkley, you have the flexibility-- What do you have to do under the existing Rules?

A I would recommend we incorporate our Rule Number 2 and Rule Number 4, and we'll have what we need.

MR. NUTTER: Well, under the existing Rule, when you

desire flexibility in producing rates and you have an allowable assigned to the well for the month, what does it require? Application for a supplemental allowable to change the allowable for the well?

A There is a great deal of detailed reporting and time factor, too, and detailed tests that may not be convenient or fit in with our schedule that makes it rather awkward and to a considerable extent impractical in order to preserve what we have started here. It is a simplification, shall we say, of the operator as well as the Commission that we accomplish both at once with these proposed Rules.

MR. UTZ: Are you saying that this project is so sensitive that you have to change your producing rates within the thirty days period?

A It is more sensitive than that, yes, sir. We are setting on top of this every day.

MR. UTZ: Is it necessary to change them every few days?

A Yes, sir. Could be.

MR. NUTTER: And the frequency with which you desire to change the rate of production from a given well is such that it entails an undue burden upon yourself as well as the Commission to apply for and receive supplemental--

A It would be impossible for the operator, and I think it would be unduly burdening to the Commission to receive the voluminous amount of paper work that would be required. If I can

present to you the idea of ten gas bubbles, each separator with a bank of oil under high pressure, and associate it with pressure differential between the gas bubbles, you can see how little control we have on gas movement of the entire bubble if it is not properly balanced, and once those gas bubbles get out of control, why, we may never recoup our former position, and, hence, a loss of recovery would result.

MR. PORTER: Are you saying, Mr. Brinkley, that if you are not granted this flexibility as proposed in Rule 4, that waste--there is a probability of waste of oil?

A Yes.

MR. PORTER: It will be left in the reservoir?

A Yes, sir.

MR. UTZ: Any other questions?

MR. LOAR: I would like to clear up one or two other points. It may not be confusing, but they are to me. Mr. Brinkley, Rule 2 as proposed ties the project to the market demand for the area, does it not?

A It does.

Q In other words, whatever fluctuation in allowable takes place in Northwest New Mexico, this project would be subject to, then?

A Right.

Q Your difficulty is not in total unit allowable, at ~~least at the present time, but individual allowables within the~~

total allowable, is that right?

A Right.

Q And, you are seeking an Rule 1 and some of these other Rules, to receive a total unit allowable?

A That is the objective, yes.

Q And then, the operator can allocate that to individual wells within the project?

A Exactly. Right.

Q The reason for limiting production to two times the normal unit allowable would be to protect correlative rights, wouldn't it?

A That was the intent of the existing Rules.

Q Is there any need for such a Rule within the interior of the project?

A No, none whatsoever.

Q Now then, as to the five thousand barrel a day figure, is the equipment, the injection lines, compression facilities, and associated equipment, sized for a five thousand barrel a day allowable?

A It was designed for five thousand barrels a day.

Q Now then, we could increase the equipment out there and handle a larger volume, is that right?

A That is correct.

Q If we were, and as our Rules advocate, being subject to market demand, we could also have an allowable reduced to

below five thousand barrels a day, could we not?

A That is correct.

Q This may be argumentative, but isn't it fair if we were to be cut less than our optimum producing rate at the present time to also have the privilege to increase our producing rate above that?

A That is my belief. Maintain equity.

MR. LOAR: I guess that's all.

MR. UTZ: Any other questions? If there are none, the witness may be excused.

(Witness excused.)

MR. UTZ: Did you enter your Exhibits?

MR. LOAR: Yes, sir. I did at the conclusion of his testimony.

MR. UTZ: Any other statements to be made in this case? The case will be taken under advisement.

We will recess until one-fifteen.

C E R T I F I C A T E

STATE OF NEW MEXICO)
) ss
COUNTY OF BERNALILLO)

I, J. A. TRUJILLO, Notary Public 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 stenotype and reduced to typewritten transcript by me and/or 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 26 day of March, 1960, in the City of Albuquerque, County of Bernalillo, State of New Mexico.

Joseph A. Trujillo
NOTARY PUBLIC

My commission expires:

October 5, 1960

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 1904, heard by me on Dec. 5, 1960.

Examiner
New Mexico Oil Conservation Commission

BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
May 18, 1960

IN THE MATTER OF: Application of Sunray Mid-Continent Oil Company for a hearing de novo before the Commission in Case No. 1904, Order No. R-1636, relating to special rules governing the Central Bisti LPG-Gas-Water Injection Project in the Bisti-Lower Gallup Oil Pool, San Juan County, New Mexico, particularly those provisions concerning the assignment of well allowables.	Case 1904

BEFORE: Mr. Murray Morgan
Mr. A. L. Porter Jr.

TRANSCRIPT OF HEARING

MR. PAYNE: Application of Sunray Mid-Continent Oil Company for a hearing de novo before the Commission in Case No. 1904, Order No. R-1636, relating to special rules governing the Central Bisti LPG-Gas-Water Injection Project in the Bisti-Lower Gallup Oil Pool, San Juan County, New Mexico, particularly those provisions concerning the assignment of well allowables.

MR. PORTER: Case 1904. The Commission will recognize Mr. White.

MR. WHITE: Charles White of Gilbert, White and Gilbert, Santa Fe, New Mexico appearing on behalf of the Applicant. I have associated with me Mr. William Loar of the Oklahoma Bar.

MR. LOAR: We will have one witness, Mr. Porter.

MR. PORTER: Will the witness stand and be sworn?

(Witness sworn.)

T. W. BRINKLEY

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

DIRECT EXAMINATION

BY MR. LOAR:

Q Will you please state your name and occupation?

A My name is T. W. Brinkley, I'm Chief Reservoir Engineer, Sunray in Tulsa.

Q Have you testified before this Commission previously as a reservoir engineer?

A Yes, I have.

Q Have you made a constant study of the Bisti Pool and even more particularly the operation of the Central Bisti Unit?

A Yes, I have.

MR. LOAR: Mr. Brinkley's qualifications are acceptable?

MR. PORTER: Yes, sir, they are.

Q Will you please refer to what has been marked as Sunray's Exhibit No. 1 and point out what that reflects?

A Exhibit No. 1 is an area map of the Central Bisti Unit. It reflects the unit area shown in heavy hashered lines. It also shows that the unit area is separated from the West Bisti Unit by

five water injection wells commonly referred to as the West Water Barrier, and those water injection wells are identified further by yellow color.

Similarly, on the East boundary we have four water injection wells which are commonly referred to as the East Water Barrier separating the unit area from production in Section 10 and 15. In addition we show colored in red 10 LPG injection wells on pattern running through the fairway of the reservoir within the unit boundary. Also we show colored in green the present gas injection wells located along the North flank and the South flank of the reservoir. We show 5 oil wells circled in orange that were drilled since unit operation began, namely CBU No. 4, No. 26, 27, 29 and 31. Those oil wells were drilled to complete the pattern for LPG flooding.

Also G.I. No. 18-L, which is an LPG injection well, was drilled after unitization to permit that South pattern.

In summary, Exhibit No. 1 reflects the plan of operation for the Central Bisti Unit, namely that we have LPG flooding through the major portion of the reservoir, we have gas injection along the North and South flanks which provide pressure as well as additional oil benefit by gas drive, and we show water flooding along the West boundary and East boundary, and lastly, we show that the southern extremity of the unit in Section 17 and 16 is subjected to a line drive by two gas injection wells, one LPG injection

well and water injection wells on the East boundary.

Q Mr. Brinkley, this pretty well conforms to the plan of operation that we all contemplated when we put this unit into effect, is that right?

A That is correct.

Q Will you please refer to Sunray's Exhibit No. 2 and review the performance of the Central Bisti Unit?

A Exhibit No. 2 is entitled "Reservoir Performance, Central Bisti Unit". You will notice the scale on the bottom of the exhibit which is a time scale covering the years 1958, 1959 and 1960. You will further notice a vertical line for the date July 1, 1959, identified as "date of unit activated." The data to the left of the date of activiation of the unit represents past performance history and data to the right of that date represents the performance under unitized pressure maintenance type operations.

Let's consider first the daily oil production rate. That is identified as solid bar graph type lines on the lower portion of the curve with the corresponding scale on the right-hand side of the exhibit numbered from zero to 1,000, 2,000 and up to 5,000 barrels per day.

You will notice for the month of May, 1958 and for several months thereafter we had produced a little over 4,000 barrels of oil per day. And then approximately in November of 1958 we notice that the oil production rate began a decline, reaching a value of

approximately 3,000 barrels per day for the month of June just before unitization. You will notice for the months of July, August, September, October, November and December, North, 1959, representing the first six months of unitized operation the oil production rate varied from approximately 1200 to 1400 barrels per day. That represents a self-imposed restrictive allowable as a part of the plan of operation while we were injecting LPG to restore the reservoir pressure.

For the month of January, 1960, the oil production rate dropped to approximately 500 barrels per day due to the fact the unit was shut in approximately two weeks while equipment changes were made and other facilities converted to start the processing of produced gas.

Q Mr. Brinkley, by that time we had succeeded in injecting the LPG that we had planned to inject?

A That is correct.

Q Some time in December we completed the injection of that 933,000 barrels of LPG?

A That is correct. Then for the month of February we started increasing, we lifted the self-imposed restrictive allowable and started increasing the producing rate in increments for the month of February, the producing rate appears to be approximately 26, 2700 barrels per day.

Then for the month of March it was again increased to

approximately 3400 barrels per day. This oil production data reflects that we have restored the producing capacity of the Central Bisti Unit to a value greater than what was present before the date of unitization.

Now, let's take the average daily gas production. That data is reflected with a horizontal dashed bar graph and the associated scale is to the left of the graph whose numbers read zero, two, four, and in that sequence up to ten million cubic feet per day. Again the trend prior to unitization showed a consistently increasing rate of gas production reaching a value of approximately seven million cubic feet per day prior to unitization, and then after unitization we noticed that the gas production consistently decreased due to reduced gas-oil ratios as we continued unitized operation.

During the month of January that gas production reached a value of less than a million cubic feet per day and the month of February it had increased up to a value about two and a half million cubic feet per day, and for the month of March it reached almost three million cubic feet per day.

In summary, the gas production for the month of March, 1960 is materially less than the gas production immediately prior to unitization.

Q Is that one of the results that you desired to achieve by the operation of this project?

A Yes, that's one of the manifestations, shall we say, of benefits that have accrued to date by unitized operations.

Q Go ahead.

A The next curve is the average gas-oil ratio. That curve is reflected by a solid circled dots connected by dashed lines and the scale associated with that curve is found on the left-hand side of the graph near the bottom with the scales reading from zero, one, two and three MCF per barrel. It's apparent operation prior to unitization revealed a consistently increasing value of produced gas-oil ratio reaching a value of approximately 2300 cubic feet per barrel at the time of unitization, and since unitization this gas-oil ratio has consistently declined and the value for the month of March, 1960 has reached a value of approximately 800 cubic feet per barrel.

This gas-oil ratio declined since unitization as a direct benefit that we are all acquainted with, and as a result of our unitized pressure maintenance operation. The next curve of importance is near the top of the exhibit and let's consider first the volumetric average bottom hole pressure. This data is identified with open square symbols connected by dashed lines and the scale associated with this data is on the right-hand side of the exhibit near the top.

Values reading from 800, 900, 1,000, 1100 and 1200 and represents the volumetric average bottom hole pressure for the reservoir.

You will notice immediately before unitization for the month of June we had a reservoir pressure of approximately 813 pounds. It remained rather consistent for several months and then the trend in reservoir pressure increased and that increase in pressure reached a value of approximately 1,040 pounds for the month of March, 1960. The increase in reservoir pressure, you see another manifestation of the benefits that are occurring by our present unitized operations.

The last curve on the exhibit identified as "Injected Products Per Reservoir Voidage Ratio" is identified by open circles connected by solid lines and the corresponding scale is found on the left-hand side of the exhibit near the top. Those values read from zero, one, two, three and four. Now, the units of this curve injected products per reservoir voidage means the degree in which we are replacing the reservoir voidage and all injected products are converted to reservoir volumes, that is all of the gas injected, all the water injected, all of the LPG injected is converted to reservoir volumes in barrels.

The reservoir voidage is identified as converting all of the produced stock tank oil, all the produced gas and all the produced water to reservoir barrels, thus the ratio of the injected products to the produced products is a reflection of our degree of replacement of reservoir voidage and you will notice for the months of July, August, September and October we approximated an injection

volume equivalent to that produced from the reservoir.

For the month of November, December, and the following months we have overinjected, that is we have injected more material than we have produced, and that is compatible with the increasing trend in reservoir pressure. It's interesting to note that for the month of January we injected slightly more than four times the volume that we produced. That is in part due to the fact that the withdrawals were restricted due to being shut down for approximately two months. For two weeks.

Q Two weeks during January?

A Two weeks during January. Now, the decreasing rate of injection compared to voidage will continue and we hope to stabilize at an injection rate approximately equal to the production rate.

In summary, this performance graph reveals that we have experienced a rise in reservoir pressure, we have experienced a decrease in producing gas-oil ratio, and we have restored the productivity of the reservoir to values upwards to what they were before unitization and, in fact, those values experienced early in the production history of the field.

Q Then Exhibit 2 reflects that thus far at least we have accomplished, or we are in the process of accomplishing what we set out to do at the time of unitization?

A That is exactly right.

Q Mr. Brinkley, will you please refer now to Exhibit No. 3 and point out what we are trying to reflect by this exhibit?

A Exhibit No. 3 is identical to Exhibit No. 1 except we have shown for the 10 LPG injection wells the location of the LPG, or the positions of the LPG. You will notice that the size of the pink coloring on Exhibit 3 is much larger than the pink coloring on Exhibit No. 1. You will notice further that this pink coloring in many wells is concentric to the location of the well. In other words, the position of the LPG is circular and concentric with the well.

You will notice too that in some of the other LPG injection well areas the LPG position is not circular, but eliptical, and in some cases is not concentric with the well. The object of LPG flooding in the Central Bisti Unit is to maintain the position of the LPG circular that would reflect good practices and good sweep, good displacement and maximum recovery.

When the pink coloring becomes elongated or eliptical, it is our objective then to straighten up position and make it circular to improve the sweep efficiencies and displace more oil and adhere to conservation practices.

We have been using such a plan to control our field operations by running monthly calculations, sometimes more frequent than monthly calculations to see how these LPG fronts are growing.. If they are circular we maintain the production from the oil wells to

continue the expanding LPG front in its displacement process. When the circle becomes eliptical we attempt to straighten it out by changing the withdrawal rate or reducing the withdrawal rate, whichever the case may be, to cause an adjustment of the eliptical position to a more circular position. These circles represent the flood fronts to the date March 1, 1960.

Q Now then, Mr. Brinkley, this points up the fact that rather than setting an allowable on an individual well the operator needs the flexibility as was granted in Order No. 1636 to produce the wells in order to balance out these patterns, is that right?

A That is correct.

Q The criteria that you use in balancing out these patterns is not done on a well basis, is it?

A We have some five items that we use in order to make such an interpretation as I have explained on Exhibit No. 3. Those five items that we feel are significant are as follows: The first thing we need is the individual voidage value, that is, we need to know the quantity of oil produced, the quantity of gas and any water, if it is produced.

The second most important thing we need to know is the injection volumes of LPG and gas. The third is the well bore pressure. Fourth, pore volumes around the producing wells and injection wells, and five, the displacement efficiency around the producing wells.

Q Our method of calculating these circles is not unique with us. It's been used successfully other places and we even used it in this field in the pilot project, didn't we?

A That is correct.

Q The results of that bore out that this is a pretty good way to follow the LPG pattern?

A We think so, yes.

Q You are also making similar calculations for the gas and the water injection wells?

A That is correct.

Q Ir order to maintain the shape of your injection fronts, you need to produce your wells on a good engineering basis, is that right?

A That is very vital.

Q You need to fluctuate those rates from time to time, perhaps several times during a month even?

A That is correct.

Q Mr. Brinkley, there are several criteria by which the results of your injection program can be evaluated, aren't there?

A That is correct.

Q Would you please refer to Exhibit No. 4 and discuss one of these criteria?

A Exhibit No. 4 represents our method of illustrating increases in reservoir pressure in individual wells. You notice

in the legend the red circles stand for those wells that we have arrested the pressure decline and reversed it and the well has experienced an increase in well bore pressure. The green color is used to identify the wells that have continued to experience a pressure decline. The blue color represents those wells where we have arrested the pressure decline and the pressure has remained about the same as it was at the time of the unitization.

Let's consider the minority wells first. We have one well, Well No. 46 colored in green which reveals it has continued to decline, a pressure decline with unit operation. All other wells, either of a blue color where the pressure decline was arrested or a red color where the pressure was reversed and the well has experienced a pressure increase. This reflects reservoir continuity for one thing. It also reflects that 50 of the 51 oil wells have received a benefit from pressure due to the pressure maintenance operation.

Q Would you now please refer to Exhibit No. 5 which illustrates another basis on which this project can be evaluated?

A Exhibit No. 5 is a companion to Exhibit No. 4. Here we are illustrating the benefit in gas-oil ratio by unitized operation. Again, the red color reflects wells that have displayed a decrease in producing gas-oil ratios. In other words, we have reversed the previous trend of increase in gas-oil ratio and now those wells are experiencing decreasing ratios.

The green reflects the wells that have continued to experience increase in gas-oil ratios and the blue represents those wells that the ratios, the increasing trend in ratios has been arrested and have remained rather consistent with what they were at the time of unitization. Again we find two wells No. 31 and 51 whose ratios are continuing to increase. Well No. 51, although it is displaying an increasing trend in gas-oil ratios, the maximum ratio we have is approximately a thousand cubic feet per barrel. It is not serious.

Well No. 31 has continued to experience increasing gas-oil ratio trends. However, you'll notice it's offset by two gas injection wells and one LPG injection well. That data may suggest gas channeling. In any event, again we substantiate reservoir continuity and we have at least 49 wells out of the total 51 that have experienced a benefit by unitized operation.

Q Now then, Mr. Brinkley, will you please refer to Sunray's Exhibit No. 6, which illustrates still a third method for evaluating this project?

A Exhibit No. 6 is the third companion exhibit that reflects benefit by pressure maintenance operation. Here the red colors identify those wells that have experienced a production capacity increase. Green identifies those wells that have continued to display decreasing production capacities, and blue represents those wells whose capacity decline has been arrested and remain

approximately the same as of the time of unitization.

Again, taking the most inferior wells, we find three wells that have continued to display a decline in production capacity, Well No. 45, Well No. 3 and Well No. 5. You will notice that Well No. 45 is a diagonal offset to one of our water injection wells. We have also detected water breakthrough and we feel suggests the reason for the continued decline into No. 45. Well No. 5 is also a diagonal offset to the present water injection well and that No. 5 well is one of the old oil wells in the old LPG pilot area. We feel that it has continued to decline because we haven't restored that well to its maximum benefit by virtue of the water flooding in that area.

Well No. 3 we feel is truly a well that has not benefited by production capacity increase and has followed the decreasing trend in production capacity. Here again reflects continuity of reservoir and we have at least 48 out of the 51 wells that have shown benefit due to our pressure maintenance type operation.

Q Mr. Brinkley, the well labeled Val R. Reese and Associates, Hickman, is shown as a gas injection well. That's in the Section 32. Is that still on production at this time?

A That well is still on production.

Q It is scheduled for gas injection?

A Yes, we have completed the necessary arrangements to convert the well and it will be converted to a gas injection well

some time in the near future.

Q Mr. Brinkley, Well No. 3 is offset on, you might say each side, by wells which have either increased the production capacity or they are, the production capacity has been maintained, is that right?

A That is correct.

Q What is the story on the Hickman well?

A The Hickman No. 1 well, which is an offset to the Well No. 3 which has continued its private decline, the Hickman well has shown an increase in productivity.

Q A slight increase?

A A slight increase in productivity.

Q Essentially then by all three of the criteria that we have illustrated here, essentially all of our wells have been affected by one way or the other?

A That is correct.

Q Thus far would you say that we have pretty much of a text book example of how one of these projects should operate?

A I think so.

Q Mr. Brinkley, would you now refer to Exhibit No.7 and point out what we're trying to illustrate by that?

A Exhibit No. 7 is entitled "Well Tests In Effect At Time of Unitization, Central Bisti Unit". You'll notice we have identified in two columns the well numbers and we have also

identified the oil production based on these tests and expressed in barrels per day and the total is 2389 barrels per day.

Q Mr. Brinkley, these tests were based on what we took off the oil proration schedule in July of 1959, are they not?

A That is correct.

Q They do not reflect the wells which were converted for injection service?

A That is correct.

Q Would you refer to Exhibit No. 2 and state what the production was for June and July of '59?

A For the month of June, Exhibit 2 reflects a production just slightly less than 3,000 barrels per day and for the month of July, 1959, it was approximately 1200 barrels a day.

Q This exhibit is merely an attempt to illustrate approximately what the productivity was at the time of unitization?

A That is correct.

Q Would you now refer to Exhibit No. 8 and discuss that briefly?

A Exhibit No. 8 is entitled "December, 1959 Capacity Well Tests, Central Bisti Unit". Again, we have identified the well numbers and the capacity test for December, '59 in barrels per day. From these tests the total is 4,943 barrels per day.

Q Indicating an increase over the previous tests in July, or whenever that test had been made, on the proration schedule?

A That is correct.

Q Now, then, Mr. Brinkley, will you refer to Sunray's Exhibit No. 9 and state what that reflects?

A Exhibit No. 9 is entitled "Current Capacity Well Tests, Central Bisti Unit". Again, we have shown the individual well numbers and the current test production in barrels per day, which reflects a total productivity of 7981 barrels per day.

Q Mr. Brinkley, based on the information you have, do you believe that the productivity of this unit will continue to increase?

A We expect it to increase.

Q Would you now refer to Exhibit No. 10 and point out by the major categories what this reflects?

A Exhibit No. 10 is entitled "Gross Expenditure Analyses for the Central Bisti Unit", and at the bottom of the exhibit we show a total gross expenditure of $3,334,240. Now, this total is made up of three major categories and each of these categories represent expenditures necessary for unitized operations that would not be necessary for continued natural depletion competitive type operations.

In the first category is identified as LPG and gas injection. The second category are the water barriers. The last category is oil gathering and lease facilities.

Q ~~You have attempted in this schedule to eliminate things~~

which would not have been, or work, which would not have been done if it had not been unitized?

A That is correct.

Q You will admit that there are some of them here that people can question whether they should have been included or not and possibly some eliminated that should have been included, is that right?

A That is right.

MR. PORTER: The hearing will recess until one-thirty.

(Whereupon a recess was taken.)

AFTERNOON SESSION

DIRECT EXAMINATION of
MR. BRINKLEY Continued.

MR. PORTER: The hearing will come to order, please. Mr. Loar, will you continue with your direct examination, please?

MR. LOAR: I have already put a copy of the Exhibit 11 on the Commission's desk.

Q (By Mr. Loar) Mr. Brinkley, would you please refer to Exhibit No. 11 and very briefly point out what we're trying to illustrate there?

A Exhibit No. 11 is entitled "Operating Expense Analysis, First Six Months, 1959, Sunray Wells Before Unitization Versus Central Bisti Unit Area After July 1, 1959". You will notice the exhibit is broken into two parts, the upper portion and the lower portion. The upper portion includes the first six months for 1959

representing Sunray Mid-Continent operating expense analysis for their two leases consisting of 24 oil wells in the Central Bisti Unit Area, and it reflects an operating cost per well month to vary from minimum of $195.00 to a maximum of $397.00, and this same data, based on a barrel of oil basis reflects a minimum of eight cents per barrel and a maximum of sixteen cents per barrel. We contract this data with the lower portion of the exhibit, namely from July 1, 1959 through March, 1960.

Q July 1 being the date we started the secondary recovery.

A It's the activation of the unit where we started our pressure maintenance operations.

Q Mr. Brinkley, at this point, the first portion, January through June of 1959, Sunray was injecting produced gas on their leases, were they not?

A That is correct.

Q They were also participating in the LPG pilot project, were they not?

A That is correct.

Q Are all the costs tieable to that removed from the first six months of '59?

A That is true.

Q All right.

A From the data for July 1, 1959 to March, 1960, representing the unitized operations, reflects that the operating cost on a

well month basis varies from a minimum of $353.00 to a maximum of $1875.00 per month. On a barrel of oil basis the minimum is forty-three cents per barrel and a maximum of $2.82 per barrel.

In summary, it reflects that unit operations are more expensive than the competitive operations from the two leases as shown on this exhibit.

Q By that you mean unit operations with the type of project we are conducting here?

A That is correct.

Q Now, Mr. Brinkley, as our production increases we would anticipate that this per barrel cost will decline?

A We think so.

Q Is that right? A Yes, sir.

Q Now then, Mr. Brinkley, in August of 1957, several of the operators started the LPG pilot project in the Northwest corner of the unit, is that right?

A That is correct.

Q In December of 1958 Sunray started injecting the produced gas on its Federal C Lease into which well?

A At that time the well that we were returning gas to was the Federal C-18, which is No. GI16 on our current exhibits.

Q Now then, what type of rule did the Commission issue for that operation?

A This rule consisted of several parts, the significant

parts might be summarized as follows: The area was restricted to our C Lease.

Q We had not undertaken any unitization at that time?

A That is correct. And the allowable was the summation of the individual well allowables, including the shut in wells. There was a provision for transfer of allowable and allowables may be produced from any well as long as that well that received the transfer did not produce at a rate greater than twice the top allowable.

Q Now, Mr. Brinkley, was that provision put in in order to protect the correlative rights of the operators offsetting this project?

A That is my understanding, yes.

Q All right.

A Of course, for a well to qualify we needed the test production capacity and that feature required certain testing procedure and we had a limiting gas-oil ratio of 2,000 to 1 permitting a net gas-oil ratio type operation, and we provided certain monthly reports to the Conservation Commission for their records.

Q Was that a good rule for the project that Sunray Mid-Continent was operating at that time?

A It was a good rule for that project, yes.

Q Was the project we were conducting relatively inexpensive?

A Yes, sir.

Q Would you say that it was accomplishing the same measure of conservation that we are accomplishing about our present project?

A No, sir.

Q Now then, Mr. Brinkley, your Exhibits 4, 5, 6 and 7, 8 and 9, demonstrated, or we hoped they demonstrated, that throughout the unit area we have affected the productivity, the ratios and the reservoir as a whole within the unit area, have we not?

A That was the intent of the exhibit, yes, sir.

Q Are you familiar with the water flood rule of the State of New Mexico?

A Yes, sir.

Q And that's a state-wide rule, is that right?

A Yes, sir.

Q Well, there is a provision in 2-E which I would like to read one sentence, if I may. "If, after notice and hearing, it has been established that desirable units referring to normal proration units that are not directly or diagonally offset of wells completed thereon which have experienced a substantial response to water injection, the Commission may consider them for the water flood allowable".

Do you believe that all 72 wells in this project have received some measure of stimulation or been affected in some way by this project?

A Yes, sir.

Q If that's true, what allowable would this project be entitled to?

A Well, utilizing the present water flood rules, if we were operating under water flood rules where each normal unit allowable would be 52 barrels per day, and transfer privileges from the injection wells, et cetera, we would have a total unit allowable of 6240 barrels per day.

Q Mr. Brinkley, would that, in view of the fact that the 52 barrels is a fixed amount, would that allowable be subject to market demand?

A No, sir.

Q In your opinion will the present operation which we are conducting in the Central Bisti Unit afford a greater recovery and a greater conservation measure than stripper water flooding?

A Yes, sir.

Q Mr. Brinkley, would you refer to Exhibit No. 12 and point out what that reflects?

A Exhibit No. 12 is entitled "Calculated Unit Allowable, Central Bisti Unit". This exhibit consists of two pages, first page lists the well numbers and the acres in the proration unit and the normal unit well allowable based on March, April and May well tests expressed in barrels of oil per day. The second page lists the injection wells, their acres, and the allowable available to transfer based on well tests. The summation of the first page

reveals that the oil wells have a producing well allowable of 2,865 barrels per day.

Q Mr. Brinkley, I would like to interrupt at that point. Now, that includes also GI 13 and GI 12, does it not?

A That is correct. Those two wells are listed in the first column of the first page. The transfer allowable is 1484 barrels per day for a total unit allowable of 4349 barrels per day.

Q Now, the 1484 is the 1604 on page 2 less what GI 12 and 13 have available?

A That is correct.

Q Also, Mr. Brinkley, in all of these allowable calculations have you included the Val Reese well?

A No, sir.

Q So in that case you would have a total of 73 wells and whatever that well would test at the time of conversion?

A That is correct.

Q Under the present rules is the project allowable tied to individual well tests?

A Yes.

Q And as the project progresses the productivity on the overall picture for the immediate future, the productivity of the wells in the unit will increase, will it not?

A Right.

Q Then as the project further progresses, well, the

productivity of some of the wells will decline?

A That is correct.

Q Now, this is particularly true as the LPG and the gas and the water fronts reach the producing wells, is it not?

A That is true.

Q Under the present rules where the individual well tests currently determine the allowable in order to maintain sufficient allowable to economically operate this project, will it be necessary to consider at what point the affected well should be shut in in order to maintain allowable?

A Yes, it absolutely will.

Q Will these wells that are shut in, would they still have some producible hydrocarbons?

A Yes.

Q Could the effect of trying to apply this rule in order to receive the largest allowable affect the sweep pattern inversely?

A Yes, sir, it sure will.

Q Then the operator, by the operation of the type of rule that we now have, would have to consider the alternatives of economics versus waste in order to determine whether or not to shut a well in?

A That is very true.

Q Is that one of the reasons in your request that you will

ask for a unit allowable tied to something other than individual well tests?

A That is true.

Q Now then, Mr. Brinkley, prior to June and July of 1959, was the plan of operation presented to the Oil Conservation Commission, the Land Commission and the U.S.G.S. and the working interest owners in this unit?

A Yes, it was.

Q In that plan of operation did the operators outline the wells to be converted, the wells to be drilled, the type of project, the economics and the production from this unit?

A That is very true.

Q Were all of these based on a 5,000 barrel per day figure?

A Yes, sir.

Q Was this plan an operation approved by all parties concerned as part of an approving of the unit itself?

A Yes, sir.

Q Is Sunray Mid-Continent and the other operators, other working interest owners in this unit, prepared to operate under a fixed allowable of 5,000 barrels per day?

A Yes, sir.

Q We have stated that in our past hearings, have we not?

A That is true.

Q Based on a premise that the Commission desires to tie

units such as this to market demand, have you prepared some rules?

A Yes, I have.

Q This is an attempt to take the existing rules of the State of New Mexico and subject this unit to the market demand fluctuations that might occur?

A Yes, sir.

Q Would you briefly summarize what has been handed to you as Exhibit No. 13?

A Exhibit No. 13 is entitled "Special Rules and Regulations for Sunray Mid-Continent Oil Company's Central Bisti LPG-Gas-Water Injection Project". These rules consist of ten in toto. The first rule defines the project area of the Central Bisti Unit. Rule No. 2 defines the project allowable. Rule No. 3 provides --

Q Rule No. 2 is tied to what the Commission will establish as the normal unit allowable in Northwest New Mexico, is it not?

A That is correct.

Q And also reflects the 80-acre proration units of which this unit has several?

A That is correct. Rule No. 3 provides for transfer of allowable from injection wells. Rule No. 4 states the project allowable may be produced from any well or wells in the project area in any proportion.

Q Now then, Mr. Brinkley, I believe you've testified that on the East side and the West side of this area we have established

what we hope is an effective water barrier between our operation and other operators in the pool, have we not?

A That is correct.

Q And everything within the unit area is unitized so that all parties participate?

A That is correct.

Q With this in mind, would there be any correlative rights problem within the unit area or any of the boundaries?

A No, sir.

Q Then there's no need to have the limitation which was back in the original gas injection rules for this unit, is there?

A That is correct.

Q And that was removed by the Commission in their Order 1636, was it not?

A That is correct.

Q All right, please proceed.

A Rule No. 5 provides a procedure for converting producing wells and drilling additional wells. Rule No. 6 --

Q Mr. Brinkley, I'll have to interrupt one more time. The Commission, in Rule 1636, granted a provision that if an injection well was drilled and completed and never produced provided a method for determining the allowable, did it not?

A That is correct.

Q I have neglected to put that in Rule 5, haven't I?

A That is correct.

Q You would like to have that provision incorporated in these rules, would you not?

A Yes, that would be a necessary part of Rule 5. Rule No. 6 describes the net gas-oil ratio feature and includes the Commission formula for calculating the daily adjusted oil allowable.

Q This is the same net gas-oil ratio rule that's been used throughout this several series of rules affecting this pool, is it not?

A Exactly. Rule 7 provides credit for daily average net water injected.

Q And Rule 7 is a direct take from the Rule 1336 which was issued in March for this project?

A That is correct. Rules 8, 9 and 10 briefly permit admission of the previous parts of the rule.

Q Now then, Mr. Brinkley, these rules would provide that the Commission would continue to be furnished individual well tests, individual well information so they can follow it on an individual well basis, would they not?

A That is correct.

Q Now, the $64,000 question, what allowable would these rules provide under the present 60 barrel, we didn't amend it to include 61, the normal unit allowable for the month of May.

A I'm assuming that you are permitted to transfer the full

normal unit allowable for each injection well.

Q Based on the rules you are presenting here.

A That would give a normal unit allowable of 7,200 barrels per day.

Q Would 4920 barrels of this be attributed to the producing wells?

A Yes, sir.

Q And 2280 barrels would be attributable to the injection wells?

A That is correct.

Q Mr. Brinkley, in view of the type of operation here and the fact that this is a unitized project, will there be any adverse effect on correlative rights?

A No, sir.

Q Do you believe that this type of rule, which provides a fixed yardstick for all wells in the project, and will prevent waste and permit the efficient operation of this project?

A Yes, sir.

MR. LOAR: That's all the direct we have of Mr. Brinkley.

MR. PORTER: Anyone have a question of Mr. Brinkley?

MR. PAYNE: Yes, sir.

MR. PORTER: Mr. Payne.

CROSS EXAMINATION

BY MR. PAYNE:

Q Mr. Brinkley, how much additional oil do you anticipate recovering from this pool due to your pressure maintenance project?

A We think that the best oil will be approximately the same as we would have achieved by natural depletion. In other words, we will get a hundred percent more oil.

Q Will the value of that oil amount to as much as or more than $3,334,000?

A Yes, sir.

Q But I take it that your position is that pressure maintenance people need more incentive in order to expend large sums of money in order to go into such a project as this?

A Well, incentive is one facet to the problem. Certainly that is an important part, but I think probably of more importance, or equal importance I should say, is the, oh, the simplicity of admission, shall we say, and the ability to define the unit allowable rather than the method that we presently have.

Q As I understand it, the rules that you propose here today are identical with the rules that you proposed at the previous hearing?

A Yes.

Q And the crux of it is that the injection well and the producing well should both be assigned top unit allowable?

A Yes, sir.

Q If the Commission decided to assign either injection

wells or producing wells to that unit allowable regardless of the producing wells' ability to produce or the injection wells' ability to produce prior to conversion, if you had your choice between one or the other of those two being assigned top unit allowable, which would you take?

A I may have missed a fine point on your question.

Q Well, right now neither one of them get top unit allowable unless they are capable of making it or were capable of making it at the time of conversion.

A That is correct.

Q You want top unit allowable for both?

A Yes.

Q Assuming the Commission decided to give you top unit allowable for one or the other, either the producing wells or the injection wells, which do you think would be the most feasible and the most equitable?

A Well, that has many facets. If I have to give a choice right now without running through the various ramifications and combinations, I would choose the oil wells.

Q The producing wells? A Yes.

Q Isn't it true, though, Mr. Brinkley, that in many cases an operator will institute what is called a pressure maintenance project which embraces a large extent of acreage and yet he may only have three or four injection wells?

A That has been done in the past, yes.

Q And so that such an alternative as you are taking here would allow all the producing wells to get top unit allowable regardless of their producing ability even though they might be far removed from an injection well?

A Right.

Q So if we're looking at this case as a matter of precedent, wouldn't it seem to be more feasible and equitable to assign the injection well top unit allowable?

A Well, that is a very interesting point. I deeply appreciate your position on that. It's one of the many facets of defining the unit allowable. Maybe I can help by suggesting one item. Although we can define a top unit allowable for the Central Bisti Unit or any other unit and that value might be a high figure, and in order to tie it to a market demand you would want to modify that figure, well, then, there's no reason why the top unit allowable couldn't be multiplied by some factor.

Q Well, now, Mr. Brinkley, if each one of your injection wells was assigned top unit allowable and the producing wells were only assigned the allowable based on the ability to produce up to top unit allowable, what project allowable would you come up with here? Would it be 5145 barrels?

A I wonder --

MR. LOAR: For my benefit would you mind restating that

so I can also figure it?

Q If all injection wells were assigned top unit allowable, as of the present time 60 barrels, the allowable assigned to the producing wells remained the same as it is under the existing rules, what would the allowable for the project be?

MR. LOAR: Mr. Porter, in the interest of time may I suggest a couple of points here to Mr. Brinkley that might get this answer?

MR. PORTER: Sure, go ahead.

REDIRECT EXAMINATION

BY MR. LOAR:

Q Referring to your calculations as to what the present rules would give you, don't you have 21 injection wells at the present time with a 2280 allowable based on normal unit allowable?

A That is correct.

Q And then referring to Exhibit No. 12, you show 2865 as your normal unit allowable, I'm sorry, four producing wells restricted to capacity or normal unit allowable, whichever is the lesser?

A No, sir, that should be 2745 because you included two injection wells.

Q You have taken the step that I have taken next. Would the additional figures give you the answer. Mr. Payne is looking for?

A They will fluctuate, yes, sir.

Q But generally speaking, until you reach the peak they are going to be going up, aren't they?

A As you recall, we have several displacement processes going on in the reservoir. We have gas injection, water injection and LPG injection and the correlation, shall we say, or coordination of rising and peaking out and declining, we will find during parts of this history that some of the wells will be declining while others continue to increase. So it is rather awkward to say that we will continually receive a rise and then peak out because of this relative distribution, shall I say.

Q But thus far at least every well I believe you testified has received some benefit from your injection project?

A Right.

Q I assume that that benefit means that the producing ability of them has either increased or has not declined?

A Well, I think we pointed out --

Q Except for two or three wells?

A Yes, that is correct.

Q Now, under your proposed rule, the unit allowable would be 7,200 barrels?

A That is correct.

Q If this were water flood it would get 6240?

A That is correct.

Q Now, do you believe, Mr. Brinkley, that a pressure maintenance project should be assigned a greater allowable than a water flood project, and if so, why?

A Well, I'm not saying that it should get a greater allowable than water flood projects because the process of operation, the reservoir mechanics is the same, essentially the same, we will displace oil by another fluid, a modification as to what goes on in the reservoir, but the physical mechanism and so forth is the same.

Q Generally speaking, would you say that it's true that there's more risk involved in initiating a water flood project than in a pressure maintenance project?

A In past history there is more risk in LPG flooding than there is in water flooding due to the general acceptance in industry and water flooding you might say has proven itself whereas the LPG flooding is still in the development stage, shall we say, and there is a high risk factor in LPG flooding.

Q Of course, in this LPG flood you operated a very small pilot until you had established to your satisfaction it would be successful, didn't you?

A That is correct.

Q I take it Sunray would have no opposition to a rule which provided that the project would be assigned 5,000 barrels a day regardless of allowable in the Northwest?

A Are you referring to a unit allowable?

Q Yes.

A A flat unit allowable, of 5,000 barrels a day?

Q Yes, sir. A No objection.

Q So even if you have a unit allowable of 7,200 barrels per day, you only propose to produce 5,000?

A Will you repeat your question?

Q So that even if this project should receive a unit allowable in the amount of 7,200 barrels per day, nonetheless you would produce it at 5,000 barrels a day, or thereabouts?

A No. No. We suggested that the allowable be tied to market demand.

Q Yes, but you don't want your production to go under 5,000 do you?

A Well, if we tie to market demand and if the market demand requires that the allowable be reduced below the 5,000, we will abide by it.

Q But we're going up now? A Yes.

Q We'll say your allowable is considerably more than 5,000, what are you going to produce then?

A We will produce the allowable.

Q You will produce the 7,200 barrels?

A We can make modifications with our present equipment and enlarge facilities to provide for that.

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you receive a considerably higher allowable than that, you will manage to change your equipment in such a way as to produce it?

A We will consider that alternative, yes, sir.

MR. PAYNE: Thank you.

MR. PORTER: As I understand your testimony is that you don't plan to produce above 5,000 barrels a day, but you would like to have the opportunity in case you do?

A Yes, sir.

MR. PORTER: Anyone else have a question? Mr. Nutter.

BY MR. NUTTER:

Q Mr. Brinkley, I notice in your direct testimony that you placed rather heavy emphasis on the necessity to change the producing rates of the various wells from time to time during the month?

A Yes.

Q In order to control the shape of the LPG sweep?

A Yes.

Q And other reasons? A Yes, sir.

Q The present existing rule does afford you that opportunity, doesn't it?

A The present rules do afford us that opportunity.

Q You also mentioned that in the event you had a well that on account of high gas-oil ratio or for some other reason should be

shut in, the operator would have to make a choice between economics and possible waste by having to produce the well?

A That is correct.

Q Do the rules that are presently in effect afford you the opportunity to make a wise decision there?

A No, sir.

Q Rule No. 3 of the present rules provides that 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 the characteristics of reservoir liquids or progress of sweep?

A Right.

Q Why can't you make a decision to shut a well in and transfer your allowable under that rule?

A Well, what you say is very very true, but I wonder if we did that, wouldn't an operator be prone to shut a well in while the capacity was high to take advantage of the allowable?

Q Well, I think it would be wise to if he could foresee that some damage was going to occur in the reservoir if he didn't shut it in.

A That is very true. I would like to make this one statement, however, and that is an operator would be faced with a choice of maintaining his allowable or improving the oil recovery. Now, in order to maintain the allowable at a high value, the present field rules would encourage an operator to shut in remote wells while their capacities are high. Now, if those remote wells, or any well, is shut in while the capacity is high, that will prevent the completion of the sweep efficiency in that area. We will gain the increased allowable at the expense of continuing the displacement in that area, and those hydrocarbons will be not produced until blowdown occurs and hence we feel that waste will occur.

Q Well now, Mr. Brinkley, if you foresaw that waste was going to occur by producing a well from top allowable down to a marginal status so that you could, or if you saw that waste was going to occur as a result of producing the well too long, wouldn't you go ahead and shut the well in while it's still a top allowable well?

A Well, the waste doesn't occur if we continue the well and displacing the oil, but if we did that --

Q How is waste going to occur if you don't produce the oil but would occur if you did produce the oil?

A I'm sorry, I was thinking about something else.

MR. PORTER: I don't believe you have allowed the witness to complete his answer.

A This is a pretty important point, I believe with the present field rules we are tied to the well capacity tests. Now, in order to maintain our allowables high, a company would favor shutting in wells while their capacities are high in order to gain the advantage of the higher allowable. Now, when those wells are shut in, that means the displacement process around those wells ceases and hence the oil is not produced and will not be produced until we start blowdown operations, which would permit a lesser efficient recovery.

Now, if we take the other extreme that we continue producing each oil well at its capacity and continue recovering the higher oil, prevent the waste, then we are handicapped by declining allowables which materially affect the economics of LPG flooding. We must make a decision on economics versus waste.

Q Well now, Mr. Brinkley, on your Exhibit No. 3 you show the eliptical pattern of the LPG --

A Yes.

Q -- sweep. Now, for instance, it appears that GI 6-L has an eliptical pattern in a Southwesterly direction towards that No. 19 well. Now, it's in the interest of obtaining a round pattern for the sweep to curtail the production of No. 19, is it not?

A Well, that would be one approach to the problem. We have an alternate choice. We could also increase the withdrawal from No. 8 and also from No. 7 and No. 18 to go the other way and

still end up with a circular position of the LPG.

Q Yes, sir, but now it appears that this pattern at the present time is moving in a Southwesterly direction.

A This I recollect.

Q Now, the allowable for No. 19 well at the present time is probably high, is it not?

A I will have to look for my records if you want me to do that.

Q No. 19 does carry a top allowable of 120 barrels at this present time according to Exhibit 12. If you curtailed No. 19 well or shut it in at the present time you would be transferring a high allowable to another well, wouldn't you?

A That is correct, right.

Q Which would be in accordance with the provisions of Rule No. 3 of the present rules. You would get full benefit for curtailing production of that well?

A That is right.

Q I notice that some of the wells, particularly in the Southern part of the project andalong the Southwest flank of the pool, carry marginal allowables at this present time.

A That's right.

Q Were any of those wells marginal wells upon initial completion, do you know?

A Many of those wells were inferior compared to the Fairway

wells. As a matter of fact, I think we have testified earlier that the wells on the isopack map of less than 10 feet were all inferior compared to the wells completed in isopack thickness greater than ten feet.

Q So some of these wells weren't capable of making top allowable for the pool even when they were originally completed, is that true?

A That is possible.

Q But your proposal would assign top allowable to those wells?

A Right.

Q Which have never been capable of making it?

A That is correct.

Q Mr. Brinkley, I think in your direct testimony you stated that the unit at the present time is producing more oil than it was at the time the unit was first formed, is that correct?

A That is correct.

Q It's also producing considerable amount of oil in excess of what the normal decline would have been to this present time, is it not?

A Well, I don't know the meaning of the word considerably in excess, but it is producing more than had we stroplated the normal decline and compared that value today with what the unit is producing today.

Q Would it be unreasonable on Exhibit No. 2 to project a decline to approximately 2500 barrels at this present time had no pressure maintenance project been instituted?

A No, that is not unreasonable.

Q And it is producing 3500 at the present time?

A Yes.

Q So a thousand barrels a day more than it would have been making?

A That is correct.

Q Your Exhibits 4, 5 and 6-- A Yes, sir.

Q --give us some comparisons of the pressures, the gas-oil ratios, and production capacity and some of them it has increased, some decreased and some stayed about the same. What interval of time do the exhibits cover?

A From the date of unitization to the present time.

Q That would be from July to the present?

A Yes.

Q Mr. Brinkley, on Exhibit No. 10, in which you have itemized the gross expenditures for the operation of the project, the sum total here is about three and one-third million dollars. A large percentage of that three and one-third million dollars is for the purchase of LPG, is that correct?

A Almost two-thirds of it.

Q Well, now, you will recover this LPG we presume, do you

agree?

A We hope so.

Q You anticipate that you will?

A We anticipate recovering LPG, the precise amount we are not sure since this is a new recovery method, and we have no field history to compare with.

Q You are not injecting LPG at this present time in any wells, are you?

A No, sir.

Q All of the wells on the various exhibits shown as LPG wells are now gas injection wells?

A That is correct.

Q Now, on Exhibit No. 11, Mr. Brinkley, I note that the average operating cost of a well in June of 1959 was $397.00 and then in July it jumped up to $1875?

A Yes, sir.

Q When the unit was formed? A Yes, sir.

Q Is that increase of $1500 entirely attributable to the fact that it was a well in a unit?

A Well, I might state this, I went through our accounting records and to the best of my ability lifted out the operating costs consistent with what I testified to, and there is a normal lead or lag in these items and there might be some adjustment in here that would modify these values a little bit, but it does

reflect that the total amount of money that we allocated for operating expenses for the month of July for the 65 wells amounted to $1875 per well a month, yes, sir.

Q Your heading here says these are operating costs less the injection expenses?

A Right.

Q Do they include such expenses as converting wells to injection?

A Yes.

Q And drilling new wells. Are any new wells amortized in this?

A Wait a minute, let me get my list out. There seems to be a conflict internally.

Q Exhibit No. 11 is the one I'm referring to.

A Yes. These values do not include the costs of drilling and completing. It does include the remedial work. Now, many of these wells were opened up into the second and third bench where before they were completed only in the first bench, but to specifically answer your question, it does not include the drilling and completing but it does include the remedial work.

Q I see.

A I have some, oh, fifteen or twenty items that we in our accounting procedure allocate to operating expenses, and they are separate and divorced from the Exhibit 10 items which are commonly

more in the investment.

Q Then the items in Exhibits 10 and 11 in some ways reflect the same information. One is not operating costs and the other one the cost of developing the unit for pressure maintenance.

A I believe you can refer to operating costs or listing costs, lease operating cost and the other more in the investment items possibly.

Q Exhibit 11, while it is operating costs, does include some investment in the wells, however, such as perforating and opening up new benches and so forth?

A Those aren't investment items, those are expense. At least we carry them in the expense analysis.

Q We can't exactly take Exhibit 11 and say this is the cost of operating a unit?

A Yes, that's exactly what it is. That's what it's costing us to operate. These figures were taken directly from our lease operating expense book. I'll be happy to read these items off.

Q No, I don't think it's necessary. However, the point I'm trying to make, this isn't all unit overhead, it includes remedial work, it includes opening up new zones in wells which have never been opened previously and items such as that?

A It's the normal operating expense items and does not include overhead. I don't have any figures for district overhead,

or Tulsa overhead or division overhead. It's only the lease operating expense analysis. What it costs us to lift the oil out of the ground.

Q And these costs would be high if this work was being done whether it was in a unit or not?

A Yes.

Q Is that correct? A Yes.

MR. NUTTER: I believe that's all, Mr. Brinkley, thank you.

MR. PORTER: Mr. Payne.

BY MR. PAYNE:

Q Mr. Brinkley, what Sunray is proposing here is identical to what two operators proposed in the water flood hearing and the Commission in the case of water floods at least felt that was too high. Do you have any particular reason why you feel this type of allowable should be assigned to a pressure maintenance project when it was felt that it was too high in a water flood project?

A I'm assuming you are thinking of the 7200 barrels per day allowable.

Q Well, actually, what you have proposed is that all wells producing and injection receive top unit allowable even though they aren't on a tract directly offsetting an injection well?

A Right.

Q Since they have received some kind of response?

A Right.

Q What I'm saying is that identical rule was proposed by two companies in a water flood hearing. Presumably the Commission felt it was too high so they came out with another rule. Now, I'm wondering if you have any reason that you could give me why you think it's not too high in a pressure maintenance project.

A Well, as I have stated before, we are prepared to produce at 5,000 barrel per day and we are also want to be tied to market demand and we will have to make a decision whether the additional investment to move the allowable up or cut it back as the market demand might dictate.

Q Well, would you prefer, Mr. Brinkley, to produce this project at 5,000 barrels, period?

A We will be happy at 5,000 barrels per day unit allowable.

Q However, if the allowable goes up you might also go up with your production over 5,000?

A We would have to consider the alternatives, the economics of additional expenditure for equipment, et cetera, and as we do in all of our operations.

MR. PAYNE: Thank you.

BY MR. PORTER:

Q You figure your ultimate recovery would be as great with a 5,000 barrel a day allowable as it would if you were allowed the 72 or exercised the option in case you were giving it at,

producing at 7200?

A We think it would be the same.

Q Would be the same? A Yes, sir.

MR. PORTER: Mr. Nutter.

BY MR. NUTTER:

Q Mr. Brinkley, assuming that you had the allowable at 7200 barrels and also assuming that there are 51 producing wells, an average producing well allowable is 141 barrels per day would be somewhere in the ball park, would it not?

A Right.

Q Is Sunray operating any pressure maintenance project anywhere at an equivalent depth of this one where the average allowable for the producing wells is 141 barrels per day?

MR. PAYNE: In a prorated state?

Q In a prorated state.

A Well, the answer to your question is yes.

Q What is the number of wells on the project?

A Well, now, I don't have that detailed information with me, but I'll be happy to assemble it and send it back to you. I might mention this, that our Cycle G projects fall in that category and many of them are deeper than this and I'm satisfied and confident that we can provide you with the information.

Q I meant wells as shallow as this, not deeper.

A As shallow as this, I am satisfied that we do.

Q Yes. A Yes, sir.

Q Under the current rules you have an allowable of 4349 barrels, is that correct?

A Yes, sir.

Q And at the present time your desired rate of operation is 5,000 barrels. Now, you do have some wells that are continuing to increase in their producing capability, have you not?

A Right.

Q Do you think that this project area within a period of 90 days will be capable of being assigned an allowable of 5,000 barrels per day under this existing rule?

A I'm satisfied that that is very true. Our suggestion is that the present rules are not satisfactory for future operation because of this waste or the decision that we will have to make of economics continuing a high allowable, but shutting wells in early or continuing displacement and then suffering the component decision of cutting back on our allowable.

Q Yes. Right now at 4345 you are 651 barrels away from the desired 5,000, correct?

A Yes.

Q And your proposal would permit an allowable of 7200 barrels?

A Yes.

Q Which comes closer to the desired 5,000, the 7200 or

the 4349?

A The former, the 4349.

MR. PORTER: Anyone else have a question? Mr. Utz.

BY MR. UTZ:

Q Mr. Brinkley, I note that you have very few injection wells in the Southeast part of this unit. Do you intend to drill any more injection wells in that area?

A I prefer to answer it this way, we don't want to leave it a closed door that we won't drill injection wells down there because we learn things from month to month and year to year and Bisti being of unusual nature, shall we say, why there's a possibility that we may want to modify this plan of operation.

Q If you don't drill any injection wells in say Section 16, do you think you'll recover more oil than you would from primary?

A With our present method of operation?

Q Yes. A Yes, sir.

Q Do you feel that the injection wells that are considerable distance away will help to produce oil out of that area?

A Yes, yes, sir.

Q Referring to your Exhibit 10 again, besides the LPG which Mr. Nutter inquired about, is there other items on that list that you will be able to recover certain amounts of value from such as the gas injected or the salvage value of equipment?

A Of course, Exhibit No. 10 does not include gas purchase. That's at the top of the exhibit.

Q I see, okay, well any other items?

A Yes, we do have salvageable value for many of these items. Of course, when we abandon the reservoir some time why we will salvage some of the casing and the other equipment that's attached to the well, of course, our injection lines will be salvageable and we've discussed the LPG purchase, separators will be salvageable, some of this test equipment might have some salvageable value, actually the salvageable value on most of the physical property will be rather small.

Q Then actually your net expenditure will be substantially less than the 3.3 million dollars?

A It will be less than that. I don't know how much.

Q Referring to your Exhibit No. 11, particularly your cost per barrel column, from July '59 through March, '60, that was a period when you on your own volition reduced your takes from this unit, was it not?

A Yes, sir.

Q So that would account to a great extent to the high cost per barrel, wouldn't it?

A I'll put it this way, if we had produced twice as much barrels as we had here with no additional expense, thence the lifting costs dollars per barrel would be half what this exhibit

reflects.

Q Yes. And your production during that period ranged anywhere from 500 barrels up to 3500, is that about right?

A Correct, yes, sir.

Q I note in July your cost per barrel was $282 and you produced approximately 1200 barrels and in December it was $119 and you produced approximately 1200 barrels. The additional cost in July could be attributed to workovers and things of that nature?

A It's due to the heavy activity we had during that month to get the unit into operation, whereas in December all that work had been done and hence although we had a reduction in, and of course not as much work done in December, the lifting cost was approximately half that for July.

MR. UTZ: I believe that's all.

MR. PORTER: Anyone else have a question of Mr. Brinkley? Do you have any more, Mr. Loar?

REDIRECT EXAMINATION

BY MR. LOAR:

Q Mr. Brinkley, in response to Mr. Payne's first question I believe it was we have modified these rules to include a Rule 7 which was not presented at the Examiner Hearing of February 25, haven't we? You said these were identical, they do include that additional rule?

A Oh, yes, that is true.

Q Now, Mr. Payne proposed a hypothetical question of two or three injection wells on an area this size and what the allowables would be. Actually the Commission has a chance to regulate these projects and determine the validity of this type of project, do they not?

A That is correct.

Q Our big problem, or one of our big problems is not during the time of increasing productivity is it, Mr. Brinkley?

A That is correct.

Q Isn't our big problem going to come in admission of this as some of the wells, as the LPG front hits them or the water front or the gas injection begins to hit them?

A That's correct.

Q Now, I believe Mr. Nutter referred to Exhibit No. 3 and he discussed shutting in 19, rather than perhaps some method of operation you had been conducting, in order to stabilize your LPG circle. Don't you have to consider the injection into GI 16, GI 15, the injection into the LPG GI 5-L and all of those factors?

A Oh, yes.

Q Isn't that the reason you requested the flexibility that we now partially have?

A That is true, very true.

Q Now, then, if you shut in GI 19, I am sorry, if you shut in producing well 19 as was suggested, aren't you back to the

problem of perhaps distorting your sweep and perhaps having an inefficient operation in that area?

A Precisely.

Q In referring to your Exhibits No. 10 and 11, the investment costs and the operating costs, aren't Sunray's books pretty well scrutinized by Internal Revenue Service and must not these be kept in accordance with current practices?

A Yes, sir.

MR. LOAR: I believe that's all.

MR. PORTER: Anyone else have a question? The witness may be excused.

(Witness excused.)

MR. PORTER: You didn't offer your exhibits.

MR. LOAR: No, at this time if no objection, we would like to offer Sunray's Exhibits 1 through 13.

MR. PORTER: Without objection the exhibits will be admitted. Does anyone have any further testimony to offer in this case?

MR. MEECH: Thomas Meech, appearing on behalf of Amerada Petroleum Corporation, in association with Jason Kellahin. Amerada supports this application, and as one of the owners of the working interest in the unit, we request that the application be granted.

MR. PORTER: Anyone else have a statement? Mr. Spann.

MR. SPANN: Charles C. Spann of Grantham, Spann and

Sanchez, Albuquerque, New Mexico. First, I would like to enter an appearance for El Paso Natural Gas Products Company who concur in the application, and we urge that it be granted, and secondly I would like to enter an appearance for Phillips Petroleum Company and Mr. Pete Nicola of that company has a statement to make for Phillips.

MR. NICOLA: Phillips Petroleum Company is a part owner of the unit under discussion today. We recognize the Commission has adopted a water flood rule which restricts water flood allowables to wells offsetting input wells. We also recognize that the Commission by its action on the prior hearing in this matter is seeking to restrict pressure maintenance operations through the allowables which would accrue to the same wells as if no injection were being carried on. Phillips Petroleum Company believes that both actions are unduly and unnecessarily restrictive.

Unless the Commission grants somewhat more liberal allowables, operators will have little incentive to undertake other projects of similar character in the State of New Mexico. It is noted that oil production in Northwest New Mexico is being held below demand to reduce waste of gas. The Central Bisti-Lower Gallup Sand Unit is not wasting gas, but rather is an operation of experimental character which seeks to produce oil in a most efficient manner and to recover a greater percent of the oil in place. The operation

is costly. It may show the way for large future increases in New Mexico oil production.

The Commission should therefore do everything reasonable to help this project to be an economic success. Phillips Petroleum Company strongly urges that the application of Sunray Mid-Continent for increased allowable be approved.

MR. PORTER: Mr. Selinger.

MR. SELINGER: If the Commission please, George W. Selinger, representing Skelly Oil Company. We have no interest in the Central Bisti Unit. We have interest in units being formed now, secondary recovery in the Bisti Field itself. We urge the Commission's approval of the application on file here and as presented by Sunray Mid-Continent.

MR. PORTER: Does anyone else have a statement to make in this case? The Commission will take the case under advisement and take up next Case 1893.

STATE OF NEW MEXICO)
: SS
COUNTY OF BERNALILLO)

I, ADA DEARNLEY, 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.

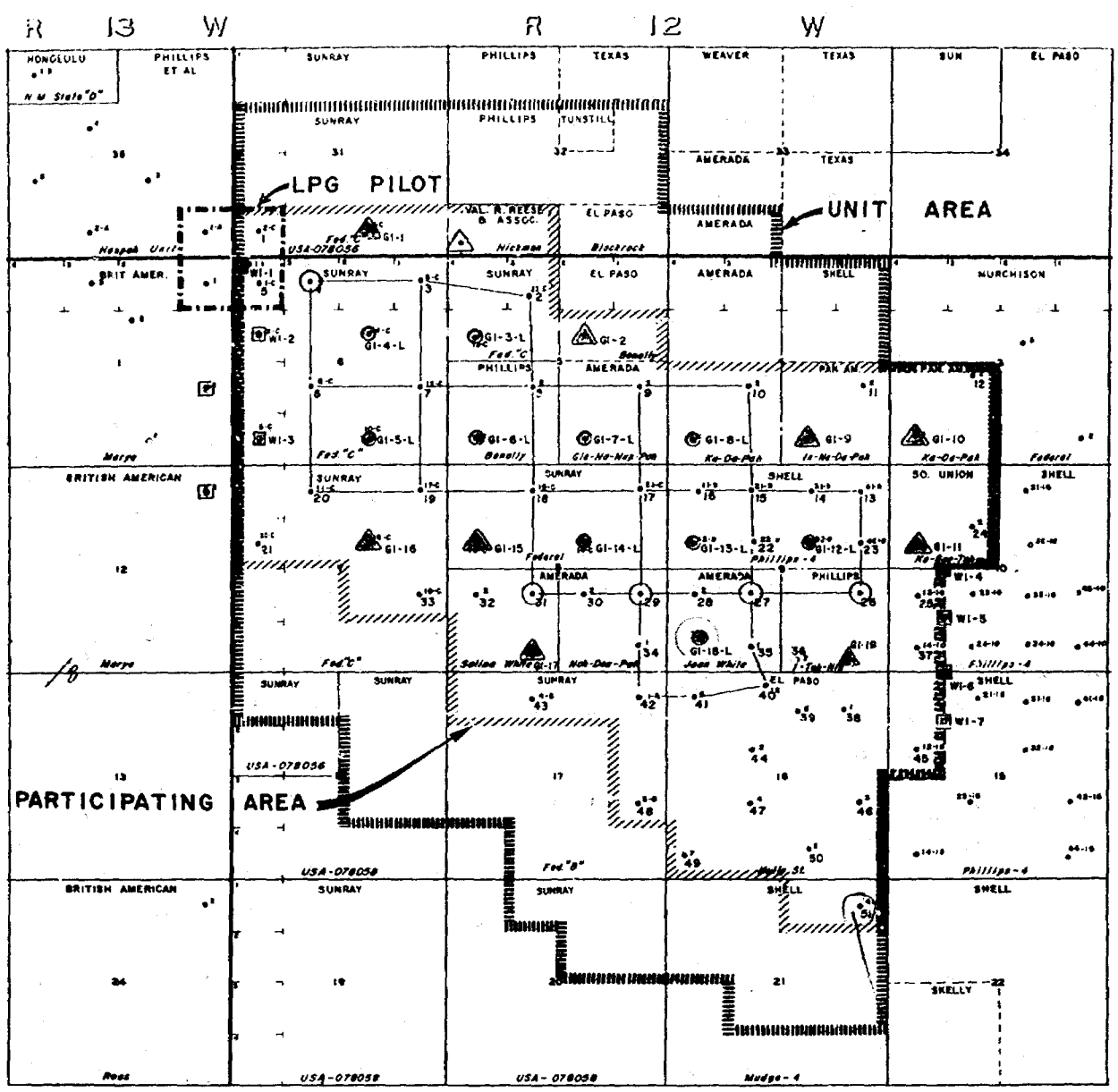
IN WITNESS WHEREOF I have affixed my hand and notarial seal this 25th day of May, 1960.

Ada Dearnley
Notary Public - Court Reporter

My commission expires:

June 19, 1963.

SUNRAY MID-CONTINENT OIL COMPANY
EXHIBIT NO. 1 CASE NO. 1964



CENTRAL BISTI LOWER GALLUP SAND UNIT
San Juan County, New Mexico

LEGEND
- LPG INJECTION WELL
- GAS INJECTION WELL
- DRILLED AFTER UNITIZATION
- WATER INJECTION WELL

SCALE
2000 1000 0 1000 2000
FEET

EX. 1

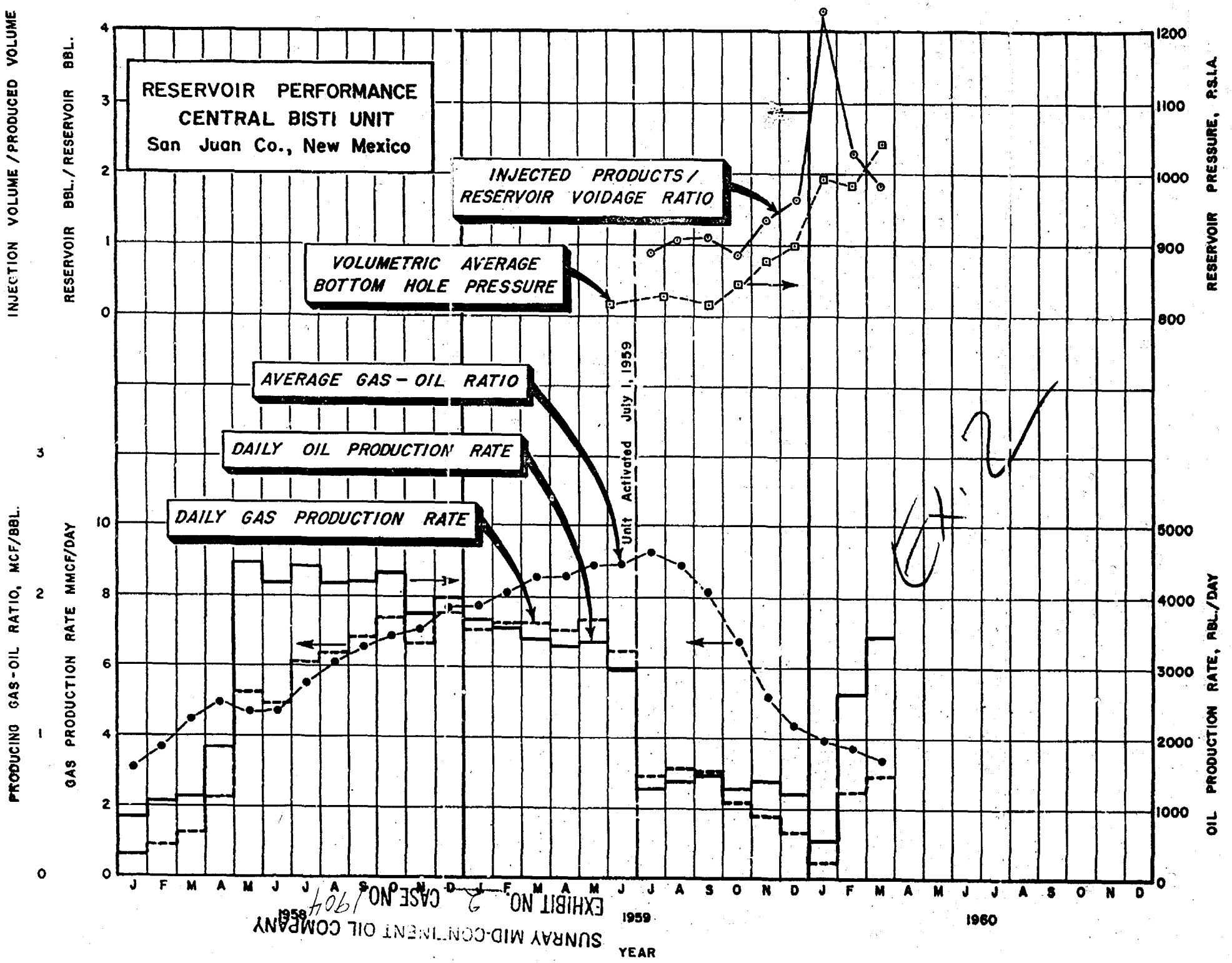
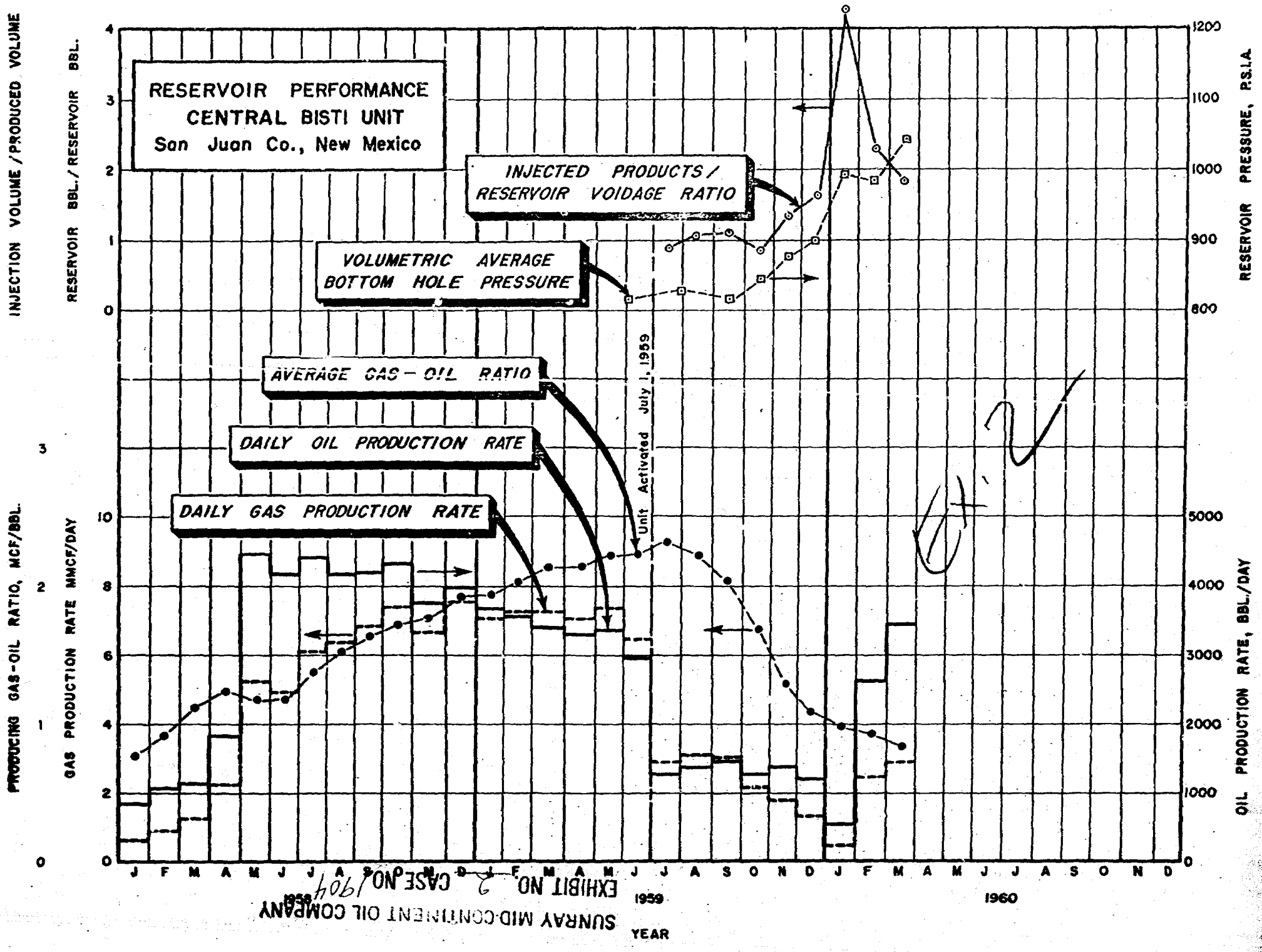
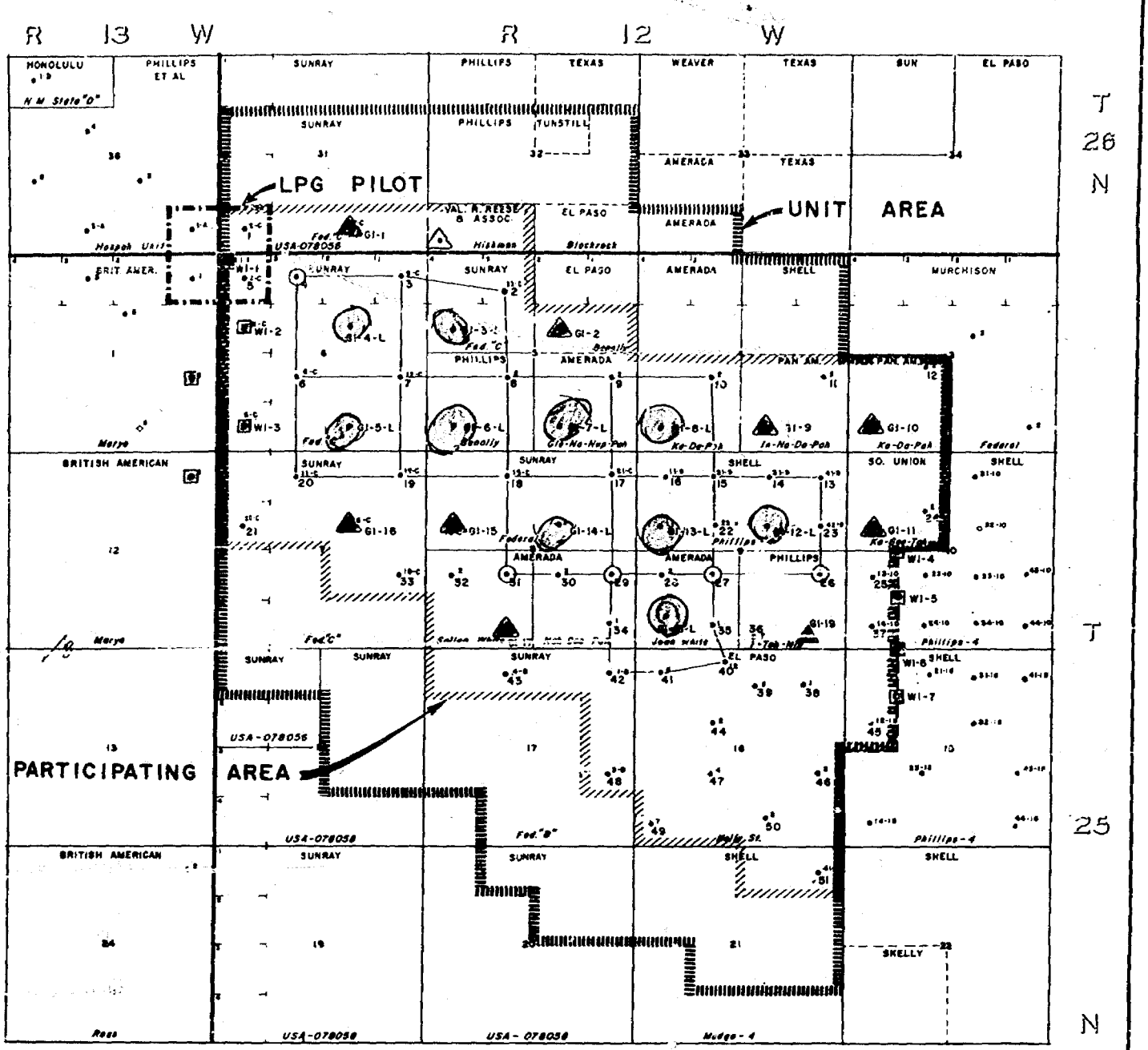


EXHIBIT NO. 2 CASE NO. 1904

SUNRAY MID-CONTINENT OIL COMPANY


RESERVOIR PERFORMANCE
CENTRAL BISTI UNIT
San Juan Co., New Mexico
INJECTED PRODUCTS / RESERVOIR VOIDAGE RATIO
VOLUMETRIC AVERAGE BOTTOM HOLE PRESSURE
AVERAGE GAS – OIL RATIO
DAILY OIL PRODUCTION RATE
DAILY GAS PRODUCTION RATE
Unit Activated July 1, 1959
INJECTION VOLUME / PRODUCED VOLUME
RESERVOIR BBL. / RESERVOIR BBL.
PRODUCING GAS-OIL RATIO, MCF/BBL.
GAS PRODUCTION RATE MMCF/DAY
RESERVOIR PRESSURE, P.S.I.A.
OIL PRODUCTION RATE, BBL./DAY
J F M A M J J A S O N D J F M A M J J A S O N D
1959
1960
YEAR
EXHIBIT NO. 2 CASE NO. 1904
SUNRAY MID-CONTINENT OIL COMPANY

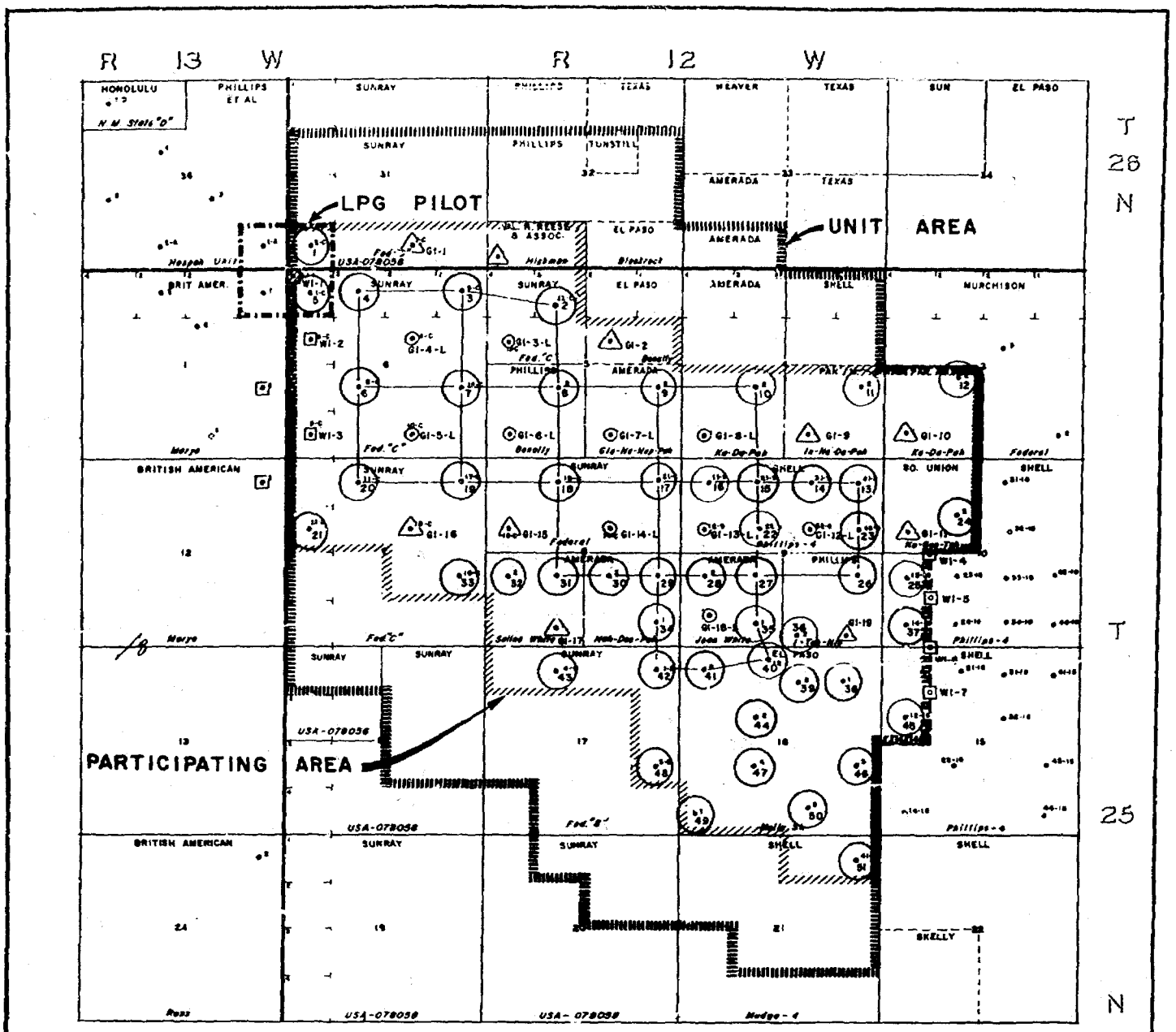
SUNRAY MID-CONTINENT OIL COMPANY
EXHIBIT NO. 3 CASE NO. 1704



CENTRAL BISTI LOWER GALLUP SAND UNIT
San Juan County, New Mexico

EX. 3

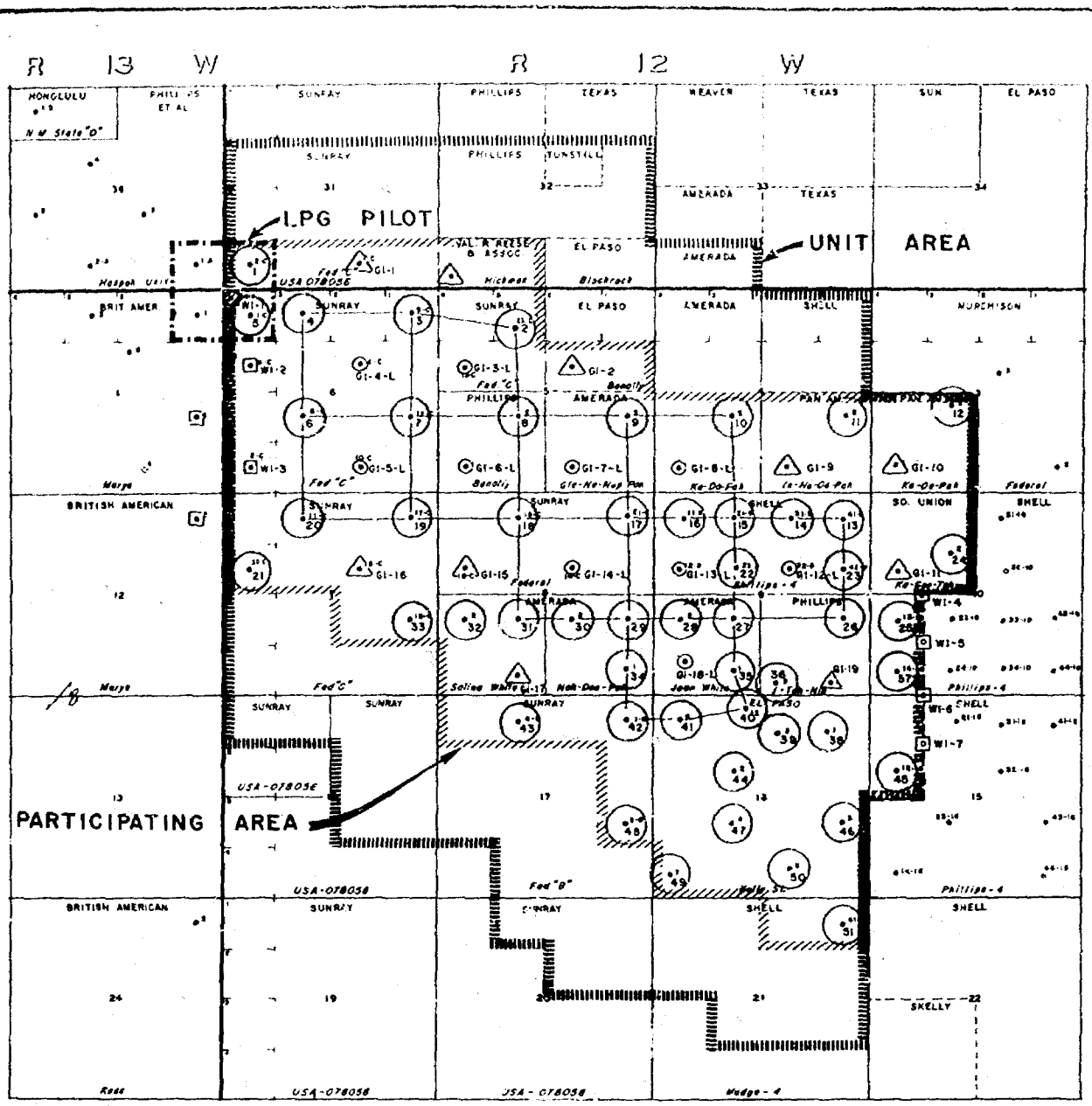
SUNRAY MID-CONTINENT OIL COMPANY
EXHIBIT NO. 4 CASE NO. 1704



CENTRAL BISTI LOWER GALLUP SAND UNIT
San Juan County, New Mexico

EX. 4

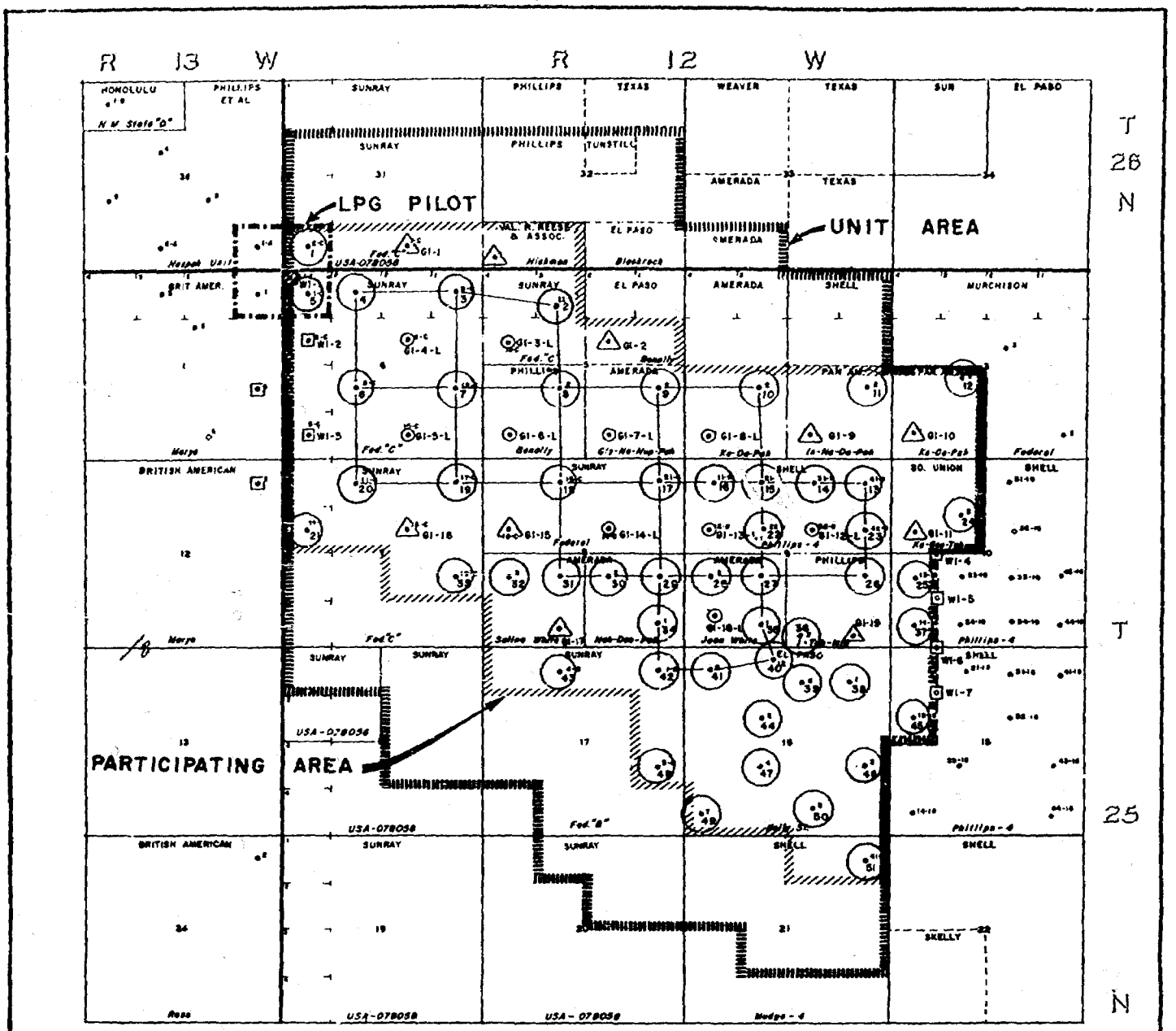
SUNRAY MID-CONTINENT OIL COMPANY
EXHIBIT NO. 5 CASE NO. 7774



CENTRAL BISTI LOWER GALLUP SAND UNIT
San Juan County, New Mexico

EX. 5

SUNRAY MID-CONTINENT OIL COMPANY
EXHIBIT NO. 6 CASE NO. 1204



SUNRAY MID-CONTINENT OIL COMPANY
EXHIBIT NO. 7 CASE NO. 1764

WELL TESTS IN EFFECT AT TIME OF UNITIZATION
CENTRAL BISTI UNIT
BISTI POOL, SAN JUAN COUNTY, NEW MEXICO

CENTRAL BISTI UNIT WELL NUMBER	OIL PRODUCTION BARRELS PER DAY	CENTRAL BISTI UNIT WELL NUMBER	OIL PRODUCTION BARRELS PER DAY
1	25	26	--
2	9	27	--
3	93	28	46
4	--	29	--
5	118	30	122
6	112	31	--
7	132	32	20
8	131	33	22
9	125	34	23
10	25	35	46
11	10	36	23
12	7	37	*
13 }	110	38	28
14 }		39	12
15 }	127	40	10(4)
16		41	15
17	132	42	9
18	46	43	8
19	95	44	**
20	65	45	125
21	30	46	25
22	125(1)	47	7
23	125(2)	48	7
24	40	49	11
25	126(3)	50	7
		51	15
		TOTAL	2,389

(1) Includes Test for GI-13
(2) Includes Test for GI-12
(3) Includes Test for CBU-37
* Included with Test for CBU-25
(4) Includes Test for CBU-44
** Included with Test for CBU-40

Ex. 7

DECEMBER, 1959, CAPACITY WELL TESTS
CENTRAL BISTI UNIT
BISTI POOL, SAN JUAN COUNTY, NEW MEXICO

CENTRAL BISTI UNIT WELL NUMBER	OIL PRODUCTION BARRELS PER DAY
1	23
2	6
3	32
4	486
5	101
6	103
7	442
8	256
9	98
10	27
11	10
12	19
13	50
14	443
15	120
16	120
17	407
18	39
19	60
20	70
21	24
22	118
23	409
24	63
25	345
26	276
27	23
28	41
29	21
30	142
31	31
32	20
33	20
34	19
35	65
36	26
37	56
38	30
39	42
40	30
41	23
42	26
43	7
44	31
45	15
46	21
47	14
48	15
49	18
50	30
51	30
TOTAL	4,943

Ex. 8

SUNRAY MID-CONTINENT OIL COMPANY
EXHIBIT NO. 7 CASE NO. 7774

CURRENT CAPACITY WELL TESTS
CENTRAL BISTI UNIT
BISTI POOL, SAN JUAN COUNTY, NEW MEXICO

CENTRAL BISTI UNIT WELL NUMBER	OIL PRODUCTION BARRELS PER DAY	CENTRAL BISTI UNIT WELL NUMBER	OIL PRODUCTION BARRELS PER DAY
1	50	26	805
2	10	27	29
3	49	28	95
4	399	29	169
5	95	30	143
6	115	31	30
7	1,067	32	33
8	339	33	19
9	170	34	39
10	35	35	79
11	30	36	59
12	19	37	68
13	57	38	67
14	507	39	29
15	265	40	26
16	248	41	78
17	649	42	28
18	51	43	8
19	163	44	10
20	170	45	8
21	32	46	27
22	523	47	19
23	732	48	8
24	49	49	16
25	220	50	12
		51	33
		TOTAL	7,981

Ex. 9

GROSS EXPENDITURE ANALYSIS
(NOT INCLUDING OPERATING EXPENSE AND GAS PURCHASE)

CENTRAL BISTI UNIT

BISTI POOL - SAN JUAN COUNTY, NEW MEXICO

SUNRAY MID-CONTINENT OIL COMPANY
EXHIBIT NO. 10 CASE NO. 1204

LPG AND GAS INJECTION	
CONVERT 9 WELLS FOR LPG INJECTION	$ 23,000
DRILL AND COMPLETE 1 WELL FOR LPG INJECTION	51,890
CONVERT 8 WELLS FOR GAS INJECTION	20,200
LPG SUPPLY AND INJECTION LINES	99,560
GAS SUPPLY, INJECTION LINES AND COMPRESSOR FACILITIES	332,700
PRODUCED GAS GATHERING SYSTEM	165,060
LPG PURCHASE @ $2.10/BBL.	1,972,000
LPG INJECTION	72,200
SUB TOTAL	$2,736,610
WATER BARRIERS	
WEST BARRIER	
CONVERT 2 WELLS, ACQUIRE AND RECOMPLETE	
GI #1 FOR W.I. LESS BRITISH AMERICAN 50%	$ 8,700
INJECTION LINE	4,310
SUB TOTAL	$ 13,010
EAST BARRIER	
DRILL AND COMPLETE 4 WATER INJECTION WELLS	$ 71,050
DRILL AND COMPLETE 1 WATER SUPPLY WELL	28,700
INJECTION PLANT AND FACILITIES	42,950
SUB TOTAL	$ 142,700
OIL GATHERING AND LEASE FACILITIES	
DRILL AND COMPLETE 5 OIL WELLS	$ 227,470
INSTALL CONTROL LACT SYSTEM AND CRUDE OIL GATHERING SYSTEM	175,000
RELOCATION OF OIL LINES	17,380
TRANSFERRING SEPARATORS AND TREATERS ON LEASE	13,160
CHROMATOGRAPH AND TEST EQUIPMENT	3,490
FIELD OFFICE, WAREHOUSE AND LAB	5,420
SUB TOTAL	$ 441,920
TOTAL	**$3,334,240**

EX. 10

SUNRAY MID-CONTINENT OIL COMPANY
EXHIBIT NO. 11 CASE NO. 1904

OPERATING EXPENSE ANALYSIS
FIRST SIX MONTHS 1959, SUNRAY WELLS BEFORE UNITIZATION
vs.
CENTRAL BISTI UNIT AREA AFTER JULY 1, 1959

BISTI POOL - SAN JUAN COUNTY, NEW MEXICO

		No. of Producing Oil Wells	Operating Costs Less Injection Expense	
			$/Well Month	$/Bbl. Oil
1959	January	24	$ 195	$0.08
	February	24	312	0.16
	March	24	322	0.16
	April	24	262	0.12
	May	24	222	0.11
	June	24	397	0.11
	July	65	1,875	2.82
	August	71	1,107	2.04
	September	73	550	1.02
	October	78	791	1.59
	November	78	353	0.43
	December	78	561	1.19
1960	January	78	566	2.68
	February	78	1,350	1.39
	March	78	1,269	0.92

Note: January through June 1959, no gas injection expense, July 1959 through March 1960, gas injection expense included but excluding LPG expense.

EX. 11

SUNRAY MID-CONTINENT OIL COMPANY
EXHIBIT NO. 12 CASE NO. 4284

CALCULATED UNIT ALLOWABLE
CENTRAL BISTI UNIT
BISTI POOL, SAN JUAN COUNTY, NEW MEXICO

CENTRAL BISTI UNIT WELL NO.	ACRES IN PRORATION UNIT	NORMAL UNIT WELL ALLOWABLE BASED ON MARCH, APRIL & MAY WELL TESTS BARRELS OIL/DAY	CENTRAL BISTI UNIT WELL NO.	ACRES IN PRORATION UNIT	NORMAL UNIT WELL ALLOWABLE BASED ON MARCH, APRIL & MAY WELL TESTS BARRELS OIL/DAY
1	80	50	25 & 37	80	120
2	80	10	26	80	120
3	80	49	27 & 28	80	120
4 & 5	80	120	29 & 30	80	120
6	80	115	31 & 32	80	63
7	80	120	33	80	19
8	80	120	34	80	39
9	80	120	35	80	79
10	80	35	36	80	59
11	80	30	38	80	67
12	80	19	39	80	29
13 & 14	80	120	40 & 44	80	35
15 & 16	80	120	41	80	78
17	80	120	42	80	28
18	80	50	43	80	7
19	80	120	45	80	8
20	80	120	46	80	27
21	80	32	47	80	19
22 & GI-13	80	120	48	80	8
23 & GI-12	80	120	49	80	16
24	80	49	50	80	12
			51	80	33

TOTAL 2,865 will go up will it not

Producing Well Allowable - B/D 2,865
Transferred Allowable from Injection Wells - B/D 1,484

Total Unit Allowable - B/D 4,349

Ex. #12

operations limited to 5,000 bbls. per day figure

INJECTION WELL ALLOWABLE
AVAILABLE TO TRANSFER

WELL NO	AC	ALLOW AVAIL TO TRANS
GI 1	80	33
GI 2	80	24
GI 3	80	55
GI 4	80	120
GI 5	80	120
GI 6	80	120
GI 7	80	120
GI 8	80	100
GI 9	80	47
GI 10	80	120
GI 11	80	77
GI 12	40	60
GI 13	40	60
GI 14	80	113
GI 15	80	110
GI 16	80	18
GI 17	80	16
GI 18	40	28
GI 19	40	23
GI 20	80	0
WI 2	80	120
WI 3	80	120
		1,604

letter stating that all offset operators to the project area have been furnished a complete copy of the application and the date of the notification.

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.

Rule 6. Each well shall be subject to the limiting gas-oil ratio (2,000 to 1) for the Bisti-Lower 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 into the Bisti-Lower Gallup Oil Pool within the project area to such high gas-oil ratio well. The daily adjusted oil allowable for any such well receiving gas injection credit shall be determined in accordance with the following formula:

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

Where:

A_{adj} = the well's daily adjusted allowable

TUA = top unit allowable for 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.

l_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, $\frac{P_g - l_g}{P_o}$ to be less than 2,000 cubic feet of gas per barrel of oil produced.

Rule 7. Credit for daily average net water injected into the Bisti-Lower 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:

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

SUNRAY MID-CONTINENT OIL COMPANY
EXHIBIT NO. 13 CASE NO. 1904

SPECIAL RULES AND REGULATIONS
FOR SUNRAY MID-CONTINENT OIL COMPANY'S
CENTRAL BISTI LPG-GAS-WATER INJECTION PROJECT

IT IS THEREFORE ORDERED THAT the special rules and regulations governing the operation of Sunray Mid-Continent Oil Company's Central Bisti LPG-Gas-Water Injection Project as set forth in R-1414 dated June 5, 1959, are amended as follows:

Rule 1. The project area of the Sunray Mid-Continent Oil Company Central Bisti LPG-Gas-Water Injection Project shall comprise that area described as follows:

TOWNSHIP 25 NORTH, RANGE 12 WEST, NMPM

Section 3	SW/4
Sections 4, 5, and 6	All
Sections 7, 8, and 9	All
Section 10	NW/4, W/2 SW/4
Section 15	W/2 NW/4
Section 16	All
Section 17	N/2, SE/4, N/2 SW/4, and SE/4 SW/4
Section 18	NE/4, N/2 NW/4, and N/2 SE/4
Section 20	NE/4 and NE/4 NW/4
Section 21	N/2, N/2 SE/4, and NE/4 SW/4

Ex. 13

TOWNSHIP 26 NORTH, RANGE 12 WEST, NMPM

Section 31	S/2 N/2, and S/2
Section 32	S/2, S/2 N/2
Section 33	S/2 SW/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 or are used as injection wells. The allowable assigned to the wells in the project area shall be the current normal unit allowable for NW New Mexico with 80-acre proration units being assigned an 80-acre proportional factor of two.

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 shut-in for pressure regulation, control of pattern or sweep efficiencies, to observe changes in pressures or changes in characteristics of reservoir liquids, or progress of sweep.

Rule 4. The project allowable may be produced from any well or wells in the project area in any proportion.

Rule 5. Conversion of producing wells to injection or the drilling of additional wells for injection shall be done only after approval of same by the Secretary-Director of the Commission. To obtain such approval, the Project Operator shall file proper application with the Commission which application shall include the following:

1. A plat showing location of proposed injection well, all wells within the project area and offset operators, locating their off-setting wells to the project area.

2. A schematic drawing of the proposed injection well which fully describes the casing, tubing, perforated interval, and depths and showing that injection of LPG-gas-water will be confined into the Bisti-Lower Gallup formation.

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 upper pay-zone of Bisti-Lower Gallup Oil Pool in project area, psig ÷ 11.5, as determined from most recent survey

15.025 = Pressure base, psi

520° = Temperature base of 60°F expressed as absolute temperature

T_s = Reservoir temperature of 145°F expressed as absolute temperature

Z = Compressibility factor from analysis of Bisti-Lower Gallup gas at average reservoir pressure, P_a, interpolated from compressibility tabulation below:

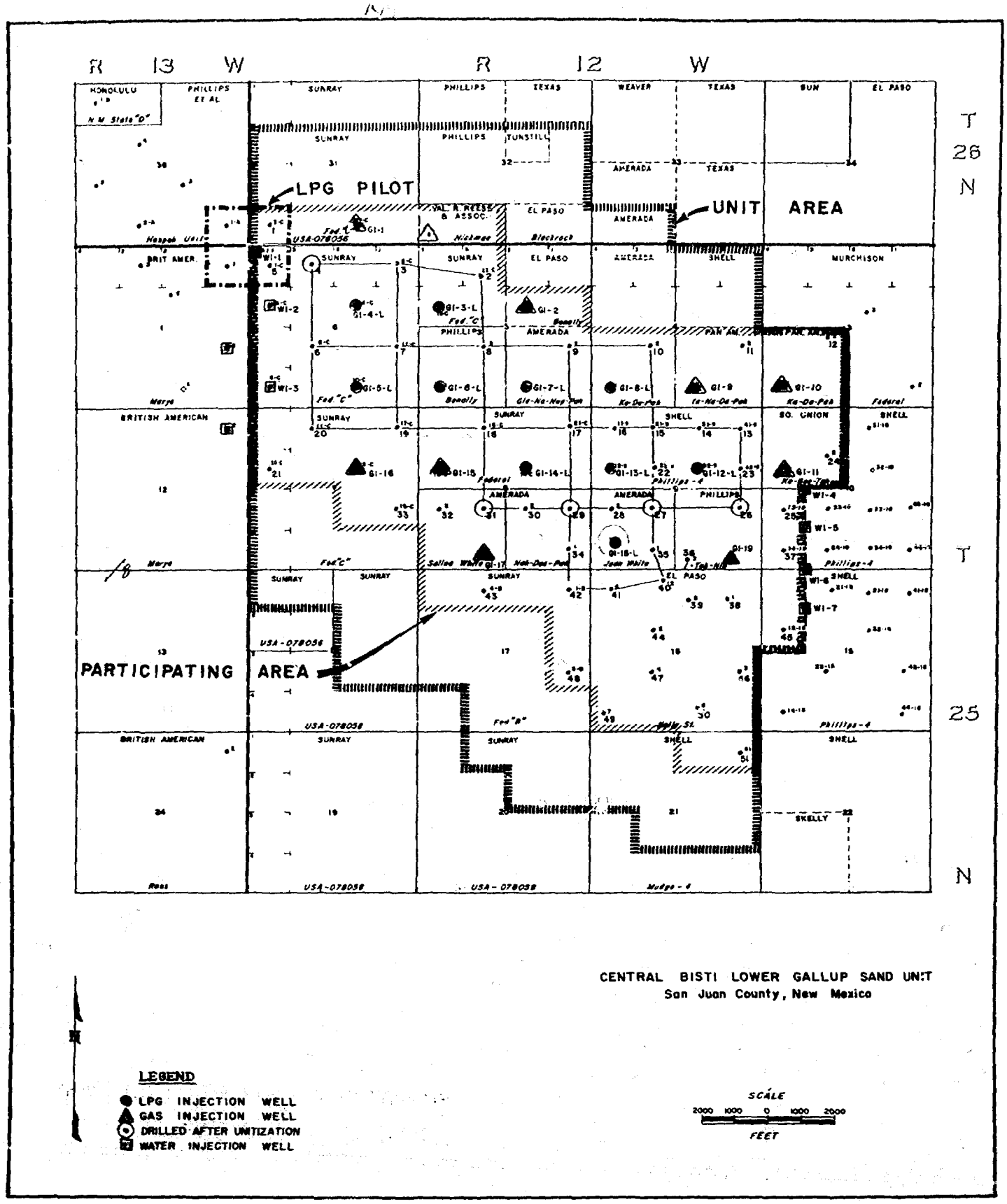
Reservoir Pressure	Z	Reservoir Pressure	Z
50	.9950	800	.9000
100	.9900	850	.8938
150	.9825	900	.8875
200	.9775	950	.8825
250	.9725	1000	.8775
300	.9625	1050	.8713
350	.9563	1100	.8663
400	.9500	1150	.8600
450	.9425	1200	.8550
500	.9363	1250	.8500
550	.9300	1300	.8450
600	.9238	1350	.8400
650	.9175	1400	.8360
700	.9115	1450	.8325
750	.9050		

Rule 8. Each month the Project Operator shall within three days after the normal unit allowable for NW New Mexico has been established, submit to the Commission a Project Operator's report on a form prescribed by the Commission outlining thereon the data required and requesting the allowable for the project.

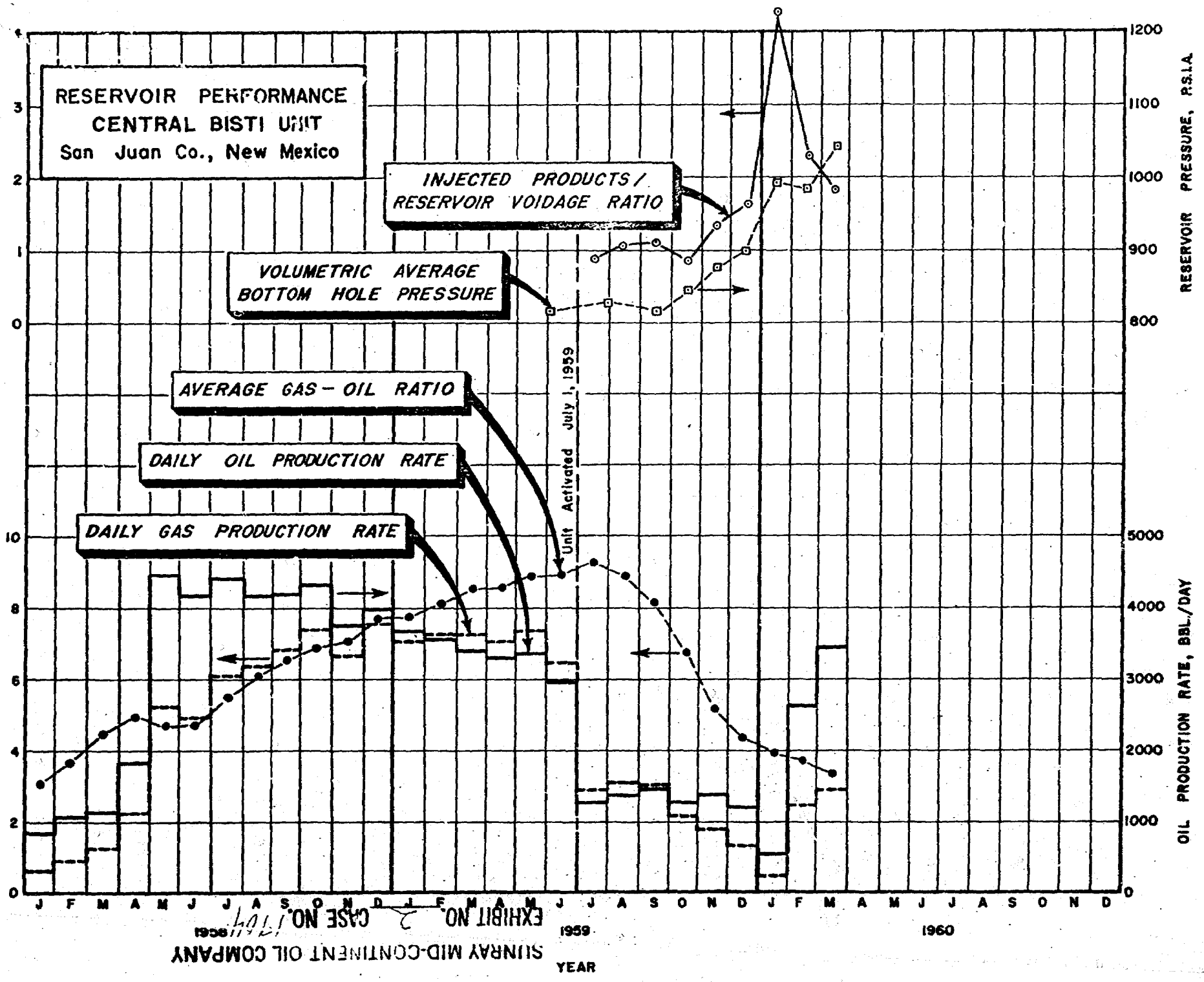
Rule 9. The Commission shall upon the review of the report and after any adjustments deemed necessary assign an allowable to the project for the next succeeding month in accordance with these rules.

Rule 10. The Special Rules and Regulations for the operation of the subject Project shall prevail against the Statewide Rules and also against the Special Rules and Regulations for the Bisti-Lower Gallup Oil Pool, if in conflict therewith.

SUNRAY MID-CONTINENT OIL COMPANY
EXHIBIT NO. 1 CASE NO. 1904



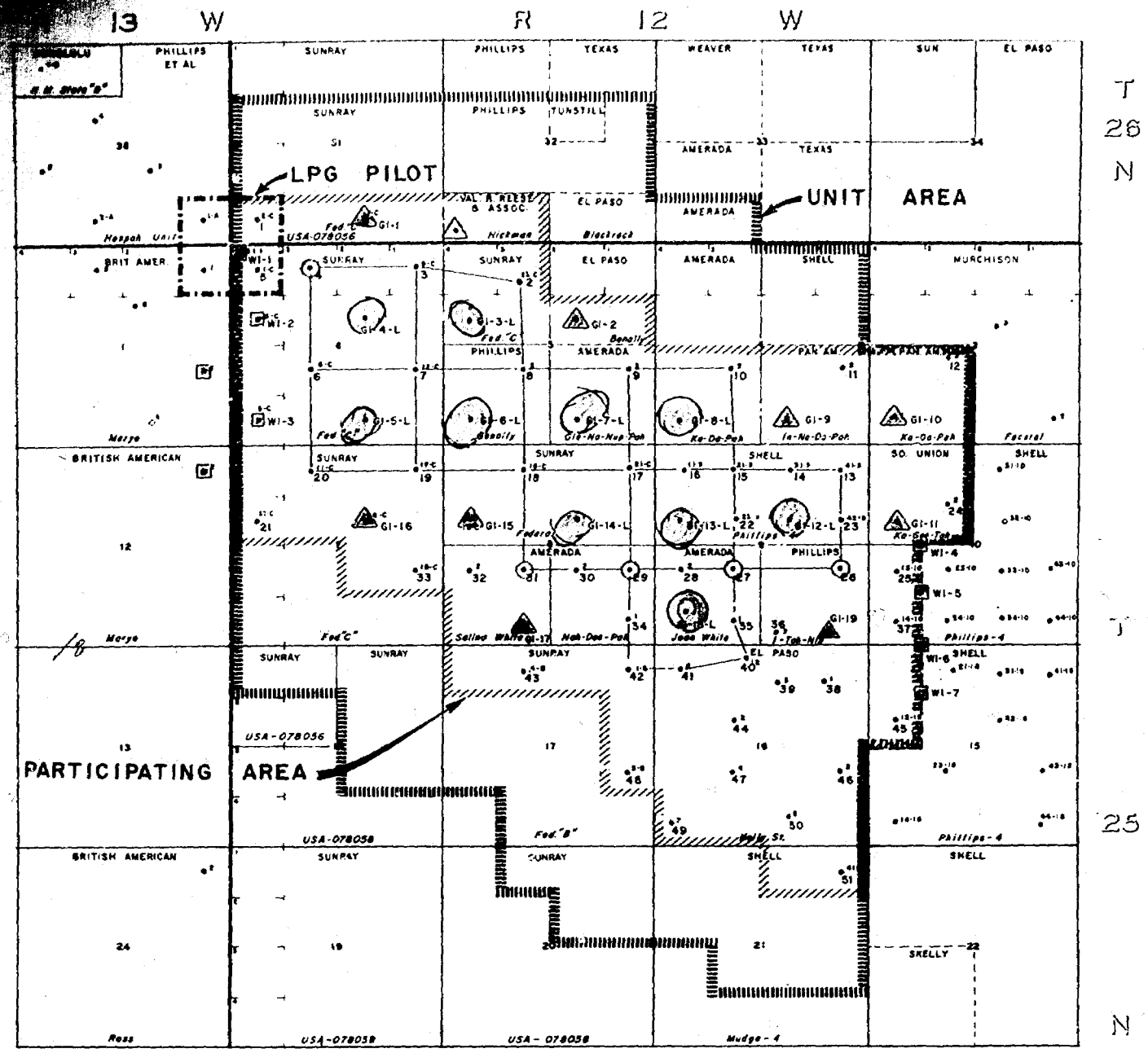
RESERVOIR PERFORMANCE
CENTRAL BISTI UNIT
San Juan Co., New Mexico



SUNRAY MID-CONTINENT OIL COMPANY

EXHIBIT NO. 2 CASE NO. 1767

SUNRAY MID-CONTINENT OIL COMPANY
EXHIBIT NO. 3 CASE NO. 1704

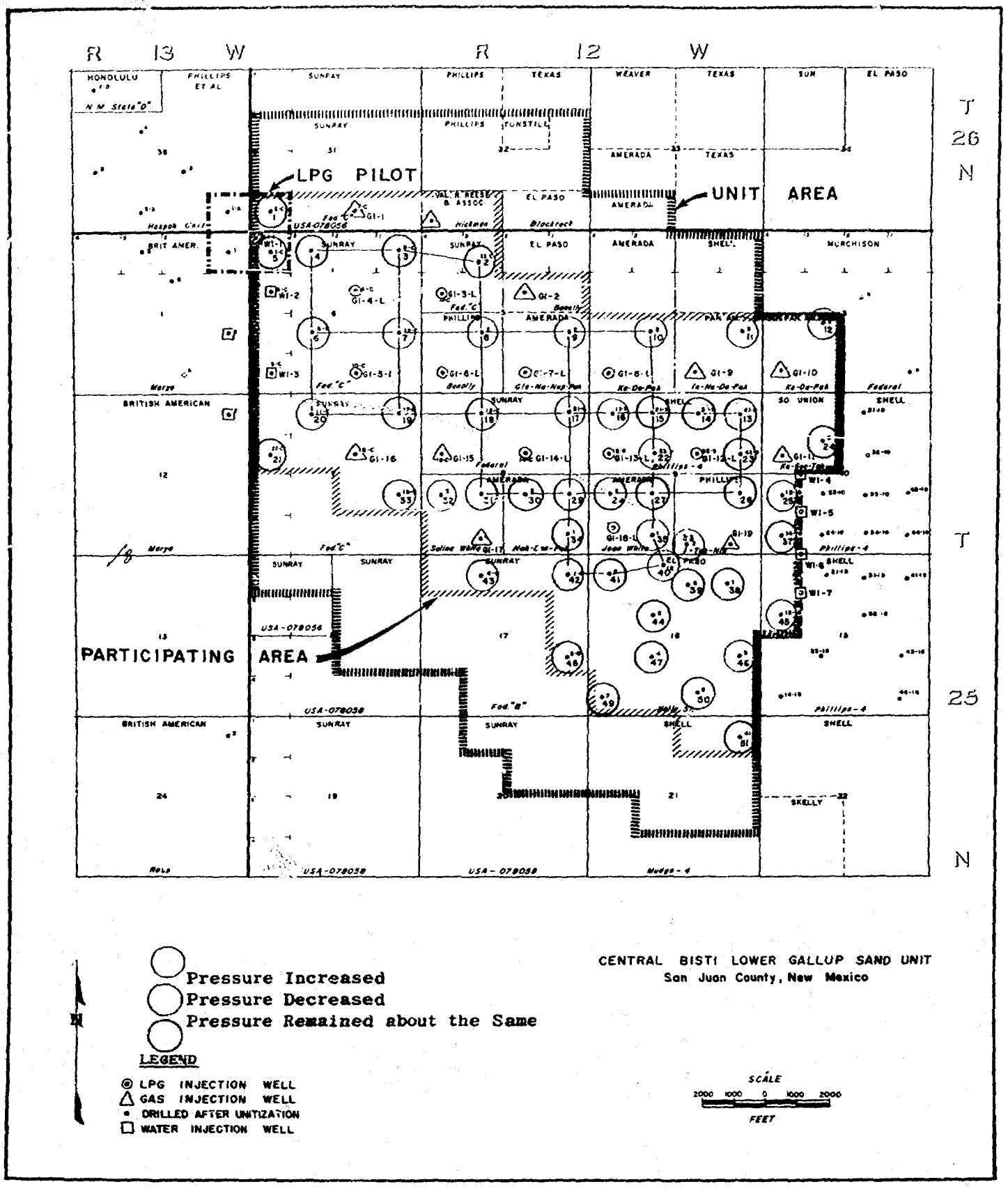


CENTRAL BISTI LOWER GALLUP SAND UNIT
San Juan County, New Mexico

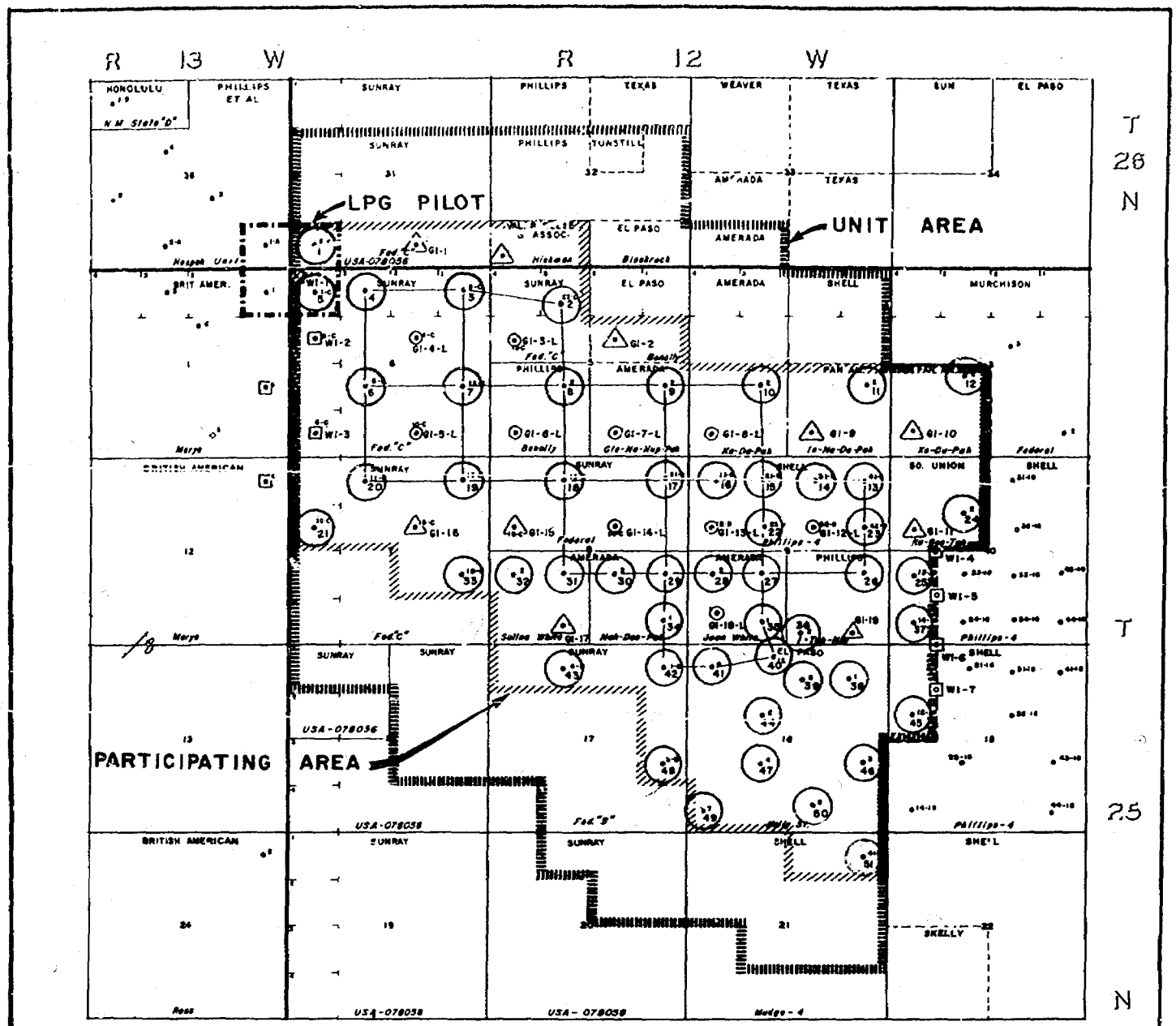
LEGEND
- LPG INJECTION WELL
- GAS INJECTION WELL
- DRILLED AFTER UNITIZATION
- WATER INJECTION WELL

SCALE
2000 1000 0 1000 2000
FEET

SUNRAY MID-CONTINENT OIL COMPANY
EXHIBIT NO. 4 CASE NO. 1764

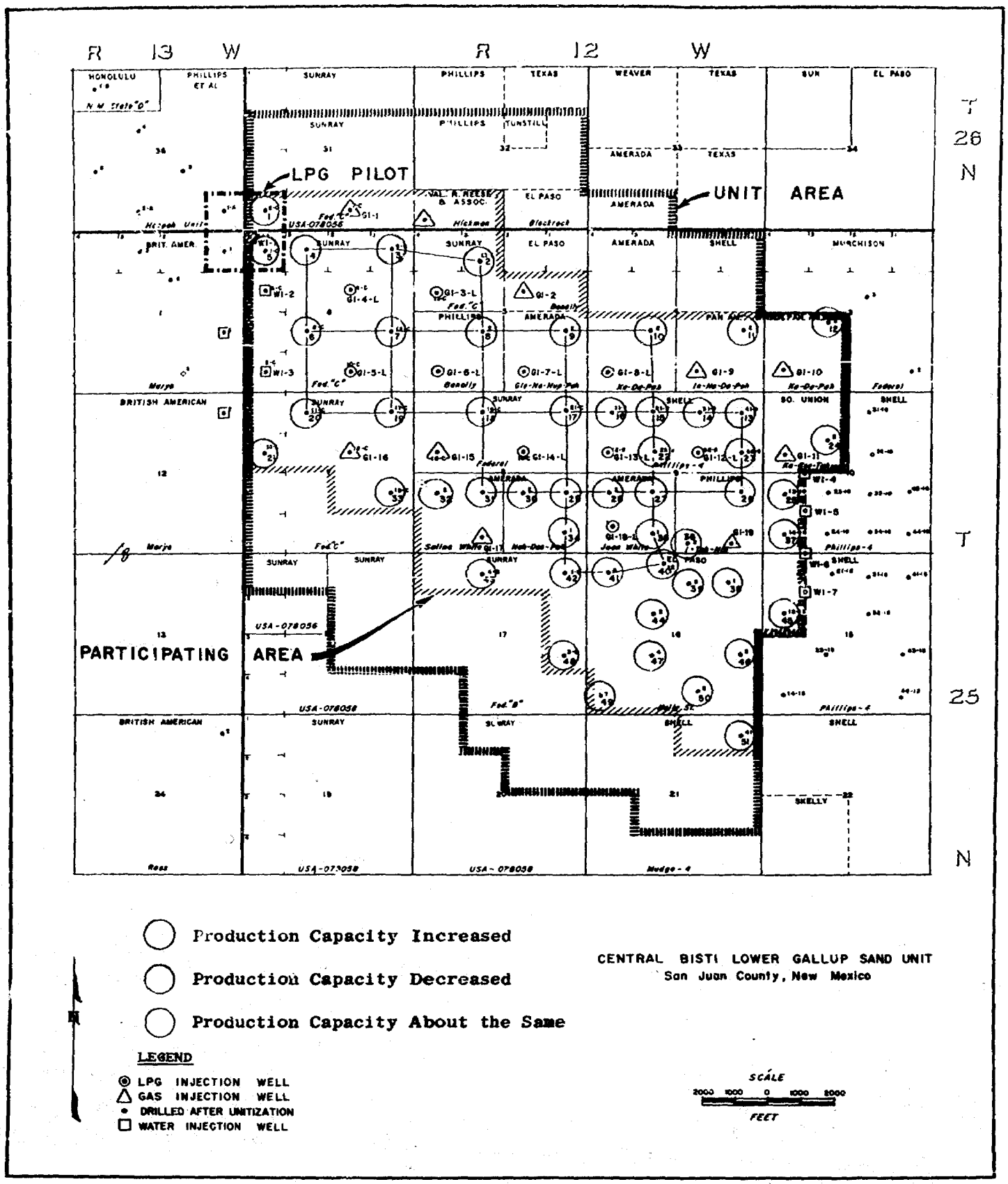


SUNRAY MID-CONTINENT OIL COMPANY
EXHIBIT NO. 5 CASE NO. 1904



CENTRAL BISTI LOWER GALLUP SAND UNIT
San Juan County, New Mexico

SUNRAY MID-CONTINENT OIL COMPANY
EXHIBIT NO. 6 CASE NO. 1904



CENTRAL BISTI LOWER GALLUP SAND UNIT
San Juan County, New Mexico

SUNRAY MID-CONTINENT OIL COMPANY
EXHIBIT NO. 7 CASE NO. 1904

WELL TESTS IN EFFECT AT TIME OF UNITIZATION
CENTRAL BISTI UNIT
BISTI POOL, SAN JUAN COUNTY, NEW MEXICO

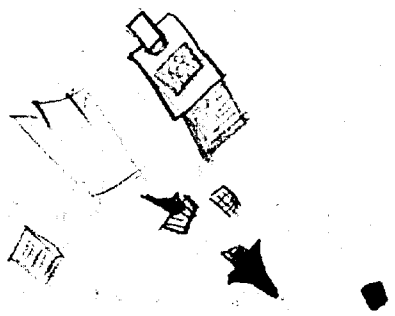
CENTRAL BISTI UNIT WELL NUMBER	OIL PRODUCTION BARRELS PER DAY	CENTRAL BISTI UNIT WELL NUMBER	OIL PRODUCTION BARRELS PER DAY
1	25	26	--
2	9	27	--
3	93	28	46
4	--	29	--
5	118	30	122
6	112	31	--
7	132	32	20
8	131	33	22
9	125	34	23
10	25	35	46
11	10	36	23
12	7	37	*
13 }	110	38	28
14 }		39	12
15 }	127	40	10(4)
16 }		41	15
17	132	42	9
18	46	43	8
19	95	44	**
20	65	45	125
21	30	46	25
22	125(1)	47	7
23	125(2)	48	7
24	40	49	11
25	126(3)	50	7
		51	15
		TOTAL	2,389

(1) Includes Test for GI-13
(2) Includes Test for GI-12
(3) Includes Test for CBU-37
* Included with Test for CBU-25
(4) Includes Test for CBU-44
** Included with Test for CBU-40

SUNRAY MID-CONTINENT OIL COMPANY
EXHIBIT NO. 5 CASE NO. 1704

DECEMBER, 1959, CAPACITY WELL TESTS
CENTRAL BISTI UNIT
BISTI POOL, SAN JUAN COUNTY, NEW MEXICO

CENTRAL BISTI UNIT WELL NUMBER	OIL PRODUCTION BARRELS PER DAY	CENTRAL BISTI UNIT WELL NUMBER	OIL PRODUCTION BARRELS PER DAY
1	23	27	23
2	6	28	41
3	32	29	21
4	486	30	142
5	101	31	31
6	103	32	20
7	142	33	20
8	256	34	19
9	98	35	65
10	27	36	26
11	10	37	56
12	19	38	30
13	50	39	42
14	443	40	30
15	120	41	23
16	120	42	26
17	407	43	7
18	39	44	31
19	60	45	15
20	70	46	21
21	24	47	14
22	118	48	15
23	409	49	18
24	63	50	30
25	345	51	30
26	276		
		TOTAL	4,943



SUNRAY MID-CONTINENT OIL COMPANY
EXHIBIT NO. 9 CASE NO. 1704

CURRENT CAPACITY WELL TESTS
CENTRAL BISTI UNIT
BISTI POOL, SAN JUAN COUNTY, NEW MEXICO

CENTRAL BISTI UNIT WELL NUMBER	OIL PRODUCTION BARRELS PER DAY	CENTRAL BISTI UNIT WELL NUMBER	OIL PRODUCTION BARRELS PER DAY
1	50	26	805
2	10	27	29
3	49	28	95
4	399	29	169
5	95	30	143
6	115	31	30
7	1,067	32	33
8	339	33	19
9	170	34	39
10	35	35	79
11	30	36	59
12	19	37	68
13	57	38	67
14	507	39	29
15	265	40	26
16	248	41	78
17	649	42	28
18	51	43	8
19	163	44	10
20	170	45	8
21	32	46	27
22	523	47	19
23	732	48	8
24	49	49	16
25	220	50	12
		51	33
		TOTAL	7,981

GROSS EXPENDITURE ANALYSIS
(NOT INCLUDING OPERATING EXPENSE AND GAS PURCHASE)

CENTRAL BISTI UNIT

BISTI POOL - SAN JUAN COUNTY, NEW MEXICO

SUNRAY MID-CONTINENT OIL COMPANY
EXHIBIT NO. 10 CASE NO. 1964

LPG AND GAS INJECTION	
CONVERT 9 WELLS FOR LPG INJECTION	$ 23,000
DRILL AND COMPLETE 1 WELL FOR LPG INJECTION	51,890
CONVERT 8 WELLS FOR GAS INJECTION	20,200
LPG SUPPLY AND INJECTION LINES	99,560
GAS SUPPLY, INJECTION LINES AND COMPRESSOR FACILITIES	332,700
PRODUCED GAS GATHERING SYSTEM	165,060
LPG PURCHASE @ $2.10/BBL.	1,972,000
LPG INJECTION	72,200
SUB TOTAL	$2,736,610
WATER BARRIERS	
WEST BARRIER	
CONVERT 2 WELLS, ACQUIRE AND RECOMPLETE	
GI #1 FOR W.I. LESS BRITISH AMERICAN 50%	$ 8,700
INJECTION LINE	4,310
SUB TOTAL	$ 13,010
EAST BARRIER	
DRILL AND COMPLETE 4 WATER INJECTION WELLS	$ 71,050
DRILL AND COMPLETE 1 WATER SUPPLY WELL	28,700
INJECTION PLANT AND FACILITIES	42,950
SUB TOTAL	$ 142,700
OIL GATHERING AND LEASE FACILITIES	
DRILL AND COMPLETE 5 OIL WELLS	$ 227,470
INSTALL CONTROL LACT SYSTEM AND CRUDE OIL GATHERING SYSTEM	175,000
RELOCATION OF OIL LINES	17,380
TRANSFERRING SEPARATORS AND TREATERS ON LEASE	13,160
CHROMATOGRAPH AND TEST EQUIPMENT	3,490
FIELD OFFICE, WAREHOUSE AND LAB	5,420
SUB TOTAL	$ 441,920
TOTAL	**$3,334,240**

78,000

SUNRAY MID-CONTINENT OIL COMPANY
EXHIBIT NO. 11 CASE NO. 1964

OPERATING EXPENSE ANALYSIS
FIRST SIX MONTHS 1959, SUNRAY WELLS BEFORE UNITIZATION
vs.
CENTRAL BISTI UNIT AREA AFTER JULY 1, 1959

BISTI POOL - SAN JUAN COUNTY, NEW MEXICO

		No. of Producing Oil Wells	Operating Costs Less Injection Expense	
			$/Well Month	$/Bbl. Oil
1959	January	24	$ 195	$0.08
	February	24	312	0.16
	March	24	322	0.16
	April	24	262	0.12
	May	24	222	0.11
	June	24	397	0.11
	July	65	1,875	2.82
	August	71	1,107	2.04
	September	73	550	1.02
	October	78	791	1.59
	November	78	353	0.43
	December	78	561	1.19
1960	January	78	566	2.68
	February	78	1,350	1.39
	March	78	1,269	0.92

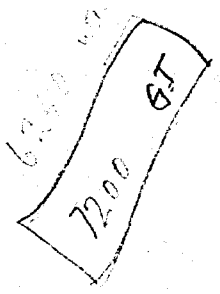
Note: January through June 1959, no gas injection expense, July 1959 through March 1960, gas injection expense included but excluding LPG expense.

SUNRAY MID-CONTINENT OIL COMPANY
EXHIBIT NO. 12 CASE NO. 1704

CALCULATED UNIT ALLOWABLE
CENTRAL BISTI UNIT
BISTI POOL, SAN JUAN COUNTY, NEW MEXICO

CENTRAL BISTI UNIT WELL NO.	ACRES IN PRORATION UNIT	NORMAL UNIT WELL ALLOWABLE BASED ON MARCH, APRIL & MAY WELL TESTS BARRELS OIL/DAY	CENTRAL BISTI UNIT WELL NO.	ACRES IN PRORATION UNIT	NORMAL UNIT WELL ALLOWABLE BASED ON MARCH, APRIL & MAY WELL TESTS BARRELS OIL/DAY
1	80	50	25 & 37	80	120
2	80	10	26	80	120
3	80	49	27 & 28	80	120
4 & 5	80	120	29 & 30	80	120
6	80	115	31 & 32	80	63
7	80	120	33	80	19
8	80	120	34	80	39
9	80	120	35	80	79
10	80	35	36	80	59
11	80	30	38	80	67
12	80	19	39	80	29
13 & 14	80	120	40 & 44	80	35
15 & 16	80	120	41	80	78
17	80	120	42	80	28
18	80	50	43	80	7
19	80	120	45	80	8
20	80	120	46	80	27
21	80	32	47	80	19
22 & GI-13	80	120	48	80	8
23 & GI-12	80	120	49	80	16
24	80	49	50	80	12
			51	80	33
				TOTAL	2,865

Producing Well Allowable - B/D	2,865
Transferred Allowable from Injection Wells - B/D	1,484
Total Unit Allowable - B/D	4,349



INJECTION WELL ALLOWABLE
AVAILABLE TO TRANSFER

WELL NO	AC	ALLOW AVAIL TO TRANS
GI 1	80	33
GI 2	80	24
GI 3	80	55
GI 4	80	120
GI 5	80	120
GI 6	80	120
GI 7	80	120
GI 8	80	100
GI 9	80	47
GI 10	80	120
GI 11	80	77
GI 12	40	60
GI 13	40	60
GI 14	80	113
GI 15	80	110
GI 16	80	18
GI 17	80	16
GI 18	40	28
GI 19	40	23
GI 20	80	0
WI 2	80	120
WI 3	80	120
		1,604

SUNRAY MID-CONTINENT OIL COMPANY
EXHIBIT NO. 12 CASE NO. 1704

SPECIAL RULES AND REGULATIONS
FOR SUNRAY MID-CONTINENT OIL COMPANY'S
CENTRAL BISTI LPG-GAS-WATER INJECTION PROJECT

IT IS THEREFORE ORDERED THAT the special rules and regulations governing the operation of Sunray Mid-Continent Oil Company's Central Bisti LPG-Gas-Water Injection Project as set forth in R-1414 dated June 5, 1959, are amended as follows:

Rule 1. The project area of the Sunray Mid-Continent Oil Company Central Bisti LPG-Gas-Water Injection Project shall comprise that area described as follows:

TOWNSHIP 25 NORTH, RANGE 12 WEST, NMPM

Section 3	SW/4
Sections 4, 5, and 6	All
Sections 7, 8, and 9	All
Section 10	NW/4, W/2 SW/4
Section 15	W/2 NW/4
Section 16	All
Section 17	N/2, SE/4, N/2 SW/4, and SE/4 SW/4
Section 18	NE/4, N/2 NW/4, and N/2 SE/4
Section 20	NE/4 and NE/4 NW/4
Section 21	N/2, N/2 SE/4, and NE/4 SW/4

TOWNSHIP 26 NORTH, RANGE 12 WEST, NMPM

Section 31	S/2 N/2, and S/2
Section 32	S/2, S/2 N/2
Section 33	S/2 SW/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 or are used as injection wells. The allowable assigned to the wells in the project area shall be the curren' normal unit allowable for NW New Mexico with 80-acre proration units being assigned an 80-acre proportional factor of two.

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 shut-in for pressure regulation, control of pattern or sweep efficiencies, to observe changes in pressures or changes in characteristics of reservoir liquids, or progress of sweep.

Rule 4. The project allowable may be produced from any well or wells in the project area in any proportion.

Rule 5. Conversion of producing wells to injection or the drilling of additional wells for injection shall be done only after approval of same by the Secretary-Director of the Commission. To obtain such approval, the Project Operator shall file proper application with the Commission which application shall include the following:

1. A plat showing location of proposed injection well, all wells within the project area and offset operators, locating their off-setting wells to the project area.

2. A schematic drawing of the proposed injection well which fully describes the casing, tubing, perforated interval, and depths and showing that injection of LPG-gas-water will be confined into the Bisti-Lower Gallup formation.

3. A letter stating that all offset operators to the project area have been furnished a complete copy of the application and the date of the 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.

Rule 6. Each well shall be subject to the limiting gas-oil ratio (2,000 to 1) for the Bisti-Lower 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 into the Bisti-Lower Gallup Oil Pool within the project area to such high gas-oil ratio well. The daily adjusted oil allowable for any such well receiving gas injection credit shall be determined in accordance with the following formula:

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

Where:

A_{adj} = the well's daily adjusted allowable

TUA = top unit allowable for 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.

l_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, $\frac{P_g - l_g}{P_o}$ to be less than 2,000 cubic feet of gas per barrel of oil produced.

Rule 7. Credit for daily average net water injected into the Bisti-Lower 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:

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

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 upper pay-zone of Bisti-Lower Gallup Oil Pool in project area, psig + 11.5, as determined from most recent survey

15.025 = Pressure base, psi

520° = Temperature base of 60°F expressed as absolute temperature

T_s = Reservoir temperature of 145°F expressed as absolute temperature

Z = Compressibility factor from analysis of Bisti-Lower Gallup gas at average reservoir pressure, P_a, interpolated from compressibility tabulation below:

Reservoir Pressure	Z	Reservoir Pressure	Z
50	.9950	800	.9000
100	.9900	850	.8938
150	.9825	900	.8875
200	.9775	950	.8825
250	.9725	1000	.8775
300	.9625	1050	.8713
350	.9563	1100	.8663
400	.9500	1150	.8600
450	.9425	1200	.8550
500	.9363	1250	.8500
550	.9300	1300	.8450
600	.9238	1350	.8400
650	.9175	1400	.8360
700	.9115	1450	.8325
750	.9050		

Rule 8. Each month the Project Operator shall within three days after the normal unit allowable for NW New Mexico has been established, submit to the Commission a Project Operator's report on a form prescribed by the Commission outlining thereon the data required and requesting the allowable for the project.

Rule 9. The Commission shall upon the review of the report and after any adjustments deemed necessary assign an allowable to the project for the next succeeding month in accordance with these rules.

Rule 10. The Special Rules and Regulations for the operation of the subject Project shall prevail against the Statewide Rules and also against the Special Rules and Regulations for the Bisti-Lower Gallup Oil Pool, if in conflict therewith.

SUNRAY MID-CONTINENT OIL COMPANY

March 7, 1960

Mr. Elvis Utz
New Mexico Oil Conservation Commission
Box 871
Santa Fe, New Mexico

Dear Mr. Utz:

Enclosed are the Central Bisti Unit bottom hole pressure datum depths that you requested from Mr. T. W. Brinkley.

Yours truly,

SUNRAY MID-CONTINENT OIL COMPANY

T. R. Laverty

T. R. Laverty

TRL:jl

Enc.

OIL CONSERVATION COMMISSION
P. O. BOX 871
SANTA FE, NEW MEXICO

May 25, 1960

COPY

Mr. Charlie White
P. O. Box 787
Santa Fe, New Mexico

Dear Mr. White:

On behalf of your client, Sunray Mid-Continent Oil Company, we enclose two copies of Order R-1636-A in Case 1904 issued by this Commission May 25, 1960.

Very truly yours,

A. L. PORTER, Jr.
Secretary-Director

ALP/ir

Carbon Copy of Order sent to:

Tom Lynch
Charlie Spann
Pete Nicola
George Selinger
Oil Conservation Commission:
Aztec, New Mexico
Hobbs, New Mexico

TOWNSHIP 26 NORTH, RANGE 12 WEST, NMPM
Section 31: S/2 N/2, SE/4, N/2 SW/4, and SE/4 SW/4
Section 33: S/2 SW/4

(3) That the applicant is the operator of the Sunray Mid-Continent Oil Company Federal "C" Gas Injection Project, which project was authorized by Commission Order No. R-1315 and comprises the following-described acreage:

TOWNSHIP 25 NORTH, RANGE 12 WEST, NMPM
Section 6: NE/4 NW/4, S/2 NW/4, NE/4 and the S/2
Section 7: N/2 and the SE/4

TOWNSHIP 26 NORTH, RANGE 12 WEST, NMPM
Section 31: N/2 SW/4, SE/4 SW/4 and the SE/4

Bisti-Lower Gallup Oil Pool, San Juan County, New Mexico.

(4) That said Order No. R-1315 authorized the injection of gas into one well, namely the Sunray Mid-Continent Federal "C" Well No. 18, located in the SW/4 NE/4 of Section 7, Township 25 North, Range 12 West, NMPM, and promulgated special rules and regulations governing the operation of said project.

(5) That the applicant, Sunray Mid-Continent Oil Company, seeks an order amending said Order No. R-1315, to enlarge the area governed by the special rules and regulations for the project to include all of that area described in Finding No. 2 of this order and further, to authorize, in addition to the above-described gas injection well and the two water injection wells authorized by Commission Order No. R-1413, the conversion for injection purposes of the following wells:

LIQUEFIED PETROLEUM GAS (LPG) INJECTION
FOLLOWED BY GAS INJECTION

Sunray Mid-Continent Oil Company
Federal "C" Well No. 4
SW/4 NE/4, Section 6, Township 25 North, Range 12 West

Sunray Mid-Continent Oil Company
Federal "C" Well No. 13
SW/4 NW/4, Section 5, Township 25 North, Range 12 West

Amerada Petroleum Corporation
Gle-Na-Nup-Pah Well No. 1
SW/4 SE/4, Section 5, Township 25 North, Range 12 West

Phillips Petroleum Company
Benally Well No. 1
SW/4 SW/4, Section 5, Township 25 North, Range 12 West

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. 1665
Order No. R-1414

APPLICATION OF SUNRAY MID-CONTINENT
OIL COMPANY FOR AN ORDER AUTHORIZING
AN LPG-GAS-WATER INJECTION PROJECT
IN THE BISTI-LOWER GALLUP OIL POOL IN
SAN JUAN COUNTY, NEW MEXICO, AND FOR
THE PROMULGATION OF SPECIAL RULES
AND REGULATIONS GOVERNING SAID
PROJECT

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 o'clock a.m. on May 12, 1959, at Santa Fe, New Mexico, before Daniel S. Nutter, 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 5th day of June, 1959, the Commission, a quorum being present, having considered the application, the evidence adduced, and the recommendations of the Examiner, Daniel S. Nutter, 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, Sunray Mid-Continent Oil Company, is the operator, under an underwriting agreement pending unitization, of the following-described acreage in the Bisti-Lower Gallup Oil Pool, San Juan County, New Mexico:

TOWNSHIP 25 NORTH, RANGE 12 WEST, NMPM	
Section 3:	SW/4
Sections 4 and 5:	All
Section 6:	E/2, SW/4, S/2 NW/4, and NE/4 NW/4
Sections 7, 8, and 9:	All
Section 10:	NW/4
Section 16:	All
Section 17:	N/2, SE/4, N/2 SW/4, and SE/4 SW/4
Section 18:	NE/4, N/2 NW/4, and N/2 SE/4
Section 20:	NE/4 and NE/4 NW/4
Section 21:	N/2, N/2 SE/4, and NE/4 SW/4

(8) That the applicant's proposal to convert the several wells described in Finding No. 5 to LPG-Gas Injection and Gas Injection should be approved.

(9) That special rules and regulations governing the proposed LPG-Gas-Water injection project area in the Bisti-Lower Gallup Oil Pool, San Juan County, New Mexico, should be promulgated.

(10) That Order No. R-1315, establishing the Sunray Mid-Continent Oil Company Federal "C" Gas Injection Project and promulgating special rules and regulations therefor should be superseded.

IT IS THEREFORE ORDERED:

(1) That Commission Order No. R-1315, dated December 31, 1958, be and the same is hereby superseded.

(2) That the applicant, Sunray Mid-Continent Oil Company, be and the same is hereby authorized to operate a liquefied petroleum gas-gas-water injection project in the Bisti-Lower Gallup Oil Pool, San Juan County, New Mexico, subject to the special rules and regulations for said injection project as hereinafter set forth.

(3) That the applicant be and the same is hereby authorized to convert, for the purpose of injecting liquefied petroleum gas followed by gas, the following-described wells:

Sunray Mid-Continent Oil Company
Federal "C" Well No. 4
SW/4 NE/4, Section 6, Township 25 North, Range 12 West, NMPM

Sunray Mid-Continent Oil Company
Federal "C" Well No. 13
SW/4 NW/4, Section 5, Township 25 North, Range 12 West, NMPM

Amerada Petroleum Corporation
Gle-Na-Nup-Pah Well No. 1
SW/4 SE/4, Section 5, Township 25 North, Range 12 West, NMPM

Phillips Petroleum Company
Benally Well No. 1
SW/4 SW/4, Section 5, Township 25 North, Range 12 West, NMPM

Sunray Mid-Continent Oil Company
Federal "C" Well No. 10
SW/4 SE/4, Section 6, Township 25 North, Range 12 West, NMPM

Sunray Mid-Continent Oil Company
Federal "C" Well No. 14
SW/4 NE/4, Section 8, Township 25 North, Range 12 West, NMPM

Sunray Mid-Continent Oil Company
Federal "C" Well No. 10
SW/4 SE/4, Section 6, Township 25 North, Range 12 West

Sunray Mid-Continent Oil Company
Federal "C" Well No. 14
SW/4 NE/4, Section 8, Township 25 North, Range 12 West

GAS INJECTION ONLY

Sunray Mid-Continent Oil Company
Federal "C" Well No. 7
SW/4 SE/4, Section 31, Township 26 North, Range 12 West

Sunray Mid-Continent Oil Company
Federal "C" Well No. 16
SW/4 NW/4, Section 8, Township 25 North, Range 12 West

El Paso Natural Gas Products Company
Benally Well No. 1
SW/4 NE/4, Section 5, Township 25 North, Range 12 West

Amerada Petroleum Corporation
Salina White Well No. 1
SE/4 SW/4, Section 8, Township 25 North, Range 12 West

(6) That the applicant further proposes that special rules and regulations be promulgated to govern the operation of said project, which rules would provide for:

(a) The conversion of additional wells to injection wells without notice and hearing, subject to administrative approval by the Commission.

(b) The transfer for allowables from injection wells to producing wells within the project area.

(c) The transfer of allowables from wells which have been shut-in for observation, or to increase the efficiency of the project, to other wells within the project area.

(d) Operation of the wells in the project on a net gas-oil ratio basis giving allowance for gas injected.

(e) Such other rules and regulations as are deemed appropriate by the Commission.

(7) That the applicant has established by a preponderance of the evidence that approval of the subject application will prevent waste and result in greater ultimate recovery of oil from the Bisti-Lower Gallup Oil Pool.

TOWNSHIP 26 NORTH, RANGE 12 WEST, NMPM
Section 31: S/2 N/2, SE/4, N/2 SW/4, and SE/4 SW/4
Section 33: S/2 SW/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 or are used as injection wells.

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 shut-in for pressure regulation, control of pattern or sweep efficiencies, to observe changes in pressures or changes in characteristics of reservoir liquids, or progress of sweep.

RULE 4. The project allowable may be produced from any well or wells in the project area in any proportion, subject to the limitations set forth in Rule 8, provided that the rate of production is consistent with the efficient operation of the Project and provided further that no well shall produce in excess of two times the top unit allowable for the Bisti-Lower Gallup Oil Pool, or 200 barrels per day, whichever is greater.

RULE 5. The allowable assigned to any injection well, which allowable is to be transferred to any well or wells in the project area for production, shall in no event exceed the producing capacity of the well prior to conversion to injection, as determined by the testing procedure prescribed by Rule 7. Conversion of producing wells to injection, or the drilling of additional wells for injection, shall be done only after approval of same by the Secretary-Director of the Commission. To obtain such approval, the Project operator shall file proper application with the Commission, which application shall include the following:

(1) A plat showing location of proposed injection well, all wells within the project area and offset operators, locating their off-setting wells to the project area.

(2) A schematic drawing of the proposed injection well which fully describes the casing, tubing, perforated interval, and depths and showing that injection of gas will be confined into the Bisti-Lower Gallup formation.

(3) A letter stating that all offset operators to the project area have been furnished a complete copy of the application and the date of the 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.

(4) That the applicant be and the same is hereby authorized to convert, for the purpose of injecting gas, the following-described wells:

Sunray Mid-Continent Oil Company
Federal "C" Well No. 7
SW/4 SE/4, Section 31, Township 26 North, Range 12 West, NMPM

Sunray Mid-Continent Oil Company
Federal "C" Well No. 16
SW/4 NW/4, Section 8, Township 25 North, Range 12 West, NMPM

El Paso Natural Gas Products Company
Benally Well No. 1
SW/4 NE/4, Section 5, Township 25 North, Range 12 West, NMPM

Amerada Petroleum Corporation
Salina White Well No. 1
SE/4 SW/4, Section 8, Township 25 North, Range 12 West, NMPM

Sunray Mid-Continent Oil Company
Federal "C" Well No. 18
SW/4 NE/4, Section 7, Township 25 North, Range 12 West, NMPM

(5) That the interval of injection for the above-described LPG-gas and gas injection wells shall include the three main sands of the Lower Gallup formation.

(6) That special rules and regulations governing the operation of the Central Bisti Injection Project, Bisti-Lower Gallup Oil Pool, San Juan County, New Mexico, be and the same are hereby promulgated as follows, effective June 1, 1959.

SPECIAL RULES AND REGULATIONS FOR THE
SUNRAY MID-CONTINENT OIL COMPANY CENTRAL
BISTI LPG-GAS-WATER INJECTION PROJECT

RULE 1. The project area of the Sunray Mid-Continent Oil Company Central Bisti LPG-Gas-Water Injection Project shall comprise that area described as follows:

TOWNSHIP 25 NORTH, RANGE 12 WEST, NMPM

Section 3:	SW/4
Sections 4 and 5:	All
Section 6:	E/2, SW/4, S/2 NW/4, and NE/4 NW/4
Sections 7, 8, and 9:	All
Section 10:	NW/4
Section 16:	All
Section 17:	N/2, SE/4, N/2 SW/4, and SE/4 SW/4
Section 18:	NE/4, N/2 NW/4, and N/2 SE/4
Section 20:	NE/4 and NE/4 NW/4
Section 21:	N/2, N/2 SE/4, and NE/4 SW/4

where:

A_{adj} = the well's daily adjusted allowable

TUA = top unit allowable for 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 10. 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 Gas Injection 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.

RULE 11. The Commission shall, upon review of the report and after any adjustments deemed necessary, assign allowables to each well in the Project for the next succeeding month in accordance with these rules.

RULE 12. The Special Rules and Regulations for the operation of the subject Project shall prevail against the Statewide Rules and also against the Special Rules and Regulations for the Bisti-Lower Gallup Oil Pool, if in conflict therewith.

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

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

SEAL

JOHN BURROUGHS, Chairman

MURRAY E. MORGAN, Member

vem/

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

RULE 6. The allowable assigned to any well which is shut-in or 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~~ exceed the producing capacity of the well prior to such shut-in or curtailment as determined by the ~~testing procedure prescribed by Rule 7~~.

RULE 7. The allowable assigned to any well which is used for the purpose of injection, or 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 shall be produced in the same manner and at a constant rate. (In no event ~~shall a well receive an allowable~~ greater than its ability to produce during ~~such~~ test, or greater than top unit allowable for the pool at the time of such test multiplied by the well's acreage factor, or greater than the current top unit allowable for the pool during the month of transfer, multiplied by the well's acreage factor, whichever of the three is less.) The project operator shall notify all operators offsetting the Project, 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 8. No well in the project area shall be assigned any allowable transferred from any other well or wells in the project area unless and until said well has been approved by the Commission as a duly authorized "Transfer Well." To receive approval for any such Transfer Well, the Project operator shall file application with the Secretary-Director of the Commission for permission to transfer allowable to the well, setting forth therein the well's current allowable and the maximum allowable which will be assigned to the well. Copies of the application shall be provided to the operator of each well offsetting the proration unit on which the transfer well is located. The Secretary-Director may designate the well as a Transfer Well subject to the maximum expected allowable for the well if, within 20 days after receiving the application, no objection to the designation is received. The Secretary-Director may grant immediate designation as a Transfer Well provided waivers of objection are received from all such offset operators.

RULE 9. The allowable assigned to any well in the Project shall be based upon the ability of the well to produce and shall be subject to the limiting gas-oil ratio (2,000 to 1) for the Bisti-Lower 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 into the Bisti-Lower Gallup Oil Pool within the project area to such high gas-oil ratio well. The daily adjusted oil allowable for any such well receiving gas injection credit shall be determined in accordance with the following formula:

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

Lea. Rec. Order.

Rule 1.- Describing Project area.

Rule 2.- 11 (a) of 1191 — Project allowable.

Rule 3 - Rule 3 of 1414 — ~~Dispensing~~ Allowable.

Rule 4 - Rule 6 1414 — Amount of Trans. allow.

Rule 5 - Rule 7 - 1414 — Test for Transferred allow.

Rule 6 - Rule 6 of Sum-Rep. — Determining allow for New D.O.R. wells.

Rule 7 - Rule 11(8) 1191 — Converting net H_2O injection to Gas equivalent value of $\frac{1}{2}$ use as I_g in above formula.

Rule 8 - Rule 7 of Summary. — Submitting Project allow.

Rule 9 - Rule 8 of Summary. — Commission approval of project allow.

Rule 10 - Rule 5 of Summary. — Establishing injection wells.

Rule 11 - Rule (a) 2 of 1191-A. — Expansion of Project area.

$\frac{2}{1}$ $\frac{2}{1}$

BEFORE EXAMINER UTZ
OIL CONSERVATION COMMISSION
COMPANY'S EXHIBIT NO. 2
CASE NO. 1904

SPECIAL RULES AND REGULATIONS
FOR SUNRAY MID-CONTINENT OIL ~~COMPANY'S~~ PROJECT
CENTRAL BISTI LPG-GAS-WATER INJECTION

IT IS THEREFORE ORDERED THAT the special rules and regulations governing the operation of Sunray Mid-Continent Oil Company's Central Bisti LPG-Gas-Water Injection Project as set forth in R-1414 dated June 5, 1959 are amended as follows:

Rule 1. The project area of the Sunray Mid-Continent Oil Company Central Bisti LPG-Gas-Water Injection Project shall comprise that area described as follows:

TOWNSHIP 25 NORTH, RANGE 12 WEST, NMPM

Section 3	SW/4
Sections 4, 5, and 6	All
Sections 7, 8, and 9	All
Section 10	NW/4, W/2 SW/4
Section 15	W/2 NW/4
Section 16	All
Section 17	N/2, SE/4, N/2 SW/4, and SE/4 SW/4
Section 18	NE/4, N/2 NW/4, and N/2 SE/4
Section 20	NE/4 and NE/4 NW/4
Section 21	N/2, N/2 SE/4, and NE/4 SW/4

TOWNSHIP 26 NORTH, RANGE 12 WEST, NMPM

Section 31	S/2 N/2, and S/2
Section 32	S/2, S/2 N/2
Section 33	S/2 SW/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 or are used as injection wells. The allowable assigned to the wells in the project area shall be the current normal unit allowable for NW New Mexico with 80-acre proration units being assigned an 80-acre proportional factor of two.

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 shut-in for pressure regulation, control of pattern or sweep efficiencies, to observe changes in pressures or changes in characteristics of reservoir liquids, or progress of sweep.

Rule 4. The project allowable may be produced from any well or wells in the project area in any proportion. (removes limitation of lower normal unit allowable)

Rule 5. Conversion of producing wells to injection or the drilling of additional wells for injection shall be done only after approval of same by the Secretary-Director of the Commission. To obtain such approval, the Project Operator shall file proper application with the Commission which application shall include the following:

1. A plat showing location of proposed injection well, all wells within the project area and offset operators, locating their off-setting wells to the project area.

2. A schematic drawing of the proposed injection well which fully describes the casing, tubing, perforated interval, and depths and showing that injection of LPG-gas-water will be confined into the Bisti-Lower Gallup formation.

3. A letter stating that all offset operators to the project area have been furnished a complete copy of the application and the date of the 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.

Rule 6. Each well shall be subject to the limiting gas-oil ratio (2,000 to 1) for the Bisti-Lower 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 into the Bisti-Lower Gallup Oil Pool within the project area to such high gas-oil ratio well. The daily adjusted oil allowable for any such 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 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 7. Each month the Project Operator shall within three days after the normal unit allowable for NW New Mexico has been established, submit to the Commission a Project Operator's report on a form prescribed by the Commission outlining thereon the data required and requesting the allowable for the project.

Rule 8. The Commission shall upon the review of the report and after any adjustment necessary assign an allowable to the project for the next succeeding month in accordance with these rules.

Rule 9. The Special Rules and Regulations for the operation of the subject Project shall prevail against the Statewide Rules and also against the Special Rules and Regulations for the Bisti-Lower Gallup Oil Pool, if in conflict therewith.

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. 1663
Order No. R-1416

APPLICATION OF BRITISH-AMERICAN
OIL PRODUCING COMPANY FOR
PERMISSION TO INSTITUTE A WATER
INJECTION PROJECT IN THE BISTI-
LOWER GALLUP OIL POOL, SAN JUAN
COUNTY, NEW MEXICO, AND FOR THE
PROMULGATION OF SPECIAL RULES
AND REGULATIONS GOVERNING SAID
PROJECT

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 o'clock a.m. on May 12, 1959, at Santa Fe, New Mexico, before Daniel S. Nutter, 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 5th day of June, 1959, the Commission, a quorum being present, having considered the application, the evidence adduced, and the recommendations of the Examiner, Daniel S. Nutter, 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, British-American Oil Producing Company, is the operator of the following-described acreage in the Bisti-Lower Gallup Oil Pool, San Juan County, New Mexico:

TOWNSHIP 25 NORTH, RANGE 13 WEST, NMPM
Section 1: All
Section 12: All

TOWNSHIP 26 NORTH, RANGE 13 WEST, NMPM
Section 35: All

BEFORE EXAMINER UTZ
OIL CONSERVATION COMMISSION
EXHIBIT NO. 2
CASE NO. 1904

SPECIAL RULES AND REGULATIONS
FOR SUNRAY MID-CONTINENT OIL ~~COMPANY'S~~ COMPANY
CENTRAL BISTI LPG-GAS-WATER INJECTION PROJECT

IT IS THEREFORE ORDERED THAT the special rules and regulations governing the operation of Sunray Mid-Continent Oil Company's Central Bisti LPG-Gas-Water Injection Project as set forth in R-1414 dated June 5, 1959 are amended as follows:

Rule 1. The project area of the Sunray Mid-Continent Oil Company Central Bisti LPG-Gas-Water Injection Project shall comprise that area described as follows:

TOWNSHIP 25 NORTH, RANGE 12 WEST, NMPM

Section 3	SW/4
Sections 4, 5, and 6	All
Sections 7, 8, and 9	All
Section 10	NW/4, W/2 SW/4
Section 15	W/2 NW/4
Section 16	All
Section 17	N/2, SE/4, N/2 SW/4, and SE/4 SW/4
Section 18	NE/4, N/2 NW/4, and N/2 SE/4
Section 20	NE/4 and NE/4 NW/4
Section 21	N/2, N/2 SE/4, and NE/4 SW/4

TOWNSHIP 26 NORTH, RANGE 12 WEST, NMPM

Section 31	S/2 N/2, and S/2
Section 32	S/2, S/2 N/2
Section 33	S/2 SW/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 or are used as injection wells. The allowable assigned to the wells in the project area shall be the current normal unit allowable for NW New Mexico with 80-acre proration units being assigned an 80-acre proportional factor of two.

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 shut-in for pressure regulation, control of pattern or sweep efficiencies, to observe changes in pressures or changes in characteristics of reservoir liquids, or progress of sweep.

Rule 4. The project allowable may be produced from any well or wells in the project area in any proportion. (removes limitation of two normal unit allowable)

Rule 5. Conversion of producing wells to injection or the drilling of additional wells for injection shall be done only after approval of same by the Secretary-Director of the Commission. To obtain such approval, the Project Operator shall file proper application with the Commission which application shall include the following:

1. A plat showing location of proposed injection well, all wells within the project area and offset operators, locating their off-setting wells to the project area.

2. A schematic drawing of the proposed injection well which fully describes the casing, tubing, perforated interval, and depths and showing that injection of LPG-gas-water will be confined into the Bisti-Lower Gallup formation.

3. A letter stating that all offset operators to the project area have been furnished a complete copy of the application and the date of the 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.

Rule 6. Each well shall be subject to the limiting gas-oil ratio (2,000 to 1) for the Bisti-Lower 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 into the Bisti-Lower Gallup Oil Pool within the project area to such high gas-oil ratio well. The daily adjusted oil allowable for any such 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 pool

F_a = the well's average 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 ration, $\frac{P_g - I_g}{P_o}$ to be less than 2,000 cubic feet of gas per barrel of oil produced.

Rule 7. Each month the Project Operator shall within three days after the normal unit allowable for New Mexico has been established, submit to the Commission a Project Operator's report on a form prescribed by the Commission outlining therein the data required and requesting the allowable for the project.

Rule 8. The Commission shall upon the review of the report and after any adjustments thereof necessary assign an allowable to the project for the next succeeding month in accordance with these rules.

Rule 9. The Special Rules and Regulations for the operation of the subject Project shall prevail against the Statewide Rules and also against the Special Rules and Regulations for the Bisti-Lower Gallup Oil Pool, if in conflict therewith.

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. 1663
Order No. R-1416

APPLICATION OF BRITISH-AMERICAN
OIL PRODUCING COMPANY FOR
PERMISSION TO INSTITUTE A WATER
INJECTION PROJECT IN THE BISTI-
LOWER GALLUP OIL POOL, SAN JUAN
COUNTY, NEW MEXICO, AND FOR THE
PROMULGATION OF SPECIAL RULES
AND REGULATIONS GOVERNING SAID
PROJECT

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 o'clock a.m. on May 12, 1959, at Santa Fe, New Mexico, before Daniel S. Nutter, 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 5th day of June, 1959, the Commission, a quorum being present, having considered the application, the evidence adduced, and the recommendations of the Examiner, Daniel S. Nutter, 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, British-American Oil Producing Company, is the operator of the following-described acreage in the Bisti-Lower Gallup Oil Pool, San Juan County, New Mexico:

TOWNSHIP 25 NORTH, RANGE 13 WEST, NMPM
Section 1: All
Section 12: All

TOWNSHIP 26 NORTH, RANGE 13 WEST, NMPM
Section 35: All

(3) That the applicant proposes to institute a water injection project, for the purpose of pressure maintenance, on said acreage by the injection of water into the entire Lower Gallup perforated intervals of the following-described wells:

British-American Marye Well No. 2, located in the NE/4 NE/4 of Section 12

British-American Marye Well No. 5, located in the NE/4 SE/4 of Section 1

both in Township 25 North, Range 13 West, NMPM, San Juan County, New Mexico.

(4) That the applicant further proposes that special rules and regulations be promulgated to govern the operation of said project, which rules would include a provision permitting the transfer of allowables from injection wells to producing wells on the acreage described in Finding No. 2.

(5) That the applicant has established that approval of the subject application will not impair correlative rights and will result in greater ultimate recovery of oil from the Bisti-Lower Gallup Oil Pool.

IT IS THEREFORE ORDERED:

(1) That the applicant, British-American Oil Producing Company, be and the same is hereby authorized to operate a water injection project for pressure maintenance in the Bisti-Lower Gallup Oil Pool in San Juan County, New Mexico, subject to the special rules and regulations for said project as hereinafter set forth.

(2) That the applicant be and the same is hereby authorized, for the purpose of pressure maintenance, to convert to water injection in the Lower Gallup formation, the following-described wells:

British-American Marye Well No. 2, located in the NE/4 NE/4 of Section 12

British-American Marye Well No. 5, located in the NE/4 SE/4 of Section 1

both in Township 25 North, Range 13 West, NMPM, San Juan County, New Mexico.

(3) That the interval of water injection in the aforesaid wells shall be between 4858 feet and 4964 feet for the said Marye Well No. 2 and between 4820 feet and 4914 feet for the said Marye Well No. 5.

(4) That special rules and regulations governing the operation of the above-described water injection project be and the same are hereby promulgated as follows, effective June 1, 1959:

SPECIAL RULES AND REGULATIONS FOR THE
BRITISH-AMERICAN OIL PRODUCING COMPANY
MARYE WATER INJECTION PROJECT

RULE 1. The project area of the British-American Oil Producing Company Marye Water Injection Project, hereinafter referred to as the "Project," shall comprise that area described as follows:

TOWNSHIP 25 NORTH, RANGE 13 WEST, NMPM
Section 1: All
Section 12: All

TOWNSHIP 26 NORTH, RANGE 13 WEST, NMPM
Section 35: All

RULE 2. The project operator may transfer the allowable for any duly authorized water injection well in the project area to any other well or wells in the project area producing from the Bisti-Lower Gallup Oil Pool, provided that such transfer of allowable shall be in accordance with the restrictions and limitations hereinafter set forth.

RULE 3. That the allowable assigned to any duly authorized water injection well located in the project area, which allowable is to be transferred to any other well or wells in the project area for production, shall in no event exceed the producing capacity of the well prior to conversion to water injection, as determined by the testing procedure prescribed in Rule 4. ~~Conversion of producing wells~~ to water injection, or the drilling of new wells for the purpose of water injection, shall be done only after approval of the same after notice and ~~hearing~~.

RULE 4. The allowable assigned to any well which is used for the purpose of ~~water~~ injection 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 shall be produced in the same manner and at a constant rate. In no event shall a well receive an allowable greater than its ability to produce during such test, or greater than top unit allowable for the pool at the time of such test multiplied by the well's acreage factor, or greater than the current top unit allowable for the pool during the month of transfer, multiplied by the well's acreage factor, whichever of the three is less. The project operator shall notify all operators offsetting the Project, as well as the Commission, of the exact time such tests are to be conducted. Tests may be witnessed by representatives of the offsetting operation and the Commission, if they so desire.

RULE 5. No well in the project area shall be assigned any allowable transferred from any other well or wells in the project area unless and until said well has been approved by the Commission as a duly authorized "Transfer Well." To receive approval for any such Transfer Well, the project operator shall file application with the Secretary-Director of the Commission for permission to transfer allowable to the well, setting forth therein the well's current

allowable and the maximum allowable which will be assigned to the well. Copies of the application shall be provided to all operators of wells offsetting the proration unit on which the transfer well is located. The Secretary-Director may designate the well as a Transfer Well subject to the maximum expected allowable for the well if, within 20 days after receiving the application, no objection to the designation is received. The Secretary-Director may grant immediate designation as a Transfer Well provided waivers of objection are received from all such offset operators.

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

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

S E A L

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BEFORE EXAMINER UTZ
OIL CONSERVATION COMMISSION
EXHIBIT NO. 1
CASE NO. 1904

Injected Products - Reservoir Voidage Ratio

Volumetric Average B.H.P., p.s.i.g.

Monthly Oil Production Rate, M. Bbls.

Monthly Gas Production, MMSCF

Average Gas Oil Ratio, SCF/Bbl.

CENTRAL BISTI LOWER GALLUP SAND UNIT
SAN JUAN COUNTY, NEW MEXICO
1959 Reservoir Performance Data

Unit Volumetric Average B.H.P., p.s.i.g.

Unit Production Rate M. Bbls./Mo.

Gas Production - MMSCF

Injected Products - Reservoir Voidage Ratio

Average Gas - Oil Ratio, SCF/Bbl.

1050 1000 950 900 850 800

100 90 80 70 60 50 40 30 20

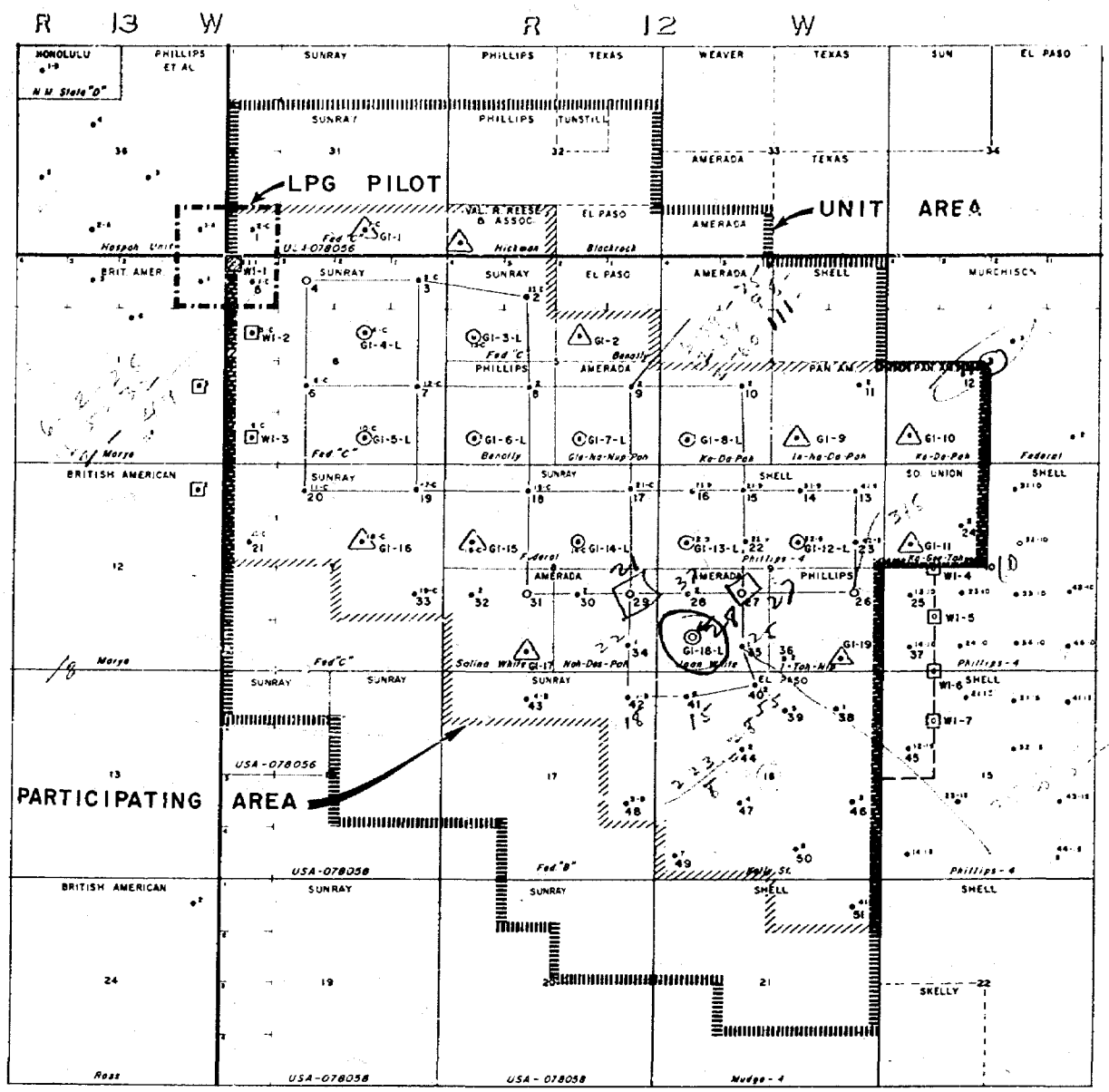
200 180 160 140 120 100 80 60 40

2.5 2.0 1.5 1.0 0.5 0

4000 3500 3000 2500 2000 1500 1000 500 0

JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC.

1959



CENTRAL BISTI LOWER GALLUP SAND UNIT
San Juan County, New Mexico

LEGEND

- ◉ LPG INJECTION WELL
- △ GAS INJECTION WELL
- ○ TO BE DRILLED
- □ WATER INJECTION WELL

SCALE
1000 500 0 500 1000
FEET

NEW CASES

CASE 1901 Application of Caulkins Oil Company for a gas-gas dual completion and for establishment of a 320-acre non-standard Dakota gas unit. Applicant, in the above-styled cause, seeks an order authorizing the dual completion of its PC-233 Well, located in Unit D, Section 16, Township 26 North, Range 6 West, Rio Arriba County, New Mexico, in such a manner as to permit the production of gas from the South Blanco-Pictured Cliffs Pool and the production of gas from the Dakota Producing Interval. Applicant further seeks the establishment of a 320-acre non-standard gas unit in the Dakota Producing Interval consisting of the N/2 N/2 and S/2 NW/4 and N/2 SW/4 of said Section 16 to be dedicated to said PC-233 Well.

CASE 1902: Application of Kenneth Murchison & Company for permission to commingle the production from two separate non-contiguous leases. Applicant, in the above-styled cause, seeks permission to commingle the Bisti-Lower Gallup Oil Pool production from the Federal lease NM-036255-A, consisting of the S/2 SE/4 of Section 3 and the Federal Lease NM-036255-B, consisting of the S/2 NE/4 of said Section 3, Township 25 North, Range 12 West, San Juan County, New Mexico.

CASE 1903: Application of Texaco Inc. for permission to commingle the production from two separate pools. Applicant, in the above-styled cause, seeks permission to commingle the liquid hydrocarbon production from the Moore-Pennsylvanian Pool and the Moore-Wolfcamp Gas Pool from all wells on its State "BN" (NCT-1) lease consisting of the SW/4 of Section 25, Township 11 South, Range 32 East, Lea County, New Mexico.

CASE 1904: Application of Sunray Mid-Continent Oil Company for an amendment of Order R-1414, as amended by R-1414-A and R-1414-B. Applicant, in the above-styled cause, seeks an order amending the provisions of Order R-1414 which relate to assignment and transfer of allowables in the Central Bisti LPG-Gas-Water Injection Project, Bisti-Lower Gallup Oil Pool, San Juan County, New Mexico.

CASE 1905: Application of Humble Oil & Refining Company for an oil-oil dual completion utilizing parallel strings of small diameter casing cemented in a common well bore. Applicant, in the above-styled cause, seeks an order authorizing the dual completion of its State M-20 Well, located 1930 feet from the North line and 1980 feet from

No. 6-60

DOCKET: EXAMINER HEARING FEBRUARY 25, 1960

Oil Conservation Commission - 9 a.m., State Corporation Commission Hearing Room, Basement, Capitol Building, Santa Fe, New Mexico

The following cases will be heard before Elvis A. Utz, Examiner, or A. L. Porter, Jr., Secretary-Director:

CONTINUED CASES

CASE 1868: Application of Hamilton Dome Oil Company, Ltd. for permission to commingle the production from three separate pools. Applicant, in the above-styled cause, seeks an order authorizing it to commingle the production from the Justis-Drinkard Pool, the Justis-Fusselman Pool and an undesignated Tubb pool from wells on a lease consisting of the S/2 SE/4 of Section 25, Township 25 South, Range 37 East, Lea County, New Mexico.

CASE 1879: Application of Amerada Petroleum Corporation for a gas-oil dual completion and for a non-standard gas proration unit. Applicant, in the above-styled cause, seeks an order authorizing the dual completion of its State EM "A" Well No. 2, located 660 feet from the South and West lines of Section 22, 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 Eumont Gas Pool through the casing-tubing annulus and the tubing respectively. Applicant further seeks the establishment of a 160-acre non-standard gas proration unit in the Eumont Gas Pool consisting of the SW/4 of said Section 22 to be dedicated to the said State EM "A" Well No. 2.

CASE 1888: Application of C. W. Trainer for off-lease storage of oil production. Applicant, in the above-styled cause, seeks permission to store the Pearl-Queen Oil Pool production from his Rushing lease, consisting of the W/2 NE/4 of Section 22, Township 19 South, Range 35 East, Lea County, New Mexico, in a tank battery located on his Signal State lease, consisting of the E/2 NW/4 of said Section 22.

CASE 1894: (Continued)
Application of Robert N. Enfield for designation of a unit area. Applicant, in the above-styled cause, seeks a designation of the following-described 560 acres as the Southwest Mescalero Unit Area: Section 32, E/2 NE/4; Section 33, S/2 and NW/4, Township 10 South, Range 32 East, Lea County, New Mexico.

the West line of Section 29, Township 22 South, Range 37 East, Lea County, in such a manner as to permit the production of oil from the Langlie-Mattix Pool and the production of oil from the Drinkard Pool through 2 7/8-inch casing and 4½-inch casing respectively with said casing being cemented in a common well bore.

CASE 1906: Application of El Paso Natural Gas Products Company for permission to produce more than sixteen wells in a common tank battery. Applicant, in the above-styled cause, seeks an order authorizing the production into a common tank battery of all Horseshoe-Gallup Oil Pool wells presently drilled or hereafter completed on its Horseshoe Ute lease, comprising portions of Sections 27, 28, 33 and 34, Township 31 North, Range 16 West, San Juan County, New Mexico.

CASE 1907: Application of Gulf Oil Corporation for an oil-oil dual completion. Applicant, in the above-styled cause, seeks an order authorizing the dual completion of its J. N. Carson (NCT-A) Well No. 11, located in Unit K of Section 28, Township 21 South, Range 37 East, Lea County, New Mexico, in such a manner as to permit the production of oil from the Wantz-Abo Pool and the production of oil from the Paddock Pool through parallel strings of 2 3/8-inch tubing.

CASE 1908: Application of Val R. Reese & Associates, Inc. for an oil-gas dual completion. Applicant, in the above-styled cause, seeks an order authorizing the dual completion of its Sperling Well No. 1-30, located in Unit I, Section 30, Township 24 North, Range 6 West, Rio Arriba County, New Mexico, in such a manner as to permit the production of oil from the Gallup formation adjacent to the Escrito-Gallup Oil Pool and the production of gas from the Dakota Producing Interval through parallel strings of 2 3/8-inch tubing.

CASE 1909: Application of Pan American Petroleum Corporation for a 386-acre non-standard gas unit in the Dakota Producing Interval. Applicant, in the above-styled cause, seeks the establishment of a 386-acre non-standard gas unit in the Dakota Producing Interval consisting of all of partial Section 7 and the W/2 of partial Section 8, Township 28 North, Range 10 West, San Juan County, New Mexico, said unit to be dedicated to the J. F. Day "F" Well No. 1, to be located in the E/2 of said partial Section 7.

CASE 1910: Application of Roy H. Smith Drilling Company for permission to commingle the production from two separate pools. Applicant, in the above-styled cause, seeks permission to commingle the production from the Maljamar-Yates Pool and the Pearsall Pool from all wells on its Walker "A" lease in Section 5, Township 18 South, Range 32 East, and to commingle the production from the Baish Pool and the Maljamar Pool from wells on its Gulf State lease in Section 16, Township 17 South, Range 32 East, all in Lea County, New Mexico.

CASE 1911: Application of Johnston and Shear for a multiple zone slim hole completion. Applicant, in the above-styled cause, seeks an order authorizing the multiple completion of its Jicarilla Well No. 1-4, located 985 feet from the North line and 805 feet from the West line of Section 4, Township 24 North, Range 5 West, Rio Arriba County, New Mexico, in such a manner as to produce gas from the South Blanco-Pictured Cliffs Pool (or Otero Chacra), gas from the Dakota Producing Interval, and oil from the Gallup formation adjacent to the Otero-Gallup Pool, each to be produced through 2 7/8-inch tubing which tubing is to be cemented in a common well bore.

CASE 1912: Application of Southern Union Gas Company for a gas-oil dual completion. Applicant, in the above-styled cause, seeks an order authorizing the dual completion of its Jicarilla 1-F, Unit L, Section 27, Township 26 North, Range 4 West, Rio Arriba County, New Mexico, in such a manner as to permit the production of gas from the Blanco Mesaverde Pool, and the production of oil from the Dakota producing interval through parallel strings of 2 3/8-inch tubing.

CASE 1913: Application of Continental Oil Company for a non-standard oil well location. Applicant, in the above-styled cause, seeks a non-standard oil well location for its Wm. Mitchell "A" Well No. 20, to be located 1320 feet from the North line and 1520 feet from the West line of Section 20, Township 17 South, Range 32 East, Maljamar Paddock Pool, Lea County, New Mexico.

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3. A letter stating that all offset operators to the project area have been furnished a complete copy of the application and the date of the 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.

Rule 6. Each well shall be subject to the limiting gas-oil ratio (2,000 to 1) for the Bisti-Lower 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 into the Bisti-Lower Gallup Oil Pool within the project area to such high gas-oil ratio well. The daily adjusted oil allowable for any such well receiving gas injection credit shall be determined in accordance with the following formula:

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

Where:

A_{adj} = the well's daily adjusted allowable

TUA = top unit allowable for 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.

l_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, $\frac{P_g - l_g}{P_o}$ to be less than 2,000 cubic feet of gas per barrel of oil produced.

Rule 7. Each month the Project Operator shall within three days after the normal unit allowable for NW New Mexico has been established, submit to the Commission a Project Operator's report on a form prescribed by the Commission outlining thereon the data required and requesting the allowable for the project.

Rule 8. The Commission shall upon the review of the report and after any adjustments deemed necessary assign an allowable to the project for the next succeeding month in accordance with these rules.

Rule 9. The Special Rules and Regulations for the operation of the subject Project shall prevail against the Statewide Rules and also against the Special Rules and Regulations for the Bisti-Lower Gallup Oil Pool, if in conflict therewith.

GILBERT, WHITE AND GILBERT
ATTORNEYS AT LAW
SANTA FE, NEW MEXICO

BEFORE THE OIL CONSERVATION COMMISSION

OF THE STATE OF NEW MEXICO

IN THE MATTER OF SUNRAY MID-CONTINENT OIL COMPANY'S APPLICATION TO AMEND ORDER R 1414 AS AMENDED BY ORDER R 1414-A IN REGARD TO ALLOWABLES INCLUDING THE ASSIGNMENT AND TRANSFER THEREOF FOR ITS CENTRAL BISTI LPG-GAS-WATER INJECTION PROJECT.

CASE No. 1904

A P P L I C A T I O N

Comes now Sunray Mid-Continent Oil Company and respectfully states and alleges:

1. That it is the operator of the Central Bisti LPG-Gas-Water Injection Project within the Bisti-Lower Gallup Oil Pool, San Juan County, New Mexico.

2. That the special rules and regulations governing the operation of the Central Bisti Injection Project have been appropriate rules until the present to govern the injection operations during its initial stage and early development.

3. That the project is now developed to the stage where the provisions pertaining to allowables including the assignment and transfer thereof as set forth in this Commission's Order R 1414, as amended by Order R 1414-A, should be amended to more properly conform with the operations of the Injection Project and to permit a more flexible and efficient program.

WHEREFORE, Applicant prays that this Application be set for hearing; that notice be given as required by law, and that Order R 1414 and Order R 1414-A be further amended by an Order based upon the evidence adduced at the hearing.

SUNRAY MID-CONTINENT OIL COMPANY
By W. R. LOAR
P. O. Box 2039, Tulsa 2, Oklahoma

By _____
L. C. WHITE
P. O. Box 787, Santa Fe, New Mexico

Docketed 4-15-60

OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO

Date 3-1-60

CASE 1904 Hearing Date 2-25-60

My recommendations for an order in the above numbered cases are as follows:

1. Write ~~Leon-Ray~~ Sunray Mid Cont. application formula Change as follows:

(a) Semis 40 x 80 ~~Units~~ Acre ~~normal~~ normal unit allowable for all ~~well~~ producing and injection wells regardless of their producing capacity.

(b) Remove top limitation of production on any well in accordance with the ~~Rule~~ recommended Project rules attached.

2. Binding order should clearly state that the maximum allowable provisions being removed will ~~cause no~~ protect correlative rights in this particular instance — as not to set a precedent on this point.

Staff Member

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

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

CASE NO. 1420
Order No. R-1191

APPLICATION OF CAULKINS OIL COMPANY
TO AMEND THE SPECIAL POOL RULES FOR
THE SOUTH BLANCO-TOCITO OIL POOL,
RIO ARRIBA COUNTY, NEW MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 o'clock a.m. on April 16, 1958, at Roswell, New Mexico, before the Oil Conservation Commission of New Mexico, hereinafter referred to as the "Commission."

NOW, on this 10th day of June, 1958, the Commission, a quorum being present, having considered the application and the evidence adduced, 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, Caulkins Oil Company, is the operator of a water injection project in the South Blanco-Tocito Oil Pool in Rio Arriba County, New Mexico.

(3) That the applicant proposes that the Special Rules and Regulations for the South Blanco-Tocito Oil Pool as promulgated by Order No. R-326, dated May 26, 1953, and by Commission Order No. R-1144, dated March 25, 1958, be amended to provide for a system of transferring allowables within said water injection project and to provide credit against gas-oil ratio limitations for net water injected into the reservoir.

(4) That amendment of the Special Rules and Regulations for the South Blanco-Tocito Oil Pool to provide that allowables may be transferred from injection wells to other producing wells within the water injection project will not impair correlative rights.

(5) That production from any one well within the water injection project should be limited to twice the top unit allowable or three hundred (300) barrels a day,

whichever is greater.

(6) That in order to prevent the waste of casinghead gas, a no-flare order should be entered for the South Blanco-Tocito Oil Pool, effective October 1, 1958.

(7) That the Rules and Regulations for the South Blanco-Tocito Oil Pool, as set forth in Commission Order No. R-326, dated May 26, 1953, and Commission Order No. R-1144, dated March 25, 1958, should be superseded by this order so as to consolidate all Special Rules and Regulations for the South Blanco-Tocito Oil Pool and for the South Blanco-Tocito Water Injection Project in one order.

(8) That the findings of the Commission, as recited in Commission Order R-326 and Commission Order R-1144, should be incorporated by reference in this order.

IT IS THEREFORE ORDERED:

(1) That the findings of the Commission, as recited in Commission Order R-326 and Commission Order R-1144, be and the same are hereby incorporated by reference in this order.

(2) That the Rules and Regulations for the South Blanco-Tocito Oil Pool as set forth in Commission Order R-326, dated May 26, 1953, and Commission Order R-1144, dated March 25, 1958, be and the same are hereby superseded.

(3) That Special Pool Rules for the South Blanco-Tocito Pool, Rio Arriba County, New Mexico, be and the same are hereby promulgated as follows, effective July 1, 1958:

SPECIAL RULES AND REGULATIONS
FOR THE SOUTH BLANCO-TOCITO OIL POOL

RULE 1. Any well drilled to or completed in the Tocito formation within one mile of the boundaries of the South Blanco-Tocito Oil Pool shall be spaced, drilled, operated, and prorated in accordance with the Special Rules and Regulations hereinafter set forth.

RULE 2. All wells projected to or completed in the South Blanco-Tocito Oil Pool shall be located on a tract containing 80 acres, more or less, comprising the East half, West half, North half, or South half of the governmental quarter section in which the well is located. Allowables for wells located on such 80-acre tracts shall be assigned in accordance with the 80-acre proportional factor for pools in the 6,000-to 7,000-foot depth range. Wells located on tracts comprising less than 80 acres shall be assigned an allowable which shall bear the same proportion to the standard 80-acre allowable that the acreage assigned to such well bears to 80 acres.

RULE 3. All wells hereafter projected to or completed in the South Blanco-Tocito Oil Pool shall be located in the center of the Northwest quarter or the Southeast

Blanco-Tocito Oil Pool shall be flared or vented after October 1, 1958.

RULE 10. All wells drilled to and completed in the South Blanco-Tocito Oil Pool prior to May 26, 1953, whose locations do not conform to the well spacing requirements of Rule 3 above are excepted from the requirements of said Rule and their locations are hereby approved as unorthodox well locations. This approval shall apply to the following wells:

	Well No.	Unit	Sec.	Twp.	Rge.
Caulkins Oil Company	T-132	A	9	26N	6 W
" " "	T-134	C	10	26N	6W
" " "	T-157	E	10	26N	6W
" " "	T-182	K	10	26N	6W
" " "	T-207	O	10	26N	6W

RULE 11. In addition to the above Rules for the South Blanco-Tocito Oil Pool, the following Rules shall apply to the operation of all wells completed in the Tocito formation and located within the South Blanco Water Injection Project Area, hereinafter referred to as the "Project."

(a) The project Area shall comprise that area described as follows:

TOWNSHIP 26 NORTH, RANGE 6 WEST, NMPM

Section 3:	S/2 SW/4
Section 4:	S/2
Section 8:	N/2 NE/4
Section 9:	N/2 and N/2 S/2
Section 10:	NW/4, N/2 SW/4, and SE/4
Section 11:	W/2 SW/4

(b) 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 or are used as [redacted] injection wells. Allowables for all wells shall be determined in a manner hereinafter prescribed.

(c) Allowables for any duly authorized [redacted] injection wells may be transferred to producing wells within the project area, as may be the allowables for producing wells which, in the interest of more efficient operation of the Project, are shut-in or are curtailed in their rate of production.

(d) The project allowable may be produced from any well or wells in the project area in any proportion, provided said rate of production is consistent with

quarter of a governmental quarter section, with a tolerance of 100 feet in any direction to avoid surface obstructions.

RULE 4. That all wells hereafter projected to or completed in the South Blanco-Tocito Oil Pool shall be cased in accordance with the following casing rules:

(a) The surface casing shall consist of new or reconditioned pipe with an original mill test of not less than 1000 pounds per square inch, and at least one string of surface casing shall be set at a depth sufficient to protect all potable water-bearing strata encountered, and not less than 450 feet below the surface of the ground. Sufficient cement shall be used to fill the annular space back of the pipe to the bottom of the cellar. Cement shall be allowed to stand a minimum of 24 hours before initiating tests. Before drilling the plug a pump pressure of at least 600 pounds per square inch shall be applied. If at the end of 30 minutes the pressure shows a drop of 100 pounds per square inch, or more, the casing shall be condemned, subject to corrective operations and further testing.

(b) The producing oil string shall consist of new or reconditioned pipe with an original mill test of not less than 2100 pounds per square inch. The producing string shall be set and cemented with sufficient cement to fill the calculated annular space behind the pipe to a minimum of 1000 feet above the guide shoe. Cement shall be allowed to stand a minimum of 72 hours before initiating tests. Before drilling the plug a pump pressure of at least 600 pounds per square inch shall be applied. If at the end of 30 minutes the pressure shows a drop of 100 pounds per square inch, or more, the casing shall be condemned, subject to corrective operations and further testing.

RULE 5. Upon completion of any well in the South Blanco-Tocito Oil Pool and semi-annually, during the months of April and October, a bottom-hole pressure test shall be made and a report thereof filed with the Commission on Commission Form C-124. Bottom hole pressures shall be taken in accordance with the provisions of Rule 302 of the Commission Rules and Regulations except that wells shall remain shut-in for a minimum of 72 hours prior to testing. Tests shall be corrected to a reservoir datum plane of minus 100 (-100) feet.

RULE 6. Upon completion of any well in the South Blanco-Tocito Oil Pool and semi-annually during the months of April and October, a gas-oil ratio test shall be made and a report thereof filed with the Commission on Commission Form C-116.

RULE 7. Prior to making tests required in Rules 5 and 6 above, each operator in the South Blanco-Tocito Oil Pool shall notify all other operators in the pool, as well as the Commission, of the time such tests are to be conducted. Tests may be witnessed by representatives of the other operators and the Commission, if they so desire.

RULE 8. The limiting gas oil ratio for the South Blanco-Tocito Oil Pool shall be two thousand (2,000) cubic feet of gas for each barrel of oil produced.

RULE 9. No casinghead gas produced from any well completed in the South

$V_{w\ inj}$ = Average daily volume of water injected, barrels

$V_{w\ prod}$ = Average daily volume of waterproduced, barrels

P_a = Average reservoir pressure at datum of -100 feet, psig + 11.5, as determined from most recent semi-annual survey.

15.025 = Pressure base, psi

520° = Temperature base of $60^\circ F$ expressed as absolute temperature

635° = Reservoir temperature of $175^\circ F$ expressed as absolute temperature

$\frac{1}{Z}$ = Supercompressibility factor for 0.7 gravity gas at average reservoir pressure, P_a, interpolated from supercompressibility tabulation below:

Pressure	Z	$\frac{1}{Z}$	Pressure	Z	$\frac{1}{Z}$
2000	.829	0.845	1200	.873	0.889
1900		0.849	1100		0.897
1800		0.853	1000		0.905
1700		0.857	900	.900	0.914
1600	.847	0.861	800		0.923
1500		0.865	700	.921	0.932
1400		0.873	600		0.941
1300		0.881	500	.944	0.950

Distribution of the total calculated average daily gas equivalent volume may be made to any well or wells with gas-oil ratios in excess of two thousand to one. The daily adjusted oil allowable for any such well receiving water injection credit shall be determined as follows:

$$\text{Well's Adjusted Allowable} = \frac{(\text{Top unit allowable} \times 2000) + \text{gas equivalent volume assigned to well}}{\text{Well's gas-oil ratio}}$$

efficient operation of the Project and provided further, that no well shall produce in excess of two times the top unit allowable for the South Blanco-Tocito Oil Pool, or 300 barrels per day, whichever is greater.

(e) The allowable assigned to any water injection well, which is to be transferred to any other well or wells in the Project area for production, shall in no event exceed the producing capacity of the well prior to conversion to ~~water~~ injection, as determined by the average daily rate of production during the last three months the well was produced prior to such conversion.

Conversion of producing wells to ~~water~~ injection, ~~as abandonment of~~ said producing wells is necessitated by water encroachment, shall be made only after approval of such conversion by the Secretary-Director of the Commission. To obtain such approval, the Project operator shall file proper application for conversion with the Commission, providing copies of said application to all interested parties. The Secretary Director may approve the conversion to ~~water~~ injection if, within 20 days after receiving the application, no objection to said conversion is received. The Secretary-Director may grant immediate approval provided waivers of objection are received from all interested parties.

(f) The allowable assigned to any well which is to be shut-in or curtailed and which is to be transferred from said well to any other well or wells in the project area shall in no event exceed the ability of the well to produce oil as 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 under test shall be produced in the same manner and at a constant rate. The project operator shall notify all other operators in the South Blanco-Tocito Oil Pool, as well as the Commission, of the time such tests are to be conducted. Tests may be witnessed by representatives of the other operators and the Commission, if they so desire.

(g) ~~The allowable assigned to any well in the Project shall be based upon the ability of the well to produce oil and shall be subject to the limiting gas-oil ratio (2000 to 1) for the South Blanco-Tocito Oil Pool, except that~~ credit for daily average net water injected into the ~~Tocito formation~~ through any injection well ~~or wells~~ located within the project area may be applied to any well ~~or wells~~ 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:

$$E_g = (V_{w\ inj} - V_{w\ prod}) \times 5.61 \frac{ft^3}{bbl} \times \frac{P_a}{15.025} \times \frac{520^\circ}{635^\circ} \times \frac{1}{Z}$$

where:

E_g = Average daily gas equivalent of net water injected,

provided however, that in no event shall the gas equivalent volume assigned to a well be such as to cause the well's adjusted allowable to exceed the top unit allowable for the pool.

(h) 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 South Blanco-Tocito Water Injection 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.

(i) The Commission shall, upon review of the report and after any adjustments deemed necessary, assign allowables to each well in the Project for the next succeeding month in accordance with these rules.

(j) The Special Rules and Regulations for the operation of wells in the project area shall prevail as against the Special Rules and Regulations for the South Blanco-Tocito Oil Pool, if in conflict therewith.

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

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

EDWIN L. MECHEM, Chairman

MURRAY E. MORGAN, Member

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

SEAL

ga

TOWNSHIP 26 NORTH, RANGE 12 WEST, NMPM

Section 31	S/2 N/2, and S/2
Section 32	S/2, S/2 N/2
Section 33	S/2 SW/4

(3) That Order Nos. R-1414, R-1414-A, and R-1414-B, insofar as they set forth the acreage in the Central Bisti LPG-Gas-Water Injection Project and promulgate special rules and regulations therefor, should be superseded.

(4) That the applicant proposes that each month an allowable be established for the Central Bisti Pressure Maintenance Project, said allowable to be determined by multiplying the current Northwest New Mexico normal unit allowable for an 80-acre proration unit times the number of 80-acre proration units in the pressure maintenance project, including in such computation those proration units having wells which are shut-in or [illegible].

(5) 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 ~~injection wells or~~ 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 ~~conversion or~~ shut-in or curtailment. In no event should such allowable be greater than the current normal unit allowable for the Bisti-Lower Gallup Oil Pool during the month of transfer multiplied by the well's acreage factor.

(6) That special rules and regulations for the operation of the Central Bisti LPG-Gas-Water Injection 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. Such flexibility will not, in this case, impair correlative rights.

IT IS THEREFORE ORDERED:

(1) That insofar as they describe the acreage in the Central Bisti LPG-Gas-Water Injection and promulgate special rules and regulations therefor, Order Nos. R-1414, R-1414-A, and R-1414-D, be and the same are hereby superseded.

(2) That special rules and regulations governing the operation of the Central Bisti LPG-Gas-Water Injection Project, Bisti-Lower Gallup Oil Pool, San Juan County, New Mexico, be

That Order No. R-1636 be and the same is hereby superseded.

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. 1904
Order No. R-1636-A

APPLICATION OF SUNRAY MID-CONTINENT
OIL COMPANY FOR THE PROMULGATION OF
SPECIAL RULES GOVERNING THE OPERATION
OF ITS CENTRAL BISTI LPG-GAS-WATER
INJECTION PROJECT IN THE BISTI-LOWER
GALLUP OIL POOL, SAN JUAN COUNTY, NEW
MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 a.m. on February 25, 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, and was heard de novo by the Commission on May 18, 1960.

NOW, on this ~~24th~~ day of ~~March~~ May, 1960, the Commission, a quorum being present, having considered the application and 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, Sunray Mid-Continent Oil Company, is the operator of the Central Bisti LPG-Gas-Water Injection project in the Bisti-Lower Gallup Oil Pool, San Juan County, New Mexico, which Project comprises the following-described acreage:

TOWNSHIP 25 NORTH, RANGE 12 WEST, NMPM

Section 3	SW/4
Sections 4, 5, and 6	All
Sections 7, 8, and 9	All
Section 10	NW/4, W/2 SW/4
Section 15	W/2 NW/4
Section 16	All
Section 17	N/2, SE/4, N/2 SW/4, and SE/4 SW/4
Section 18	NE/4, N/2 NW/4, and N/2 SE/4
Section 20	NE/4 and NE/4 NW/4
Section 21	N/2, N/2 SE/4, and NE/4 SW/4

(5) That while the Commission does not feel that the allowable provisions of Order R-1636 are unduly restrictive, it does recognize that pressure maintenance projects are beneficial conservation-wise and should be encouraged.

(6) That the project allowable proposed by the applicant is not warranted from the standpoint of conservation and the protection of correlative rights, nor is it necessary on the basis of economics.

(7) 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.

lift up

shall be one-half of top unit allowable for the Pool.

RULE 6. The allowable assigned to any well ~~which is used for the purpose of injection, or~~ 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 shall 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 (2000 to 1) for the Bisti-Lower Gallup Oil Pool shall be waived during such tests. The project operator shall notify all operators offsetting the proposed injection 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. ~~In the event a well is drilled and placed on injection prior to establishing its ability to produce, the allowable for said well shall be determined by the arithmetic average of the producing abilities of the offsetting producing wells at the time said well is placed on injection.~~

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 Bisti-Lower Gallup Oil Pool, whichever is less. Each such producing well shall be subject to the limiting gas-oil ratio (2,000 to 1) for the Bisti-Lower 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 into the Bisti-Lower Gallup Oil Pool within the project area to such high gas-oil ratio well. The daily adjusted oil allowable, for any such well receiving gas injection credit shall be determined in accordance with the following formula:

multiplied by the well's acreage factor,

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

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

and the same are hereby promulgated as follows, ~~effective April 1, 1960~~ effective June 1, 1960:

SPECIAL RULES AND REGULATIONS FOR THE
SUNRAY MID-CONTINENT OIL COMPANY CENTRAL
BISTI LPG-GAS-WATER INJECTION PROJECT

RULE 1. The project area of the Sunray Mid-Continent Oil Company Central Bisti LPG-Gas-Water Injection Project shall comprise that area described as follows:

TOWNSHIP 25 NORTH, RANGE 12 WEST, NMPM

Section 3:	SW/4
Sections 4, 5, & 6:	All
Sections 7, 8, & 9:	All
Section 10:	NW/4, W/2 SW/4
Section 15:	W/2 NW/4
Section 16:	All
Section 17:	N/2, SE/4, N/2 SW/4, and SE/4 SW/4
Section 18:	NE/4, N/2 NW/4, and N/2 SE/4
Section 20:	NE/4, NE/4 NW/4
Section 21:	N/2, N/2 SE/4, and NE/4 SW/4

TOWNSHIP 26 NORTH, RANGE 12 WEST, NMPM

Section 31:	S/2 N/2, S/2
Section 32:	S/2 N/2, S/2
Section 33:	S/2 SW/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 injection well or~~ any well which is shut-in or 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 5, below, or greater than the current top unit allowable for the pool during the month of transfer, multiplied by the well's acreage factor, whichever is less.

RULE 5. The allowable assigned to any injection well on an 80-acre proration unit shall be top unit allowable for the pool. The allowable assigned to any injection well on a 40-acre proration unit

Reservoir Pressure	Z	Reservoir Pressure	Z
50	.9950	800	.9000
100	.9900	850	.8938
150	.9825	900	.8875
200	.9775	950	.8825
250	.9725	1000	.8775
300	.9625	1050	.8713
350	.9563	1100	.8663
400	.9500	1150	.8600
450	.9425	1200	.8550
500	.9363	1250	.8500
550	.9300	1300	.8450
600	.9238	1350	.8400
650	.9175	1400	.8360
700	.9115	1450	.8325
750	.9050		

RULE 8. 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 9. 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.

RULE 10. The conversion of producing wells to injection, or the drilling of additional wells for injection, shall be done only after approval of same by the Secretary-Director of the Commission. To obtain such approval, the Project operator shall file proper application with the Commission, which application shall include the following:

(1) A plat showing 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 injection of gas will be confined to the Lower Gallup formation.

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 Bisti-Lower 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:

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

where:

E_g = Average daily gas equivalent of net water injected, cubic feet

$V_{w\ inj}$ = 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 upper pay-zone of Bisti-Lower Gallup Oil Pool in project area, psig + 11.5, 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 145°F expressed as absolute temperature (605°R)

Z = Compressibility factor from analysis of Bisti-Lower Gallup gas at average reservoir pressure, P_a, interpolated from compressibility tabulation below:

(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.

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

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

S E A L

esr/

BEFORE EXAMINER UTZ
OIL CONSERVATION COMMISSION
EXHIBIT NO. 2
CASE NO. 1904

SPECIAL RULES AND REGULATIONS
FOR SUNRAY MID-CONTINENT OIL COMPANY'S
CENTRAL BISTI LPG-GAS-WATER INJECTION PROJECT

IT IS THEREFORE ORDERED THAT the special rules and regulations governing the operation of Sunray Mid-Continent Oil Company's Central Bisti LPG-Gas-Water Injection Project as set forth in R-1414 dated June 5, 1959 are amended as follows:

Rule 1. The project area of the Sunray Mid-Continent Oil Company Central Bisti LPG-Gas-Water Injection Project shall comprise that area described as follows:

TOWNSHIP 25 NORTH, RANGE 12 WEST, NMPM

Section 3	SW/4
Sections 4, 5, and 6	All
Sections 7, 8, and 9	All
Section 10	NW/4, W/2 SW/4
Section 15	W/2 NW/4
Section 16	All
Section 17	N/2, SE/4, N/2 SW/4, and SE/4 SW/4
Section 18	NE/4, N/2 NW/4, and N/2 SE/4
Section 20	NE/4 and NE/4 NW/4
Section 21	N/2, N/2 SE/4, and NE/4 SW/4

TOWNSHIP 26 NORTH, RANGE 12 WEST, NMPM

Section 31	S/2 N/2, and S/2
Section 32	S/2, S/2 N/2
Section 33	S/2 SW/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 or are used as injection wells. The allowable assigned to the wells in the project area shall be the current normal unit allowable for NW New Mexico with 80-acre proration units being assigned an 80-acre proportional factor of two.

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 shut-in for pressure regulation, control of pattern or sweep efficiencies, to observe changes in pressures or changes in characteristics of reservoir liquids, or progress of sweep.

Rule 4. The project allowable may be produced from any well or wells in the project area in any proportion.

Rule 5. Conversion of producing wells to injection or the drilling of additional wells for injection shall be done only after approval of same by the Secretary-Director of the Commission. To obtain such approval, the Project Operator shall file proper application with the Commission which application shall include the following:

1. A plat showing location of proposed injection well, all wells within the project area and offset operators, locating their off-setting wells to the project area.

2. A schematic drawing of the proposed injection well which fully describes the casing, tubing, perforated interval, and depths and showing that injection of LPG-gas-water will be confined into the Bisti-Lower Gallup formation.

3. A letter stating that all offset operators to the project area have been furnished a complete copy of the application and the date of the 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.

Rule 6. Each well shall be subject to the limiting gas-oil ratio (2,000 to 1) for the Bisti-Lower 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 into the Bisti-Lower Gallup Oil Pool within the project area to such high gas-oil ratio well. The daily adjusted oil allowable for any such 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 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 ration, $P_g - \frac{I_g}{P_o}$ to be less than 2,000 cubic feet of gas per barrel of oil produced.

Rule 7. Each month the Project Operator shall within three days after the normal unit allowable for NW New Mexico has been established, submit to the Commission a Project Operator's report on a form prescribed by the Commission outlining thereon the data required and requesting the allowable for the project.

Rule 8. The Commission shall upon the review of the report and after any adjustments deemed necessary assign an allowable to the project for the next succeeding month in accordance with these rules.

Rule 9. The Special Rules and Regulations for the operation of the subject Project shall prevail against the Statewide Rules and also against the Special Rules and Regulations for the Bisti-Lower Gallup Oil Pool, if in conflict therewith.

GILBERT, WHITE AND GILBERT
ATTORNEYS AND COUNSELORS AT LAW
BISHOP BUILDING
SANTA FE, NEW MEXICO

CARL H. GILBERT
L. C. WHITE
WILLIAM W. GILBERT
SUMNER S. KOCH
WILLIAM B. KELLY

February 1, 1960

New Mexico Oil Conservation Commission
State Capitol Building
Santa Fe, New Mexico

Attention: Ida Rodriguez

Re: Application of Sunray Mid-Continent to Amend Order R 1414 as Amended by Order R 1414-A in regard to Allowables Including the Assignment and Transfer thereof for its Central Bisti LPG-Cas-Water Injection Project.

Dear Ida:

I am enclosing herewith original and two copies of the subject Application.

It would be greatly appreciated if you could arrange to have the Application set down for hearing on February 25, 1960.

Thanking you and with kindest personal regards, I am

Sincerely,

L. C. WHITE

LC
Enclosures

Well No.	Datum Elev. Depth	Datum Sea Level
1	4848	+1323
2	4800	+1354
3	4826	+1344
4	4833	+1353
5	4846	+1350
6	4832	+1379
7	4822	+1372
8	4805	+1377
9	4789	+1378
10	4763	+1382
11	4802	+1373
12	4837	+1367
13	4786	+1415
14	4782	+1417
15	4766	+1418
16	4776	+1410
17	4769	+1419
18	4803	+1404
19	4810	+1458
20	4853	+1405
21	4881	+1422
22	4774	+1432
23	4792	+1430
24	4808	+1425
25	4744	+1444
26	4733	+1434
27	4758	+1458
28	4757	+1452
29	4775	+1448
30	4776	+1453
31	4805	+1430
32	4838	+1449
33	4847	+1442
34	4766	+1473
35	4754	+1472
36	4765	+1471
37	4787	+1459
38	4740	+1500
39	4747	+1492
40	4729	+1585
41	4768	+1484
42	4766	+1474
43	4818	+1484
44	4758	+1498
45	4708	+1518
46	4709	+1524
47	4756	+1514
48	4770	+1501
49	4741	+1529
50	4724	+1536
51	4722	+1546
WI 1	4838	+1352
WI 2	4832	+1367
WI 3	4846	+1395
WI 4	4756	+1444

Well No.	Datum Elev. Depth	Datum Sea Level
WI 5	4754	+1458
WI 6	4770	+1468
WI 7	4763	+1499
GI 1	4835	+1328
GI 2	4800	+1366
GI 3	4813	+1355
GI 4	4831	+1359
GI 5	4724	+1396
GI 6	4816	+1397
GI 7	4792	+1398
GI 8	4773	+1397
GI 9	4788	+1395
GI 10	4813	+1386
GI 11	4791	+1427
GI 12	4761	+1430
GI 13	4766	+1432
GI 14	4779	+1422
GI 15	4811	+1430
GI 16	4849	+1432
GI 17	4784	+1470
GI 18	4795	+1427
GI 19	4739	+1470

DEVIATION FROM IDEAL GAS

CENTRAL BISTI UNIT, NEW MEXICO
LOWER GALLUP OIL RESERVOIR

Pressure Psia	Injected Gas	Solution Gas
50	0.9950	0.9950
100	0.9900	0.9900
150	0.9850	0.9825
200	0.9787	0.9775
250	0.9725	0.9700
300	0.9675	0.9625
350	0.9619	0.9563
400	0.9556	0.9500
450	0.9500	0.9425
500	0.9450	0.9363
550	0.9388	0.9300
600	0.9331	0.9238
650	0.9275	0.9175
700	0.9225	0.9115
750	0.9163	0.9050
800	0.9113	0.9000
850	0.9050	0.8938
900	0.9000	0.8875
950	0.8950	0.8825
1000	0.8900	0.8775
1050	0.8850	0.8713
1100	0.8800	0.8663
1150	0.8775	0.8600
1200	0.8725	0.8550
1250	0.8688	0.8500
1300	0.8650	0.8450
1350	0.8610	0.8400
1400	0.8570	0.8360
1450	0.8535	0.8325
1500	0.8495	

SUNRAY MID-CONTINENT OIL COMPANY

TULSA 2, OKLAHOMA

March 4, 1960

Mr. Elvis Utz
New Mexico Oil Conservation Commission
P. O. Box 871
Santa Fe, New Mexico

Re: Central Bisti Unit,
New Mexico

Dear Elvis:

Consistent with your telephone request today, I am attaching appropriate factors (Z), representing deviation from ideal gas for solution and injected gases in the captioned unit. The injected gas deviation factors are representative for El Paso Transmission Gas which supplies the injected gas for unit operations.

The datum elevations for the wells in the Central Bisti Unit have been requested forwarded to you from our Farmington, New Mexico office.

Yours very truly,

Thos. W. Brinkley

Thos. W. Brinkley
Chief Reservoir Engineer

TWB/gs
Attach.

OIL CONSERVATION COMMISSION
P. O. BOX 871
SANTA FE, NEW MEXICO

March 24, 1960

COPY

Mr. Charlie White
Box 787
Santa Fe, New Mexico

Dear Mr. White:

On behalf of your client, Sunray Mid-Continent, we enclose two copies of Order R-1636 in Case 1904 issued by the Oil Conservation Commission March 24, 1960.

Very truly yours,

A. L. PORTER, Jr.
Secretary-Director

ir/

Enclosures: (2)

Copies to
Hobbs +
Artesia

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. 1904
Order No. R-1636

APPLICATION OF SUNRAY MID-CONTINENT
OIL COMPANY FOR THE PROMULGATION OF
SPECIAL RULES GOVERNING THE OPERATION
OF ITS CENTRAL BISTI LPG-GAS-WATER
INJECTION PROJECT IN THE BISTI-LOWER
GALLUP OIL POOL, SAN JUAN COUNTY, NEW
MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 o'clock a.m. on February 25, 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 24th day of March, 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, Sunray Mid-Continent Oil Company, is the operator of the Central Bisti LPG-Gas-Water Injection project in the Bisti-Lower Gallup Oil Pool, San Juan County, New Mexico, which Project comprises the following-described acreage:

TOWNSHIP 25 NORTH, RANGE 12 WEST, NMPM

Section	SW/4
Sections 4, 5, and 6	All
Sections 7, 8, and 9	All
Section 10	NW/4, W/2 SW/4
Section 15	W/2 NW/4
Section 16	All
Section 17	N/2, SE/4, N/2 SW/4, and SE/4 SW/4
Section 18	NE/4, N/2 NW/4, and N/2 SE/4
Section 20	NE/4 and NE/4 NW/4
Section 21	N/2, N/2 SE/4, and NE/4 SW/4

TOWNSHIP 26 NORTH, RANGE 12 WEST, NMPM

Section 31	S/2 N/2, and S/2
Section 32	S/2, S/2 N/2
Section 33	S/2 SW/4

(3) That Order Nos. R-1414, R-1414-A, and R-1414-B, insofar as they set forth the acreage in the Central Bisti LPG-Gas-Water Injection Project and promulgate special rules and regulations therefor, should be superseded.

(4) That the applicant proposes that each month an allowable be established for the Central Bisti Pressure Maintenance Project, said allowable to be determined by multiplying the current Northwest New Mexico normal unit allowable for an 80-acre proration unit times the number of 80-acre proration units in the pressure maintenance project, including in such computation those proration units having wells which are shut-in or wells which are used as injection wells.

(5) That the allowable assigned to any 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 injection wells or 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 conversion or shut-in or curtailment. In no event should such allowable be greater than the current normal unit allowable for the Bisti-Lower Gallup Oil Pool during the month of transfer multiplied by the well's acreage factor.

(6) That special rules and regulations for the operation of the Central Bisti LPG-Gas-Water Injection 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. Such flexibility will not, in this case, impair correlative rights.

IT IS THEREFORE ORDERED:

(1) That insofar as they describe the acreage in the Central Bisti LPG-Gas-Water Injection and promulgate special rules and regulations therefor, Order Nos. R-1414, R-1414-A, and R-1414-B, be and the same are hereby superseded.

(2) That special rules and regulations governing the operation of the Central Bisti LPG-Gas-Water Injection Project, Bisti-Lower Gallup Oil Pool, San Juan County, New Mexico, be

and the same are hereby promulgated as follows, effective April 1, 1960.

SPECIAL RULES AND REGULATIONS FOR THE SUNRAY MID-CONTINENT OIL COMPANY CENTRAL BISTI LPG-GAS-WATER INJECTION PROJECT

RULE 1. The project area of the Sunray Mid-Continent Oil Company Central Bisti LPG-Gas-Water Injection Project shall comprise that area described as follows:

TOWNSHIP 25 NORTH, RANGE 12 WEST, NMPM

Section 3:	SW/4
Sections 4, 5, & 6:	All
Sections 7, 8, & 9:	All
Section 10:	NW/4, W/2 SW/4
Section 15:	W/2 NW/4
Section 16:	All
Section 17:	N/2, SE/4, N/2 SW/4, and SE/4 SW/4
Section 18:	NE/4, N/2 NW/4, and N/2 SE/4
Section 20:	NE/4, NE/4 NW/4
Section 21:	N/2, N/2 SE/4, and NE/4 SW/4

TOWNSHIP 26 NORTH, RANGE 12 WEST, NMPM

Section 31:	S/2 N/2, S/2
Section 32:	S/2 N/2, S/2
Section 33:	S/2 SW/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 injection well or any well which is shut-in or 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 5, below, or greater than the current top unit allowable for the pool during the month of transfer, multiplied by the well's acreage factor, whichever is less.

[illegible] for the purpose of injection, or which may be used for or [illegible] in accordance with Rule 7, shall be established 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 shall 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 (2000 to 1) for the Bisti-Lower Gallup Oil Pool shall be waived during such tests. The project operator shall notify all operators offsetting the proposed injection well, as well as the Commission, of the date and time such tests are to be conducted. Tests may be witnessed by representatives of the offsetting operators and the Commission, if they so desire. In the event a well is drilled and placed on injection prior to establishing its ability to produce, the allowable for said well shall be determined by the arithmetic average of the producing abilities of the offsetting producing wells at the time said well is placed on injection.

RULE 6. 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 Bisti-Lower Gallup Oil Pool, whichever is less. Each such producing well shall be subject to the limiting gas-oil ratio (2,000 to 1) for the Bisti-Lower Gallup Oil Pool, except that any well or wells within the project area producing with a gas-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 into the Bisti-Lower Gallup Oil Pool within the project area to such high gas-oil ratio well. The daily adjusted oil allowable, for any such 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 7. Credit for daily average net water injected into the Bisti-Lower 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:

$$E_g = (V_{w\ inj} - V_{w\ prod}) \times 5.61 \times \frac{P_a}{15.025} \times \frac{520^\circ}{T} \times \frac{1}{z}$$

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 upper pay-zone of Bisti-Lower Gallup Oil Pool in project area, psig + 11.5, as determined from most recent survey

15.025 = Pressure base, psi

520° = Temperature base of 60°F expressed as absolute temperature

T_s = Reservoir temperature of 145°F expressed as absolute temperature

Z = Compressibility factor from analysis of Bisti-Lower Gallup gas at average reservoir pressure, P_a, interpolated from compressibility tabulation below:

Reservoir Pressure	Z	Reservoir Pressure	Z
50	.9950	800	.9000
100	.9900	850	.8938
150	.9825	900	.8875
200	.9775	950	.8825
250	.9725	1000	.8775
300	.9625	1050	.8713
350	.9563	1100	.8663
400	.9500	1150	.8600
450	.9425	1200	.8550
500	.9363	1250	.8500
550	.9300	1300	.8450
600	.9238	1350	.8400
650	.9175	1400	.8360
700	.9115	1450	.8325
750	.9050		

RULE 8. 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 9. 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.

RULE 10. The conversion of producing wells to injection, or the drilling of additional wells for injection, shall be done only after approval of same by the Secretary-Director of the Commission. To obtain such approval, the Project operator shall file proper application with the Commission, which application shall include the following:

(1) A plat showing 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 injection of gas will be confined to the Lower 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.

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

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

esr/

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. 1904
Order No. R-1636-A

APPLICATION OF SUNRAY MID-CONTINENT
OIL COMPANY FOR THE PROMULGATION OF
SPECIAL RULES GOVERNING THE OPERATION
OF ITS CENTRAL BISTI LPG-GAS-WATER
INJECTION PROJECT IN THE BISTI-LOWER
GALLUP OIL POOL, SAN JUAN COUNTY, NEW
MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 o'clock a.m. on February 25, 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, and was heard de novo by the Commission on May 18, 1960.

NOW, on this 25th day of May, 1960, the Commission, a quorum being present, having considered the application and the evidence adduced, 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, Sunray Mid-Continent Oil Company, is the operator of the Central Bisti LPG-Gas-Water Injection Project in the Bisti-Lower Gallup Oil Pool, San Juan County, New Mexico, which Project comprises the following-described acreage:

TOWNSHIP 25 NORTH, RANGE 12 WEST, NMPM	
Section 3:	SW/4
Sections 4, 5, & 6:	All
Sections 7, 8, & 9:	All
Section 10:	NW/4, W/2 SW/4
Section 15:	W/2 NW/4
Section 16:	All
Section 17:	N/2, SE/4, N/2 SW/4, and SE/4 SW/4
Section 18:	NE/4, N/2 NW/4, and N/2 SE/4
Section 20:	NE/4 and NE/4 NW/4
Section 21:	N/2, N/2 SE/4, and NE/4 SW/4

TOWNSHIP 26 NORTH, RANGE 12 WEST, NMPM	
Section 31:	S/2 N/2, and S/2
Section 32:	S/2, S/2 N/2
Section 33:	S/2 SW/4

(3) That Order Nos. R-1414, R-1414-A, and R-1414-B, insofar as they set forth the acreage in the Central Bisti LPG-Gas-Water Injection Project and promulgate special rules and regulations therefor, should be superseded.

(4) That the applicant proposes that each month an allowable be established for the Central Bisti Pressure Maintenance Project, said allowable to be determined by multiplying the current Northwest New Mexico normal unit allowable for an 80-acre proration unit times the number of 80-acre proration units in the pressure maintenance project, including in such computation those proration units having wells which are shut-in or wells which are used as injection wells.

(5) That while the Commission does not feel that the allowable provisions of Order R-1636 are unduly restrictive, it does recognize that pressure maintenance projects are beneficial conservation-wise and should be encouraged.

(6) That the project allowable proposed by the applicant is not warranted from the standpoint of conservation and the protection of correlative rights, nor is it necessary on the basis of economics.

(7) 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.

(8) 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 Bisti-Lower Gallup Oil Pool during the month of transfer multiplied by the well's acreage factor.

(9) That special rules and regulations for the operation of the Central Bisti LPG-Gas-Water Injection 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. Such flexibility will not, in this case, impair correlative rights.

IT IS THEREFORE ORDERED:

(1) That insofar as they describe the acreage in the Central Bisti LPG-Gas-Water Injection Project and promulgate special rules and regulations therefor, Order Nos. R-1414, R-1414-A, and R-1414-B, be and the same are hereby superseded.

(2) That Order No. R-1636 be and the same is hereby superseded.

(3) That special rules and regulations governing the operation of the Central Bisti LPG-Gas-Water Injection Project, Bisti-Lower Gallup Oil Pool, San Juan County, New Mexico, be and the same are hereby promulgated as follows, effective June 1, 1960:

SPECIAL RULES AND REGULATIONS FOR THE SUNRAY MID-CONTINENT OIL COMPANY CENTRAL BISTI LPG-GAS-WATER INJECTION PROJECT

RULE 1. The project area of the Sunray Mid-Continent Oil Company Central Bisti LPG-Gas-Water Injection Project shall comprise that area described as follows:

TOWNSHIP 25 NORTH, RANGE 12 WEST, NMPM	
Section 3:	SW/4
Sections 4, 5, & 6:	All
Sections 7, 8, & 9:	All
Section 10:	NW/4, W/2 SW/4
Section 15:	W/2 NW/4
Section 16:	All
Section 17:	N/2, SE/4, N/2 SW/4, and SE/4 SW/4
Section 18:	NE/4, N/2 NW/4, and N/2 SE/4
Section 20:	NE/4, NE/4 NW/4
Section 21:	N/2, N/2 SE/4, and NE/4 SW/4

TOWNSHIP 26 NORTH, RANGE 12 WEST, NMPM	
Section 31:	S/2 N/2, S/2
Section 32:	S/2 N/2, S/2
Section 33:	S/2 SW/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 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, multiplied by the well's acreage factor, whichever is less.

RULE 5. The allowable assigned to any injection well on an 80-acre proration unit shall be top unit allowable for the Pool. The allowable assigned to any injection well on a 40-acre proration unit shall be one-half of top unit allowable for the 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 shall 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 (2000 to 1) for the Bisti-Lower Gallup Oil Pool shall be waived during such tests. The project operator shall notify all operators offsetting the proposed injection 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 Bisti-Lower Gallup Oil Pool multiplied by the well's acreage factor, whichever is less. Each such producing well shall be subject to the limiting gas-oil ratio (2,000 to 1) for the Bisti-Lower 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 into the Bisti-Lower Gallup Oil Pool within the project area to such high gas-oil ratio well. The daily adjusted oil allowable, for any such 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 Bisti-Lower 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:

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

where:

E_g = Average daily gas equivalent of net water injected, cubic feet

$V_{w\ inj}$ = 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 upper pay-zone of Bisti-Lower Gallup Oil Pool in project area, psig + 11.5, as determined from most recent survey

15.025 = Pressure base, psi

520° = Temperature base of $60^\circ F$ expressed as absolute temperature

T_r = Reservoir temperature of $145^\circ F$ expressed as absolute temperature ($605^\circ R$)

Z = Compressibility factor from analysis of Bisti-Lower Gallup gas at average reservoir pressure, P_a, interpolated from compressibility tabulation below:

Reservoir Pressure	Z	Reservoir Pressure	Z
50	.9950	800	.9000
100	.9900	850	.8938
150	.9825	900	.8875
200	.9775	950	.8825
250	.9725	1000	.8775
300	.9625	1050	.8713
350	.9563	1100	.8663
400	.9500	1150	.8600
450	.9425	1200	.8550
500	.9363	1250	.8500
550	.9300	1300	.8450
600	.9238	1350	.8400
650	.9175	1400	.8360
700	.9115	1450	.8325
750	.9050		

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.

RULE 11. The conversion of producing wells to injection, or the drilling of additional wells for injection, shall be done only after approval of same by the Secretary-Director of the Commission. To obtain such approval, the Project operator shall file proper application with the Commission, which application shall include the following:

(1) A plat showing 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 injection of gas will be confined to the Lower 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.

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

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

esr/