BEFORE THE OIL AND GAS CONSERVATION COMMISSION

OF THE STATE OF COLORADO

26.9

IN THE MATTER OF THE INVESTIGATION TO TAKE MEASURES TO PREVENT WASTE OF OIL AND GAS IN THE "D" AND "J" SANDS OF THE ADENA FIELD, IN MORGAN COUNTY, COLORADO.	CAUSE NO. 26.

Room 704, State Capitol Annex,
Denver, Colorado,
Thursday, May 6, 1954.

Met, pursuant to notice, at 10 a. m.

BEFORE:

MR. WARWICK DOWNING
MR. H. C. BRETSCHNEIDER
MR. RUSSELL H. VOLK
MR. JOHN E. CRONIN
MR. F. M. VAN TUYL,
Commissioners.

WILBUR ROCCHIO, Attorney.
D. V. ROGERS, Petroleum Engineer.
A. J. JERSIN, Deputy Director.
ANNABEL HOGSETT, Assistant Secretary.

APPEARANCES:

PATRICK M. WESTFELDT, Attorney at Law, 520 Equitable Building, Denver, Colorado;

O. F. ZIMMERMAN, JR., El Dorado, Arkansas, and BRUCE E. ROLL, Continental Oil Building, Denver, Colorado, all appearing for the Lion Oil Company.

L. A. OGDEN, Tulsa, Oklahoma, appearing for The Pure Oil Co.

[redacted]

CHARLES SHINN and JOHN A. PHILLIPS, appearing for the Colorado Interstate Gas Company.

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I N D E X

E X H I B I T S

NUMBER	FOR IDENT.	IN EVIDENCE
Lion No. 1 ✓	4	5
Lion No. 2 ✓	14	15

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P R O C E E D I N G S

MR. DOWNING: First is the Adena case. Let's first take up who all is represented here. Will you rise one after the other and give your names to the stenographer?

MR. WESTFELDT: I am Patrick M. Westfeldt, appearing for Lion Oil Company, and also for Lion Oil Company is Mr. O. F. Zimmerman, Jr., and Bruce E. Roll.

Pure Oil Company is represented here by Mr. L. A. Ogden.

MR. DOWNING: Who else is here?

MR. PHILLIPS: John Phillips and Charles Shinn of the Colorado Interstate Gas Company.

MR. DOWNING: Proper notice has been given?

MR. ROCCHIO: Yes, sir.

MR. DOWNING: The record shows proper notice and the Commission declares it has jurisdiction to proceed. We have all the appearances; everyone who wants to be heard has entered their appearance, is that right?

MR. STOCKMAR: On the possibility we might wish to participate, Ted Stockmar and John Tolleson, appearing for H. C. Carmack and C. M. Crawford, Jr. I am also appearing for McElroy Ranch Company.

MR. DOWNING: I don't mean you will be disbarred if you don't enter an appearance; we would like to get all possible appearances on our record.

All right, proceed.

MR. WESTFELDT: If the Commission please, we would like to proceed in this way. First of all, we would like to have Mr. Roll testify. Mr. Roll is the petroleum engineer with the Lion Oil Company. He will give all the factual data that has been assembled by the Engineering Committee of the operators in the case. After he has given all the factual data we would like to call first Mr. Ogden of Pure Oil Company to present his interpretations and recommendations, and Mr. Zimmerman of the Lion Oil Company to do the same if that meets with your approval.

Mr. Roll, will you come forward?

BRUCE E. ROLL

was sworn and testified as follows:

DIRECT EXAMINATION BY MR. WESTFELDT:

Q Will you please state your name and the company that you work for?

A Bruce E. Roll, Lion Oil Company.

Q What is your job with that company, Mr. Roll?

A I am petroleum engineer.

Q In connection with this proceeding I understand you have acted as Chairman for the Engineering Committee of the Adena Field operators, is that correct?

A That is correct.

Q Will you please state to the Commission your training and experience as a petroleum engineer?

MR. DOWNING: Unless there is objection, his competency will

be allowed.

MR. WESTFELDT: If the Commission please, at this time I have no idea whether there will be any opposition to this proceeding or objection to the order that the Commission might enter. In the event that there is some objection and any appeal should be taken, I think that on an appeal a person would have a right to go into all this question and I believe that even in brief form it would be advisable to have this witness and the other two make a summary of their training and qualifications.

MR. DOWNING: All right. Go ahead.

MR. WESTFELDT: Would you go ahead?

MR. DOWNING: Make it brief.

A I received a Petroleum Engineering Degree from the Colorado School of Mines at Golden, Colorado, in 1951. I was employed in June 1951 by Lion Oil Company as a petroleum engineer. I spent two years in South Arkansas with the operations down there, acting as petroleum engineer, and spent one year here in Denver, Colorado, in this region.

(A document was marked as Lion Exhibit No. 1.)

Q (By Mr. Westfeldt) Mr. Roll, I hand you a document marked Lion Exhibit 1, and ask you to tell the Commission what this is.

A The following data has been accumulated by the operators of the Adena Field and has been compiled and summarized by the Adena Field Engineering Committee. I would like to present the factual data concerning the "J" sand first, then I will present

the factual data on the "D" sand.

MR. WESTFELDT: If the Commission please, I would like to ask that this exhibit, Lion No. 1, be formally admitted in evidence and that the witness be permitted to summarize it as he just outlined.

MR. DOWNING: Any objection? If not, it is so ordered.

(Lion Exhibit No. 1 received in evidence.)

A Adena Field "J" sand factual data is listed here. Item No. 1 shows the discovery date and well. The gas discovery was Falcon Seaboard's No. 1 Snodgrass in May 1953. The oil discovery was in December 1953, Mr. Bill Tomberlin's No. 1 Cochran and also Petroleum, Inc. No. 1 Clar.

Item 2 shows the producing horizon, which is the first bench of the "J" sand at approximately a depth of 5500 to 5700 feet.

Item 3 indicates the number of wells as of May 1, 1954. This is rather approximate, 104 wells completed in the "J" sand in the oil area, 7 wells in the gas area, and 10 wells currently drilling.

MR. DOWNING: Were those all producing wells?

A Yes, sir, they are all producing wells at this time.

Item 4, the reservoir rock characteristics--

Q (By Mr. Westfeldt) Before going into these in detail, will you explain the information from which this data was taken?

A The information listed under the "Reservoir Rock Characteristics"

was obtained from the core analyses from 40 different wells that were cored and analyzed in the Adena Field, a total of approximately 873 samples that were analyzed.

The average porosity was shown to be 19 to 20 percent, and the average permeability 300 millidarcies for the horizontal permeability and 250 millidarcies vertical permeability; average total core water saturation, between 35 and 40 percent; estimated interstitial water between 18 and 22 percent; average residual oil saturation, about 10 percent.

Item No. 5 indicates the geological features of the reservoir. The reservoir is a stratigraphic trap consisting of the "J" sand deposit on the west dipping monocline with a permeability barrier on the north, south and east, defining the productive limits of the reservoir.

Attached to the exhibit is a structure map. This map was prepared by the Geological Department, Lion Oil Company, and was presented to the Engineering Committee. The Committee compared it with a similar structure map that was prepared by the Geological Department of the Pure Oil Company and the Engineering Committee adopted this structure map as being representative.

MR. DOWNING: Who does the Engineering Committee represent?

THE WITNESS: Sir, the Engineering Committee--there are engineers on the Committee that represent each operator in the field.

MR. DOWNING: All operators are so represented?

THE WITNESS: With the exception of one or two.

Q (By Mr. Westfeldt) Roughly, how many members on the committee?

A There are approximately 20 members.

MR. JERSIN: Do you know the names of the operators who do not have representatives?

THE WITNESS: I do not have that list handy, but I would like to elaborate on that. There are several operators in the field that do not have an engineering staff, and they appoint a representative which might not be an engineer and some of them do not appoint a representative for that reason. Who I had in mind was Eddie Fisher, Verne Simmons, and I believe Mr. Tomberlin, he has an engineering representative on the Committee--

Q (By Mr. Westfeldt) On your Engineering Committee?

A There is a question about that. I was notified that Mr. Ken Webb was his representative, but I couldn't verify that.

Q But with the exception of one or two of the operators, all of them actually have had representatives, whether they are engineers or not, on your committee?

A Yes, sir, that's right.

MR. WESTFELDT: Is there anything else you wanted?

MR. JERSIN: Not right now.

Q (By Mr. Westfeldt) Will you continue, Mr. Roll, with the information concerning--I think you were talking about the structure map and the data below that.

A From the structure map a dip of the "J" sand is indicated as approximately 50 feet per mile. The gas oil contact is approximately minus 1060 feet subsea, and the water oil contact approximately a minus 1140 feet subsea.

An estimate of the area of the oil zone is 6500 to 7500 acres, and an area of the gas zone between 3,000 and 4,000 acres, average thickness of the oil zone approximately 18 to 23 feet, average thickness of the gas zone is approximately 15 to 17 feet; estimated acre feet of oil zone is 130,000 to 150,000 acre feet, and the estimated acre feet of gas zone between 50,000 and 60,000; the ratio of the gas cap volume to the oil zone volume is approximately four-tenths.

Item 6--

MR. DOWNING: Let me ask, are the limits of the structure or area determined yet?

THE WITNESS: No, sir; and definitely--the east end where the gas cap lies, that is not pinned down definitely. The west end is more or less determined.

MR. DOWNING: And north and south?

THE WITNESS: The south end is left a little open. I believe the north end is fairly well pinned down.

MR. VAN TUYL: The gas area has extended about a half mile to the east since the map was prepared?

THE WITNESS: Yes, sir, that is correct. And these acre feet determinations are based on the area as shown in your

structure map; they do not take into consideration the enlarged area due to the completion of the one well there in Section 4.

Item 6 lists the characteristics of the reservoir fluids.

Q (By Mr. Westfeldt) Prior to going into the details on that, will you explain the basis of the conclusions of the Committee?

A During the month of February Pure Oil Company and Lion Oil Company had two bottom hole fluid samples taken from two different wells in the Adena Field. Both these samples were analyzed by Core Laboratories and the results of the samples were compared by the Engineering Committee and found to compare favorably and the following tabulation here of the characteristics of the fluids is taken from the analysis of those fluid samples:

Crude gravity, oil gravity, about 42 to 45 degrees API; solution gas, 569 cubic feet per barrel; saturation pressure, 1545 psig, which was the original initial bottom hole pressure. The fluid samples indicated that the reservoir fluid was saturated at the time of sampling and at the original bottom hole pressure. Formation volume factor at initial conditions is 1.391; reservoir temperature 180 degrees Fahrenheit; reservoir oil viscosity at 181 Degrees Fahrenheit, saturation pressure is .352 centipoises, and the oil viscosity at 181 Degrees, atmosphere pressure, 1.158 centipoises. Gas cap specific gravity is estimated at seven-tenths, and the gas compressibility at 1500 psi

0.88.

Item No. 7 indicates the reservoir pressure. The original pressure was 1545 psi. The Engineering Committee selected this pressure as being the original pressure in the field, since it is the highest recorded bottom measurement in the field and was taken from Falcon Seaboard's Snodgrass No. 1 well the first part of February. That was prior to--there wasn't very much withdrawal from the reservoir around that well at that time and there have been some drill stem test pressures that are higher, but the Engineering Committee feels that the actual measured bottom hole pressure is more in line than the drill stem test pressure.

On April 19, 1954, a field-wide bottom hole pressure survey was taken, in which the average or the areally weighted pressure was 1498 pounds per square inch. On April 18, 1954, all the wells completed in the "J" sand in the Adena Field were shut in. The pressure in the reservoir was allowed a 24-hour buildup and on the 19th of April they started actually taking the pressure measurements of the reservoir. Now, we selected 34 key wells to take the pressures of and did manage to reach bottom and obtain a good pressure on 30 of them. The Isobaric map is shown as a map drawn up from the results of this survey.

Also with the map is a tabulation of the wells tested and the actual pressures measured. These pressures are measured at a datum of minus-1050.

The Engineering Committee is going to recommend another such survey to be conducted in the month of July this year.

Q Mr. Roll, will you refer to your Isobaric map and just summarize for the Commission what it indicates?

A The map--the 34 wells that were picked, were picked scattered throughout the reservoir to give us a good picture of the entire field and when the pressures were obtained and checked and calculated, they were plotted on this map and contoured and each line on the Isobaric map represents a level of equal pressure in the field.

As you will note, where there aren't any wells in the gas cap in the east end there is not as much control there. We feel like with the 30 key wells we had considerable control, anyway good enough control to construct an Isobaric map which gives us a good picture of the reservoir pressure at this time.

MR. JERSIN: At what point in the "J" sand would that minus-1050 be, approximately?

THE WITNESS: The elevation, ground elevation, out there is approximately 4600 feet. So that would be--

MR. JERSIN: The center of the "J" sand?

THE WITNESS: No, sir, the datum was picked to be located at the gas-oil contact. You will notice the gas-oil contact was a minus-1060, that is average, and the bottom hole pressure datum is a minus-1050.

Q (By Mr. Westfeldt) Would you please proceed, Mr.Roll?

A Item No. 8 indicates statistical data. Cumulative oil as drawn from the "J" sand reservoir as of the 1st of May was approximately 710,000 barrels and the current gas-oil ratios are listed as a part of this exhibit and these ratios are the ratios submitted by the operators to the Engineering Committee.

Q What are the ranges of these gas-oil ratios?

A They range from 400--well, 350 to 8,000. This is not a complete list of gas-oil ratios in the field. It is just the list that the operators submitted to the Engineering Committee and it is all of the ratios that we had available at this time.

Q But they are shown on the last two pages that are attached to your exhibit?

A Yes, sir, that is correct.

Q Will you go ahead, Mr. Roll?

A Item No. 9, reservoir calculations; the oil in place, approximately 110 to 120 million stock tank barrels, and the free gas in place approximately 35 to 40 billion cubic feet figured at standard conditions. These calculations were based on the above data and were calculated by the Engineering Committee.

Item No. 10, Recovery Estimates, primary recovery, 25 to 35 percent, and by fluid injection, 50 to 60 percent. By fluid injection we mean gas, water--gas and water, or both.

MR. WESTFELDT: If the Commission please, I would next like to ask Mr. Roll to go into whatever factual data is available on the "D" sand, but perhaps before doing that some of the

members of the Commission would like to ask Mr. Roll questions about the "J" sand data, or members of the staff.

MR. VAN TUYL: Yes. The primary recovery estimate of 25 to 30 percent, that is based upon the assumption that there will be unitization and that the gas cap will be retained as at present?

THE WITNESS: Yes, sir, the 25 percent is a figure that represents more or less an uncontrolled reservoir. In other words, we feel like if the reservoir was uncontrolled--

MR. WESTFELDT: Uncontrolled and un-unitized.

THE WITNESS: Yes, sir, un-unitized. --the recovery would be probably in the order of 25 percent. Now, with unitization and without pressure maintenance of any type, we feel like that that could be raised to 35 percent. Then with the unitization and pressure maintenance it could be raised as high as 60 percent.

MR. WESTFELDT: Any further questions?

Q (By Mr. Jersin) Mr. Roll, the gas-oil ratios submitted, were those 24-hour actual testing periods, or are they taken on lesser hours and calculated through a 24-hour period?

A I can't answer about any of the other tests except those of Lion Oil Company, and those are not a 24-hour measurement. They are calculated on 24 hours. The tests vary from 6 to 24 hours. The minimum test, I would say, would be a six-hour test.

Q All of the information here concerns the "J" sand, I mean in your oil area you show 104 wells. Is that from the "J" sand?

A Yes, sir, that is completed in the "J" sand.

Q (By Mr. Westfeldt) Mr. Roll, with respect to the two sheets attached to the exhibit showing particularly high gas-oil ratio wells, will you please state whether or not these wells are being produced at that rate or being produced at all?

A Again, I can only state for the wells listed as Lion Oil Company wells. There are three that are excessive ratios, and at the present time all three of them are shut in.

MR. WESTFELDT: Any other questions concerning the "J" sand information?

(Lion Exhibit No. 2 marked for identification.)

Q (By Mr. Westfeldt) Mr. Roll, I hand you document marked Lion exhibit No. 2, and will you please state what it is, how it was prepared?

A This exhibit 2 contains the factual data on the "D" sand as in the Adena Field. This information was also prepared by the Adena Field Engineering Committee. Although the committee is more concerned with the "J" sand, the operators in the "D" sand are also operators in the "J" sand. So this information was prepared by the Engineering Committee.

MR. WESTFELDT: If the Commission please, I also ask that this exhibit be formally admitted into evidence and that Mr. Roll summarize it as the one you previously admitted.

MR. DOWNING: Any objection? If not, so ordered.

(Lion Exhibit No. 2 was received in evidence.)

A Adena "D" sand factual data. In Item No. 1 is the discovery well and date. This well is the Petroleum, Inc., L. J. Clar No. 1; discovered oil in the sand on December 1953.

The producing horizon is the "D" sand which is approximately 5500 to 5600 feet.

The number of wells as of May 1st, were 9 oil producing wells and one drilling.

Reservoir rock characteristics, Item No. 4. I might add here that these characteristics are based on the analysis of cores from seven of the nine producing wells. There are approximately 77 samples.

The average porosity, 19 percent, with the average permeability about 300 millidarcies. That is horizontal permeability. The average total core water, approximately 35 percent. Estimated interstitial water, between 20 and 25 percent. The average residual oil approximately 10 percent.

Item No. 5, geological features of the reservoir. The "D" sand reservoir is a stratigraphic trap with permeability barriers to the east, north and south. The oil and gas accumulation appears to be rather localized in relatively small areas of good sand development.

The structure, it would appear, is approximately the same as the "J" structure. If you would prepare a structure map of the "D" sand it would look similar to the "J" sand structure. Dip of the sand is approximately the same, about 50 feet per

mile. Gas-oil contact and the water-oil contact are variable. The known area of good sand development is approximately 1700 acres and the thickness approximately 10 to 20 feet.

Item No. 6, characteristics of reservoir fluid. To date, I have no knowledge of any bottom hole reservoir sample being taken of the "D" sand oil, and, consequently, the only characteristics of the reservoir fluid we have is the gravity of the crude oil, which is 39 degrees API.

Item No. 7, reservoir pressure. To date, we have no pressures available for the "D" sand. The original pressure was estimated here as approximately 1500 psi, which is a drill stem test pressure. We averaged the drill stem test pressures of the nine wells and 1500 is approximately the average of the good indicated drill stem test pressures.

Item No. 8, production statistics. Cumulative oil as of May 1st, approximately 40,000 barrels. That is also an estimated figure. We had the produced oil submitted to the Committee for some of the operators but we didn't have a complete list, so that is an estimate.

The GOR's, to date there are none available, but they are estimated to vary from 500 to 3000 cubic feet per barrel. These estimates are just by field men from the size of the flare and such. To date, we have no gas-oil ratios, actual measurements, available.

Item No. 9, no estimates of oil and gas in place have ever

been made because of the limited development to date.

MR. WESTFELDT: Any further questions that the Commission would like to ask or members of the staff with respect to the "D" sand?

MR. DOWNING: Anyone in the audience here who would like to ask any questions concerning the "D" sand?

How about you, Mr. Jersin or Mr. Rogers, any questions?

Q (By Mr. Jersin) I may have missed it, Mr. Roll. Did you tell us what the predominant source of energy was in the "D" sand?

A No, I didn't. The "D" sand has evidence of having a gas cap because gas has been recovered on drill stem tests from wells that have been completed in the "J" sand, and as I mentioned, the ratios are fairly high. They run as high as 3,000, which indicates possibly a gas cap. I would say that there is a gas cap; as to the size, I would have no idea.

Q (By Mr. Westfeldt) You say that is a primary source of the energy?

A Yes, sir. Of course, gas cap and gas in solution.

MR. DOWNING: Have the members of the Commission any questions?

MR. WESTFELDT: I have no further questions of this witness and ask that he be excused, and would like to call Mr. Ogden of the Pure Oil Company.

MR. DOWNING: Thank you very much for your clear and able

presentation.

(Witness excused.)

L. A. OGDEN

was sworn and testified as follows:

DIRECT EXAMINATION BY MR. WESTFELDT:

Q Will you please state your name and the company for which you work, your position and qualifications, Mr. Ogden?

A My name is L. A. Ogden. I am employed by the Pure Oil Company as Chief Division Petroleum Engineer. I have been engaged in the oil business since 1917, having been rated an associate petroleum engineer by the United States Bureau of Mines in 1923. Since that time I have been continuously in petroleum engineering work, some eight years with what is now City Service Oil Company and twenty-one years plus with the Pure Oil Company.

I started my experience in California, then came to Mid-Continent in 1923 and have been located at Bartlesville, Tulsa, Fort Worth, Olney, Illinois, having engineering jurisdiction over drilling and production work in, you might say, all the Middle States. I am a registered engineer in Texas, Oklahoma and Illinois.

MR. WESTFELDT: Unless there is any objection, we ask that the witness's qualifications be accepted as an expert.

MR. DOWNING: If there is no objection, they will be accepted as an expert.

MR. JERSIN: Does he know anything about the Denver-Julesburg

Basin?

Q (By Mr. Westfeldt) Your present job covers the Denver-Julesburg area?

A Yes, sir.

Q Mr. Ogden, you have heard the testimony of Mr. Roll. Have you also examined the exhibits which have been presented to the Commission?

A I have. I am a member of the Engineering Committee and participated in most of their meetings.

Q Will you please give to the Commission any recommendations and reasons therefor that you might have concerning the production in the Adena Field and methods of achieving the greatest ultimate recovery of oil?

A Well, to start with, I would like to state that the Adena operators have organized an Operators' Committee, on which each operator is represented. They have in turn--

Q This is in addition to the Engineering Committee Mr. Roll was talking about?

A Yes, I wanted to give the picture there. In addition to that, each operator was asked to name a member of the Engineering Committee and a member of the Geological Committee. Now, some people did not have engineering or geological staffs and consequently did not appoint qualified engineers or geologists. In some cases they are represented, however, by consultants, I believe, and I might say that the operators have been very

cooperative. For instance, early this month, without any order from any regulatory body, the entire field, as far as the "J" sand--I am simply discussing the "J" sand--the entire field was shut in voluntarily on Easter morning, left shut in until the following Monday, at which time bottom hole pressures on some 30 key wells were run. I think that indicates very good cooperation because it was all voluntary.

I think that no field--when you consider that the Adena Field is less than six months old, as far as the oil measures are concerned, no field that I know of--in no field has as much technical data been accumulated in that length of time. The majority of the wells have been cored, the cores have been analyzed. Practically every well has the Schlumberger log on it. We and Lion have--well, we have taken two bottom hole samples, oil samples, one of which was analyzed. Lion has taken one bottom hole sample, I believe, which has been analyzed, oil sample. Falcon Seaboard has taken a sample from their gas well, which is being analyzed.

In addition to that, there are in the laboratory now a number of core samples which are being run for reservoir studies, permeability studies as to gas, water and oil, and I know of no situation we have ever had where we have had as much factual data. Of course, it has not yet been possible to assimilate all this information and come up with the final answers. However, we anticipate having that data before too long.

The operators are conducting a study to determine the best--well, the capacity of compressor equipment necessary to gather, compress or sell or re-inject the gas. They are likewise engaged in making reservoir studies from which the characteristics of the reservoir can be definitely determined and which can be used in estimating the best possible way to produce the reservoir. Whether it should be produced by using gas injection, whether using water injection, or a combination of both, we hope to have those very definite answers in the near future.

Now, as to recommendations, I see no reason, unless you gentlemen want me to elaborate on some of these figures which Mr. Roll has so ably presented. However, I might expand on it. His figures are in the nature of percentages of oil in place which might be recovered under various means. Now, he testified that there is estimated to be from 110 to 120 million barrels of stock tank oil in place, and under primary production you might recover 25 to 35 percent of this.

Now, to give you an idea of what that means--I think I have got it here--25 to 35 percent might be from 27-1/2 million to 37-1/2 million barrels of oil. Now, if unitization can be effected and pressure maintenance installed, you might recover from 50 to 60 percent of the oil in place, which would be in the order of 55 million to 72 million barrels of oil. I am just giving you that figure because it looks a little better than the mere percentages.

Now, this field is a stratigraphic trap having a large gas cap. Under unrestrained production, non-cooperative production, term it what you like, it is probable that the gas in the gas cap will be dissipated. If the pressure in the gas cap is pulled down to a point which will allow migration of the oil into the unsaturated portion of the sand now containing gas, there will be a very serious loss because that oil will be absorbed just as water is absorbed by a sponge, and we know, with our present knowledge, no way of recovering it. So that it seems to me it is of great importance that we keep this field under control to the extent that--well, the most, I believe--while our studies are not complete, I think certainly in my own mind I have concluded that the most effective way to produce it is by pressure maintenance, possibly using water on the down dip side and gas reinjected into the gas cap.

Now, it is fairly evident that there is no effective water drive on the flanks of this structure. There is some water encountered there but the bottom hole pressure map showing a pressure reading of some hundred pounds across the field would indicate that the water drive is not effective in maintaining the pressure.

I think that is the characteristic of the field in this general area.

Q Mr. Ogden, prior to the development of a pressure maintenance system or unitization, is it your opinion that it is

necessary to keep the reservoir and the reservoir energy in as good condition as possible until those methods are determined?

A It is, yes, sir. The studies are being pushed and if it appears advisable that the pressure maintenance be pursued, of course, many calculations are necessary to determine the participating percentage of each operator and of each royalty owner and each person interested in the block. Some equitable determination will have to be made of that. We haven't gottento that point yet, of course.

Now, if the field suffers uneven withdrawals, there will be a tendency--

MR. DOWNING: That is, withdrawals of oil or gas, or both?

A Of oil, I am speaking now. --there will be a tendency for the gas cap to finger out and cone into wells adjacent, which will lead to excessive production of gas and loss of pressure.

The same thing is true with too heavy withdrawals. There will be probably water coning in some area because generally this water underlies most of this area and that will give trouble.

Now, in order to properly maintain the reservoir in as near its initial condition as possible, I believe we have got to withdraw evenly over the field at a rate so this well and this well and the other well (indicating on map) are all producing at the same rate and at an efficient rate, which will not constitute excessive depletion of pressures.

Q And this would be necessary to avoid this dissipation of

reservoir energy?

A Right. We want to keep as much of the energy in there as possible because if it is dissipated prematurely, then we have got to build it back up or we can not sustain it at an efficiently high level. If we can maintain pressure in the reservoir sufficiently high, it is very possible that we can produce the majority of the oil that will be produced by flowing. I know of fields, one of which Pure is interested in, that was discovered some 25 years ago and the discovery well is still flowing, has been flowing continuously because of an effective water drive and because the water produced was reinjected.

The same thing is true with East Texas. Many of the wells over that field have produced tremendous quantities of oil. Many of the wells there are still flowing. That is simply an indication of what can be done if it can be done soon enough.

Our Engineering Committee considered this problem and after weighing the evidence that we have and taking into consideration our own experience with similar areas and that sort of thing, we believe that the maximum efficient rate or the most efficient rate for the Adena Field under present conditions is the order of 100 to 150 barrels per well per day.

Q This is from the "J" sand?

A From the "J" sand I am speaking of. And 150,000 cubic feet of gas.

Q Which would permit a gas-oil ratio of--?

A Of 1250, which is higher than the ratio in most of the wells but we do not believe that an operator should be penalized too severely who has a well that will make a ratio of, say, a thousand to twelve hundred barrels. These things have got to be handled so as not to work a hardship on anybody. We would therefore recommend that a production rate of 125 barrels of oil and 150,000 cubic feet of gas per well per day be set for the "J" sand wells in the Adena Field.

MR. DOWNING: How much gas?

A 150,000. Such rate to continue for a period of six months, pending completion of field studies. Now, I might say that that is a recommendation from the Engineering Committee and the following companies were represented at this meeting in which this recommendation was made, and they concur in this recommendation:

Pure Oil Company, Lion Oil Company, Shell Oil Company, U. S. Smelting and Refining, Petroleum, Inc., Falcon Seaboard, Bill Gaddes, Union Oil Company, S. D. Johnson and Frank Baumgartner.

Q Mr. Ogden, this is also your opinion as an expert?

A That is my opinion.

Q As to the method of extracting the greatest ultimate amount of oil from the "J" sand, is that correct?

A It is.

MR. DOWNING: What operators did not concur, if any?

THE WITNESS: There was no one who did not concur. There was a representative of the British American Oil Company there who said they were not going to make any statement, be included in any such statement. I believe, however, they said they would not oppose it.

MR. VAN TUYL: Do they have any production in the field?

MR. ROGERS: They have one well. In the major part of that field it is the Colorado State C-1, I believe.

MR. BRETSCHNEIDER: E-2.

MR. ROGERS: In the center of the field they have Colorado State C-1. That well is located in Section 7, 1 North 57.

MR. VAN TUYL: And they do have production?

MR. ROGERS: And they do have some production there in the northwest part of the field which is outside of the map, your isobaric map shows here.

THE WITNESS: That is "D", I believe, isn't it?

MR. ROGERS: Yes, sir.

Q (By Mr. Westfeldt) The list of operators that you mentioned represents the greatest percentage of the acreage involved?

A Yes, sir.

MR. VOLK: There was no opposition whatsoever to your report, as such?

THE WITNESS: No, sir; not in the Engineering Committee, at least.

MR. JERSIN: Are there some scheduled bottom hole pressure

or gas-oil ratios planned by this Engineering Committee within six months?

THE WITNESS: We plan to take another bottom hole pressure survey approximately 90 days after the previous one, which was the 1st of April or first week in April, I believe.

MR. BRETSCHNEIDER: Mr. Ogden, how far do you think you will get toward unitization by the end of six months, or is that a fair question now?

THE WITNESS: Well, I don't know. I hope we will know that we either are able to unitize or we are not able to unitize by that time.

MR. BRETSCHNEIDER: In connection with your gas-oil ratio and the oil production, do you think you know yet the dividing line between the gas cap and the oil?

THE WITNESS: I think we know the dividing line between the gas cap and oil cap fairly well. That is not an exact line. It is a transitional zone probably in there. I don't know that we know the outer limits of the gas cap yet or, as far as that is concerned, the exact outer limits of the oil.

MR. BRETSCHNEIDER: You mean the outer limits of the oil on the west and the gas on the east?

THE WITNESS: Yes.

MR. BRETSCHNEIDER: I was more interested in the other edge of the oil and the gas, the east edge of the oil and the west edge of the gas.

THE WITNESS: Well, I think we can define that fairly well, yes, sir.

MR. VAN TUYL: Isn't it true there is an overlap of the gas cap on the oil belt?

THE WITNESS: There is an overlap, yes, sir.

MR. WESTFELDT: Any further questions?

MR. DOWNING: Anyone in the audience wish to ask Mr. Ogden any questions? Is there anyone here--perhaps I will ask the question although it may not be altogether fair--is there anyone here who disagrees with the conclusion or recommendation made by Mr. Ogden?

MR. ROCCHIO: Are you making any recommendations for the "D"?

THE WITNESS: No, sir, the other gentleman will.

MR. WESTFELDT: We will have another witness to cover that point.

MR. CONWAY: Conway of British American Oil. We do not favor an oil allowable at this time.

MR. ROCCHIO: Do you favor an MER?

MR. CONWAY: We have only three wells in there, all recently completed, and we haven't formed an opinion as yet.

MR. VOLK: Your statement, then, is that you have no opinion at present; it isn't a question of allowable, is it?

MR. CONWAY: We don't favor proration at this time.

MR. VOLK: I want you to clarify yourself there because

this hasn't anything to do with allowable or proration.

MR. JERSIN: On market demand, that is.

MR. VOLK: This is nothing except an MER recommended by an Engineering Committee. You are not opposed to that, are you?

MR. CONWAY: As specified, 125 barrels and 150,000, we wouldn't concur with that particular volume at this time. We may have some other opinion later on, as soon as we compile our data, as to another figure other than 125 and 150,000.

MR. BRETSCHNEIDER: You don't have any opinion today?

MR. CONWAY: No, sir, not today. Our studies aren't completed.

MR. ROCCHIO: Do I understand you do have a representative on the Engineering Committee?

MR. CONWAY: Yes, sir, we do.

MR. DOWNING: That formula that you presented, would that in any way penalize the owners of the gas area in favor of the owners of the oil area?

THE WITNESS: Well, at the present time, of course, there is no outlet for the gas anyway, right at the moment. So in that respect I do not see that it would penalize them. Of course, if a gas market is developed, it is possible to determine by formula a ratable volume withdrawal from the reservoir; that is, you take out so many barrels of oil which occupies so much space under certain conditions and you have got so much gas over here, you can take out that much gas, I would say.

MR. DOWNING: In other words, that would be a matter to determine when the occasion arises?

THE WITNESS: Well, that would be a matter very easily determined if the occasion arises, yes, sir.

MR. BRETSCHNEIDER: But your unit plan, Mr. Ogden, doesn't contemplate that type of withdrawal, does it?

THE WITNESS: No, sir. If the field were unitized then I can't say now just what disposition might be made of the gas and the oil; possibly if it were unitized it would be possible to take the gas that you are producing down here with the oil and put it in the gas cap, which you can not do without unitization because you can't take John Smith's office and put it in Tom Jones' well. You would be paying double royalty.

MR. BRETSCHNEIDER: On that basis all the gas area owners would be in the unit on a basis which would have to be determined before the unit were completed?

THE WITNESS: Yes, sir, and they would participate even though no gas was taken out.

MR. BRETSCHNEIDER: Or no oil out of their property?

THE WITNESS: Or no oil. They would participate ratably in anything sold out of the field.

MR. DOWNING: If we made the order according to your recommendation, what would be the relative effect in the way of conservation between that order and, say, the unitization?

THE WITNESS: Well, I would say this, that unitization

would be preferable were it possible to get it. We can't get that immediately, but I think that it would be a cooperative order that would certainly sustain our reservoir conditions until this unitization could be accomplished and it would be a fair withdrawal, one well as compared to another or one operator as compared to another, where without something like that there is nothing to prevent a man bleeding off his neighbor.

MR. DOWNING: Any questions from the engineering staff or the attorney? Any more questions from the Commission?

Thank you very much.

MR. JERSIN: It wasn't of the witness, Mr. Chairman. I would like to direct a question to Mr. Conway, Mr. Chairman.

MR. WESTFELDT: Would it be proper--we have some more testimony on this matter and maybe it would be proper to have Mr. Zimmerman go through with his testimony first, then if you wanted Mr. Conway sworn as a witness you could do that. Whichever way you want to do it, it doesn't really matter to me. We haven't quite finished.

MR. JERSIN: It won't be much. I would just like Mr. Conway to pinpoint his objection a little bit more. Now, you believe that an excessive rate of production in a gas cap type of field could cause waste?

MR. CONWAY: Well, as I say, I haven't an opinion formulated on the evidence presented here today on information compiled from your wells.

MR. JERSIN: Your objection is, you think probably 150 barrels per day would be too low a rate of production?

MR. CONWAY: I am not at this time ready to make such a statement. I haven't all the evidence as yet.

MR. JERSIN: You do believe that this type of reservoir could be harmed by excessive production?

MR. CONWAY: Yes, I do.

MR. JERSIN: Thank you.

MR. DOWNING: Mr. Conway, if you want this as evidence you ought to be sworn.

MR. JERSIN: Well, he directed a question to the witness, or made a statement.

MR. DOWNING: You may proceed and finish your case, then we will ask Mr. Conway.

O. F. ZIMMERMAN, JR.

was sworn and testified as follows:

DIRECT EXAMINATION BY MR. WESTFELDT:

Q Would you please state your name, the company you are employed by and your position with that company, and then something about your training and experience?

A My name is O. F. Zimmerman, Jr. I am employed by Lion Oil Company. I graduated from the University of Kansas in 1942 with a Bachelor of Science in Petroleum Engineering. And thereafter going to work immediately for Lion Oil Company in El Dorado, Arkansas. After two years of employment as a petroleum engineer

and approximately two years of service in the United States Army I returned to the University of Kansas, and in 1947 received a Master's Degree in Petroleum Engineering. Since that time I have been continuously employed by Lion Oil Company located in El Dorado. My title at this time is Chief Reservoir Engineer.

Q And your work and studies have included the studies of the Adena Field which is now being considered by the Commission, is that right?

A Yes, sir.

Q And you have heard the testimony that has previously been given this morning, is that correct?

A Yes, sir, I have.

Q And, in addition, you have examined the exhibits which have been submitted to the Commission?

A Yes, sir.

Q Now, will you please state what recommendations you have as the proper method of extracting the greatest amount of oil from this reservoir, and in making your remarks, I wish you would point out to the Commission when your remarks are directed to the "J" sand and when your remarks are directed to the "D" sand.

A I would like to make some remarks first about the "J" sand. The "J" sand reservoir has been shown to have a very large gas cap. The reservoir oil also contained 569 cubic feet of gas in solution in the oil initially. The principal sources of natural energy in the reservoir are the expanding gas cap and expanding

solution gas. This is definitely, then, a rate sensitive reservoir.

Q Will you explain what you mean by that?

A I mean by a rate sensitive reservoir that the ultimate recovery will have a direct relation to the rate of withdrawal from the reservoir. In order to obtain the greatest ultimate recovery in the absence of some type of fluid injection pressure maintenance program, it is my opinion that the rate of withdrawal must be restricted and controlled in order to minimize gas coning and gas channeling and by-passing of gas.

Q All of which would result in what?

A Gas coning, channeling and by-passing, of course, occurs when a reservoir is being produced inefficiently and excess gas is being produced per barrel of oil produced. Gas coning and channeling--

MR. VOLK: That would result in waste, wouldn't it?

THE WITNESS: Yes, sir, it would; it would definitely result in waste. Gas coning and channeling can't be completely eliminated from a reservoir of this type. It is definite, however, that by restricting the rate of withdrawal those effects can be minimized. That, of course, is what we would like to do. The maximum rate at which Adena Field wells could be produced is not subject to precise mathematical calculation. We, however, have examined all of the data and have come to certain conclusions based on that examination and our experience in other reservoirs of similar characteristics and have concluded that the recommended

rate of 125 barrels of oil per day and 150,000 cubic feet gas limit will be an efficient rate of producing.

MR. DOWNING: Should that gas limit be on a well basis or lease basis?

THE WITNESS: In order to obtain the maximum benefit it should be on a well basis. I believe that such a rate will conserve natural reservoir energy by minimizing gas coning and channeling and by-passing and that it will promote an increase in the ultimate recovery of hydrocarbons in the reservoir. Therefore, Lion Oil Company wishes to concur with the recommendations that have been made concerning the 125 barrel oil rate and the 150,000 cubic foot gas rate, and we wish further to recommend that the Commission order quarterly gas-oil ratio tests on each individual well and that those tests be used for the purpose of establishing rates for the next quarter.

Q (By Mr. Westfeldt) Mr. Zimmerman, Lion has also been a participant in the surveys and negotiations leading toward gas-gathering lines, unitization, and things of that nature, is that correct?

A Yes, sir, we are represented on each and every committee that has been formed to study the field.

Q As I understand, it is also your opinion that your recommendation is directed towards avoiding waste, particularly until the unitization program and fluid injection systems are developed?

A The most desirable thing that could happen, in our opinion,

would be to be able to unitize the reservoir, and, of course, that is what we are hoping to accomplish. It takes a long time, so to speak, to accomplish that sort of a project, and in the meantime we would like to conserve as much of the natural energy as possible.

Q The remarks that you have made to this time, as I understand it, are directed to the "J" sand?

A To the "J" sand only.

Q The reservoir. Now, do you want to add any more to that at this time, or would you like to go ahead and explain your recommendations with respect to the "D" sand?

A I have nothing further to add.

Q Then will you please make whatever suggestions or recommendations you have with respect to the "D" sand?

A The "D" sand reservoir is very small in size when related to the size of the "J" sand reservoir. Its ultimate size, of course, is not known at this time, but it is apparent that it will contribute a relatively small amount to the total ultimate recovery from the Adena Field. The lenticular nature of the oil and gas saturated sand in the "D" Adena Field and the lack of appreciable producing history make it very difficult to estimate future reservoir performance at this time. Only nine wells have been completed as producers in the "D" sand. However, there has been a total of 34 wells which have found porous and permeable "D" sand in the area. At least six of those wells

have found gas productive sand only and several wells have found on drill stem test the sand is productive of water only. Accurate gas-oil ratios are not available at this time in the "D" sand. They vary, the estimates vary, from 300 cubic feet per barrel, in that order, to around 3,000 cubic feet per barrel. The presently available data leads me to the conclusion that gas cap expansion will be a major portion of the natural energy in the "D" sand. Also, the fact that a good many drill stem tests were made with water production only makes me feel that at least locally there will be some amount of water drive in the "D" sand. I think that the water drive will be local. I don't think that the aquifer is large enough to completely sweep the reservoir with natural water drive.

Based on those observations, then, and on the factual data that we have at this time, it is my opinion that the "D" sand is a rate sensitive reservoir, also, and that unrestricted withdrawals in the "D" sand will have the same effect on ultimate recovery as would be observed in the "J" sand. I believe that restricting the rate of withdrawal from the "D" sand will be in the interest of conservation and that it will increase the ultimate recovery to be obtained from that reservoir.

Lion Oil Company, then, recommends that the same oil and gas rates be permitted for the "D" sand as were recommended for the "J" sand, that is, 125 barrels of oil per well per day, with a gas limit of 150,000 cubic feet per well per day.

MR. JERSIN: That would be for a six-month period?

THE WITNESS: We are willing to make the recommendation for as long as it appears advisable, then ask for another hearing when it appears it should be changed.

MR. DOWNING: Is that the recommendation of the committee or simply your own?

THE WITNESS: That is Lion Oil Company, or my own recommendation.

MR. DOWNING: Has the Committee made any study of the question at all?

THE WITNESS: The Committee has not made a joint recommendation for the "D" sand.

MR. DOWNING: Your idea, until you know more about it, that that would be a fair order to make on the premises at this time?

THE WITNESS: Yes, sir.

Q (By Mr. Bretschneider) Mr. Zimmerman, if I remember correctly, you said you recommend 125 barrels of oil a day and 150,000 cubic feet of gas for the "J" sand and that the order contain a provision requiring new gas-oil ratios every three months?

A Yes, sir.

Q And that the new gas-oil ratio would then be used as a basis for the next three months?

A Yes, sir.

Q If I remember correctly, Mr. Ogden suggested that whatever order is issued now would be good for six months. Is there a conflict there in your recommendations, or am I not correct?

A I don't believe Mr. Ogden's recommendation included the recommendation for gas-oil ratio tests, I am not sure of that. That is the way I recall the testimony.

MR. OGDEN: I didn't mention a gas-oil ratio but we concur in Mr. Zimmerman's recommendation both as to the gas-oil ratio and as to the "D" sand.

MR. VOLK: Individually or as the Committee?

MR. OGDEN: As the Pure Oil Company.

MR. DOWNING: Any questions from those present who are interested? Any questions from our staff? Any questions from members of the Commission?

MR. WESTFELDT: If the Commission knows of any other information they would like to get from us, we would be glad to furnish it.

MR. DOWNING: Any other information anyone present would like to have from this witness?

Q (By Mr. Van Tuyl) Isn't it true there is a little "D" production at the end of the main Adena Field, in addition to this production from the small field to the northwest?

A Yes, sir, there is. It is, oh, I believe you might call it the southwest flank of the "J" sand reservoir.

Q You are making no recommendations regarding that, or are

including it in the recommendations for the main Adena Field?

A I am including it, yes, sir.

MR. WESTFELDT: That is all we have.

Q (By Mr. Jersin) Mr. Zimmerman, do you think it would be proper to recommend some type of bottom hole pressure survey for the "D" sand?

A Yes, sir, I do. I think that the operators will take bottom hole pressure surveys in the "D" sand. I think that the reason they have not been taken is because the "J" sand so overwhelms it in importance that all efforts have been directed toward examining the "J" sand so far. We will take bottom hole pressure surveys in the "D" sand.

MR. DOWNING: Anyone else? Thank you.

(Witness excused.)

MR. DOWNING: Would anyone else like to offer any evidence or make any statement or argument before we close this case?

MR. SHINN: Charles Shinn of the Colorado Interstate Gas Company, and I would like to state our position with regard to the Adena Field.

MR. DOWNING: Do you wish to make a statement of it or give evidence concerning it?

MR. SHINN: Make a statement of it.

MR. DOWNING: Go ahead.

MR. SHINN: Our position in this case, if the Commission pleases, is similar to that which we expressed in the recent

Little Beaver hearing. We are, as you know, engaged in the business of purchasing, transporting and re-selling natural gas. We are quite desirous of purchasing gas from the Adena Field as well as from Little Beaver and using such gas to augment our supply into Denver as well as to the town of Brush.

In addition to that, we are proposing to supply the City of Fort Morgan with natural gas in order to construct our line from your main lateral coming out of Hugeton into Denver. We propose to build the line from that lateral on to the Little Beaver Field to Adena, thence to Fort Morgan.

As I say, we are interested in purchasing gas from Adena along with the Little Beaver gas. However, in order to purchase Adena gas it is quite important that we also have a commitment for gas from Little Beaver. Purchasing gas from either one of the fields separately will not justify the installation of a line into Adena or into Little Beaver, or even supplying Fort Morgan.

We have been conducting negotiations with both the independent operators in Adena and Little Beaver for some time, as well as with the major companies and the basic terms and conditions of our contract which we have presented to those parties have been generally acceptable. As a matter of fact, the contracts have been drafted a number of times and we feel that we have a form of contract now which will be acceptable.

These contracts which we have prepared are, we feel, as

fair as we can make them. The contracts give the operators the right to return all gas to the formation for repressuring if they so desire. It also gives them a right to operate a gasoline plant for the extraction of liquids for the ultimate recovery of products from the reservoir. It provides for lease operations, and that type, usual surface operation and lease use as well as furnishing gas to the lessors.

Under our contract we will also agree to purchase all casinghead gas which may be produced in the field providing that it is produced on a uniform rate each day and throughout the month.

Our desires in this matter are similar to the Commission's, that we are interested in producing all the oil possible from the field. We are likewise interested in purchasing all of the gas that we can get from the field. However, our motive is somewhat selfish in that we prefer a longer life in order to justify the economics of our pipe line. We can not justify building a pipe line which would deplete the field in a matter of a few years and then have to abandon our line.

With the rights granted in our contract for repressuring, our project is feasible. In addition to purchasing all of the casinghead gas which may be produced in the field and available at a common point in the field from the outlet of a gasoline plant, we will likewise agree that if there is a gas well located in the field, to purchase at the rate of one MCF

per day for each 10,000 MCF of initially recoverable reserves. That purchase from gas wells would, of course, be subject to the rules and regulations of the Commission. Certainly we would not obligate ourselves to go in and purchase from a gas cap well at that rate, assuming that it would exceed the allowable as established by the Commission.

In order to accomplish the construction of our line, as I stated before, it is necessary that we do have a dedication to us of a majority of the gas in both Little Beaver and Adena Fields before we can proceed. Once we receive those contracts we will then be in position to advise the City of Fort Morgan that the contract has been signed. We will then file before the Federal Power Commission for a certificate to authorize us to install the facilities. In the event we can get contracts signed by the 1st of July and get our papers prepared for the Federal Power Commission, we feel that we will be in a position to commence the purchase of gas from Adena during the month of October this year.

Now, if we do not get these contracts signed by the 1st of July, the chances are it will be next spring, we will have to wait for spring before construction rather than try to construct during the winter.

I believe that states our position.

MR. DOWNING: Any questions anyone wishes to ask?

MR. K. D. SHEPPARD (Continental Oil Company): I would

like to ask in any current draft of this contract concerning the Little Beaver area, if the clause is still in there that if the rate of production of gas from the field falls below a certain amount and gas is being used for repressuring, there is a payment to Colorado Interstate of some stipulated amount.

MR. SHINN: That is correct. That provision is still in our contract. However, from our own standpoint we do not anticipate that the operators will be penalized by that provision for the reason that we are tying on Little Beaver and Adena and any other gas which is feasibly economical to connect in the general area, and the provision that you are referring to only applies if we are purchasing on that pipe line less than five million feet of gas. That is our entire extension from the Denver lateral clear to Fort Morgan. If we are getting five million feet from anyone there would be no penalty.

Now, you will not have a penalty on that particular provision if you are furnishing to us at least 50 percent of the residue which you have available from the Adena plant; it would not apply then if we are still purchasing even from other sources at least five million feet a day. That provision has been taken care of and we do not anticipate penalties being made.

MR. BRETSCHNEIDER: What is the penalty?

MR. SHINN: The penalty is at the rate of six and a half cents per MCF when the producers are furnishing gas less than five million, in accordance with the contract.

MR. VOLK: Is it necessary to have that penalty in there? I mean is there a calculated risk so great on a pipe line? How far do you have to build this pipeline?

MR. SHINN: The exact mileage on there, I would say it is somewhere around 75, 80, 100 miles. But what we are looking at there, with five million feet of gas per day moving into our line, the facilities can be justified and we can show a break-even on it.

MR. VOLK: I mean, do you think that a company the size of Interstate Gas Company could take a calculated risk of that amount without subjecting the operators to a penalty of that type? I think it is an unfair provision in your contract.

MR. SHINN: Well, of course, we are giving the operators the option of returning every foot of gas back to the sand, and likewise we are taking on the obligation of furnishing Fort Morgan with gas, and certainly the town of Fort Morgan itself will not justify, the quantity of gas which they will require would not by any means justify the extension of a pipeline there. So the only way that we can do it is to get the operators to agree to sell us so much gas in order that we can justify the installation of a line and where we give the operator the right to return 100 percent of his gas back to the formation, with that type of provision in our contract we just can't justify it any other way.

MR. BRETSCHNEIDER: Is five million average rate?

MR. SHINN: Yes, sir.

MR. BRETSCHNEIDER: What is the peak estimate?

MR. SHINN: We will build our pipe line to purchase all the gas which the producers tell us they have available. But if the producer has 15 million a day in the Adena Field, he has a right to return--and we purchase no gas from anyone else--he can return ten million back to the formation without penalty.

MR. VOLK: That would mean free gas any place that you would pick it up along that line?

MR. SHINN: Yes, sir, as long as it is not delivered from our main line into the lateral; if it is gas which we purchase on the lateral and feed into the line, that applies against the five million feet.

MR. DOWNING: Anyfurther questions?

MR. WESTFELDT: Gentlemen, I assume the Commission will want to take this Adena matter under advisement, and in summary we request that the recommendations that have been made be granted.

MR. DOWNING: Any further testimony in this Adena case?

Anyone anything further to say?

If not, the hearing is closed.

(At 11:40 a. m., May 6, 1954, the hearing was closed.)

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